The invention relates to a coke quenching tower for horizontal coke oven batteries and more particularly to those towers of the general type of Patent No. 1,848,818 of March 8, 1932, which are provided with a spray device for quenching the coke and a stack provided with spray nozzles for precipitating the particles of coke entrained by the quenching steam.

The quenching of the coke, pushed from the coke oven, usually occurs in a quenching car by introduction of considerably large amounts of water onto the coke in a quenching car while the car is in a quenching tower provided with a spraying device therein and a stack above the spraying device.

The large amounts of steam produced, especially in the first period of the quenching, under high pressure contain considerable amounts of small particles of coke or coke ash which leave the stack with the quenching steam and contaminate the surroundings.

It has already been suggested, as in the aforesaid patent, that the solid material entrained by the quenching steam be removed from the quenching steam in the stack by spraying the steam with water in the stack. However, a large amount of water must be sprayed into the stack in order to achieve a thorough separation of the solid material from the steam before it leaves the stack to pass into the atmosphere.

The resistance to upflow of steam is so great due to the downflow of spray liquid that the draft effect on the steam in the stack is more or less annulled so that the steam leaves at the bottom of the tower through the entrance passage for the quenching car to the quenching tower.

Now the object of the invention is a coke quenching tower having the stack constructed in the form of a venturi and in which spray nozzles, which spray liquid across the entire section of the stack, are arranged above the throat construction of the venturi in the gradually widening upper section of the venturi.

A better suction effect on the quenching steam immediately over the coke in the quenching car is achieved as a result of the high velocity of flow in the constricted throat part of the venturi stack, which velocity is again reduced in the upwardly widening part by such venturi construction of the stack of the coke quenching tower.

By the arrangement of nozzles producing a very fine spray of water in the upper part of the venturi stack, a thorough cleaning of the quenching steam of its solid particles is achieved, since neither the danger of an escape from entainment of the separated solid materials nor too great a resistance which would prevent the removal of the steam by suction exists in this upper part of the stack as a result of the slight flow velocity of the steam.

The invention also consists in providing in the region of the stack above the venturi throat and below the level of the spray nozzles, jets of the baffles which deflect the liquid from the spray nozzles to the walls of the quenching stack.

In this way, the sprayed water descending from the upper part of the stack is prevented from flowing down on to the coke in the quenching car and oversaturating the coke with water in an undesired manner. A practically uniform quenching of the coke can be achieved with cleaning of the quenching steam in this manner by the use of separate spray nozzles in the lower venturi section which produce a very fine spray of the water suitable for spraying the coke, so that oversaturation of the coke with water in individual localized areas is prevented.

A preferred embodiment of the invention is illustrated in the drawing, in which FIG. 1 is a longitudinal vertical cross section and FIG. 2 is a transverse vertical cross section through a coke quenching tower constructed in accordance with the invention.

As apparent from FIG. 1, the quenching tower 2 has in the lower part a car receiving quenching space corresponding essentially to the size of the coke quenching car 1. A spraying device 3 is arranged above quenching tower 2 and is provided with spray nozzles 4 for spraying water to the top surface of coke on the inclined bottom of a quenching car 1 where it is loaded with incandescent coke to be quenched. Spray nozzles 4 are so constructed that they bring the water on to the coke in the form of a very fine spray and thus effect a uniform quenching.

The quench water flowing out from the bottom of the quenching car 1, flows in the customary manner into a quenching water sump (not shown) from which it is again delivered after separation of the solid materials to spraying device 3, by means of a high tank (also not illustrated). The end walls 5 of the lower part of a stack 8 are connected to quenching tower 2 so as to considerably converge towards the top of the stack to form a venturi throat 6 which is a narrow cross section and to which is connected an upper stack section 8a with outwardly diverging end walls 7, whereby the effective cross section is increased towards the top of the stack 8 where it discharges the clean quench steam into the upper atmosphere.

By this venturi throat construction of stack 8, the steam produced with attendant high pressure by heat absorbed in the quenching of the coke in car 1 is rapidly removed by high velocity of the throat section 6, and it issues from the constricted throat section 6 through which the quenching steam flows with a rather high velocity along the upper section 8a of the stack 8 in which the velocity of the flow of the quenching steam is progressively reduced due to the divergence of its end walls 7. In the upper part of the stack of upper section 8a there is arranged a distributing line 9 with spray nozzles 10, which spray water in a very finely distributed condition across the entire cross section of the upper section 8a of the quenching stack 8. The fine particles of coke entrained by the off flowing quenching steam during the quenching of the coke, are precipitated by this very fine spray of water without essentially hindering the rising motion of the quenching steam out into the upper atmosphere.

Jalousie-like baffles 12 are arranged upwardly alongside of the side walls 13 under the spray nozzles 10, starting from both sides of a central roof-like covering 11. The steam flows laterally through the baffles. As a result of the inclined arrangement of the baffles 12, the water from the spray nozzles is deflected to flow down along the walls 13 of the upper section 8a of the stack 8. Underneath the bilaterally arranged jalousie-like baffles 12 there are arranged, below the throat 6 at the base of wall 13 of the stack 8, collecting grooves or troughs 14 from which grooved pipes 15 lead to the lower end 16 of the quenching tower 2 so that the water flowing down from the spray nozzles 10 cannot pass to the quenching car along with the water from nozzles 4, thus avoiding waterlogging of the quenched coke.

In operation, the quenching car 1, when loaded with incandescent coke from one or more coking chambers of a battery of horizontal coke ovens, is run into the quenching tower 2 through one longitudinal end thereof which operation, as conventional, also
automatically sets the spray heads 3 and 10 into operation to suddenly quench the coke in the car. At the completion of the quenching operation, the car is run out of the tower to discharge the quenched coke onto a coke wharf or conveyor belt, and the car returned to the battery to receive the next coke oven charge to be quenched.

The water from sprays 4 drains through the coke on the car to the inclined bottom which discharges the quench water to the floor and sump, not shown.

The quench steam suddenly evolved as a result of the water from sprays 3 meeting incandescent coke, rises to enter the throat 6. The convergence of the walls 5 to the throat increases the velocity of flow of the quench steam under the pressure of the steam developed by the heat of the coke.

As the quench steam leaves the throat 6 to enter the upper atmosphere it expands, thus decreasing its velocity due to the divergence of the walls 7 of the upper section 8 of stack 8. At this decreased velocity the quench steam is sprayed with water from spray nozzles 10 in the form of fine globules which precipitate dust from the quench steam or vapors. This spray water and its precipitated dust is deflected to the longitudinal side walls 13 by the baffles 12. The water and dust flows down the side walls, out of the path of rise of the greatest portion of the quench vapors to enter the collecting troughs 14, from which the water and dust flows through drain pipes 15 to the floor or sump to which water from sprays 4 flows after leaving the inclined bottom of the car 1. The water in pipes 15 thus bypasses the coke in the car 1.

The invention as hereinabove set forth is embodied in a particular form of construction, but may be variously embodied within the scope of the following claims.

I claim:

1. A coke quenching tower adapted to receive in the lower part thereof a quenching car loaded with coke to be quenched from a battery of horizontal coke ovens and provided with a stack above said lower part; a lower set of spray nozzles above said lower part for discharge of quenching water on top of coke in a car in the tower for quenching of the coke; and an upper set of spray nozzles at a higher level in the stack than the level of said lower set of nozzles for precipitation of the particles of coke entrained by the steam evolved in said quenching; characterized by: said stack being constructed as a venturi having a lower upwardly converging section composed of oppositely disposed upwardly converging walls disposed above the lower set of spray nozzles, an upper upwardly diverging section enclosing said upper spray nozzles disposed above said lower converging section and composed of oppositely disposed downwardly converging walls for discharge of quench vapors at its top into the upper atmosphere, and a constricted throat intermediate and communically connecting the lower and upper sections at a level between the levels of the upper and lower spray nozzles.

2. A coke quenching tower as claimed in claim 1, and in which the upper section of the stack is provided with baffles between the upper spray nozzles and the constricted throat and disposed therein in a manner for deflecting the liquid from the upper spray nozzles to a wall of the upper section of the stack, to deliver such liquid out of the path of the flow of quench steam to and from the throat.

3. A coke quenching tower as claimed in claim 2, and which includes a collecting trough disposed below the constricted throat at the base of the upper section to receive the water deflected by the baffles, and a conduit for draining the trough and disposed to by-pass the quenching car with the water from the trough.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>796,304</td>
<td>Eba</td>
<td>Aug. 1, 1905</td>
</tr>
<tr>
<td>1,848,818</td>
<td>Becker</td>
<td>Mar. 8, 1932</td>
</tr>
<tr>
<td>2,234,826</td>
<td>Koppers</td>
<td>Mar. 11, 1941</td>
</tr>
<tr>
<td>2,837,470</td>
<td>Hayden</td>
<td>June 3, 1958</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Patent</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>419,146</td>
<td>Germany</td>
<td>Sept. 21, 1925</td>
</tr>
</tbody>
</table>

OTHER REFERENCES