Dec. 23, 1930. J. BECKER 1,785,760

COKE RETORT WITH QUENCHING DEVICE AND METHOD FOR SAME

Filed Feb. 16, 1925 3 Sheets-Sheet 1

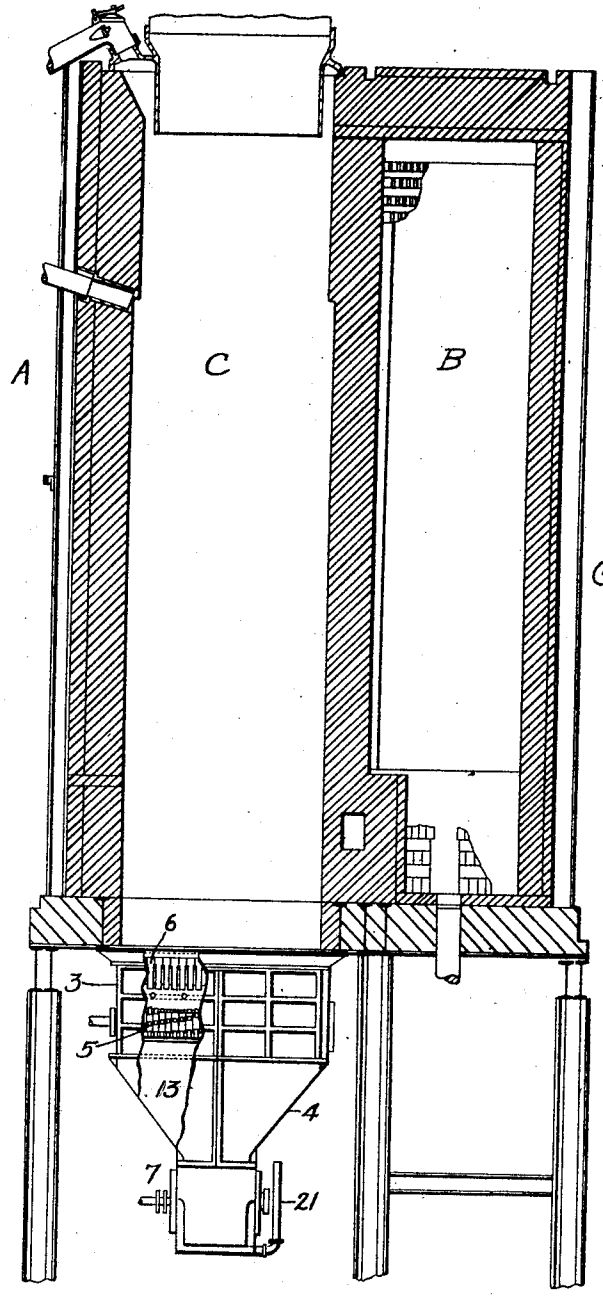


Fig. 1

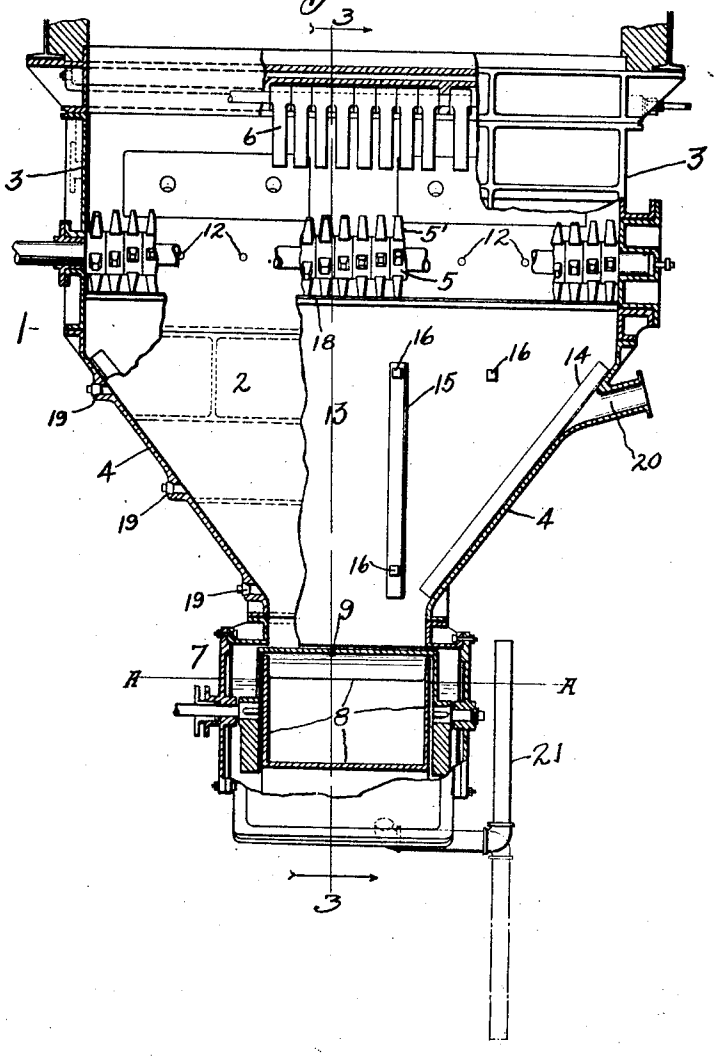
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Fig. 2.



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Fig. 3

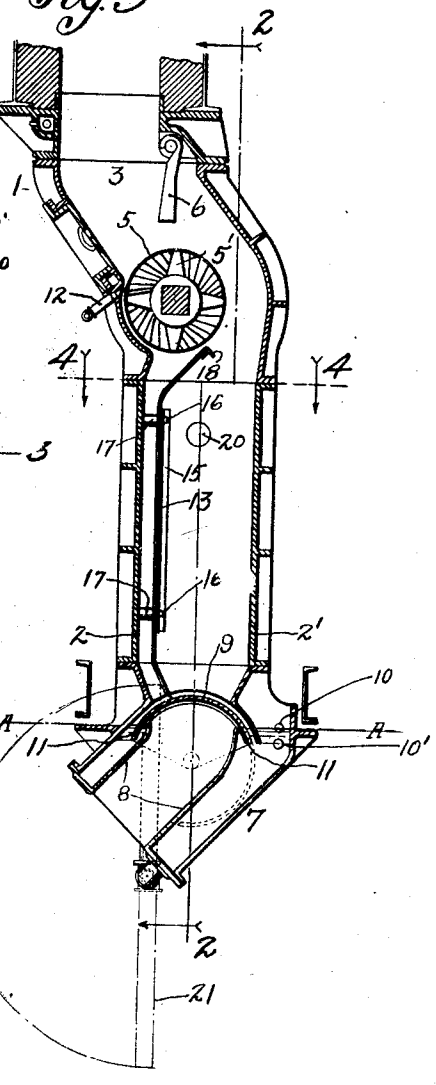
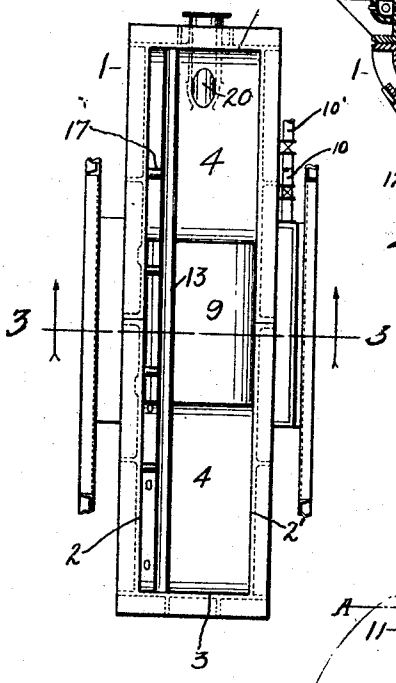


Fig. 4.



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UNITED STATES PATENT OFFICE

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COKE RETORT WITH QUENCHING DEVICE AND METHOD FOR SAME

Application filed February 16, 1925. Serial No. 9,509.

This invention relates broadly to improvements in the heat treating art and more particularly to means and methods for cooling the coke in vertical coking retorts with a liquid, such as water.

The methods ordinarily employed in cooling coke in retorts by steam or water inherently result in the production of such large quantities of water gas as to reduce the resultant mixture of the rich distillation gases and the leaner water gas much below the B. t. u. value allowed by the authorities. I propose to avoid the formation of such large quantities of water gas by effecting the requisite cooling by flooding the coke with water, thus cooling it without forming such large quantities of steam as will react with the heated fuel above to produce water gas of a volume to dilute the distillation gases beyond the degree desired, and my invention further contemplates removing the portion of water not converted into water gas in a manner to prevent its absorption by the coke in the discharge hopper or by the coke being discharged. I thereby avoid the soaking of the coke or imparting to it a high water content. By regulating the quantity of water introduced I can also produce a resultant gas mixture of the B. t. u. value desired.

As a specific embodiment of my invention I preferably provide means for introducing a quenching liquid, such as water, into the mass of hot coke in the region of the coke extractor mechanism, in the coke extractor magazine, in combination with a quenching liquid deflector plate designed to collect the major portion of the spent liquid which drips through the coke after quenching the same or through the extractor mechanism and to by-pass the same past the coke in the magazine hopper, conveying it preferably to a liquid seal valve at the bottom of the hopper from which it may overflow and pass off without coming into contact with the cooled coke which later is discharged from the hopper through the valve at its bottom in the usual manner.

I may further provide an outer end wall of the by-pass passageway with ports or clean-out holes which will permit the inspection and removal of any accumulation of coke breeze or other material tending to clog it.

My invention further consists in such other improvements and has for further objects such other operative advantages or results as may be found to obtain in the process and apparatus hereinafter described or claimed.

While as a specific embodiment I have disclosed the principles involved in my invention applied to a vertical coking retort, it will be obvious to those skilled in the art that they are not limited to such use.

In the accompanying drawings forming part of this specification and showing for purposes of exemplification, a preferred form and manner in which the invention may be embodied and practiced, but without limiting the claimed invention specifically to such illustrative instance or instances:

Figure 1 is a vertical section crosswise of the battery showing the discharging mechanism partially in plan and partially in section.

Fig. 2 is a vertical section of the discharge device transversely of the battery on the line 2—2 of Figure 3.

Fig. 3 is a vertical section on the lines 3—3 of Figs. 2 and 4.

Fig. 4 is a horizontal section on the line 4—4 of Fig. 3.

The same characters of reference designate the same parts in each of the several figures.

In the illustrated embodiment of my invention there is shown a coke extractor magazine 1 having substantially parallel sides 2, 2^1 and ends 3, the latter comprising lower portions 4 converging from a point substantially midway the magazine to the bottom to form a hopper. The lower portion of the magazine may conveniently be made separate from the upper portion and may be attached thereto in any suitable manner. As shown in Fig. 2, the magazine is offset below its top from the longitudinal axis of the battery and at a point adjacent the side 2 and above the converging ends 4 is preferably located an extractor roll 5 parallel to the sides of the magazine and provided with radial teeth 5^1. Above the roll and pivoted near the sides 2^1 are coke restraining tumblers 6. Communi-

cating with the bottom of the magazine hopper is a liquid seal valve casing 7 provided with inner substantially parallel coke guiding walls 8 in alignment at the upper end with the sides 2, 2^1 and ends 4 of the extractor magazine hopper. The casing 7 and guide walls are preferably inclined downwardly and outwardly. Pivoted to freely turn between the upper end of the walls 8 and the lower end of the hopper is a shelf or support 9 preferably arc-shaped in cross section which in closed position supports the mass of coke thereabove, but which may be turned into the space between the lower inclined wall 8 and side of the valve casing 7. The coke guide walls 8 are spaced from the sides of the valve casing 7 to form a compartment therebetween, closed at its bottom, to permit the accumulation of the liquid between the two to a depth determined by the overflow outlet 10, the liquid lever A—A being maintained at a height sufficient to effect an efficient seal between the wall 8 and edges 11 of the cover 9 when the latter is in closed position. In quenching the coke, a liquid such as water may be introduced into the extractor magazine, for instance, at the inlets 12 located adjacent the coke extractor roll 5. In order to insure sufficient liquid to maintain the seal at all times the inlet 10^1 is provided.

In the structure hereinbefore set forth as previously used the portion of the liquid introduced through the inlets 12 which was not converted into gas would drop by gravity through the extractor roll or past the sides of the same and in its further descent would normally be absorbed by the descending coke therebelow, imparting to the latter a large water content.

My improvement contemplates means for preventing this highly undesirable result. This, I may accomplish by providing a liquid deflector plate 13 extending substantially vertically, in a plane parallel and in proximity to the side 2 of the magazine, its upper portion being deflected away therefrom to bring its upper edge parallel to and adjacent the line on which the coke fed downwardly by the extractor roll leaves the latter. The lower end of the plate extends to a point approximately above the upper side wall 8 of the liquid seal valve. The deflector plate may be attached to the ends 4 of the hopper in any convenient manner as by angle plates 14. It may be further stiffened or reinforced at intermediate points by angle plates 15. It is also preferably supported and spaced from the side 2 of the hopper by bolts 16 provided with spacer members 17.

At the upper edge of the deflector plate may be provided an angle plate 18 the outer end of which is directed downwardly at an angle from the extractor roll to constitute a stiffening means and an inner guide for the coke fed downwardly by the roll. There may also be provided ports or clean out holes 19 in one end 4 of the hopper between the deflector plate 13 and the adjacent side 2 to permit the removal of the coke breeze or other accumulations. The hopper is also preferably provided with a vent pipe 20. In order to effect removal of any accumulation of coke breeze or the like in the liquid seal valve casing the water outlet pipe 21, mounted to turn about a horizontal axis, is connected to the bottom of the water seal compartment and normally remains in the upright position to maintain the seal but may be turned downwardly momentarily to permit a sudden inrush of water from the inlet 10^1 through the compartment and down through the outlet 21 to carry off the accumulations therein. The outlet pipe 21 is thereupon immediately restored to upright position to preserve the seal.

In the operation of my device, water, for instance, is introduced through the inlets 12 in sufficient quantity to quench the coke and limit the formation of steam to the quantity which will react with the hot fuel to form water gas sufficient to mix with the gases of distillation to produce a resultant gas having the desired B. t. u. value. The surplus water, as the coke is carried transversely by the roll from a point adjacent the side 2 to a point adjacent the side 2^1, will flow downwardly through the extractor teeth 5^1 and around the roll and will be all substantially entrapped in its downward passage by the upper end 18 of the deflector plate 13 and conducted through the passageway between the same and the adjacent side 2 of the hopper to the valve cover 9 by which it will be deflected into the space between the inner coke guide walls 8 and the outer sides of the valve chamber 7 to assist in maintaining the liquid seal, any excess flowing off through the overflow outlet 10. When it is desired to discharge the coke the cover 9 is first rotated to the right until its left edge is substantially in vertical alignment with the plate 13, whereupon the accumulated water and coke breeze in the passageway will be discharged through the valve outlet. The cover 9 is then further rotated to the right to the position shown in dotted lines in Fig. 3, whereupon the coke will be discharged through the valve outlet. During the brief interval when the cover 9 is opened to discharge coke the water descending through the passageway between the deflector plate and hopper side 2 will tend to trickle down the latter and pass off as before, but in any case the temporary opening of the cover plate does not operate to effect any substantial wetting of the coke, it being delivered from the extractor mechanism in a substantially dry state in all cases. It is obvious that the separation of the water from the coke after the cooling operation is facilitated by the offsetting of the portion of

the hopper carrying the extractor roll from the portion thereabove compelling the roll to carry the coke substantially horizontally away from the wet zone to the further or dry side 2^1 of the magazine where it is delivered in a dry state through the passageway between the deflector plate 13 and side 2^1 of the magazine. The removal of any accumulation in the water offtake passageway may be readily accomplished through the ports or clean-out openings 19.

The invention as hereinabove set forth, or exemplified, may be variously practiced or embodied within the scope of the claims hereinafter made.

I claim:—

1. In an apparatus for discharging coke ovens, in combination: an extractor magazine having its upper portion offset from its lower portion; means for subjecting the hot coke as it descends from said upper portion to the action of a quenching liquid; means located below said upper portion for feeding the quenched coke across said magazine to and down the side of said lower portion remote from said upper portion, said means being pervious to the passage of the quenching liquid for separation of the spent liquid from the coke during the transverse passage; means located below said feeding means for collecting the separated spent liquid in the lower portion of the magazine that supports previously quenched coke and for maintaining the separated spent liquid out of contact with the previously quenched coke therein; and means for discharging the spent liquid from the magazine from the portion thereof that supports the previously quenched coke.

2. In an apparatus for discharging coke ovens, in combination: an extractor magazine in open communication with a coking chamber and adapted for substantially continuous extraction and discharge of finished coke therefrom; liquid supply means for subjecting extracted hot coke in said magazine to the action of a quenching liquid therein; means pervious to the passage of the quenching liquid for feeding the quenched coke through said magazine and for effecting discharge of the spent liquid from quenched coke; means for collecting quenched coke in said magazine; and separating means forming a chamber below said pervious means and in said magazine for collecting the discharged liquid in the portion of the magazine that collects the quenched coke and maintaining the collected liquid separate from and out of contact with the previously quenched coke after it leaves the pervious means.

3. In an apparatus for discharging coke ovens, in combination; an extractor magazine in open communication with a coking chamber and adapted for substantially continuous extraction and discharge of finished coke therefrom; liquid supply means for subjecting extracted hot coke in said magazine to the action of a cooling liquid while therein; means pervious to the cooling liquid for separating the spent liquid from the coke cooled thereby; means in said magazine for accumulating cooled coke from the pervious means; means forming a chamber below said pervious means and in the portion of the magazine that contains accumulated cooled coke for collecting spent liquid from the pervious means and maintaining such liquid out of contact with previously cooled coke after such coke leaves the pervious means; and means for delivering such liquid and the coke separately from the magazine.

4. An apparatus for discharging coke ovens comprising, in combination: an extractor magazine in open communication with a coking chamber and adapted for substantially continuous extraction and discharge of finished coke therefrom; means for subjecting extracted hot coke in said magazine to the action of a quenching liquid while therein; means pervious to the quenching liquid for feeding the quenched coke through said magazine and for effecting discharge of spent quenching liquid from the quenched coke; and separating means for receiving the discharged spent liquid and maintaining it separate from and out of contact with previously quenched coke in said magazine after it leaves the feeding means; and in which the separating means comprises a deflector plate dividing the magazine into two passageways—one for the passage of coke and the other for the passage of the spent liquid, said plate being flared laterally at its top away from the liquid passageway to substantially span the region of the feeding means; substantially as specified.

5. An apparatus for discharging coke ovens comprising, in combination: an extractor magazine in open communication with a coking chamber and adapted for substantially continuous extraction and discharge of finished coke therefrom; means for subjecting extracted hot coke in said magazine to the action of a quenching liquid while therein; means pervious to the quenching liquid for feeding the quenched coke through said magazine and for effecting discharge of spent quenching liquid from the quenched coke; and separating means for receiving the discharged spent liquid and maintaining it separate from and out of contact with previously quenched coke in said magazine after it leaves the feeding means; and in which the separating means comprises a deflector plate dividing the magazine into two passageways—one for the passage of coke and the other for the passage of the spent liquid; said plate being provided at its upper edge with a flange inclined toward the coke passageway to direct the coke away from the

feeding means and into said coke passageway; substantially as specified.

6. An apparatus for discharging coke ovens comprising, in combination: an extractor magazine in open communication with a coking chamber and adapted for substantially continuous extraction and discharge of finished coke therefrom; means for subjecting extracted hot coke in said magazine to the action of a quenching liquid while therein; means pervious to the passage of quenching liquid for discharging spent quenching liquid from the coke during its passage in said magazine; and separating means within said magazine for maintaining the spent liquid, after the quenching and spent liquid discharging operations, separate from previously quenched coke in said magazine; and in which the separating means comprises a deflector plate dividing the magazine into two passageways—one for the passage of coke and the other for the passage of the spent medium; substantially as specified.

7. An apparatus for discharging coke ovens comprising, in combination: an extractor magazine in open communication with a coking chamber and adapted for substantially continuous extraction and discharge of finished coke therefrom; means for subjecting extracted hot coke in said magazine to the action of a quenching liquid while therein; means pervious to the passage of quenching liquid for discharging spent quenching liquid from the coke during its passage in said magazine; and separating means within said magazine for maintaining the spent liquid, after the quenching and spent liquid discharging operations, separate from previously quenched coke in said magazine; and in which a water seal valve at the bottom of the extractor magazine is provided into the water sealing portion of which the spent liquid is delivered, said valve being provided with means which in one position closes the main valve passageway against the passage of coke and the spent liquid, while permitting the passage of the latter to the water seal portion of said valve, and which in a second position permits the passage of the coke; substantially as specified.

8. In an apparatus for discharging coke ovens, in combination: an extractor magazine; means for subjecting the hot coke therein to the action of a quenching liquid; means for separating the spent liquid, after the quenching operation, from the coke, said means comprising a liquid deflector plate substantially parallel to the sides of the extractor magazine and separating the latter into a coke passageway and a spent liquid passageway respectively; and ports passing through the side of the magazine into the spent liquid passageway to permit the cleaning of the latter; substantially as specified.

9. The method of cooling coke in extractor magazines in open communication with and adapted for substantially continuous discharge of finished coke from coking chambers of vertical retorts, which method comprises subjecting the hot coke to the cooling effect of water in such quantity as will cool the coke without the formation of steam beyond the amount which, when passed through said vertical retorts, would decrease the B. t. u. value of the resultant mixture of water gas from said steam and the distillation gases from coking fuel in said retorts below a predetermined value, and thereafter draining the spent water from the coke, accumulating the cooled coke in said magazines, and collecting and flowing off in said magazines the drained water separately from the accumulated coke to prevent the absorption of the former by the latter; substantially as specified.

10. The combination as defined by claim 2, and in which a water seal valve is provided at the bottom of the extractor magazine; and in which the separating means is arranged so as to communicate with the water sealing portion of said valve, to deliver spent liquid thereto, and so as to communicate with the main valve passageway; said valve being provided with closure means having a plurality of different operative positions and adapted to operate in one position to close the main valve passageway against the passage of coke and the spent liquid, while effecting the passage of the latter to the water seal portion of said valve, and adapted to operate in a second position to effect the passage of the spent liquid and accumulated solid matter from said separating means through the main valve passageway while preventing the passage of coke in said magazine that is separated from spent liquid in said magazine by said separating means, and adapted to operate in a third position to effect the passage of coke in said magazine that is separated from the spent liquid in said magazine by said separating means; substantially as specified.

11. The combination as defined by claim 2, and in which a water seal valve is provided at the bottom of the extractor magazine and in which the separating means is arranged so as to communicate with the water sealing portion of said valve to deliver spent liquid thereto; substantially as specified.

12. The method of quenching coke in extractor magazines in open communication with and adapted for substantially continuous discharge of coke from coking chambers of vertical retorts, which method comprises flooding the finished hot coke with an aqueous cooling-liquid in said magazines so as to prevent formation of large quantities of steam and thereby minimize production of water gas therefrom, draining the greater

portion of the spent liquid from the coke after the cooling operation, accumulating the cooled coke in said magazines, and flowing the drained liquid separately from the accumulated coke to prevent the absorption of the former by the latter; substantially as specified.

In testimony whereof, I have hereunto set my hand.

JOSEPH BECKER.