Dec. 15, 1942. I. A. HILLS 2,304,915

STILL

Filed April 7, 1941

FIG. 1.

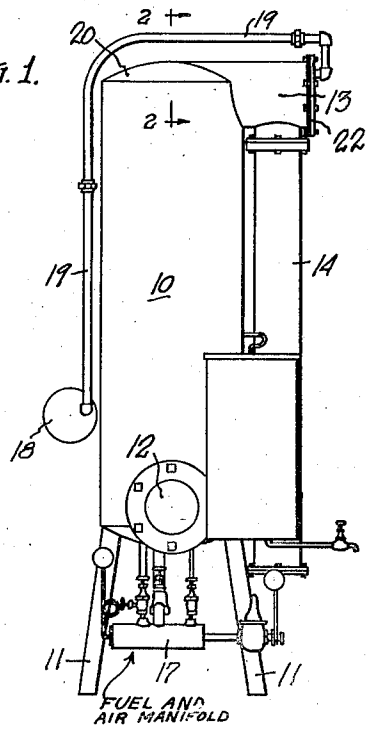


FIG. 2.

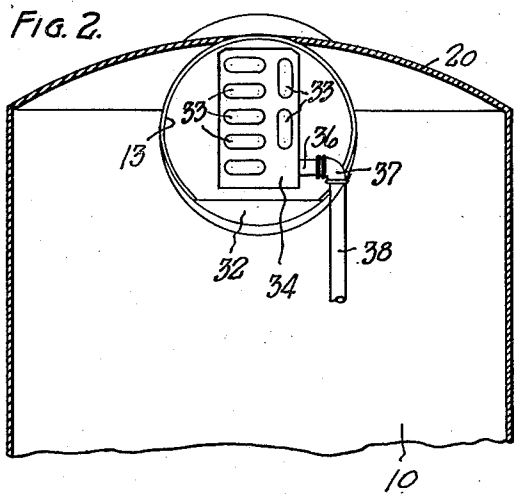
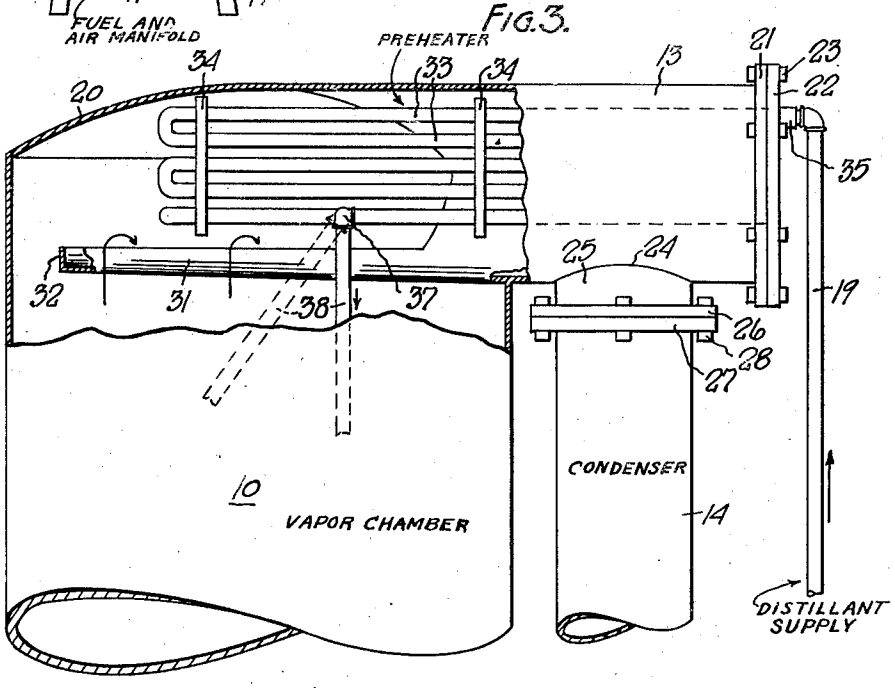


FIG. 3.



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STILL

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7 Claims. (Cl. 202—180)

This invention relates to a still, and more particularly to a still for reclaming used solvents, such as naphtha, gasoline, benzol, kerosene, toluol, mineral spirits, oleum spirits, Stoddard specification solvent, paint, lacquer thinners, etc.

The primary object of this invention is to provide a still which is economical in operation and simple in construction.

A further object is to provide a still of this character having a preheater and means for discharging liquid from the preheater to the still positioned entirely within the still.

A further object is to provide a still of this character with a preheater having a discharge within the still and which is readily attachable to and detachable from the still.

A further object is to provide a device of this character having an inclined trough for conveying initial condensate of a distilled solvent to a condenser or condensate collector.

A further object is to provide a still of this character having a minimum entrainment or "carry-over" of undesirable materials in the vapors of distillation.

Other objects will be apparent from the description and appended claims.

In the drawing:

Fig. 1 is a view of the still in front elevation.

Fig. 2 is an enlarged fragmentary vertical sectional view taken through the still on line 2—2 of Fig. 1, and illustrating the preheater and associated parts in elevation.

Fig. 3 is an enlarged fragmentary view similar to Fig. 1 and showing parts of the still housing broken away.

Referring to the drawing, the numeral 10 designates a vapor chamber or kettle suitably mounted upon supporting legs 11, and provided with a clean-out door 12 at its lower end. From the upper end of the chamber 10 projects a horizontal vapor duct 13 communicating with the chamber 10. A condenser 14 depends from duct 13 in spaced relation to chamber 10. Suitable means 17 are provided for controlling the flow of fuel and air to the burner (not shown) for heating the chamber 10. Means 18 for supply dirty solvents, which may constitute either a container for the dirty solvent or means for pumping solvent from a separate container, is located adjacent the container 10, and a conduit 19 extends therefrom to the outer end of duct 13.

Referring particularly to Figs. 2 and 3, which best illustrate the novel features of my improved still, it will be obvious that the container 10 has a rounded top 20 and that the duct 13 is welded or otherwise secured to container 10 at its inner end. The outer end of duct 13 is provided with an enlarged flange 21, and a closure plate 22 is bolted to flange 21 at 23 for the purpose of providing an air tight seal at the outer end of duct 13.

The duct 13 has a conduit 25 welded or otherwise fixedly secured thereto at 24. Conduit 25 has a flange 26 to which a flange 27 on the condenser 14 is secured by means of bolts 28. The duct 13 has a trough portion 31 projecting therefrom and extending into and substantially across the upper end of the still chamber 10. Trough 31 is provided with a dam or end plate 32 at its inner end, and is preferably inclined at a slight angle from the horizontal and in the direction of condenser 14, so that any liquid collected thereon will flow toward condenser 14.

A preheater is mounted within the duct 13 and the upper end of the chamber 10. This preheater may be of desired construction and is here illustrated as comprising a set of tubes 33 mounted by the closure plate 22 and interconnected by spacer plates 34 at various points along the length of said tubular unit. The intake end of the tube unit is designated 35 and is connected with the conduit 19 for delivering dirty solvent thereto. The discharge end of the preheater is located within the chamber 10, and includes a transverse conduit 36 extending laterally beyond the trough 31 and mounting a swivel joint or elbow 37 with which a discharge conduit 38 is connected.

The swivel joint 37 and the conduit 38 are so positioned that said discharge conduit 38 passes clear of and to one side of the trough 31 in its normal or operative position, as illustrated in Fig. 2, and at the same time does not project laterally to such an extent as to strike the inner end of duct 13 when the preheater is removed. Removal of the preheater is accommodated by swinging the discharge conduit 38 into substantially parallel relation to the preheater, as accommodated by swivel 37. It will also be observed that the mounting of the preheater on the closure plate 22 renders installation and removal thereof very simple.

The use of a large vapor duct 13 projecting from the vapor chamber 10 of the still permits installation of a heat exchanger or solvent preheater 33 in the vapor duct without unduly increasing the velocity of vapor passing through the duct on the way to the condenser. This minimizes the entrainment or carry-over of undesirable materials in the vapor of distillation. The pivoted mounting of the preheater discharge

conduit 38 permits the installation and removal thereof through the large duct. At the same time the discharge conduit of the heat exchanger is positioned within the still chamber 10 when the device is operative, and there is no loss of heat, as by radiation, in passing the solvent from the preheater to the vapor chamber or kettle 10. In this connection, it has previously been common practice to connect the preheater with the chamber 10 by a conduit extending exteriorly of the still so that a substantial heat radiation loss occurred during the transfer of the heated solvent from the heat exchanger to the still chamber 10.

Another important advantage of the swinging joint 37 is that the weight of the discharge conduit 38, when the preheater is installed in the still, will cause said pipe to assume a vertical position to insure delivery of the preheated solvent to the lower end of chamber 10 without interference to or from the vapor generated within the chamber, and without interfering with continuous operation and feeding of the still. At the same time, the conduit 38 may swing to a horizontal position when the heat exchanger is removed from or reinstalled in the vapor duct as occasion arises for cleaning, repair or replacement of the heat exchanger.

The inclined trough within the upper end of the still and beneath the heat exchanger permits any condensation of vapor occurring incident to exchange of heat from vapor to preheater, and especially when operation of the still is first started, to be caught and drained to the condenser, and hence avoids any loss of distillation capacity which would otherwise result from such condensation within duct 13. The provision of the low dam or end wall 32 at the high end of the trough 31 assures positive draining into the condenser.

It will be understood that the still is of the vacuum type i. e., is connected with a vacuum pump (not shown) in a manner well understood in the art which requires only a low temperature to obtain liquid vaporization. The mounting of the preheater on closure plate 22, and particularly the discharge of the preheated solvent directly into the still chamber 10, without being passed through the usual external piping connecting the preheater and said chamber, reduces the points at which leakage of air can occur, and hence increases the efficiency of the still. It will be also understood that the still serves to vaporize the solvent only and that the vapor passes through duct 13 into the condenser 14 for reconversion to the liquid state. The residue of the dirty solvent, consisting of the substances contaminating the solvent which is fed to the still, has a higher boiling point than the solvent per se, and remains in the vaporizing chamber. This residue is adapted to be removed from chamber 10 through the access door 12, as is obvious.

I claim:

1. A still comprising a vapor chamber, a vapor duct projecting laterally from and communicating with said chamber, a condenser communicating with said duct, a removable closure mounted on the end of said duct, a preheater carried by said closure and projecting through said duct and into said chamber, an outlet conduit of small diameter compared to said duct, and a swinging connection between said conduit and the inner end of said preheater for normally suspending said conduit within said chamber, the axis of said connection extending in horizontal transverse relation to the axis of said duct, said duct and the opening between said duct and chamber being of a size and shape larger than the overall transverse dimensions of said preheater and connector to accommodate removal of the latter through said duct as a unit.

2. A still comprising a vapor chamber, a vapor duct projecting laterally from and communicating with said chamber, a condenser communicating with said duct, a preheater removably mounted in said duct and projecting into said chamber, and a discharge member pivotally connected with the inner end of said preheater and positioned entirely within said chamber, said discharge member being of a small cross-section compared to said duct and chamber and being shiftable to horizontal substantially parallel relation to said preheater for removal thereof and of said preheater as a unit through said duct.

3. A still comprising a vapor chamber, a vapor duct projecting laterally from and communicating with said chamber, a condenser spaced from said chamber and communicating with said duct, a preheater positioned within said duct and projecting into said chamber, and an inclined trough projecting into said chamber from the lower portion of said duct below said preheater and adapted to drain condensate to said duct and condenser, said trough being narrower than said duct and a discharge conduit depending from the inner end portion of said preheater in laterally spaced relation to said trough and pivotally mounted for movement to horizontal substantially parallel relation to said preheater within a projection of the outline of said duct.

4. A still as defined in claim 3, wherein said trough is wider than said preheater and is vertically centered relative to said preheater, and the inner end of said trough projects into said chamber beyond the inner end of said preheater.

5. A still comprising a vapor chamber, a vapor duct communicating with and projecting laterally from the upper end of said chamber, a condenser spaced from said chamber and communicating with and depending from said said duct, a preheater removably mounted in said duct and projecting into said chamber, said duct including a comparatively narrow trough projecting from the lower portion thereof and into said chamber below said preheater, said trough being inclined downwardly toward said condenser, and an outlet conduit communicating with the inner end of said preheater and pivotally suspended in said chamber, said conduit extending below and to one side of said trough and being shiftable to horizontal position aligned with and within a projection of the outline of said duct for free passage through said duct upon removal of said preheater.

6. A still as defined in claim 5, wherein said trough is of narrower width than said duct and of greater width than said preheater.

7. A still as defined in claim 5, wherein said outlet conduit includes a laterally projecting part, a depending part, and an elbow interconnecting said parts and swinging about a horizontal axis.

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