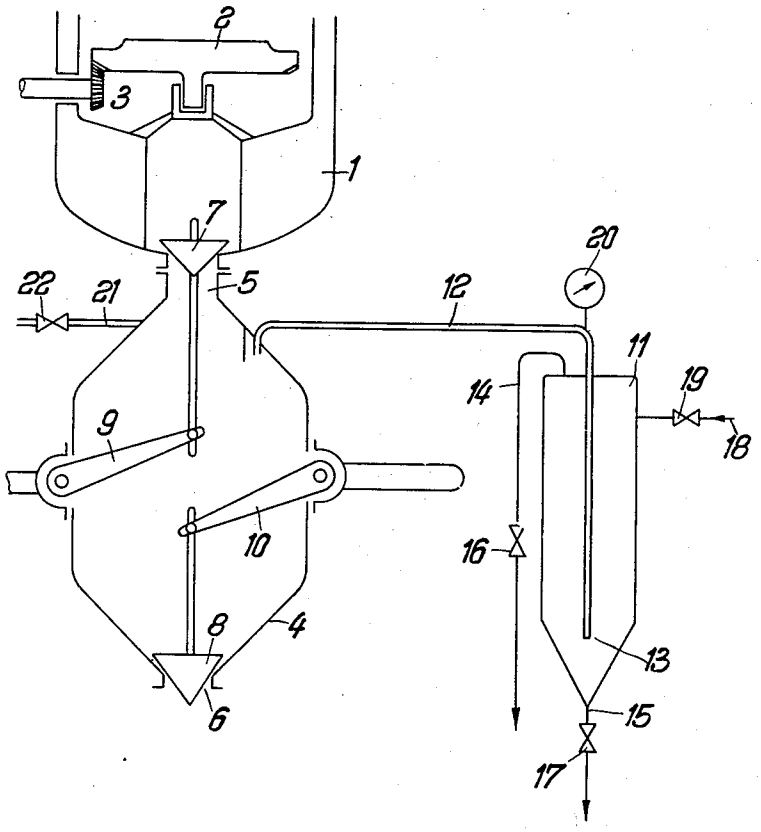
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DEPRESSURIZING OF ASH DISCHARGE LOCKS AND SIMILAR CHAMBERS

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DEPRESSURIZING OF ASH DISCHARGE LOCKS AND SIMILAR CHAMBERS

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This invention relates to new and useful improvements in the depressurizing of ash discharge locks and similar chambers operated under pressure.

In pressure gas generators it is necessary to discharge the ash which forms as a residue, while maintaining the pressure in the gasification chamber. This is conventionally effected by means of ash discharge locks.

The ash discharge locks conventionally consist of a pressure-tight lock chamber which has an opening at its upper and lower ends. These openings may be sealed in a gas-tight manner by means of closures which can be operated from the outside of the chamber, preferably independently of one another.

The lock chamber is generally positioned below the gas generator in communication with the gasification chamber through the upper opening.

When the bottom opening of the lock chamber is sealed with the closure and the top opening is open, the lock chamber will be under the pressure prevailing in the gas producer and ash may trickle down from the gas generator into the lock chamber. When the lock chamber becomes filled with ash in this manner, the top opening is sealed with its closure. After reducing the pressure prevailing in the lock chamber, the ash is discharged to the outside by opening the closure which seals the bottom opening of the lock chamber.

The emptied lock is then resealed against the atmosphere by closing the bottom closure, and with the aid of steam, produced gas, or the like, is restored to the pressure prevailing in the gas generator so that the communication between the lock chamber and gasification chamber can be re-established by opening the top closure without impairing the gasification process. The working cycle of the ash discharged through the lock chamber then recommences.

The reduction of the pressure of the lock chamber before emptying the ash is generally effected with the aid of a valve, such as a pressure reduction valve. This valve, however, is subject to a great deal of wear since the gas released is very hot, and particularly when the ash throughput is high, contains a considerable amount of entrained flue dust which acts as an abrasive.

One object of this invention is to avoid the wear caused by the heavy mechanical and thermal stresses on the valve used to release the pressure from the lock chamber. This and still further objects will become apparent from the following description read in conjunction with the drawing, which diagrammatically shows a vertical section of the lower portion of a gas producer and the connected lock chamber with an embodiment of the device for releasing the pressure from the lock chamber in accordance with the invention.

In accordance with the invention, hot fluids under pressure may be released from a pressure chamber by passing the same in direct contact with water having a

substantially lower temperature than the fluids and thereafter releasing the cooled fluids through a pressure reduction valve.

The contacting with the water is preferably effected by establishing a pressure-confined zone, i. e. a pressure-tight container in communication with the pressure chamber and by passing the hot fluid from the chamber into the zone and effecting the contact with the water in the zone, and thereafter releasing the cooled fluid from the zone through a pressure reduction valve. The contacting with the water may be effected by introducing the hot fluid from the pressure chamber, such as the ash-discharge lock chamber, into a body of water or through a mass, such as curtains, of atomized water in a tank, scrubber or the like. The water used will preferably be cold water and the amount and temperature of the water should be such that after the contacting, the temperature of the water is not raised above its boiling point, i. e. above about 100° C., by absorbing the sensible heat of the fluid.

As a result of the contacting with the water, the hot fluids from the pressure chamber are considerably cooled and additionally a condensation of the vapor contained therein is effected and the dust entrained by the fluids is washed out. Furthermore, the volume, and thus the pressure of the fluid, is substantially reduced, further reducing the stresses on the pressure reduction valve.

The invention will be described in detail with reference to the embodiment shown in the accompanying drawing and in connection with an ash discharge lock of a gas generator.

The lower portion of the conventional pressure gas generator 1 as shown in the drawing is provided with a grate 2 which is rotated by means of the externally driven pinion gear 3 in the conventional manner. A lock chamber 4 which has an upper opening 5 and a lower opening 6, is positioned below the gas generator with the interior of the lock chamber in communication with the interior of the gas generator 1 through the opening 5. The openings 5 and 6 of the lock chamber are provided with the closures 7 and 8 respectively. These closures shown are in the form of conically shaped valves, though the same may be spherical or have any other desirable shape so as to ensure a gas-tight closure of the openings 5 and 6 respectively. These closures may, of course, be constructed in any known or conventional manner. As shown, the conical valve body 7 can be operated from the outside by means of the lever 9 and the valve body 8 may be independently operated from the outside by means of the lever 10. The levers, of course, extend through the walls of the lock chamber with a gas-tight seal.

A pressure-tight container 11 in the form of a vertical cylindrical water tank with a conically-shaped bottom is positioned alongside the lock chamber 4. The container 11 is connected to the interior of the lock chamber by means of a pressure-tight conduit-pipe 12. The conduit-pipe 12 terminates as a dip tube in the lower portion of the container 11 at 13. A pressure gauge 20 is preferably connected to the conduit pipe 12 to indicate the pressure therein in the container 11 and lock chamber 4.

At the apex of the conically shaped bottom of the container 11, a water outlet pipe 15 is provided, which has an associated shut-off valve 17. A water supply pipe 18 which has an associated shut-off valve 19, leads into the container 11. A fluid outlet conduit 14 is connected to the upper portion of the container 11 and is provided with pressure reduction valve 16.

The lock chamber 4 is provided with a pressurized fluid inlet conduit 21 which has a valve 22.

In operation the valve body 7 is moved by the lever 9

to the open position and the valve body 8 to the closed position sealing the opening 6. The pressure in the interior of the gasification chamber 1 will thus prevail in the interior of the lock chamber 2. During operation, ash discharged by the rotating grate 2 will fall down through the opening 5 to the lock chamber 4. When the lock chamber 4 becomes filled with the ash, in order to start its discharge, the opening 5 is sealed by closing the valve body 7 by means of the lever 9. Prior to this, the container 11 has been filled with water. The filling may be effected by passing water through the water supply line 18 and valve 19. With the pressure valve 18 open, the valve 14 may act as an overflow.

In order to release the pressure in the lock chamber 4, the valve body 7 is closed and pressure reduction valve 16 is opened. The hot fluid flows through the conduit 12 through the dip tube portion of this conduit into the body of water in the container 11. As the hot fluid contacts the water, the same cools the condensable portions consisting of vapor which are condensed, and the uncondensable gases, such as air, carbon monoxide, hydrogen and the like, flow upward through the body of water and are cooled, contract in volume, and washed free of dust. They then pass through pipe 14 and pressure reduction valve 16 to the atmosphere, are consumed by combustion or passed to a gas collector or gas meter.

If the hot fluids predominantly consist of condensable vapors, the amount of cooled gas going through the pressure reduction valve 16 is negligible and the valve is subject to practically no wear.

If the fluids from the lock chamber 14 predominantly consist of non-condensable gases, their volume is substantially reduced so that only a relatively small volume of dust-free gas at low temperature passes through the pressure reduction valve 16 and the stresses on the same are extremely low. Thus, the pressure reduction valve 16 is subjected to very little wear, whether the fluids consist predominantly of vapors, condensable gases or a combination of the two.

When the fluids released from the lock chamber consist entirely or predominantly of non-condensable gases, the pressure drop becomes continually smaller as the reduction of pressure progresses so that discharge will proceed with a continually decreasing speed. The equalization of the pressure may be accelerated by further opening the pressure reduction valve 16 and additionally opening the valve 17 which preferably has a larger passage cross-section than the valve 16. Valve 17 also serves to discharge heated water containing dust.

The water in the container 11 should be at a sufficiently low temperature and present in a sufficient amount to absorb the entire sensible heat of the fluid being passed therethrough, and also when applicable, the heat of condensation of any vapor contained therein without reaching a temperature corresponding to a vapor pressure equal to the pressure to which the reduction of the pressure in the lock chamber 14 is to be made. Thus, for example, when pressure reduction is to be effected to atmospheric pressure, which the same generally is, the temperature of the water after the contacting should not exceed 100° C. In any event, it is desirable to have the water present at a sufficiently low temperature and in sufficient quantity so that after all the heat of the hot fluid passing therethrough is absorbed by the same, the water will not be converted into steam.

In order to adapt the heat capacity of the water contained in the container 11 to the amount of heat to be absorbed from the fluid from the lock chamber 4, cold fresh water, may for example, be supplied through the pipe 18 during the pressure reduction process, and a corresponding amount of warm dusty water may be withdrawn through the valve 17. In this manner, the heat capacity through the cooling and washing in accordance with the invention, may be varied within relatively wide limits, thus considerably contributing towards simplification and economy.

After the pressure release in the lock chamber 14 in the manner described above, the valve body 8 is opened by means of lever 10 and the ash discharges from the lock chamber. Thereafter, valve body 8 is closed and a pressure fluid under pressure is introduced through the valve 22 in line 21 into lock chamber 4 to bring the same to the pressure prevailing in the gasification chamber 1. After this pressure is reached, the valve body 7 is opened and the operation is repeated.

The filling of the container 11 with the fresh water through the line 18 and valve 19 may be effected after the pressure release from the lock chamber 4 with, for example, the pressure reduction valve 16 opening so that the line 14 acts as an overflow. The valve 17 may be opened so that the warmed water from the previous operation may be withdrawn at this time, or prior to the introduction of the fresh water.

The introduction of fresh water through the line 18 and valve 19 may also be effected during the period that the ash is being discharged from the gas generator into the lock chamber with the valves 16 and 17 closed.

The pressure prevailing in the system of the lock chamber and container 11 may be observed any time by means of the pressure gauge 20.

The positions of the valve bodies 7 and 8 in their closed positions shown in the drawing correspond to that portion of the cycle, during which the pressure release occurs as described above.

Instead of being passed through the body of water as described above, the hot fluid from the lock chamber 14 may be passed in contact with a body of atomized water. In this case, the water collecting at the lower end of container 11 may be drawn off in proportion to the amount introduced through the pipe 18 as, for example, through a nozzle or similar atomizing means. A water level regulator, as, for example, a steam trap or the like is then advantageously used instead of the valve 17.

While the invention has been described with reference to the depressurizing of a lock chamber used in connection with pressure gas generators, the same may also be used for pressure release from any pressure chambers from which hot fluids must be discharged.

Fluids which have pressures, temperatures and dust content corresponding to those which occur in ash discharge locks and gas generators must be released in pressure chambers for pressure reduction in other processes, as, for example, in processes which use recycled granular heat carriers or in chemical processes in which granular or pulverulent substances are interacted with gaseous or vaporous substances. The method in accordance with the present invention is, of course, applicable in these cases. The method may also advantageously be employed in any cases for reducing the pressure in locks under gas pressure for the purpose of discharging solid substances.

While the invention has been described with respect to the specific embodiment shown, variations and modifications will become apparent to the artisan which fall within the invention scope of the appended claims.

We claim:

1. In the method for operating pressure gas generators in which ash is discharged through an ash discharge lock, the improvement for releasing the gas pressure in the lock prior to the discharge of the ash therefrom, which comprises establishing a pressure confined zone in flow communication with the lock chamber, passing the hot gases from the chamber into said zone, contacting the hot gases with water at a substantially lower temperature in said zone to thereby cool the gases and thereafter releasing the cooled gases from said zone through a pressure reduction valve.

2. Improvement according to claim 1 in which said con-

tacting with water is effected by passing the hot gases into a body of cold water.

3. In combination with a gas generator having an ash discharge lock with a lock chamber for the discharge of ash therethrough; a pressure-tight container, conduit means connecting said lock chamber to said container, means for passing water into said container for contacting the gases passed therein through said conduit means, a pressure reducing valve for releasing said gases from said container therethrough after contact with the water and means for removing water from the container.

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