

March 8, 1932.

J. BECKER

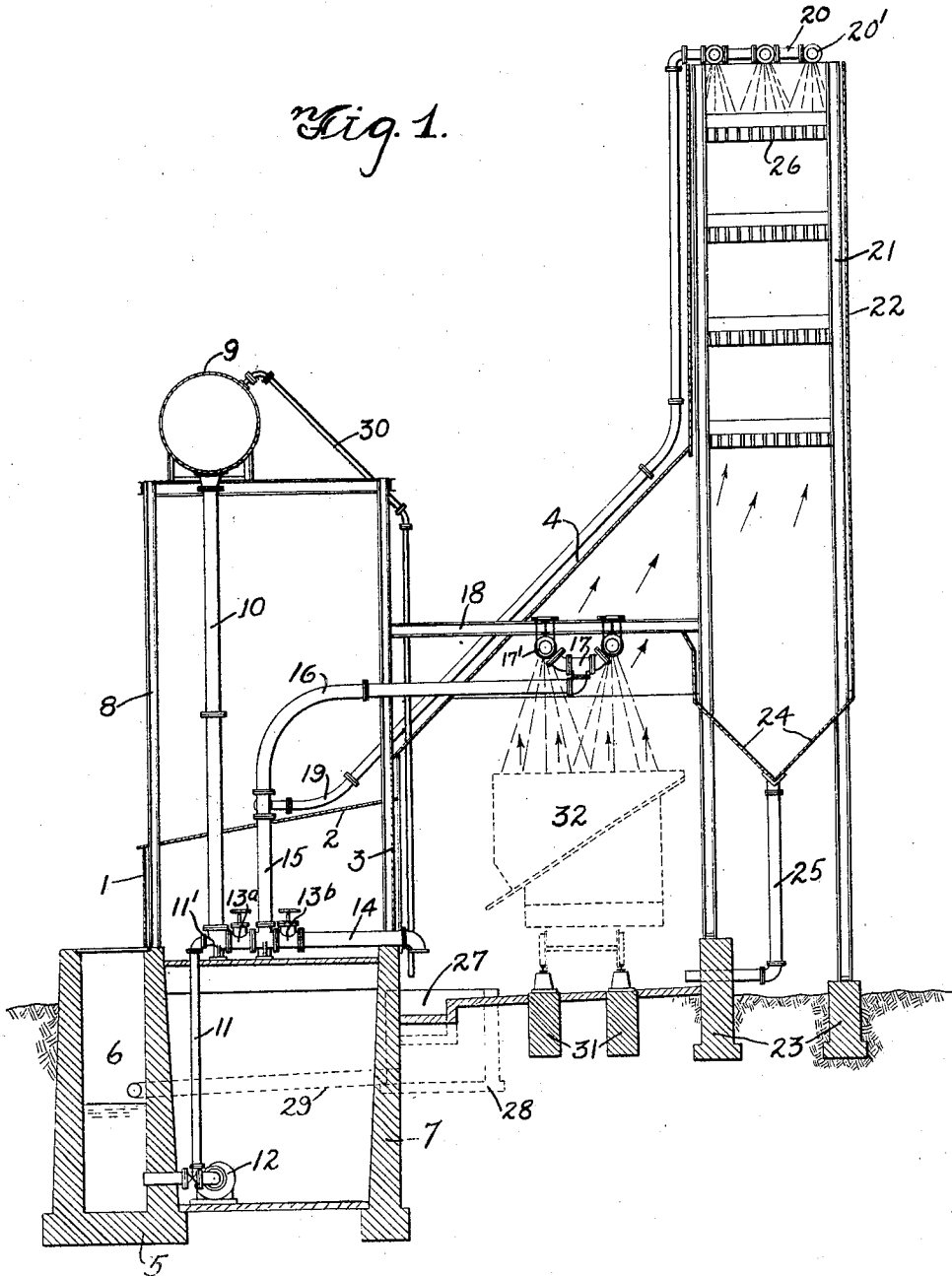
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QUENCHING STATION AND METHOD OF OPERATING THE SAME

Filed Aug. 12, 1926

3 Sheets-Sheet 1

Fig. 1.



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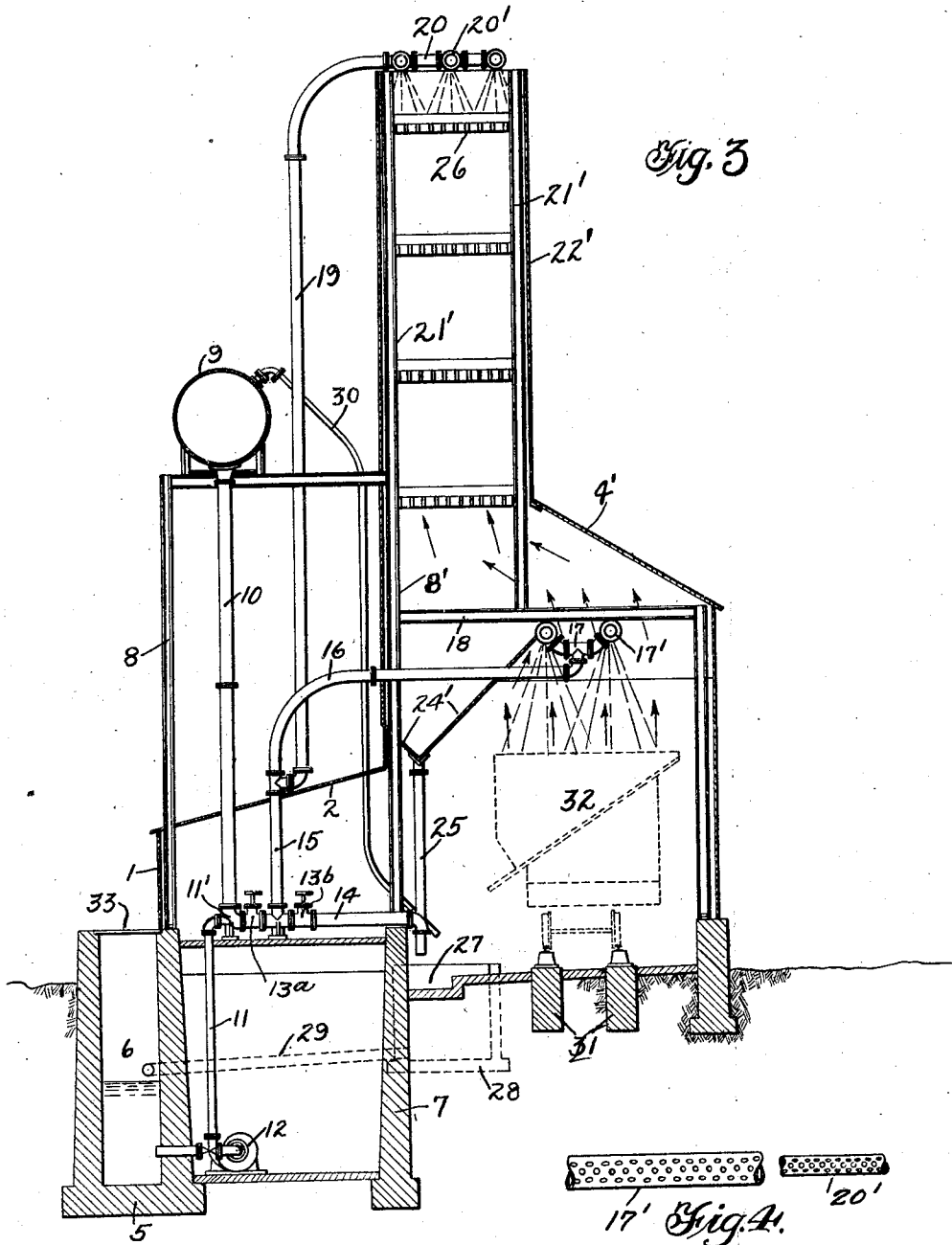


Fig. 3

Fig. 4.

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UNITED STATES PATENT OFFICE

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QUENCHING STATION AND METHOD OF OPERATING THE SAME

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This invention comprehends improvements in gas treating apparatus of general utility and in its more specific aspects relates to the treatment of gases which arise in coke oven quenching stations.

In the ordinary operation of coke ovens the hot coke at the end of the coking period is discharged from the ovens into a car in which it is conveyed to the quenching station and there subjected to sprays of water to arrest combustion. This results, however, in the evolution of steam and noxious and objectionable gases, together with impalpable ash and coke dust or coke breeze which arise in clouds from the quenching station. These products, particularly in the presence of steam, produce very deleterious effects on surrounding structures, causing corrosion of metal and abrasion and disintegration of the structural parts and are both unpleasant and harmful to animal and vegetable life in the neighborhood. Some of the objectionable features of quenching stations have been partially overcome by locating the stations at a distance from the ovens and providing them with walls and chimneys to convey the undesirable products to a more remote point, thus reducing, though not eliminating their objectionable effects.

The object of my invention is to substantially eliminate the harmful effects of the substances arising from quenching stations by treating them to a purifying or precipitating process whereby they are separated out and are not permitted to escape to regions where they may exert deleterious effects. This permits also the location of the stations nearer the ovens thereby effecting a saving of time required for the operations.

In order to accomplish these results I provide, at the quenching station, means for collecting the products which arise when the hot coke is treated with a quenching spray and thereafter treat these products before permitting escape of any of the gases from the quenching station. As a convenient manner of effecting these results I may provide a tower into which the products are passed at a point below the top of the tower and

then subject the ascending products to the action of purifying means located in the upper portion of the tower. I have found that this may be very efficiently effected by spraying downwardly from the top of the tower, a liquid of a character to accomplish the results desired. A finely divided spray of water very satisfactorily answers the purpose in ordinary cases and its effect is materially increased by the provision across the tower of a series of hurdles or reticulated obstructions which when wetted by the descending spray provide a large surface contact between the liquid and the ascending products of quenching and prevent the channeling of these products and the descending water, thereby producing an intimate commingling of the two. By this operation the noxious gases are substantially absorbed in the descending liquid, the ascending steam is condensed, and the more solid dust-like particles are carried down thereby. The liquid containing the products of quenching is collected at the base of the tower and conveyed by appropriate troughs to the settling sump where the more solid particles are precipitated. The liquid above the precipitate being substantially freed of the injurious products may be again returned by the pump to the spraying system.

The invention further consists in such other new and useful improvements, and has for further objects such other operative advantages or results, as may be found to obtain in the processes and apparatus hereinafter described and claimed.

In the accompanying drawings forming a 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 to such illustrative instance or instances:

Fig. 1 is a vertical section taken across the quenching station showing the essential features of one embodiment of my invention;

Fig. 2 is a top plan view of the station shown in Fig. 1; and

Fig. 3 is a vertical section of a modified form of station.

Fig. 4 is a bottom plan view of the sprayer pipes 17' and 20'.

The same characters of reference indicate the same parts throughout the several views.

5 Figures 1 and 2 show a quenching station in which the treating tower is located on the far side of the quenching chamber from the liquid supply system and its supporting structure which has the advantage that it
10 removes the harmful products from the latter, whereas, in Fig. 3 the tower is located above the quenching chamber and contiguous to the liquid supply system, which results in the economy of ground space and a more
15 compact and rigid structure.

Referring in detail to the drawings, and in particular to Figures 1 and 2 thereof, 1 indicates a housing or shed having a roof 2 for the pumping plant and connections. The
20 side 3 adjacent the trackway is projected upwardly to meet the sloping roof or deflector 4 of the quenching chamber extending above the trackway and serving to deflect the products which arise from the hot coke when
25 quenched to the lower portion of the tower. The housing 1 is supported upon foundation walls 5 and 7, the former forming one side of the collecting sump 6. Mounted upon these walls is a steel framework 8 support-
30 ing the tank or reservoir 9 connected by the piping 10 and 11 with a water pump 12 supplied from the sump 6. The pipe 11 is curved at its upper end into a horizontal direction at 11¹ and the horizontal section is connected
35 to the pipe 10, a horizontal drain pipe 14 leading from a point opposite their connection to an outlet beyond the wall 7. In the pipe section 14 are located two valves, 13a and 13b, between which the vertical pipe
40 15 makes connection with the pipe 14, the upper end of the pipe 15 being in turn connected to the pipe 16 leading to the branched pipe 17 carrying the quenching spray pipes 17¹ for discharging the water employed in
45 quenching the hot coke. The spray pipes are attached to horizontal supporting girders 18, respectively attached at one end to the tank framework 8 and at the other end to the tower framework 21 which supports the treating
50 spray system hereinafter referred to. The latter spray system is supplied by the pipe 19 connected at its lower end to the pipe 15 and connected at its upper end to the horizontal pipe 20 carrying the treating spray
55 pipes 20¹ provided with openings designed to produce a finely divided spray distributed across the entire area of the treating tower. This tower is supported by the framework 21 resting on foundation walls 23 and is provided with sides 22 extending down to a funnel shaped bottom 24 emptying into the discharge pipe 25. Extending crosswise of the tower above the point where the products arising in the quenching chamber enter are
60 a series of horizontal hurdles or reticulated

partitions 26. The pipe 25 discharges the water and the materials carried thereby on the sloping floor of the quenching chamber which in turn conveys it to the trough 27 by
70 which it is carried to the car drip drain 28 which extends along the trackway, and thence it is carried by the return pipe 29 to the collecting sump 6. Leading from a point near the top of the reservoir or tank 9 to
75 a point directly above the trough 27 is an overflow pipe 30 of less capacity than the feed pipe 10. The foundation members 31 in the floor of the quenching chamber support blocks which carry the rails for the car 32
80 employed to convey the burning coke from the ovens to the quenching station. 33 is a cover, usually of wood, for the sump.

In the modification shown in Fig. 3, the framework of the tower on one side consists of an extension of that portion 8¹ of the
85 framework of the tank supporting structure adjacent the trackway, while the opposite portion 21¹ of the framework of the tower rests upon the cross-beam 18, and the outer side wall 22¹ of the tower is connected at its
90 base to the deflecting roof member 4¹ extending above the quenching chamber. The funnel shaped bottom 24¹ has its outlet directly over the trough 27. The remaining features are substantially the same as in the first modifi-
95 cation.

The operation of the device is substantially as follows:

The charge of hot coke from an oven is conveyed by the car 32 to a point below the
100 spray nozzles 17¹ in the quenching chamber. The valves 13a and 13b being previously closed, 13a is opened and the pump 12 is started. The pump 12 will force a flow of water up the vertical pipe 11 through the
105 horizontal portion 11¹ into the pipe 15 and through the branched extensions 16 and 19 to the spray pipes 17¹ and 20¹, respectively. Since the tank 9 is located at a point above the quenching spray pipes 17¹ it will insure
110 a supplemental supply of water to these pipes for quenching the coke should the pump supply prove inadequate. Inasmuch as the tank 9 in the preferred form shown is located below the tower treating spray pipes 20¹ it cannot
115 be relied upon directly to feed these pipes. However, since the direction of flow from the pump at 11¹ is horizontal and the water there has considerable velocity in the horizontal direction, producing an aspirator effect, this
120 taken in connection with the fact that the relatively small capacity of the overflow pipe 30 and the head of the water in tank 9 presents considerable resistance to flow from the pump to the tank, causes the water from the pump to ascend to the tower spray pipes 20¹. I may, of course, locate the tank 9 at a sufficient elevation to create a head which would directly cause it to feed the spray pipes 20¹, but I prefer the former arrangement for the reason
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that it permits a pump of smaller capacity to be employed since during the period when the valves 13a and 13b are closed the pump need operate to replenish the tank under a relatively small head only, and when the valve 13a is opened the pump is not called upon to deliver the entire supply of water to the respective spray pipes since a portion of the supply to the spray pipes 17¹ at least may be furnished by the tank which also serves as a means for steadying the flow.

The steam, noxious and objectionable gases, together with the solid particles which arise from the quenched coke are directed by the guideway 4 (Figure 1), or 4¹ (Figure 3) to the opening in the tower 22 beneath the hurdles 26 and in rising therethrough encounter the descending spray of water or other spray liquid employed. By reason of the interposition of the hurdles they also encounter in their upward passage the films of liquid covering the reticulated surfaces. The tendency for the ascending products to form channels between similar channels in the descending liquid spray is thereby prevented and an intimate commingling of said products and the sprayed liquid insured. The steam is condensed, the gases dissolved or trapped and with the suspended solid particles are carried to the bottom of the tower from whence they are discharged by the funnel 24 and pipe 25 to the slanting floor of the quenching chamber and from there they are carried by trough 27 and return pipe 29 to the collecting sump 6. The solid particles are precipitated and the overlying liquid may again be pumped through the system and the operation repeated.

During the period when the sprays are not in operation the valve 13a is closed and the valve 13b opened to permit drainage of the spray pipes to prevent dripping therefrom. These valves are preferably magnetically actuated under control of the operator on the car.

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 a quenching station: a liquid supply system; a quenching chamber adjacent thereto; a settling tank communicably connected above its bottom to the supply system; quenching spray-means connected with said supply system and adapted to spray liquid into said quenching chamber; a tower provided at its lower portion with an opening communicating with said quenching chamber at the upper part thereof for receiving the products which may arise from the quenching operation; means located above the quenching sprayer-means to direct said products to said opening; treating sprayer-means located at the top of said tower and

communicably connected to said supply system and adapted to spray liquid into said tower; and means for collecting liquid in the lower part of said quenching chamber and the lower parts of said tower and returning the same to the settling tank; substantially as specified.

2. In a quenching station: a liquid supply system; a quenching chamber adjacent thereto; a settling tank communicably connected above its bottom to the supply system; quenching sprayer-means connected with said supply system and adapted to spray liquid into said quenching chamber; treater-means communicating with said quenching chamber at the upper part thereof and adapted for treating with liquid the products which may arise from the quenching operation; and means for collecting liquid in the lower part of said quenching chamber and the lower part of said treater means and returning the same to the settling tank; substantially as specified.

3. In a quenching station, in combination: a liquid supply system; a quenching chamber adjacent thereto and adapted for periodic insertion and removal of a quenching car therein; quenching-liquid supply-means communicating with the interior of said chamber so as to discharge into the quenching car when therein and communicating with said liquid supply system; a portion of said quenching chamber being extended upwardly above said quenching liquid supply means so as to form a treating tower, said treating tower communicating at the upper part thereof with the atmosphere and also communicating with quenching chamber at the upper part thereof so as to produce a chimney effect and thereby discharge from the quenching chamber upwardly through the treating tower into the atmosphere products and heat which may arise from the quenching operation; spray-means adapted to spray liquid downwardly into said tower; and means adapted to prevent liquid from said spray means for said tower from passing onto material to be quenched in the quenching chamber during the descent of the liquid from said spray-means.

4. In a quenching station, in combination: a liquid supply system; a quenching chamber adjacent thereto and adapted for periodic insertion and removal of a quenching car therein; quenching-liquid supply-means communicating with the interior of said chamber so as to discharge into the quenching car when therein and communicating with said supply system; a portion of said quenching chamber being extended upwardly above said quenching-liquid-supply-means to form a treating tower, said treating tower communicating at the upper part thereof with the atmosphere and also communicating with quenching chamber at the upper part there-

of so as to produce a chimney effect and thereby discharge from the quenching chamber upwardly through the treating tower into the atmosphere products and heat which may arise from the quenching operation; spray-means adapted to spray liquid downwardly in the treater tower; the said portion forming the treater tower being offset from the quenching chamber and so arranged relative thereto that liquid descending therein would be maintained from passing onto material to be quenched in the quenching chamber during the descent of the liquid from said spray-means.

5. In a coke quenching station, the combination of a quenching chamber and a treating chamber extending thereabove, said treating chamber communicating at the upper part thereof with the atmosphere and also communicating with the quenching chamber at the upper part thereof to produce a chimney effect and thereby discharge gaseous quenching products from the quenching chamber through the treating chamber into the atmosphere during the quenching operation; sprayer-means mounted near and communicating with the upper part of each of said chambers, a reservoir for a quenching liquid disposed at an elevation higher than the elevation of the sprayer-means for said quenching chamber; a supply sump; pipe connections leading from said reservoir to said sprayer-means, and from the sump to said reservoir; a pump adapted to propel fluid through said pipe connections from said sump to the reservoir and to the sprayer-means; a relief means communicating with said pipe connections for flow of surplus liquid therefrom; and means for returning surplus liquid from said relief means to said sump.

6. In a coke quenching station, the combination of a quenching chamber and a treating chamber extending thereabove, said treating chamber communicating at the upper part thereof with the atmosphere and also communicating with the quenching chamber at the upper part thereof to produce a chimney effect and thereby discharge gaseous quenching products from the quenching chamber through the treating chamber into the atmosphere during the quenching operation; sprayer-means mounted near and communicating with the upper part of each of said chambers; a reservoir for a quenching liquid disposed at an elevation higher than the elevation of the sprayer-means for said quenching chamber; a supply sump; pipe connections leading from said reservoir to said sprayer-means; and from the sump to said reservoir; a pump adapted to propel fluid through said pipe connections from said sump to the reservoir and to the sprayer-means; a valve in said pipe connections for controlling communication between said

reservoir and said sprayer-means; a relief pipe communicating with said pipe connections for relief of surplus liquid therefrom; a relief valve in said relief pipe for controlling the flow therethrough; and means for conveying liquid from said relief valve to said sump.

7. In a quenching station, in combination: a quenching chamber; a treater tower disposed at a higher elevation than said quenching chamber communicating therewith for receiving products and heat which may arise from the quenching operation and adapted to precipitate said products therein with liquid and concurrently discharge said heat and residue upwardly therethrough, said treater tower communicating at its upper part with the atmosphere and communicating with the quenching chamber at the upper part thereof so as to produce a chimney effect and thereby discharge said heat and residue upwardly from the quenching chamber through the tower into the atmosphere during quenching in said quenching chamber; means for supplying quenching liquid to said quenching chamber; treating-liquid supply means for supplying treating liquid to said treater tower, said treater tower also being offset from said quenching chamber and having liquid directing-means associated therewith whereby treating liquid supplied thereto and discharging therein would be maintained from contact with material being quenched in said quenching chamber during the descent of the treating liquid from said treating liquid supply means.

8. In a quenching station, in combination: a quenching chamber having a quenching liquid-sprayer therefor; a treater tower at a greater elevation than the quenching chamber and having a treating liquid-sprayer therefor at a greater elevation than the quenching liquid-sprayer; said treater tower communicating at the upper part thereof with the atmosphere and also communicating with the quenching chamber at the upper part thereof so as to provide a chimney effect and thereby receive products which may arise in the quenching chamber during quenching therein and discharge said products upwardly through the treater tower into the atmosphere; a sump below the levels of said chamber and said tower for receiving spent liquid therefrom; a reservoir at an elevation intermediate said sprayers; a supply pipe line leading from said sump to said reservoir; a pump in said pipe line; and pipe line connections connected to said supply pipe line intermediate the reservoir and the pump and communicably connecting the sprayers therewith.

9. In the combination defined in claim 8 an overflow pipe for the reservoir of less diameter than the portion of the pipe line leading

from the pump to the reservoir, and means for returning the overflow to said sump.

5 10. In combination with a quenching chamber adapted for quenching material therein with a liquid, a tower communicating with
5 said quenching chamber at the upper part thereof for receiving the products which may arise from quenched material mixed with air, said tower being disposed above said quenching chamber and communicating at its upper
10 part with the atmosphere so as to produce a chimney effect and thereby discharge said air and products from the quenching chamber upwardly through the tower into the atmosphere during the quenching operation, and
15 sprayer means cooperating with said tower and adapted to direct a spray of liquid thereinto for washing out of said products mixed with air concurrently with discharge of said
20 air into the atmosphere, and means adapted to maintain liquid directed into said tower from passing onto material being quenched in the quenching chamber during the descent of the liquid from said sprayer means.

25 11. The method of removing products that form and rise and flow upwardly by reason of spraying of hot coke with liquid to quench said coke, which comprises: flowing said products and the heat thereof upwardly into
30 the atmosphere during quenching of the coke; passing said products during such flow into contact with a descending spray of aqueous liquid and thereby precipitating the objectionable products therefrom; and maintain-
35 ing the spent liquid of said spray of aqueous liquid from passing directly onto the coke being quenched during the descent of the liquid from said spray.

40 In testimony whereof, I have hereunto set my hand.

JOSEPH BECKER.

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