Nov. 11, 1958 L. E. PLASSMEYER 2,860,088

VAPOR DEGREASER

Filed Aug. 24, 1953 2 Sheets-Sheet 1

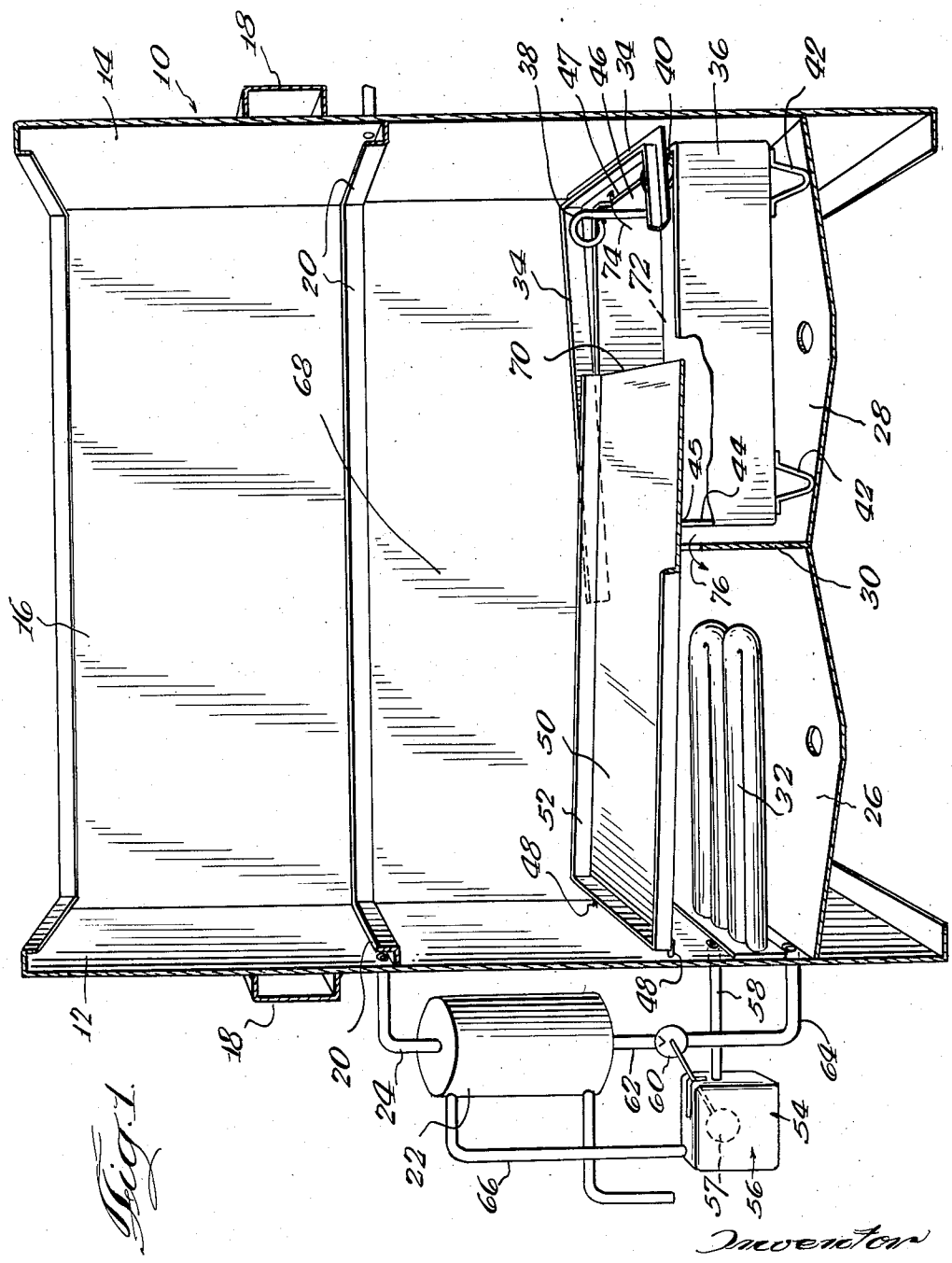


Fig. 1.

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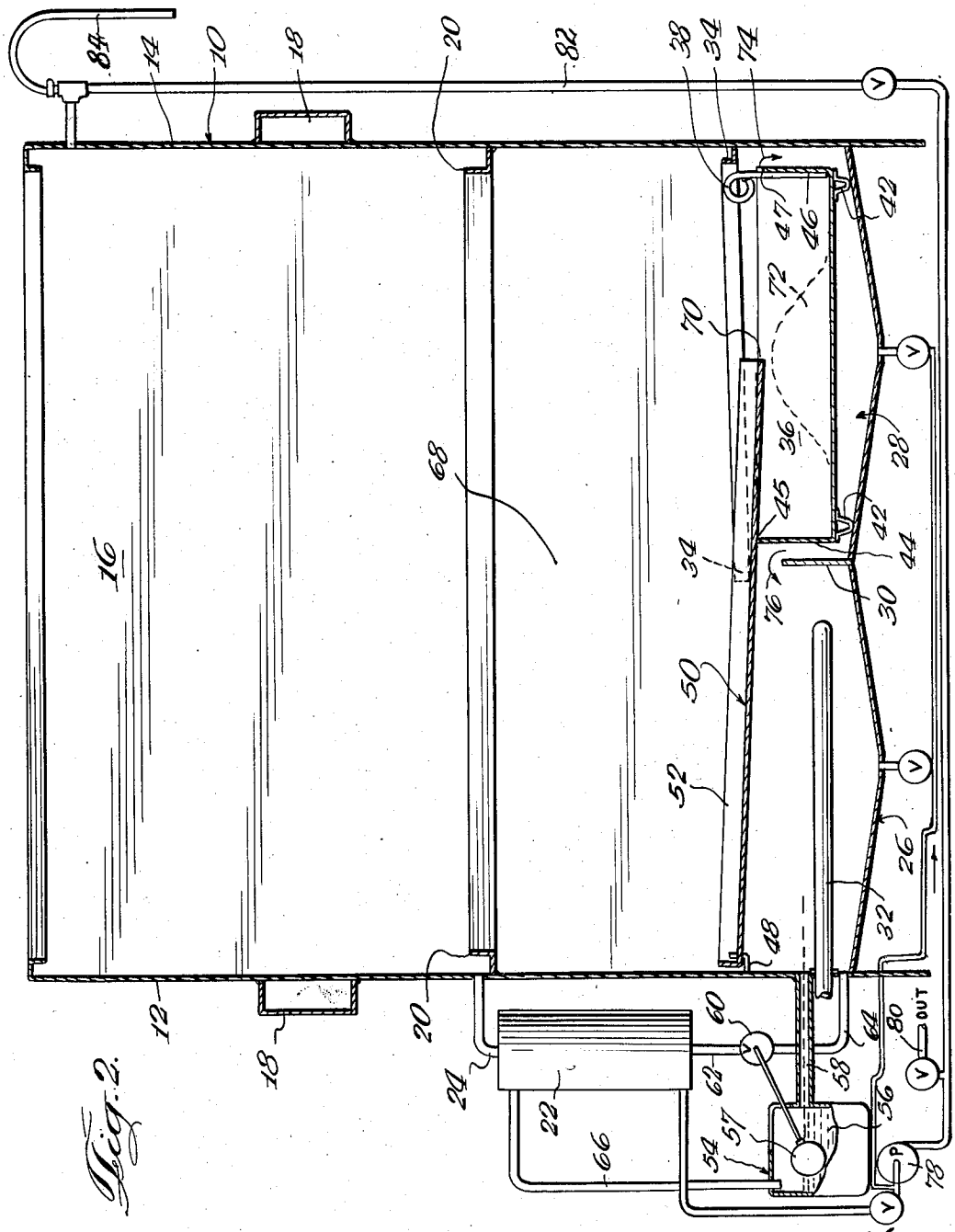


Fig. 2.

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VAPOR DEGREASER

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12 Claims. (Cl. 202—170)

This invention relates to degreasing apparatus, and particularly to a vapor degreaser.

A vapor degreaser in its simplest commercial form consists of a high tank having two sumps in the bottom, one a vaporizing sump containing heating elements, and the other a distillate sump into which is drained clean distilled solvent. A plate is placed over the distillate sump in such a manner that it drains the drippings from the work into the vaporizing sump. Such a degreaser is shown in United States Patent No. 2,574,084, dated November 6, 1951, to John Bash. The theory of this degreaser turns on collecting all sludge in the vaporizing sump so that the distillate sump will always be clean. This makes it possible to distill substantially all of the solvent in the machine collecting it in the distillate sump and draining the solvent from the distillate sump to some outside vessel. When the degreaser is empty, it can be cleaned.

The above-described apparatus is economical in operation where the parts that are being cleaned are themselves comparatively free of dirt. Thus, where the machine is being used for removing various types of light oils from newly machined parts the accumulation of dirt in the vaporizing sump is slow and the accumulation is of such a sort that it does not rapidly cake on the heating elements whether they are electrical, or gas, or steam pipes. There are some applications where the parts being degreased are very dirty, such as used engine blocks, and the collection of sludge in the vaporizing sump is rapid and the nature of the material is such that it cakes hard on the heating media. The caking is so hard that the heating media have to be cleaned with a cold chisel. Moreover, there are some applications in which the caking develops so rapidly that the heating media become inefficient within a matter of weeks.

The principal object of this invention is to protect the heating media from such caking. A feature of this invention is the reversal of the drain pan or imperforate plate and the side collection troughs so as to make the vaporizing sump a comparatively clean sump. A true distillate sump is abandoned while the old distillate sump becomes a settling sump. The drain pan is placed over the vaporizing sump and the troughs drain into the vaporizing sump.

Another object of this invention is to provide means for quickly cleaning the settling sump. A feature of the invention is the provision of a removable sludge pan in the settling sump positioned beneath the lower edge of the drain plate over the vaporizing sump. The result is that all of the drippings of dirt from the parts being degreased drop either directly into this removable pan or are carried there by the the imperforate plate. The sludge pan is liquid-tight and most of the dirt will settle to the bottom of this pan.

Another object of this invention is to establish a counter-flow of dirty solvent in the settling sump. A feature of this invention is the provision of a sludge pan

whose upper edges are higher than the height of the dam or partition between the settling and vaporizing sumps, which in conjunction with resting the edge of the drain plate on the sludge pan causes the sludge pan to act as a settling sump independent of the settling sump in which it is resting. The arrangement is such that there is a flow of the solvent out of the sludge pan in a direction away from the partition or dam and thence back through the settling sump over the dam into the vaporizing sump.

Another object of the invention is to make it possible to distill in this new type of degreaser. A feature of the machine is the provision of an outside storage tank into which is drained all condensed solvents which occurs at a comparatively high point in the degreaser. This storage reservoir is connected through a float controlled meter positioned adjacent the vaporizing sump at a level above the level of the heating elements but below the dam between the two sumps.

These and such other objects as may hereinafter appear are attained in the embodiment of the accompanying drawings wherein:

Fig. 1 is a side elevation perspective view with the front side panel removed of applicant's degreaser with a reservoir and float valve schematically illustrated on the side; and,

Fig. 2 is a schematic side elevation of the degreaser showing the pipe connections.

Continuing to refer to the drawings, in Fig. 1, applicant's degreaser with the front side panel removed is generally indicated by the numeral **10**. It comprises end panels **12** and **14** and side panels such as **16**. A water jacket **18** is mounted around the outer upper portion of the tank and connected to a suitable source of water not shown. Interiorly of the tank and beneath the water jacket is a distillation collection trough **20** which drains into a solvent reservoir **22** through a pipe **24**. A water separator is usually positioned in this line **24**. The exact positioning of the distillation trough **20** is not critical excepting that it should be below the water jacket **18** and in the upper portion of the tank.

For the purposes of this invention, the presence of the water jacket is immaterial. A water jacket is commonly used on degreasers employing trichlorethylene which boils at about 170° F., and which may be heated by steam pipes. Degreasers employing tetrachlorethylene require a hotter heating element because tetrachlorethylene boils at about 250° F. While a water jacket can be used, commonly, the heating element is electrical and it is controlled by a vapor control positioned in the upper part of the degreaser. When the vapor reaches the control, the electrical heating elements are turned off.

The bottom of applicant's degreaser is divided into two sumps, the vaporizing or boiling sump **26**, and the settling or distillate sump **28**. These are separated by a partition **30** in water-tight engagement with the side walls. Removably mounted in the vaporizing sump **26** is a set of steam heating coils **32**. The height of the partition **30**, see also Fig. 2, is above the top of the heating coils. The coils shown are steam, but might be any suitable unit operated by electricity or gas.

Around three sides of the settling sump **28** and above it is a distillation trough **34**. The trough, in liquid-tight engagement with the sides, is about one inch wide, and drains into the vaporizing sump **26**.

Positioned in the settling sump **28** is a removable sludge pan **36**. The plan dimensions of this sludge pan are slightly less than the area between the three portions of the distillation trough **34** so that by means of finger rings **38** and **40**, the sludge pan may be passed downwardly so that it will rest on its legs **42** on the bottom of the settling

sump. When in position, the end wall **44** of the sludge pan, that is, the one adjacent to the partition **30**, has its top edge **45** about one inch higher than that of the top edge of the partition **30**. The adjacent side walls of the sludge pan have their top edges at the same height as the edge **45**. The opposite end wall **46** of the sludge pan away from the partition has its top edge **47** about one-quarter inch lower than the top edges of the end wall **44**. These differences in heights of the two end walls of the sludge pan and the partition may be varied, but it is important that the top of the partition **30** be lower than the top edge **47** of the end wall **46**, and that the top edge **47** of the end wall **46** be lower than the top edges **45** of the end wall **44** and adjacent side walls.

Suspended from the inside of the side wall **12** by hooks such as **48** is an imperforate drain pan **50** having side flanges such as **52**. This drain pan at its right end rests on the top edge **45** of the end wall **44** of the sludge pan **36** and it extends to substantially the midpoint of the sludge pan. It slopes downwardly toward the sludge pan.

Mounted at one side of the vaporizing sump **26** is a float assembly **54**. A float chamber **56** is in constant communication by the pipe **58** with the vaporizing sump **26**. The float **57** controls a valve **60** schematically shown in a pipeline **62** and **64** connecting the reservoir **22** to the vaporizing sump **26**. The float is so positioned that when the level of the solvent in the vaporizing sump drops toward the top of the heating coils **32**, the float opens the valve **60** and solvent flows from the reservoir into the vaporizing sump.

A small feature which has proved useful is applicant's connecting a vent **66** on the float chamber to the upper part of the reservoir **22**. Occasionally, a reservoir floods. When this occurs, the excess moves down the pipe **66** directly into the float chamber and thence by the pipe **58** enters the vaporizing sump. This occurs usually when too much solvent has been placed in the degreaser. Without this overflow vent, the collection trough **20** will flood and the solvent will drop over onto the pan with resulting excess agitation over in the settling sump.

Operation

Assuming that the vaporizing sump **26** has been filled and the reservoir **22** adequately charged with solvent, as the solvent vaporizes, it will condense on the work suspended at the point **68**. If the solvent is vaporizing at a rate greater than condensation occurs on the work and side walls, it will reach the water jacket which will condense the heavy vapor and it will flow down the sides of the tank into the collection trough **20** and thence into the reservoir **22**. As the solvent boils out of the vaporizing sump **26**, the float **57** will drop and open the valve **60**, thereby maintaining a selected level of solvent in the vaporizing sump. This liquid level control also replenishes the vaporizing sump with solvent to offset that carried out on the work parts.

The solvent vapor that condenses on the side walls of the degreaser below the collection trough **20** is all directed into the vaporizing sump **26**. Where the condensation actually occurs on walls that form the side walls of that sump, the distilled solvent descends directly into that sump. That which occurs on the walls above the settling sump is caught by the trough **34** and carried over the partition or dam **30** into the vaporizing sump. This is the exact reverse of what is done in the apparatus disclosed in United States Patent No. 2,574,084, where all of the vapor condensing on the side walls is gathered in a distillate sump, that is, taken away from the vaporizing sump.

The vapor that condenses on the work drops either onto the pan **50** or directly into the sludge pan **36**. The delivery edge **70** of the drain pan **50**, being substantially centered over the sludge pan **36**, will tend to settle in the pan and build up a mound as indicated by the dotted lines **72**. Most of the constituents of sludge are heavier than the liquid solvent and will settle to the bottom of the sludge pan **36**. This is particularly true of sludge coming from used engine blocks where most of the material is dirt from the highways. There are many constituents of sludge that remain suspended in the liquid solvent but they are lighter. When the pan **36** is full, the solvent flows over the top edge **47** of the end wall **46** and thence it flows under and around the sludge pan **36** over to the partition **30**. When the settling sump is full, the solvent flows over the partition **30** into the vaporizing sump. The flow of the solvent, therefore, is from the sludge pan **36**, referring to Fig. 2, into the settling sump **28**, see the arrow **74**, and thence into the vaporizing sump, see the arrow **76**. While in the settling sump **28**, additional impurities will settle out of the solvent. However, it is not distilled solvent.

The advantage of this flow of condensed solvent and sludge is that the heating coils are kept comparatively clean. In the apparatus which applicant's assignee has had on the market for some years, and which is shown basically in United States Patent No. 2,574,084, the sludge is carried directly into the vaporizing sump. It tends to collect and bake on the heating elements. As the baked coating of sludge thickens, the heating elements do not perform properly. In the case of the electric heating element, there is a delay in the production of heat when the thermostat closes its circuit. In the case of the steam pipes, the amount of steam that is introduced to the coils must be increased because of this baked sludge coating and this imposes a rather difficult manual control upon operators. With either type of heating element, after the sludge coating has reached a certain thickness, the heating element must be removed and the cake chipped off with a chisel. This operation frequently damages the heating element; it takes the degreaser out of use for a substantial period of time; it necessitates removing the solvent from the machine, particularly where no reservoir is employed; and each removal of the heating element requires time and new gasketing. Applicant's assignee has users of its equipment which are obliged to remove the heating elements as many as twenty times a year, at least once every three weeks.

In the present machine, practically all of the sludge that really coats and cakes the heating element is caught in the sludge pan **36**. While some of the lighter cutting oils and the like pass on from the sludge pan through the settling sump **28** into the vaporizing sump, the quantity is comparatively small. Caking on the heating elements is reduced by 75% to 80%.

The arrangement above shown has been obtained at the sacrifice of providing a degreaser (without reservoir) which will distill. Ability to distill is important because periodically the vaporizing sump should be operating with clean solvent. In order to distill, applicant has adopted the conventional side storage reservoir. Applicant employs the collection trough **20** to carry distilled solvent into the reservoir. As previously explained, the distilled solvent is used during operation of the degreaser to feed the vaporizing sump. For completeness, applicant has shown in the schematic Figure 2, the controls for moving solvent to desirable points. A pump **78** has pipe connections to the reservoir **22**, the vaporizing sump **26** and the settling sump **28**. The output of the pump can either be delivered to some point independent of the degreaser by the line **80** or by the line **82** can be delivered to a hose **84** which may be manipulated by an operator to spray on the work. While these degreasers stand from seven feet or more in height, they are commonly placed in a floor well so that their upper edges are about three feet above the level of the floor. A workman can operate easily around the top of the degreaser.

Having the top edge of the side wall of the sludge pan **36** higher than the partition **30** but below the other walls of the pan, increases the time during which the lighter sludge elements can settle out of the solvent. The sludge pan works well if its four sides are of equal height. In-

deed, the sludge pan functions surprisingly well even when the top edges of the pan are lower than the top of the partition. The effect of the varying heights of the walls of the sludge pan is to create in one settling sump two independent settling sumps. It concentrates most of the agitation of the solvent in the sludge pan itself. The flow of liquid over the wall 46 in the partition 30 is in a sheet in most instances; it is more of a running over the edge than a heavy dripping.

It is immaterial whether the machine is operating on trichlorethylene or tetrachlorethylene. While the boiling points of these two liquids are respectively below and above the boiling point of water, in their liquid state, their flow properties are much the same.

There are many three-sump degreasers wherein the third sump is a distillate sump. The distillate sump replaces the reservoir or acts as the reservoir. These degreasers have a substantially larger plan area and are used in applications where the object immersed in the vapor is large. In such a degreaser, the imperforate drain plate would extend over both the distillate sump and the vaporizing sump, assuming that they were adjacent to each other with the three sumps in a line. The lower collection trough for distillate would be arranged to drain directly into the distillate sump. If with three aligned sumps, the settling sump was positioned in between the distillate sump and the vaporizing sump, the lower distillate trough would again drain into the distillate sump, but there would be two drain plates, one over the vaporizing sump and one over the distillate sump. In the three-sump vaporizing degreaser, the sumps could be related to each other in various ways, one sump running along the entire side of the apparatus with the other two sumps occupying the remaining bottom of the apparatus. The principal, however, would remain the same. The distillate troughs would drain directly into the distillate sump and vaporizing and distillate sumps would be covered by drain plates emptying into the settling sump.

Having thus described applicant's invention, what he claims is:

1. A degreasing apparatus comprising a tank having a bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, and an imperforate and removable drain plate positioned over the vaporizing sump and draining into the settling sump whereby solvent dripping from the work will collect in the settling sump.

2. A degreasing apparatus comprising a tank having a bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, an upwardly open sludge pan in the settling sump, and an imperforate and removable drain plate positioned over the vaporizing sump and draining into the sludge pan whereby solvent dripping from the work will first collect in the sludge pan.

3. A degreasing apparatus comprising a tank having a bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, an upwardly open sludge pan positioned in the settling sump, the upper edges of the sludge pan being above the top of the partition, and an imperforate and removable drain plate positioned over the vaporizing sump and draining into the sludge pan whereby solvent dripping from the work will first collect in the sludge pan.

4. A degreasing apparatus comprising a tank having a bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, an upwardly open sludge pan positioned in the settling sump, the upper edges of the sludge pan being above the top of the partition, a liquid passageway in the upper part of the sludge pan below its top edges but also above the top of the partition, and an imperforate and removable drain plate positioned over the vaporizing sump and draining into the sludge pan whereby solvent dripping from the work will drop its heavy sludge into the sludge pan and then circulate through the settling sump and over the partition to the vaporizing sump.

5. A degreasing apparatus comprising a tank having a bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, an upwardly open sludge pan positioned in the settling sump, the top edge of the sludge pan adjacent the partition being higher than the top of the partition and an edge of the sludge pan spaced from the partition being lower than the first-named top edge of the sludge pan and also higher than the partition, and an imperforate and removable drain plate positioned over the vaporizing sump and draining into the sludge pan whereby solvent dripping from the work will drop its heavy sludge into the sludge pan and then circulate through the settling sump and over the partition to the vaporizing sump.

6. A degreasing apparatus comprising a rectangular tank having bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two rectangular, liquid-tight sumps, called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, a removable rectangular sludge pan seated in the settling sump, the top edges of said pan being higher than the partition, a support mounted on the inside wall of the tank above the vaporizing sump and at a height above the top of the sludge pan, and an imperforate and removable drain plate having one end resting on said support and the other end resting on a top edge of the sludge pan and extending adjacent the midpoint of the sludge pan whereby solvent dripping from the work will deposit heavy sludge in the center of the sludge pan and then circulate through the settling sump and over the partition to the vaporizing sump.

7. A degreasing apparatus comprising a tank having a bottom and side walls, a partition positioned between the side walls in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a settling sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, a gutter extending around the inside walls over the settling sump and over the partition so as to drain into the vaporizing sump, and an imperforate and removable drain plate positioned over the vaporizing sump and sloped downwardly toward and terminating above the settling sump, whereby solvent dripping from the work will collect initially in the settling sump.

8. A degreasing apparatus comprising a rectangular tank having bottom and side walls, an upright transverse partition mounted in the lower part of the tank and dividing the lower part into two, liquid-tight sumps called a

settling sump and a vaporizing sump whereby the latter sump may overflow the partition into the vaporizing sump, an angle iron facing the side wall and mounted thereon and extending from a point above the partition to the end wall of the settling sump, a similar angle iron similarly mounted on the opposite side wall, an angle iron similarly mounted on the end wall connecting the first two angle irons, said angle irons forming with the side walls a U-shaped gutter over the settling sump opening at its ends into the vaporizing sump, a bracket mounted on the inside of a wall of the vaporizing sump at a height slightly above the top of the partition, and a removable, imperforate drain plate resting at one end on said bracket and at the other end at a point immediately above the top of the partition so that the plate slopes toward and drains into the settling sump.

9. A degreasing apparatus comprising a tank having a bottom and side walls, an upright partition positioned between the side walls and in the lower portion of said tank and dividing said lower portion into two, liquid-tight sumps called respectively a vaporizing sump and a distillate sump whereby the latter sump may overflow the partition into the vaporizing sump, a heating element in the vaporizing sump, a gutter opening into the distillate sump and fastened to and extending around the inside walls over the settling sump and opening at a point over the partition at its opposite end, an upwardly open liquid-tight sludge pan positioned in the settling sump adjacent the partition, and a readily removable, imperforate drain plate substantially covering the distillate sump and sloping toward and terminating above the sludge pan.

10. The degreasing apparatus set forth in claim 9 wherein the upper edge of the sludge pan is at a height slightly above the top of the partition so that the sludge pan will overflow into the settling sump and the settling sump will overflow into the vaporizing sump.

11. A degreasing apparatus comprising a tank having a bottom and side walls, two upwardly open sumps, one a vaporizing sump and the other a settling sump, spaced by a partition in the bottom of the tank, a heating element in the vaporizing sump, a water jacket around the upper portion of the tank, a distillation trough around the inner wall of the tank immediately below the water jacket, a storage reservoir mounted on the degreaser, means for draining the distillation trough into the storage reservoir, means for flowing all solvent dropped from the work into the settling sump, a chamber connected to the vaporizing sump by a liquid passageway below the top of the partition and above the heating element, a float in the chamber, a valve controlled by the position of said float, a conduit from the reservoir to the inlet of the valve and a second conduit from the outlet of the valve into the vaporizing sump, whereby when the liquid in the vaporizing sump drops toward the top of the heating elements, the float will open the valve so as to introduce distilled solvent to the vaporizing sump.

12. The degreaser of claim 11 wherein a pipe connects the float chamber with the upper part of the storage reservoir to act as both a vent and an overflow pipe so that the system will operate at atmospheric pressure.

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