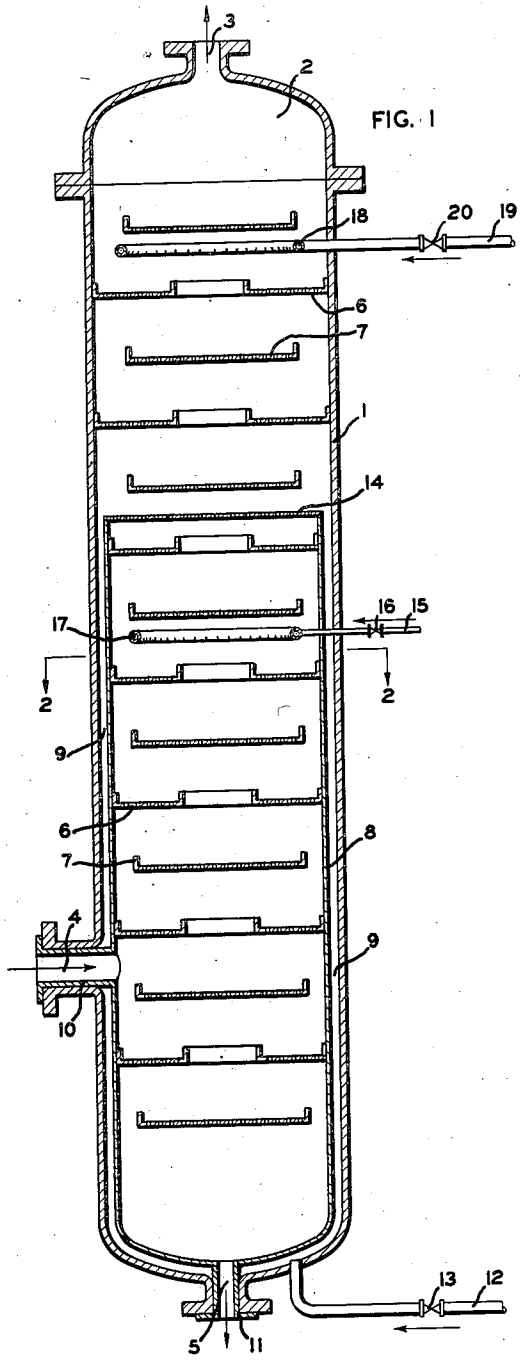
July 31, 1934. A. H. J. OTTO ET AL 1,968,093

CORROSION PREVENTION

Filed Nov. 28, 1932

FIG. 1



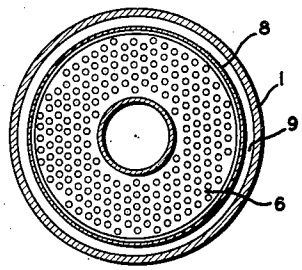


FIG. 2

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CORROSION PREVENTION

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6 Claims. (Cl. 196—133)

This invention relates to improvements in corrosion prevention and more particularly relates to an improved method and means for preventing corrosion in refining equipment such as fractionators for cracked vapors.

We have found that vapors resulting from the pyrolytic conversion of hydrocarbon oils containing appreciable sulphur compounds, acidic or other corrosive materials give trouble from corrosion in fractionating equipment principally in the lower portion of the fractionator where the temperatures are highest and that corrosion in the upper portion of the fractionator where the temperature of the vapors has been considerably decreased, is often negligible or non-existent.

It has become common practice to supply the raw oil charging stock for cracking to the system by feeding all or a portion of it into the fractionator, where it comes into direct contact with the heated vaporous conversion products, serving to cool them and assist their fractionation and being thereby pre-heated. In such processes the reflux condensate resulting from fractionation of the vapors and the preheated raw oil charging stock collect in the lower portion of the fractionator and are supplied therefrom to the heating element of the system for conversion.

The present invention, in its most specific embodiment, utilizes oil to be cracked as a means of cooling the heated vaporous conversion products in the upper portion of the fractionator of the system to below a temperature at which they are corrosive and the oil thus utilized also serves as a means of preventing corrosion of the walls of the fractionator in its lower portion, i. e. that portion of the fractionator where the vapors remain at a corrosive temperature. This is accomplished by providing a liner or, more strictly, a false shell, in the lower portion of the fractionator, spaced away from the walls of the fractionator. The space thus provided, is kept substantially filled with oil which enters preferably at a low point and overflows over the upper end of the false shell or liner into the upper portion of the fractionator proper. The oil thus fed through the space provided between the outer walls of the fractionator and the false shell or liner not only serves to keep the walls of both cool, but also serves as a protective body preventing contact of hot corrosive vapors and liquid with the outer shell.

In its broader concepts the features of the invention are applicable to use with any equipment which is subject to corrosion, particularly from fluids in a heated state and still more particularly from fluids which are less corrosive at low temperatures. The features of the invention may, for example, be utilized to advantage in a wide variety of oil refining equipment such as fractionators of all kinds, heat exchangers, scrubbers and absorbers, reaction chambers, etc., as well as for equipment utilized in the paper-making and chemical industries in general. Any non-corrosive cooling medium may be utilized and preferably it is a fluid which will remain substantially in fluid form under the conditions to which it is subjected in the space between the liner and the shell of the vessel which it protects. It may or may not be desirable to introduce the cooling fluid into direct contact with the materials undergoing treatment in the vessel after it has passed through the space provided between the walls of the vessel and the false shell or liner. In the latter case it may be simply withdrawn from the space between the walls of the vessel and the false shell and utilized in any desired manner, or it may be cooled and recirculated back to the inlet to said space.

The novelty and features of the invention may be more fully understood by reference to the attached diagrammatic drawing, Figs. 1 and 2, and the following description thereof. The following description of the drawing includes a description of the practice of the invention as it may be accomplished in the particular type of apparatus shown.

Referring to the drawing, Figure 1 is a cross sectional elevation of one specific form of fractionator for handling hydrocarbon oils, to which the principles of the invention have been applied, and Figure 2 is a plan view of the same fractionator taken along a horizontal plane indicated by the line 2—2 of Figure 1. The main shell of the fractionator is indicated at 1, a removable head 2, having vapor outlet 3, being provided at the upper end of the fractionator. The vapor inlet is indicated at 4 and the outlet for reflux condensate and preheated raw oil is designated as 5. The type of fractionator here illustrated contains perforated pans 6 and 7 although it will be understood that other well known fractionating means such as bubble trays, packing or combinations of these may be utilized.

A false shell or liner 8 is provided within the fractionator and is spaced away from the inner surface of shell 1 in such a manner that a circumferential space 9 is provided therebetween. This space also exists between the bottom head of the false shell and the bottom head of the fractionator which are integral with the walls 8 and

1 respectively. Suitable sleeves 10 and 11, preferably of non-corrosive metal, may be provided within nozzles 4 and 5 respectively, as indicated in the drawing. The liner or false shell 8 may be constructed of ordinary low carbon steel, or of any suitable non-corrosive metal such as chrome-steel, or chrome-nickel steel. The use of non-corrosive alloys for the construction of this liner is not essential and is ordinarily unnecessary except in extreme cases as the cool oil circulated between the liner and the shell of the fractionator will ordinarily keep the liner sufficiently cool to prevent its substantial corrosion and, in order to assist in keeping the liner cool, as well as for economy, the liner is preferably constructed of relatively thin sheet metal, as compared with thickness of the outer walls of the fractionator.

The oil utilized as the cooling medium is supplied through line 12 and valve 13 to the space 9 between walls 1 and 8 preferably entering this space at a relatively low point in the fractionator, as illustrated in the drawing. The oil flows continuously upward through space 9 and overflows over the upper end of false shell 8 into the central portion of the fractionator where it comes into direct contact with the vapors arising therethrough. When desired, a perforated plate 14 or other suitable means may be provided at the upper end of shell 8 to effect distribution of the cooling oil across the entire cross sectional area of the central portion of the fractionator so that substantially uniform contact between the vapors and the cooling oil is obtained.

Preferably the quantity of the cooling oil supplied, as described, through space 9 into the central portion of the fractionator is sufficient to maintain the vapors and that portion of the fractionator above the liner or false shell 8 below a corrosive temperature or, when desired, additional cooling oil of the same or different character than that supplied through line 12 and valve 13 may be introduced into the fractionator by means of line 15, valve 16 and spray coil 17, of any suitable form, to somewhat cool the vapors prior to their contact with the oil overflowing from space 9 to insure a sufficiently low vapor temperature immediately above shell 8. A spray coil 18 of any suitable form supplied, preferably, with a relatively light cooling oil, such as a portion of the final light distillate product of the system, through line 19 and valve 20, may be provided in the upper portion of the fractionator to assist fractionation and to regulate the vapor outlet temperature, thus controlling the end boiling point of the final distillate product.

The space 9 between liner 8 and shell 1 is preferably made sufficiently small in cross sectional area to maintain the velocity of the oil supplied thereto through line 12 and valve 13 sufficient to prevent its reaching the vaporization point of any substantial quantity of this oil so that a solid body of relatively cool oil is maintained between liner 8 and shell 1. This also serves to keep both the walls of shell 8 and 1 at a minimum temperature.

It will be understood that the embodiment of the invention illustrated and described is not limited to the use of raw oil charging stock for cracking as the cooling medium circulated between the false shell and the outer walls of the fractionator. For example a lighter oil such as a portion of the final light distillate product of the system may be utilized and circulated in sufficient quantities and at a sufficiently high velocity to remain substantially unvaporized until after its introduction into the central portion of the fractionator or, when desired, a portion of the reflux condensate or a portion of the combined feed for the system may be cooled and circulated around the liner as a cooling medium or, in fact, any final or intermediate product of the system which will not contaminate the materials in the fractionator may be utilized. The exact nature of the oil is not a limiting feature of the invention although an oil is preferably used which is substantially non-corrosive at the temperature attained prior to its introduction into the central portion of the fractionator and which, preferably, remains substantially in the liquid-phase prior to its introduction into the central portion of the fractionator.

As a specific example of the operation of the process of the present invention, vapors resulting from cracking of a heavy California crude oil containing substantial quantities of sulphur compounds are supplied to the fractionator at a temperature of approximately 825° F. A vapor outlet temperature of approximately 500° F. is maintained at the top of the fractionator. A light gauge liner of ordinary low carbon steel is utilized in the lower portion of the fractionator and the raw oil charging stock for the system is introduced into the space between the liner and the fractionator shell at atmospheric temperature. A sufficient quantity of this cooling oil is utilized to maintain a vapor temperature immediately above the false shell or liner at approximately 650° F. As a result of this method of operation, no portion of the outer shell of the fractionator shows any signs of corrosion upon inspection after approximately a year's operation. A portion of the inner surface of the false shell or liner directly opposite the vapor inlet showed a small amount of corrosion but the liner was otherwise intact. These results are better appreciated by comparsion with corrosion which resulted in the loss of about ⅛ inch of metal a year in the walls of an unlined fractionator operating in conjunction with the same type of cracking process utilizing the same type of charging stock.

It is to be understood, of course, that the sleeves 10 and 11 are removably associated with the liner 8.

We claim as our invention:

1. In combination with an enlarged vertical chamber provided with walls susceptible to corrosion, of a partial liner therefor spaced from the lower and bottom portions of the inner wall of the chamber to provide a circumferential space therebetween, an inlet to said liner, an outlet from said liner, an inlet to the chamber for charging the circumferential space with liquid, and an outlet for discharging the liquid from said space.

2. In combination with an enlarged vertical chamber provided with walls susceptible to corrosion, of a relatively thin partial liner therefor spaced from the lower and bottom portions of the inner wall of the chamber to provide a circumferential space therebetween, an inlet to said liner, an outlet from said liner, an inlet to the chamber for charging the circumferential space with liquid, and an outlet for discharging the liquid from said space.

3. In combination with an enlarged vertical chamber provided with walls susceptible to corrosion, of a relatively thin partial liner therefor of non-corrosive material spaced from the lower and bottom portions of the inner wall of the chamber to provide a circumferential space therebetween, an inlet to said liner, an outlet

from said liner, an inlet to the chamber for charging the circumferential space with liquid, and an outlet for discharging the liquid from said space.

4. In combination with an enlarged vertical chamber provided with walls susceptible to corrosion, of a relatively thin liner therefor of non-corrosive material spaced from the inner side and bottom walls of the chamber to provide a circumferential space therebetween and disposed in the lower portion of said chamber, the upper end of said liner terminating a substantial distance below the upper end of the chamber, an inlet to said liner, an outlet from said liner, an inlet to the chamber for charging the circumferential space with liquid, and means for passing liquid from said space to the interior of said liner.

5. In combination with a vessel adapted to retain liquids and vapors for treatment under relatively high temperatures, an inlet and outlet for said vessel, a non-corrosive liner mounted within the lower portion of said vessel and spacedly disposed from the inner walls thereof, means for passing a cooling liquid into the space thus formed, and means for dispersing said cooling liquid through said vessel after its passage through said space.

6. In combination with a vessel adapted to retain liquids and vapors for treatment under relatively high temperatures and superatmospheric pressures, an inlet and outlet for said vessel, a non-corrosive metallic liner mounted within the lower portion of said vessel and spacedly disposed from the inner walls thereof, means for introducing a cooling liquid into the space thus formed and passing the same upwardly therethrough, and means associated with said liner for dispersing the cooling liquid through said vessel after its passage through said space.

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