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2,144,109

COKE CHAMBER

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FIG. 1.

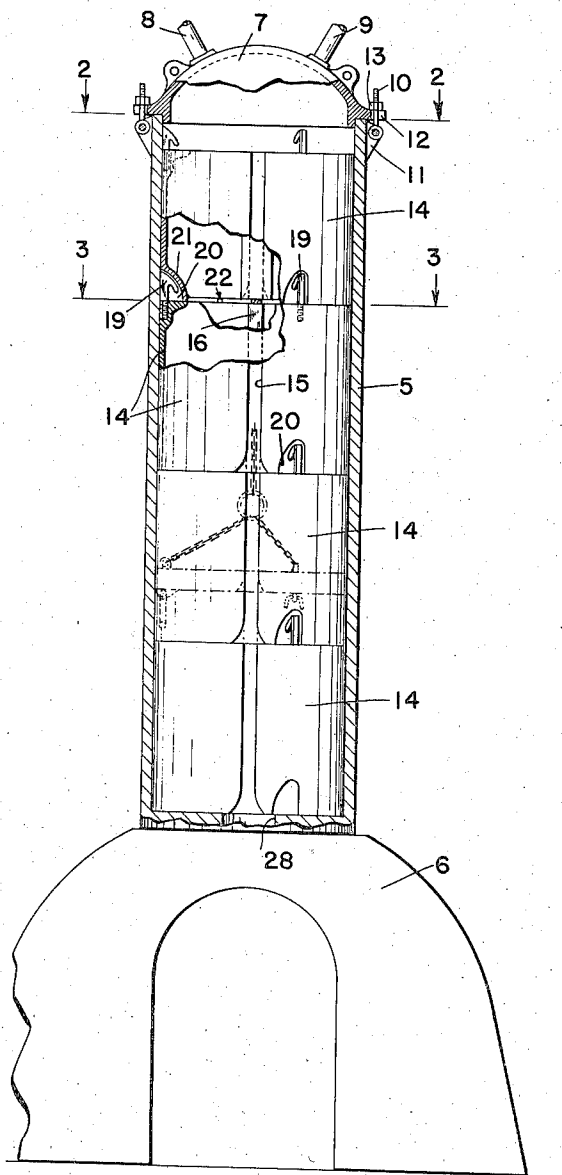


FIG. 2.

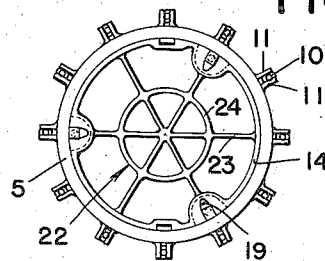


FIG. 3.

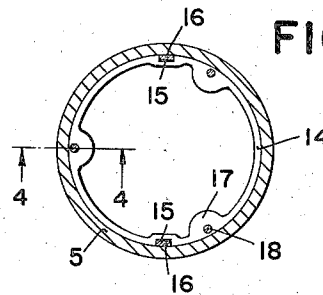
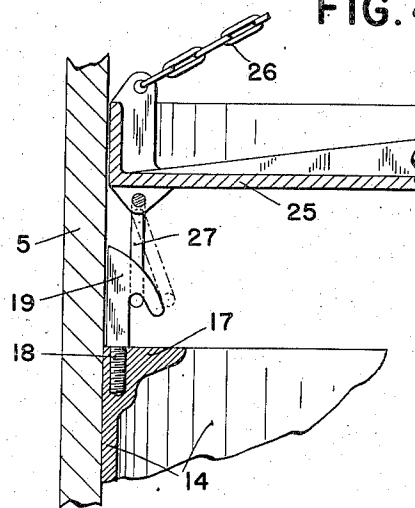


FIG. 4.



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COKE CHAMBER

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9 Claims. (Cl. 196—122)

My invention relates to coke chambers wherein the coke from crude petroleum, formed during the distillation or cracking thereof, is deposited, and more particularly to a coke chamber from which the deposited coke may be removed in an efficient manner without danger of injury to the workmen.

In known processes for the separation of gasoline and other oils from crude petroleum, the vaporized crude oil is passed through a chamber arranged to trap the solid constituents usually consisting of precipitated carbon, which forms coke when cooled. When this chamber is filled with the coke residue it is necessary to remove the residue from the chamber so that the chamber will trap efficiently the solid constituents of the oil passing therethrough. Since the present cracking processes are continuous in operation, the entire plant must be shut down while the coke is removed from the coke chamber.

The method heretofore used for removing coke from the coke chamber utilizes a chain or cable which is wound spirally on temporary supports in the inside of the chamber. The coke then is permitted to deposit in the chamber and when the chamber is filled substantially therewith, the chain is removed from the chamber through a manhole in the bottom thereof. As the chain is pulled away from the temporary supports, the deposited coke is broken into small pieces and away from the walls of the chamber. Because of the severe strain exerted on the chain when it is being removed from the chamber and because of the high temperatures to which the chain is subjected, it frequently breaks, and it is necessary then that men enter the chamber through the manhole and loosen the coke with picks or other hand operated tools. At times, huge masses of coke are dislodged within the chamber and fall on the workmen. Injuries received by the workmen in this manner usually are fatal.

While the coke chamber is in operation the interior thereof is maintained at a temperature above a thousand degrees Fahrenheit, and before a man safely can enter the chamber, it must be cooled at least to a temperature of not more than 130 degrees. Besides being dangerous, working in this confined space at such high temperatures is also a severe strain on the workmen.

After the coke is removed and before the chamber again may be operated the temporary chain supports must be welded in place in the chamber, and the chain must be wound thereon in the spiral position mentioned above.

The methods as used heretofore are both costly

and dangerous. If the chain remains intact, at least 10 or 12 hours are needed to remove the coke from the chamber, and if the chain breaks, the time for removing the coke necessarily is increased and the workmen then are exposed to the dangerous conditions mentioned above.

In view of the deficiencies of the methods and apparatus as used heretofore, my invention contemplates a method of an apparatus for cleaning a coke chamber of a distillation unit in a process for cracking petroleum, the method comprising separating the coke contained in the chamber into a plurality of masses and removing the masses from the chamber by removing a series of liner inserts from the chamber. A suitable chamber for efficiently carrying out this method includes an outer housing and a plurality of liner inserts arranged in the housing one on top of the other and each adapted to serve as a container for a mass of the precipitated carbon. The bottom of each of the inserts is formed by a grid so that the precipitated carbon contained in the chamber may be separated into a plurality of masses and be removed from the chamber by removing the inserts therefrom. To facilitate removal of the inserts from the chamber a grapple may be employed which automatically engages a plurality of hooks suitably arranged on the inserts. The coke may be removed from the inserts after the inserts are removed from the chamber, and clean inserts may replace the filled ones so that it is not necessary first to clean the inserts before again resuming operations. It is obvious, therefore, that the time required to put the coke chamber back into operation is reduced substantially, a period of two to four hours sufficing where before ten to twenty hours were necessary, and it is estimated that about 35 days in a year can be saved by the present invention with less labor cost for the cleaning operation.

Having thus briefly described my invention one object, therefore, is to provide a method of an apparatus for removing coke from a coke chamber whereby the time for cleaning the chamber and the number of men needed for the operation is reduced.

Another object of my invention is to provide a method of an apparatus for removing the coke from a coke chamber whereby the cost of the operation is reduced to a minimum.

A more specific object of my invention is to provide a method of an apparatus for removing the coke from a coke chamber whereby the coke may be removed from parts of the chamber after

the parts are separated therefrom, and duplicate parts may be installed in the chamber so that the chamber may be utilized while the coke is being removed from the other parts.

Other objects and advantages will be apparent to those skilled in the art from the following description wherein reference is made to the drawing illustrating a preferred embodiment of my invention and wherein similar reference numerals designate similar parts throughout the several views.

In the drawing:—

Fig. 1 is a vertical sectional view through a coke chamber embodying the invention;

Fig. 2 is a detail top view of the chamber with the cover removed, the same being taken along the lines 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view through the chamber together with a part of the hoisting apparatus for removing the removable inserts.

Referring to the drawing, the coke chamber shown therein is comprised of an outer housing 5, a base 6 and a top cover 7 removably secured to the top of the outer housing 5 and provided with an inlet 8 through which the vaporized crude oil is introduced into the chamber and an outlet 9 for the oil. The inlet 8 and the outlet 9 usually are provided with union couplings for connecting them to other pieces of apparatus used in the refining process so that with the unfastening of these couplings the cover 7 of the present invention may be removed from the top of the chamber by suitable hoisting equipment.

As herein shown, the cover 7 is secured to the outer housing by eye bolts 10 pivotally carried on lugs 11 on the outer housing and engaging the forked lugs 12 on the cover against which they are clamped by the nuts 13. The seal between the cover and outer housing 5 should be air tight, and for this purpose a suitable gasket may be interposed between the joint of these two parts if necessary.

The outer housing 5 is lined with a plurality of steel liners or tubular inserts 14 which are placed within the housing one on top of the other and in close relation with the inner wall thereof but spaced sufficiently therefrom to permit expansion of the tubular inserts when heated to a substantially high temperature. A tight seal between adjacent inserts is unnecessary because the heated carbon is somewhat viscous and unable to pass readily through small interstices whereby the interstices between adjacent inserts are sealed automatically by the precipitated carbon. Each insert has diametrically disposed longitudinally extending grooves or guide ways 15 cooperating with longitudinally extending guide bars or keys 16 secured to the inner wall of the housing 5 so that the inserts will be definitely located and movement relative to each other will be prevented when placed within the housing.

The top of each insert has equally spaced inwardly extending projections 17 in which the shanks 18 of lifting hooks 19 are anchored. The bottom of each insert has equally spaced hook receiving recesses 20 extending inwardly from the outer wall of the insert and aligned with the projections 17, the wall 21 adjacent the recess resting on the projection so that the recesses 20 and the hooks 19 are isolated from the interior of the

inserts. The bottom portion of each insert is also provided with a grid 22 which is here shown as formed of diagonal or radially disposed members 23 and a circular member 24 intersecting them.

With the above construction when the chamber becomes filled with deposited coke, the top cover 7 is unfastened and lifted off and then a suitable grapple is affixed to the hoist to engage the hooks 19 of the top section. This grapple may be in the form of a frame 25 secured to the hoist rope by chains 26 and provided with eyes 27 pivotally mounted and spaced on said frame so as to engage the hooks 19. The liner sections then are lifted successively out of the chamber and deposited on the ground outside the chamber or upon suitable conveyances which carry them to a place where the coke may be removed from them. As the uppermost liner section is lifted from the next lower, the grid 22 serves to break up the coke between these adjacent inserts. The opening 28 at the bottom of the chamber is provided with the usual manhole cover (not shown) whereby access may be had to the chamber from the lower end if desired.

When the coke filled liner sections are removed, another set of liners may be immediately inserted in their place in the chamber, the top cover replaced and connected up in the system so that operations may be resumed in a relatively short time.

Where as in some instances the coke chambers are relatively small, for example not more than ten feet in height, a single removable insert may be used.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. In a device of the class described, a coke chamber adapted to collect precipitated carbon from vaporized oil passed therethrough, said device comprising an outer housing and a plurality of removable liner inserts adapted to be positioned in said housing one on top of the other, the bottom of each of said inserts being formed by a grid so that the precipitated carbon collected in said chamber may be separated into a plurality of masses and being arranged whereby when said liner inserts are removed from said chamber the mass of precipitated carbon collected in said liner insert will be removed therewith, and a removable cover on one end of said chamber through which said inserts may be withdrawn from said chamber.

2. In a device of the class described, a coke chamber adapted to collect precipitated carbon from vaporized oil passed therethrough, said device comprising an outer housing and a plurality of removable liner inserts adapted to be arranged in said housing one on top of the other, the bottom of each of said inserts being formed by a grid so that the precipitated carbon collected in said chamber may be separated into a plurality of masses and be removed from said chamber by removing said inserts therefrom, means on said liner inserts to facilitate removal of said inserts from said chamber, and said means being positioned on said inserts so that said means are isolated from the interior thereof.

3. In a device of the class described, a coke chamber adapted to collect precipitated carbon

from vaporized oil passed therethrough, said device comprising an outer housing and a plurality of superimposed removable liner inserts adapted to be positioned in said housing and each arranged whereby when said liner inserts are removed from said chamber the mass of precipitated carbon collected in said liner insert will be removed therewith, means to maintain said inserts in the same relative position to each other, means to facilitate removal of said inserts from said chamber, and said removal means being isolated from the interior of said inserts so that said means do not contact said precipitated carbon.

4. In a device of the class described, a coke chamber adapted to collect precipitated carbon from vaporized oil passed therethrough, said device comprising an outer housing and a plurality of removable liner inserts adapted to be positioned in said housing one on top of the other and arranged whereby when said liner insert is removed from said chamber the mass of precipitated carbon collected in said liner insert will be removed therewith, each of said inserts having a plurality of hooks positioned at the top thereof and adapted to facilitate removal of said liner inserts from said chamber, and each of said inserts having at the bottom thereof adjacent said hooks an indented portion to accommodate said hooks so that said hooks are positioned between the outer housing and the indented portion of said insert.

5. In an apparatus for cracking hydrocarbon oils and separating the cracked products in a coking chamber wherein the residual products are collected in said chamber and the vaporized products are removed at the top thereof, said chamber comprising an outer housing with a plurality of superimposed removable liner inserts adapted to be positioned in said housing and each being arranged whereby said residual products are deposited within a zone defined by said liner inserts, and said inserts being formed and arranged in said chamber whereby when each of said inserts is removed from said chamber the mass of residual products collected in the zone of said insert will be removed therewith.

6. In an apparatus for cracking hydrocarbon oils and separating the cracked products in a coking chamber wherein the residual products are collected in said chamber and vaporized products are removed at the top thereof, said chamber comprising an outer housing and a plurality of superimposed removable liner inserts adapted to be positioned in said housing and arranged whereby said residual products are deposited within a zone defined by said liner inserts, the bottom of said inserts being formed by a grid to permit the residual products while heated to pass downwardly from one insert to another

therebelow, and said inserts being arranged in said chamber so that the residual products collected in the zone of said inserts may be removed from said chamber by removing said inserts separately therefrom.

7. In an apparatus for cracking hydrocarbon oils and separating the cracked products in a coking chamber wherein the residual products are collected in said chamber and vaporized products are removed at the top thereof, said chamber comprising an outer housing and a plurality of removable liner inserts adapted to be arranged in said housing one on top of the other and arranged whereby said residual products are deposited within a zone defined by said liner inserts, the bottom of each of said inserts being formed by a grid so that the residual products collected in said chamber may be separated into a plurality of masses, and said inserts being arranged whereby when one of said inserts is removed from said chamber the mass of residual products collected in the zone of said insert will be removed therewith.

8. In an apparatus for cracking hydrocarbon oils and separating the cracked products in a coking chamber wherein the residual products are collected in said chamber and vaporized products are removed at the top thereof, said chamber comprising an outer housing with a plurality of removable liner inserts adapted to be positioned in said housing one on top of the other and arranged whereby said residual products are deposited within a zone defined by said liner inserts, the bottom of each of said inserts being formed by a grid so that the residual products collected in said chamber may be separated into a plurality of masses and be removed from said chamber by removing said inserts separately therefrom, and means to facilitate removal of said inserts from said chamber.

9. In an apparatus for cracking hydrocarbon oils and separating the cracked products in a coking chamber wherein the residual products are collected in said chamber, said chamber comprising an outer housing with a plurality of removable liner inserts adapted to be positioned in said housing one on top of the other and arranged whereby said residual products are deposited within a zone defined by said liner inserts, the bottom of each of said inserts being formed by a grid so that the residual products collected in said chamber may be separated into a plurality of masses and be removed from said chamber by removing said inserts separately therefrom, and each of said inserts having a plurality of hooks positioned at the top thereof and adapted to facilitate removal of said liner inserts from said chamber.

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