April 28, 1936. W. LINDHORST 2,039,175

GAS GENERATOR EQUIPPED WITH ASH REMOVAL MEANS

Filed April 9, 1929

Fig. 1.

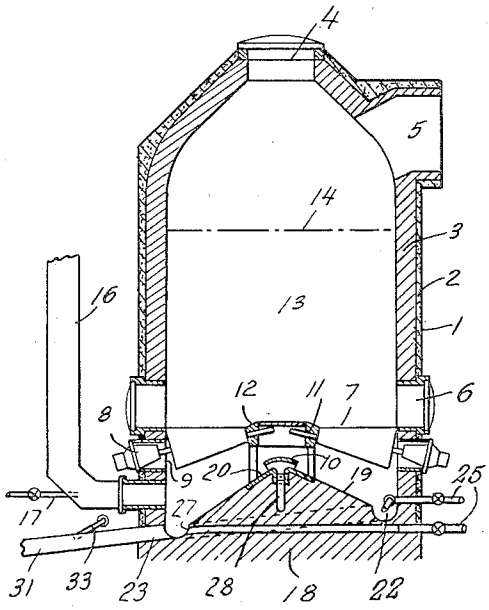


Fig. 2.

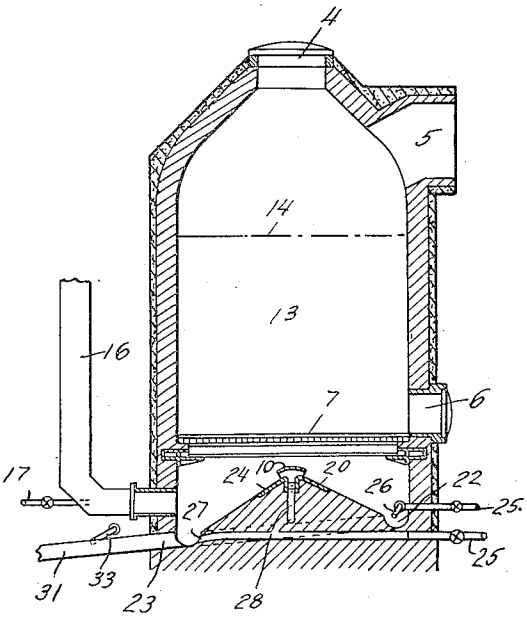
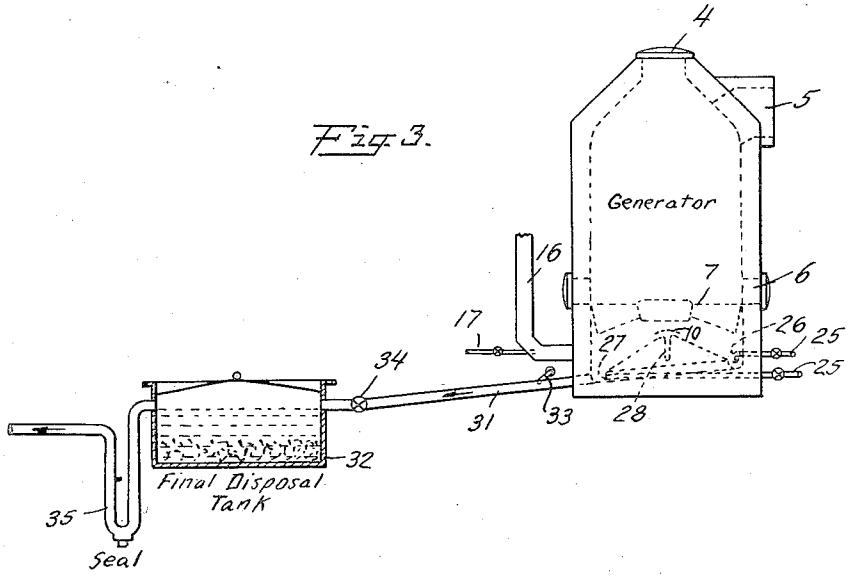


Fig. 3.



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GAS GENERATOR EQUIPPED WITH ASH REMOVAL MEANS

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4 Claims. (Cl. 48—69)

This invention relates to the removal of ashes from combustible and non-combustible gas generators and more particularly to the continuous removal of ashes from a combustible gas generator such as a water gas generator. The term "ashes" is used herein in its generic sense and is intended to include ash, clinker and other like matter which may drop from the fuel bed into the ash pit of the generator during the combustion of fuel therein or during the reaction of fuel in the generator with steam or other gas to produce a combustible gas.

One object of this invention is to provide a gas generator with automatic means for continuously removing ashes therefrom. Another object is to provide a process for the removal of ashes from gas generators which can be efficiently practiced to continuously remove ashes so that shut-downs of the gas generator for this purpose is obviated. Still another object is to provide a gas generator with automatic ash removal mechanism which requires little or no attention on the part of the operators, thereby permitting more economical operation of the gas generator.

Heretofore it has been customary to periodically discontinue the operation of the gas generator to remove accumulation of ashes therefrom. This was generally accomplished by manually raking or otherwise removing the ashes from the ash pit of the generator. In order to make the period within which the gas making operation was discontinued to remove ashes as short as possible it has been proposed to provide generators with ash pits having inclined or hopper bottoms so that the ashes would settle down the inclined bottom to the lowermost point of the bottom and thus permit ready removal from the pit through the ash door positioned at this point. Such hopper or inclined bottoms of necessity have to be positioned in cellars or beneath the operating floor of the generator. Accordingly, this type of ash pit cannot be adapted to generators which are housed in buildings not having cellars or sub-floors. Further the hopper bottom type of ash pit cannot be adapted to the usual gas generating sets without involving extensive alterations in such sets.

The present invention provides ash removal mechanism of simple and rugged construction which can be adapted to existing machines or sets without involving major changes in the construction of such sets, and has no moving parts, thereby enhancing the effective life thereof and eliminating the necessity for frequent repairs or replacements. Further, the operation of this ash removal mechanism is preferably continuous and removes the ashes as they drop from the fuel bed, thus avoiding the necessity for discontinuing the gas making operation to remove ashes and thereby increasing the gas making capacity and efficiency of the set.

According to this invention a gas generator is provided with a plate, preferably conical, positioned on the base of the generator and having the vertex of the plate extending to a point below the grate. The grate may be, for example, of the rotatable conical section type, as disclosed in the co-pending application of F. W. Steere, Serial No. 233,471, filed November 15, 1927, or of the stationary type shown in the co-pending application of F. W. Steere, Serial No. 630,676, filed April 7, 1923. The vertex of the plate as above indicated is situated immediately below the grate while the base thereof is positioned on the base of the generator and is formed with a trough preferably contiguous to the sides of the generator This trough is inclined with respect to the base of the generator so that the discharge outlet therefrom communicates with a discharge outlet provided in the base of the generator. Sprays extending through the center of the conical plate and arranged to provide a flow of liquor over the vertex down the sides of the plate and positioned through the sides of the generator to cause a flow of liquor in the trough are connected to a suitable source of water, waste, or other liquor. The aforementioned discharge outlet from the generator is connected by a valved pipe with an ash disposal tank, to which is also connected a suitable seal permitting flow of liquor therethrough but maintaining the system gas tight. Preferably, a spray is also provided in the pipe connecting the tank with the discharge outlet to insure satisfactory flow of liquor containing ashes therethrough.

The ashes and other material dropping through the grate onto the conical plate are caused to settle into the trough by the liquid flowing thereover. The sprays function to provide a flow of liquor through the trough carrying the ashes therein from the trough, through the discharge outlet into and through the connected pipe to the disposal tank, in which tank the ashes settle, the liquor flowing out through the seal. At intervals the ashes may be removed from the tank by any suitable mechanism.

Accordingly, this invention involves the provision of an ash receiver below the fuel bed of a gas generator in combination with means for causing the ashes on the ash receiver to pass

through a discharge outlet in the generator and also involves a process which comprises passing into the generator a stream of liquor arranged to receive ashes dropping from the fuel bed of the generator and withdrawing the stream of liquor containing the ashes from the generator.

Other objects and advantages will appear from the following detailed description taken in connection with the accompanying drawing, in which—

Fig. 1 is a vertical section partly in elevation of a water gas generator provided with a grate of the rolling type and illustrating a preferred embodiment of this invention;

Fig. 2 is a vertical section partly in elevation of a water gas generator provided with a stationary type grate; and

Fig. 3 is a side elevation partly in section of a water gas generator such as is shown in Fig. 1 and connected apparatus for practicing this invention.

Referring to the drawing, 1 indicates a cylindrical shell or casing of a water gas generator lined with suitable heat insulating material 2 and having a firebrick lining 3 contiguous to the heat insulating lining. The generator is provided with the usual charging opening 4 and gas outlet or offtake 5 which, in the case of a water gas set, communicates with a carburetor or heat interchanger (not shown). One or more clinker discharge doors 6 are positioned in the sides of the generator above the grate 7. In Fig. 1, grate 7 is shown of the conical rotatable roll section type having one end of the conical roll section supported in bearings 8 positioned in opening 9 in the sides of the generator, and the other end in bearings 11 in casting 12 suitably supported on the base of the generator. The grate sections are rotatable to agitate the fuel bed and cause ash and clinker from the fuel bed to drop therethrough into the ash pit or onto the base of the generator. The structure and operation of this grate per se forms no part of this invention and is fully described in the co-pending application of F. W. Steere, Serial No. 233,471, above mentioned.

In Fig. 2, a well known stationary type of grate is shown in the generator supporting the fuel bed 13. The top of the fuel bed, indicated by the dot and dash line 14, as customary in gas operation, is maintained below the gas offtake 5. The blast pipe 16 communicates with the base of the generator below the grate to supply air or other oxygen-containing gas for the blasting cycle and a valved pipe 17 leads into the blast pipe 16 for supplying steam or other gas to the generator during the gas making cycle. The generator may be operated so that a reversal of gas flow takes place through the fuel bed therein, i. e., steam or other gas may be passed up through the fuel bed during one cycle and the resultant gas withdrawn through gas offtake 5, and during a subsequent cycle, steam or other gas passed down through the fuel bed and the resultant gas withdrawn through the pipe 16.

The above described structure and operation of gas generators are well known in this art and, accordingly, have been described only in sufficient detail so that the relation thereof to the present invention will be readily understood.

The generator is formed with a refractory or other base 18. Positioned on this base is a plate 19, preferably of conical shape, the vertex 20 of this plate being positioned below the grate 7. The longitudinal axis of plate 19 is in alignment and coincides with the longitudinal axis of the generator. In other words, the plate is centrally positioned with respect to the generator. The base of the plate is formed with an annular trough or gulley 22, preferably inclined with respect to the base 18 of the generator so that flow of material in the trough towards the discharge outlet 23 in the base of the generator ensues. In lieu of forming the base of the plate with a trough, the base of the plate may be spaced away from the sides of the generator so that a trough is formed in the base of the generator, or the base of the generator may be built up or formed with a conical plate to provide a trough arranged to discharge into the outlet 23. The plate 19 may be of metal, or cast, or built up of refractory or other material capable of withstanding the prevailing temperatures and operating conditions in the generator. In Figs. 1 and 2, a refractory conical ash receiving plate 19 is shown, the vertex of which is provided with a metal lining 24.

Pipes or mains 25 provided with spray or discharge nozzles 26, 27, are positioned to extend through the sides of the generator. In the drawing, two such nozzles 26, 27 are shown. The nozzles are positioned to distribute liquor into the trough, being preferably placed tangential to the trough so that a flow therethrough into the discharge outlet 23 is insured. Longitudinally of the plate 19 a pipe 28 is provided which has one end threaded into the metal lining 24. Spray or nozzle cap 10 is positioned over the discharge end of pipe 28 and functions to cause a flow of liquor from the pipe 28 down the sides of plate 19 into the trough 22. The pipes 25 and 28 all communicate with a suitable source of water, waste or other liquor.

The discharge outlet 23 of the generator is connected by main 31 with an ash disposal tank 32. A nozzle 33 extends into the pipe 31 and is arranged to discharge liquor in the direction of flow through pipe 31 and thus accelerate flow therethrough. A valve 34 is disposed in pipe 31 and may be operated to control flow through pipe 31 and to disconnect pipe 31 from ash tank 32. A water seal 35 of the usual type has one end connected to the tank 32 and the other end communicating with a drain or suitable point for the disposal of liquor from tank 32. If desired the liquor withdrawn through seal 35 may be passed through suitable strainers or purifying apparatus and then recirculated through pipes 25, 28 in the generator base.

In operation the ashes formed in the fuel bed drop through the grate onto the plate 19. In a generator involving a conical roll grate, the fuel bed is agitated by the movement of the grate sections, thus removing ash and clinker therefrom and thereby maintaining a fuel bed of substantially uniform density. Water, waste or other liquor is pumped through pipes 25, 28 and connected nozzles. The water or other liquor passed through pipe 28 flows down the sides of the conical plate, washing the ashes thereon into the trough 22. The liquor from nozzles 26, 27 provide a flow in trough 22 and cause the liquor containing ashes to flow from the trough 22 into and through discharge outlet 23, through pipe 31 into the ash disposal tank 32. Liquor may be discharged through the nozzle 33 to accelerate the flow through pipe 31. It will be noted that the liquor is introduced into the generator at a plurality of points, 26, 27, and the liquor containing ashes is withdrawn at a localized point 23.

In the ash disposal tank 32, the ashes and suspended matter settle to the bottom while the

liquor flows through the seal **35**. Tank **32** is, of course, made of sufficient capacity to permit efficient settling of the ashes and suspended matter from the liquor before the liquor is discharged through the seal **35**. The seal maintains the system, i. e., generator, connected pipe **31** and tank **32**, gas tight and thus the ash is continuously removed from the generator without interfering with the normal operation thereof.

At desired intervals the valve **34** may be operated to disconnect tank **32** from main **31** and connected generator, and the flow of liquor through pipes **25**, **28** may also be interrupted and ash removed from the tank **32** by buckets or other suitable mechanism. The ash accumulated on the plate **19** during the period within which ashes are removed from the tank **32**, is readily removed by the flow of liquor over the plate and through the trough **22**, as hereinabove described.

It will be noted that this invention provides ash removal mechanism which involves no moving parts and, therefore, has little or no tendency to become impaired and require replacement or repairs. Further, that ashes are preferably continuously removed from the generator as they drop from the fuel bed and discontinuance of the gas making operation to remove ashes from the generator is therefore unnecessary. If desired, this invention may be intermittently operated to remove ashes from the generator.

While preferred embodiments of the invention have been shown and described, it will be understood that various changes in the details thereof may be made and the invention is not to be limited to the disclosure herein but only by the scope of the appended claims.

I claim:

1. In combination with a gas generator having a grate therein for supporting a fuel bed thereon and provided with a discharge outlet below the grate, a conical member positioned below the grate with its vertex adjacent thereto and the base thereof provided with a trough leading into said discharge outlet and means to cause liquid to flow over the sides of said conical member into and through said trough and through said discharge outlet.

2. In combination with a gas generator having a grate therein for supporting a fuel bed thereon and provided with a discharge outlet below the grate, a conical plate positioned below the grate with its vertex adjacent thereto and the base thereof provided with a trough inclined with respect to the base of said generator and discharging into said discharge outlet, the longitudinal axis of said conical plate being in substantial alignment with the longitudinal axis of said generator, and means for discharging liquor over said plate and into and through said trough.

3. In a water gas set in combination with a generator having a movable grate therein for supporting a fuel bed thereon and provided with a discharge outlet below the grate, a conical plate below the grate positioned to cause ashes dropping thereonto to pass towards the discharge outlet, a tank connected to said discharge outlet, a nozzle for discharging liquor onto said plate, and a seal connected to said tank.

4. In a water gas set in combination with a generator having a movable grate therein for supporting a fuel bed thereon and provided with a discharge outlet below the grate and a conical member positioned below the grate with its vertex adjacent thereto and the base thereof provided with a trough leading into said discharge outlet, means for passing liquor over said plate and through said trough into said discharge outlet, a tank connected to said discharge outlet and arranged to receive the liquor passing through said discharge outlet and a seal connected to said tank.

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