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APPARATUS FOR USING A THERMO-SIPHON
REBOILER IN A FRACTIONATOR
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FIG. 2.

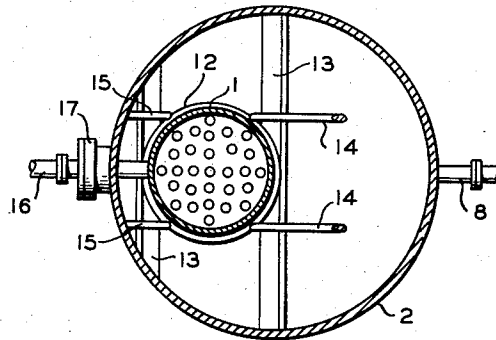
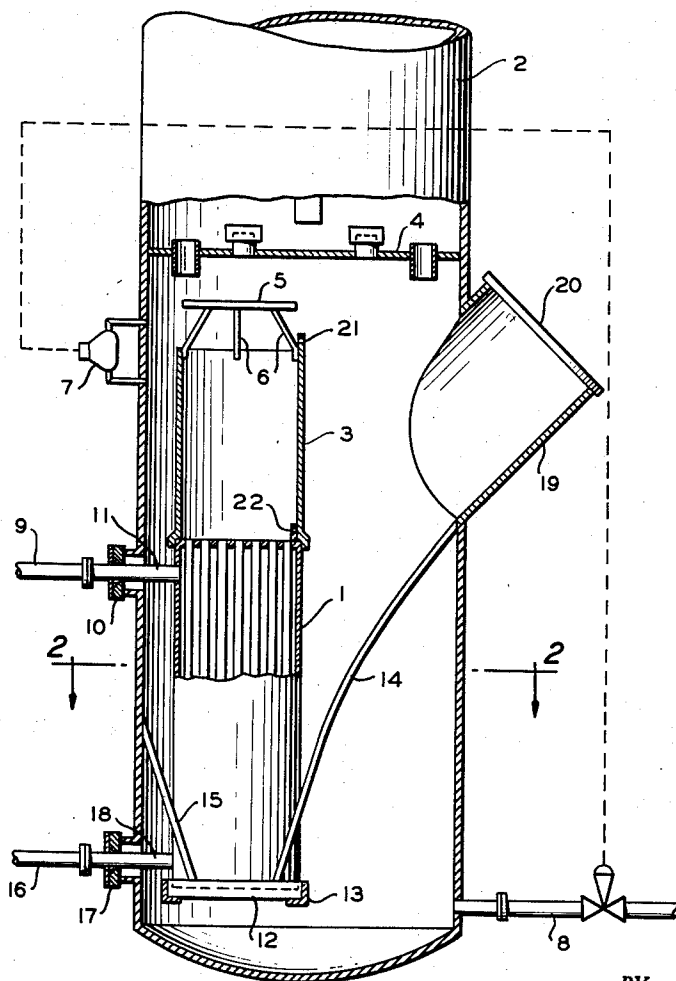


FIG. 1.

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APPARATUS FOR USING A THERMO-SIPHON REBOILER IN A FRACTIONATOR

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4 Claims. (Cl. 202—153)

This invention relates to a thermo-siphon reboiler and, more particularly, to an economical and practical method and apparatus for installing a thermo-siphon reboiler in a fractionating column and removing it therefrom.

Internal thermo-siphon reboilers have increasingly replaced external kettle type reboilers in fractionating columns due to the improved heat transfer and elimination of the connecting piping, supports, etc. Such reboilers are heated by a circulating heat exchange fluid to a temperature sufficient to vaporize the lower boiling compounds, or light ends, in the bottoms from a fractionating column; these vapors then return to the tower for further fractionation, rising countercurrently through the down-flowing condensate. Due to the high temperature at which the boiler unit is maintained, and its constant contact with a heat exchange liquid on one surface and a bottoms liquid on the opposite surface, varying deposits such as carbon, mineral deposits, etc., collect on the tubes in the reboiler so that it becomes necessary, from time to time, for efficient operation to remove this deposit from the tubes. Heretofore, considerable difficulty was experienced in removing the deposits on the outside of the tubes, due to the inaccessibility of the latter.

The principal object of the present invention is to overcome this difficulty by providing an improved reboiler for installation in a distillation column by means of which the kettle liquid, or bottoms, may be readily heated and reboiled.

Another object of the invention is to provide an improved thermo-siphon reboiler in which the bottoms from a fractionating column are raised to a high temperature and caused to circulate through a heated tube bundle to evaporate the lower boiling components of the liquid.

A further object of the invention is to provide a practical method for placing a thermo-siphon reboiler in, and withdrawing it from, a fractionating column so as to permit the removal of carbon, scale, and other deposits from the tube bundle.

In the drawings:

Figure 1 is a vertical sectional view of a thermo-siphon reboiler installed in the base of a fractionation column; and

Figure 2 is a sectional view taken along plane 2—2 of Figure 1.

Referring to the drawings, and more particularly to Figure 1, a reboiler 1 having vertically placed tubes through which the bottom product of a fractionating column 2 can rapidly flow by thermo-siphonic action, which may be further increased by use of a chimney 3, is placed below the bottom tray 4 of the column. A baffle plate 5 is attached to chimney 3 by means of supports 6 to prevent throwing liquid against the bottom tray when the liquid level in the column, controlled by liquid level controller 7 actuating a valve in product outlet line 8, is closed to the bottom tray. Heating fluid is provided the reboiler space surrounding the tubes through pipe 9 connected to a pipe 11 passing through packing gland 10, which pipe 11 is screwed into a threaded hole

in the wall of reboiler 1. Pipe 11 will be made of suitable metal, preferably stainless steel, and machine threaded so that it can be screwed into the threaded hole in the reboiler so tight that no leakage will be experienced. A stainless steel plate can be welded inside the reboiler shell at the threaded hole to thicken the metal and permit a long threaded hole to be made. The corresponding outlet connections 16, 17, and 18 from the reboiler are similarly constructed.

The reboiler 1 is supported at its base by a circular ring 12, which is in turn supported by support beams such as channel irons 13, or any other appropriate type of support. The reboiler is slid into its vertical position through inclined manhole 19 by means of skids 14 and guides 15, which may be made of angle irons or other structural members, pipe being quite satisfactory. The manhole cover 20 is removed when inserting or removing the reboiler and its chimney. An eye 21 is provided on the top of the chimney nearest manhole 19 when the chimney and the reboiler section are to be handled as a unit. However, when desired, the chimney 3 can be removed separately, in which event an eye 22 is also provided at the top of the reboiler section 1 to fit inside the chimney for attachment to a crane. The skids or guides 14 are curved so that the reboiler, which is a round, smooth cylinder, can be readily inserted through manhole 19 and, when resting on its base 12, will be in a vertical position and gripped firmly by skids 14, guides 15, and supports 13. A curved plate can be placed between the skids 14 at the base of the manhole to guide the reboiler into the manhole when it is being removed. The packing glands through which pipes carrying reboiler heating fluid to and from the reboiler can be attached to flanges which, when unbolted from the column nozzles, will permit the pipes to be easily screwed into the reboiler holes after which the reboiler can be twisted into its proper position by means of these pipes and the flanges then bolted tightly.

While the invention has been described as applied to a fractionation process, it is applicable to any heat evaporative system employing an internal thermo-siphon reboiler.

Having described the preferred embodiment of our invention, it is understood that it embraces such other variations and modifications as come within the spirit and scope thereof.

What is claimed is:

1. In a fractionating column having a kettle section with a generally cylindrical wall structure the improvement comprising, in combination, a thermo-siphon reboiler removably disposed within said kettle section, said reboiler having an over-all length greater than the diameter of said kettle section; and a manhole in the wall of said kettle section, said manhole including a conduit member joined to said wall at an angle of less than 90 degrees and forming a passage communicating with said kettle section, said passage having a cross section approximately equal to but sufficiently greater than the cross section of said reboiler to permit easy lengthwise passage of said reboiler through said passage, said conduit member being located so that said reboiler when tilted to an angle of less than 90 degrees can be removed lengthwise through said conduit member, and closure means for said conduit member.

2. In a fractionating column having a kettle section with a generally cylindrical wall structure the improvement comprising, in combination, a thermo-siphon reboiler removably disposed within said kettle section, said reboiler having an over-all length greater than the diameter of said kettle section; two conduits passing through packing glands in the wall of said kettle section and detachably connected to said reboiler for conveying heat

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exchange fluid to and from said reboiler; a manhole in the wall of said kettle section, said manhole including a conduit member joined to said wall at an angle of less than 90 degrees and forming a passage communicating with said kettle section, said passage having a cross section approximately equal to but sufficiently greater than the cross section of said reboiler to permit easy lengthwise passage of said reboiler through said passage, said conduit member being located so that said reboiler when tilted to an angle of less than 90 degrees can be removed lengthwise through said conduit member, and closure means for said conduit member; support means in said kettle section for said reboiler; and guide members in said kettle section extending from said manhole to said support means to guide said reboiler to and from said manhole.

3. In a fractionating column having a kettle section with a generally cylindrical wall structure the improvement comprising, in combination, a cylindrical thermo-siphon reboiler removably disposed within said kettle section, said reboiler having an over-all length greater than the diameter of said kettle section, said reboiler including a tube section, a chimney fitted atop said tube section, said chimney having a diameter approximately that of said tube section, and a horizontal baffle positioned across the top of said chimney below but in close proximity to the bottom tray of the fractionating column; two conduits passing through packing glands in the wall of said kettle section and detachably connected to said tube section for conveying heat exchange fluid to and from said tube section; a manhole in the wall of said kettle section, said manhole including a conduit member joined to said wall at an angle of less than 90 degrees and forming a passage communicating with said kettle section, said passage having a cross section approximately equal to but sufficiently greater than the cross section of said reboiler to permit easy lengthwise passage of said

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reboiler through said passage, said conduit member being located so that said reboiler when tilted to an angle of less than 90 degrees can be removed lengthwise through said conduit member, and closure means for said conduit member; support means in said kettle section for said reboiler; and guide members in said kettle section extending from said manhole to said support means to guide said reboiler to and from said manhole.

4. Apparatus for fractionating a fluid mixture comprising a fractionating column, a thermo-siphon reboiler positioned within the lower portion of said fractionating column, a chimney fitted atop the thermo-siphon reboiler to improve the thermo-siphon action thereof, said chimney having a cross sectional area approximately that of the reboiler, a horizontal baffle positioned across the top of said chimney below but in close proximity to the bottom tray of the fractionating column, conduit means for admitting heat exchange fluid to and withdrawing heat exchange fluid from said reboiler, a manhole in the wall of the fractionating column adjacent said reboiler of sufficient size to permit passage of the reboiler unit there-through, and skid members connecting said manhole with the base of the reboiler unit to guide said unit to and from said manhole.

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