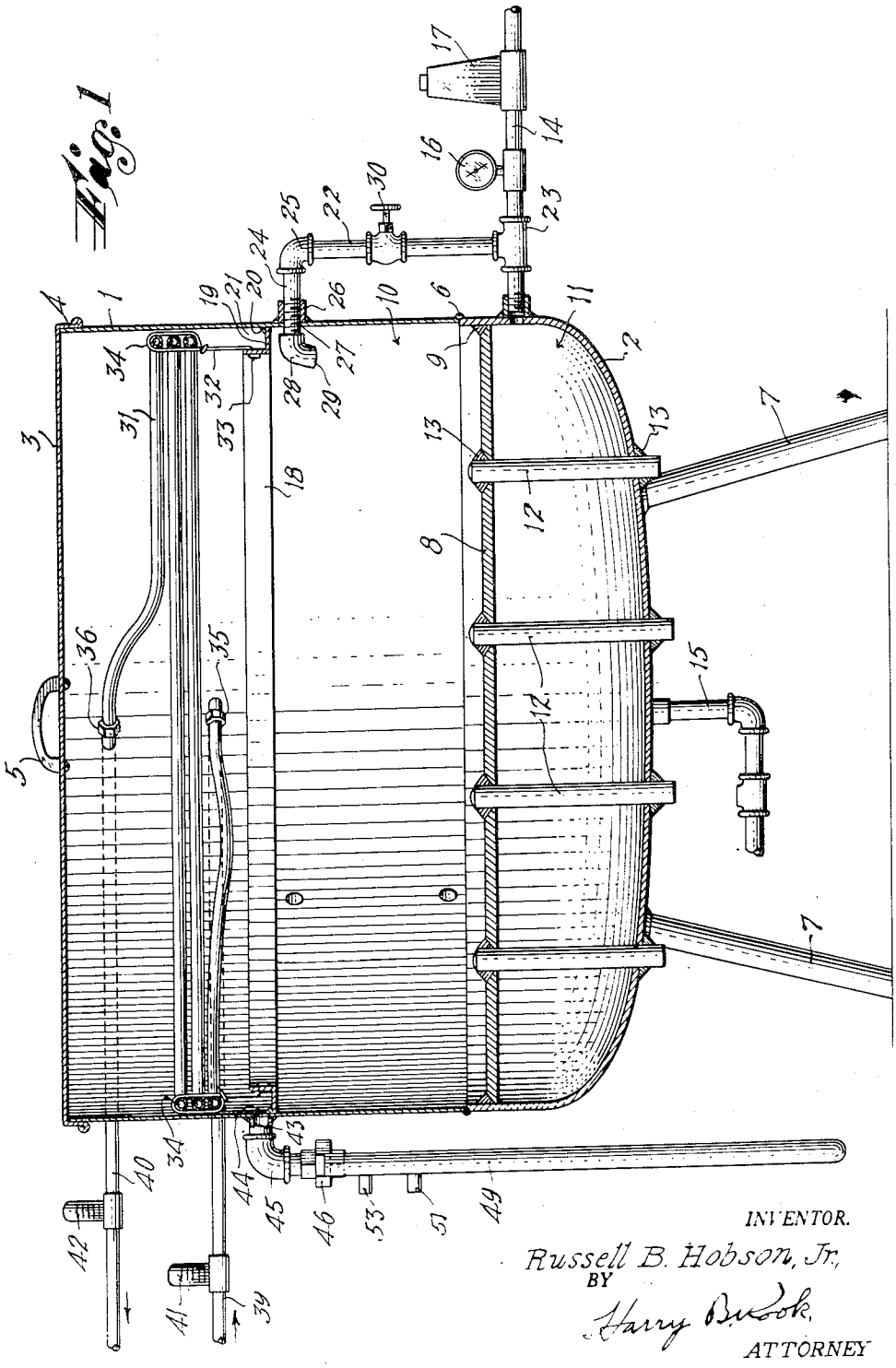
Dec. 18, 1956 R. B. HOBSON, JR 2,774,727

STILL FOR RECLAIMING SOLVENTS

Filed Oct. 21, 1954 2 Sheets-Sheet 1

Fig. 1



INVENTOR.
Russell B. Hobson, Jr.
BY
Harry Brook
ATTORNEY

Dec. 18, 1956 R. B. HOBSON, JR 2,774,727

STILL FOR RECLAIMING SOLVENTS

Filed Oct. 21, 1954 2 Sheets-Sheet 2

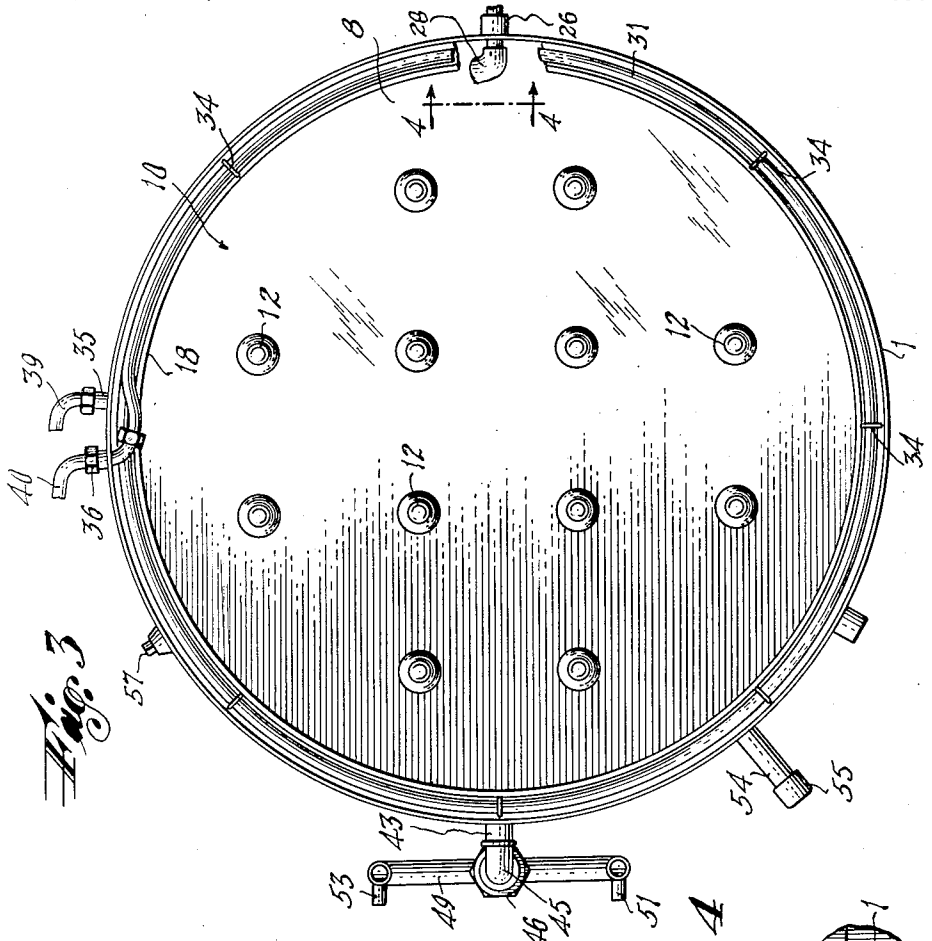


Fig. 3

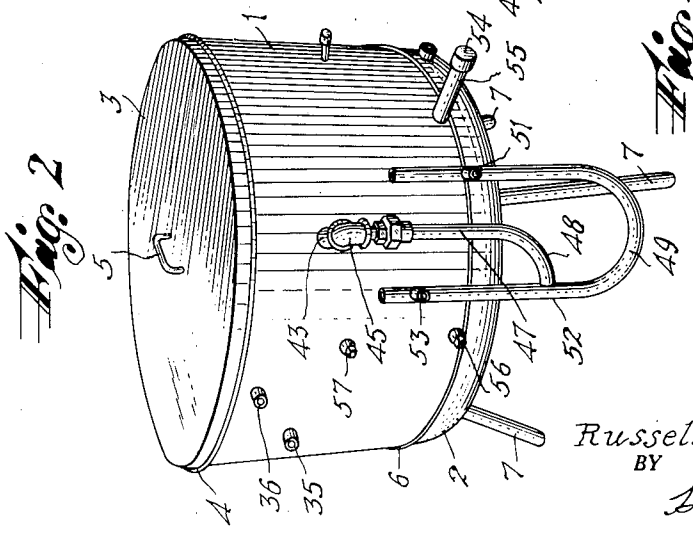


Fig. 2

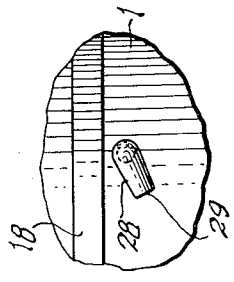


Fig. 4

INVENTOR.
Russell B. Hobson, Jr.,
BY
Harry Brook,
ATTORNY

United States Patent Office 2,774,727 Patented Dec. 18, 1956

2,774,727

STILL FOR RECLAIMING SOLVENTS

Russell B. Hobson, Jr., Montclair, N. J., assignor to Per Corporation, Montclair, N. J., a corporation of New Jersey

Application October 21, 1954, Serial No. 463,636

1 Claim. (Cl. 202—187)

This invention relates to new and useful improvements in stills for distilling or reclaiming and more particularly to stills of the jacket type.

In commercial dry cleaning, for example, the liquid solvent employed for cleaning becomes fouled with oil, soap and the like which cannot readily be removed by filtering. Furthermore, in known stills for reclaiming the solvent, the foul liquid or sludge has been introduced into the still and residue has been removed from the still through openings at the side and bottom of the stills, which is a difficult operation and the stills are tall tanks that require narrow doors and the sealing of the doors in order to prevent leakage. Moreover, the stills fail to remove much of the solvent from the residue.

Known practices for reclaiming such solvents have involved unduly complex, expensive and unsafe apparatus, or have been only partly acceptable due to excessive foaming of the oil or other dirty component of the liquid under normal pressure at boiling temperature. Fouling of the condensate and other disadvantages frequently accompany these conditions.

A prime object of the present invention is to provide a still for distilling or reclaiming filter sludge or still residue, which still is of a convenient height, relatively large diameter and open at the top for the convenient loading or removal of the sludge or residue.

Another object of the invention is to provide a still for rapid vaporization of volatile substance at substantially atmospheric pressure and wherein foaming is controlled to prevent its fouling the condensate.

A further object of the invention is to provide a still of this type with a flat heating surface to produce a layer of solvent or sludge of uniform thickness.

Other objects of the invention are to provide a still of this type which requires a minimum of maintenance and operating attention, which can be operated by an unskilled person at very small cost, which has no moving parts to get out of order, which is highly resistant to corrosion and is easily cleaned, which is easily installed and which meets all the requirements of regulating bodies.

It is further proposed to provide a still for distilling and reclaiming which is simple and sturdy in construction and which can be manufactured and sold at a reasonable cost.

Other objects and advantages will be apparent from the description of the invention to follow taken in connection with the accompanying drawings in which—

Figure 1 is a central vertical sectional vew of a distilling and reclaiming still embodying the invention, showing the steam and water supply connections.

Figure 2 is a perspective view of the still on a reduced scale.

Figure 3 is a top plan view thereof with the cover removed.

Figure 4 is a fragmentary side elevational view of the steam sweep looking in the direction of the arrows on the line 4—4 of Figure 3.

Referring in detail to the drawing, the still or distilling unit comprises a hollow body formed with a cylindrical shell 1 and with a dish-shaped plate 2 forming the bottom closure. The body is completely open at the top but is provided with a removable cover 3 having a flange 4 which engages the upper rim of the shell for sealing the top end. A handle 5 is secured to the center of the cover for lifting the same. The shell 1 and cover 3 are preferably formed of spun stainless steel, and the dish-shaped bottom closure 2 is formed of heavy boiler plate steel. The adjacent edges of the shell 1 and the bottom closure 2 are fastened by welding as indicated at 6. Spaced tubular legs 7 are welded to the bottom closure for supporting the still. As shown, the vaporizing and condensing chamber has a diameter substantially greater than the height thereof above said plate.

A flat plate 8 is disposed across the bottom closure 2 adjacent its upper end and is fastened to the bottom closure by a fillet weld joint 9, said plate 8 also extending transversely of the cylindrical body 1, thereby forming a vaporizing and condensing chamber 10 thereabove for holding liquid, and leaving a space therebelow constituting a steam chest 11. Stay bolts 12 extending through aligned openings in the plate 8 and bottom closure 2 are fastened in place by fillet weld joints 13 for bracing the plate 8 and bottom closure. The plate serves as a floor for the vaporizing and condensing chamber 10 and is heated by steam supplied to the steam chamber or chest 11 by an inlet pipe 14 and discharged through a condensate outlet pipe 15. Steam inlet pipe 14 is provided with the usual gage 16 and pressure regulator 17.

Midway the height of the vaporizing and condensing chamber 10, a flanged condensate collector ring 18, formed of angle bar, is disposed close to the inner surface of the shell 1, with its flange 19 arranged horizontally and welded to the shell as indicated at 20. The ring forms a narrow trough 21 between the ring and the inner surface of the shell 1, with the flange 19 serving as the floor thereof.

An upright pipe 22 is connected at one end to the steam inlet pipe 14 by a T-fitting 23 and at its other end to a horizontally disposed inlet pipe 24 by an elbow fitting 25. The inlet pipe 24 extends through a threaded coupling 26 welded to the shell 1 and through an aligned opening 27 in the shell just below the condensate collector ring 18. A steam sweep or injector device 28 is fastened on the inner end of the inlet pipe 24 close to the inner surface of the shell. The steam sweep may have a fan-shaped outlet end 29 directed circumferentially of the shell 1. A valve 30 is interposed in the upright pipe 22.

Above the collector ring 18, a cooling device or condenser in the form of coils 31 is supported by means of spaced wire brackets 32 spaced around the ring, each bracket having one end hooked through an opening in the ring as indicated at 33 and having its other end looped around the condenser coils as indicated at 34 for supporting the condenser above and in line with the trough 21. One end of the condenser is connected to a water inlet pipe 35 and the other end to a water outlet pipe 36. The inlet pipe 35 is connected to a water supply pipe 39 and the water outlet pipe 36 is connected to a discharge pipe 40. The supply pipe 39 and the discharge pipe 40 may be provided with thermometers 41 and 42, respectively.

An outlet or discharge pipe 43 communicates with the condensate trough 21 behind the ring 18 through an opening 44 in the shell. The outer end of pipe 43 is removably connected through an elbow fitting 45 and a nut 46 with a vertically disposed pipe 47 on the out-

side of the still, the other end 48 thereof being curved and connected to and supporting a separating unit in the form of a U-shaped or looped pipe 49. Pipe 49 is vertically disposed with its open ends directed upwardly. One leg 50 of the U-shaped pipe is provided with a branch pipe 51 above its connection with the pipe 47, and the other leg 52 is provided with a similar branch pipe 53 above the branch pipe 51. Branch pipe 51 may be connected to a pipe leading to the main tank (not shown), and branch pipe 53 may be connected to a water drip line leading to a bucket or the like (not shown).

The unit may be used for reclaiming liquid, such as perchlorethylene, from filter sludge or from still residue. The filter sludge or still residue is loaded into the unit and onto the flat plate 8 through the open top. If filter sludge is being treated, it is preferably previously dampened and is normally piled about 4" deep on the plate 8, or approximately half-way from the plate 8 to the condensate trough 21. Still residue is normally treated in batches of approximately three to ten gallons.

In operation, the legs 7 support the hollow body 10 on a floor or the like with the open top at a convenient height to permit sludge or still residue to be dumped into the body through said open top by an operator standing on the floor. After the filter sludge or still residue to be vaporized is loaded onto the plate 8, the steam and water are turned on. After the steam has been on for the desired length of time, usually an hour in the case of filter sludge and usually ten minutes in the case of still residue, the steam sweep 28 is opened by means of the valve 30, just enough in the case of filter sludge to create a swirling circular cloud, and just cracked open in the case of still residue. The unit is now operating for the length of the run, the time of which depends on the amount of sludge or residue and the amount of perchlorethylene in it. During this operation, the rising vapors of perchlorethylene will be condensed by the condensing coils 31 and the condensate collected in the trough 21 and will be drained off through the outlet pipe 43. The condensate will be separated in the U-shaped pipe 49 and the solvent discharged through branch pipe 51 to the machine tank, and the water through branch pipe 53 to the drip line leading to a bucket or the like. The unit is permitted to run until the recovery rate reaches nearly zero at which time the steam sweep, the steam supply and the water supply are shut off. The unit is permitted to cool off and the cap 54 on the drain fitting 55 provided on the still is removed and the residue drained off into a suitable container and discarded.

The still may also be provided with a fitting 56 adjacent the plate 8 for a glass gauge and a fitting 57 adjacent the ring 18 for another glass gauge.

The size and shape of the plate 8 are such that a large flat heating surface is provided whereby the matter may be loaded thereon in thin layers which have a diameter many times greater than their thickness and may be effectively treated. If the matter is in powdered form, the plate serves as a frying pan and in effect fries the volatile solvent out of the powdered matter. When liquid is being treated, the large heating surface provided by the plate compared to the depth of the liquid affords effective distillation.

Instead of feeding the solvent to the unit in batches, it will be understood that it may be fed automatically and continuously under the control of an outside float.

A still embodying the structural features above described and as shown in the drawings requires in its construction only ordinary assembling skill and a minimum of hand work compared to known stills of equivalent capacity for a similar purpose. It operates at substantially atmospheric pressure in all parts, is economical in concentrating heat on the vaporizing plate and requires no skilled attention either for results or for safety.

In distilling according to the method hereinabove disclosed, the large surfaces afforded by the plate and shell and the amount of liquid on the plate permit very rapid and effective vaporization with substantially no wasted heat, no accumulation of vapor pressure above the liquid and no fouling of the condensate or other undesirable result from foaming.

It will be understood that changes in details of construction might be made without departing from the scope and principle of the invention, and it is desired to be limited only by the state of the prior art and the appended claim.

I claim:

A still for reclaiming a liquid solvent comprising a hollow cylindrical body open at the top and having means at its bottom to set on a floor, a steam chest at the lower end of said hollow cylindrical body including an approximately flat plate extending transversely of said cylindrical body throughout the cross-sectional area thereof, said plate and the wall of said body forming a vaporizing and condensing chamber having a diameter substantially greater than the height thereof above said plate, a condensate collector trough disposed above said plate and spaced downwardly from the top of said body and extending along the inner surface of the side wall of said cylindrical body, a condenser coil above said condensate collector trough and closely adjacent the side wall of said body, an outlet pipe extending from said condensate collector trough outwardly from said body, a cover for said open top to provide for easy and quick dumping of liquid or sludge through said open top onto said plate in a layer below said condensate collector trough and for removal of said liquid or sludge from the body, and a steam inlet pipe below said condensate collector trough and above the level of the top surface of such layer having an outlet extending circumferentially of the body adjacent the side wall of the body and downwardly toward said plate to provide a blanket cloud of steam swirling or rotating circumferentially of said body over the top surface of the layer of sludge or liquid on said plate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,355,934	Bannon et al.	Oct. 19, 1920
1,938,604	Mobley	Dec. 12, 1933
2,254,867	Bonotto	Sept. 2, 1941
2,385,564	Booth et al.	Sept. 25, 1945
2,504,053	Sweeney et al.	Apr. 11, 1950