

Jan. 6, 1959

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2,867,225

DEGREASER

Filed Oct. 26, 1953

4 Sheets-Sheet 1

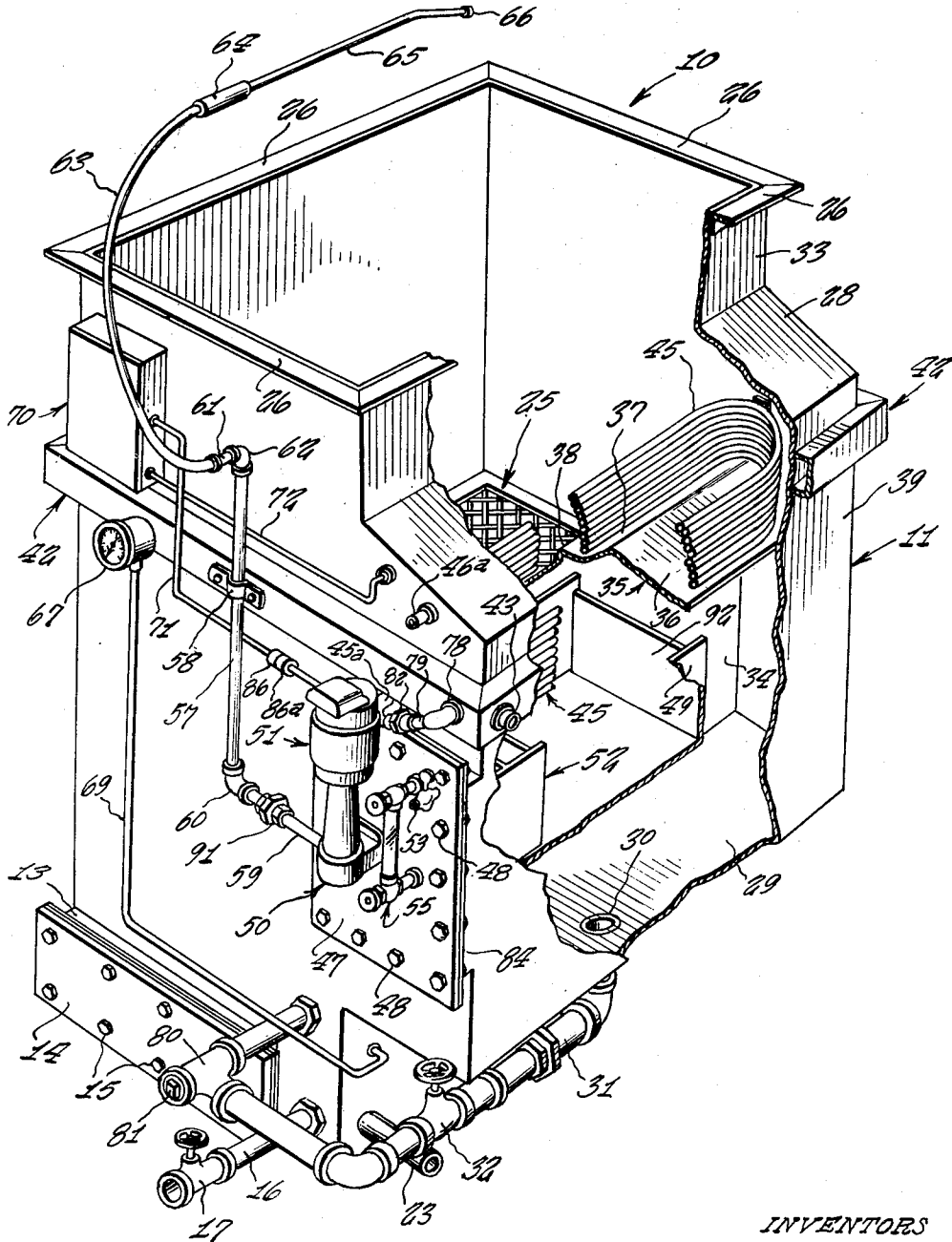


Fig. 1

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4 Sheets-Sheet 2

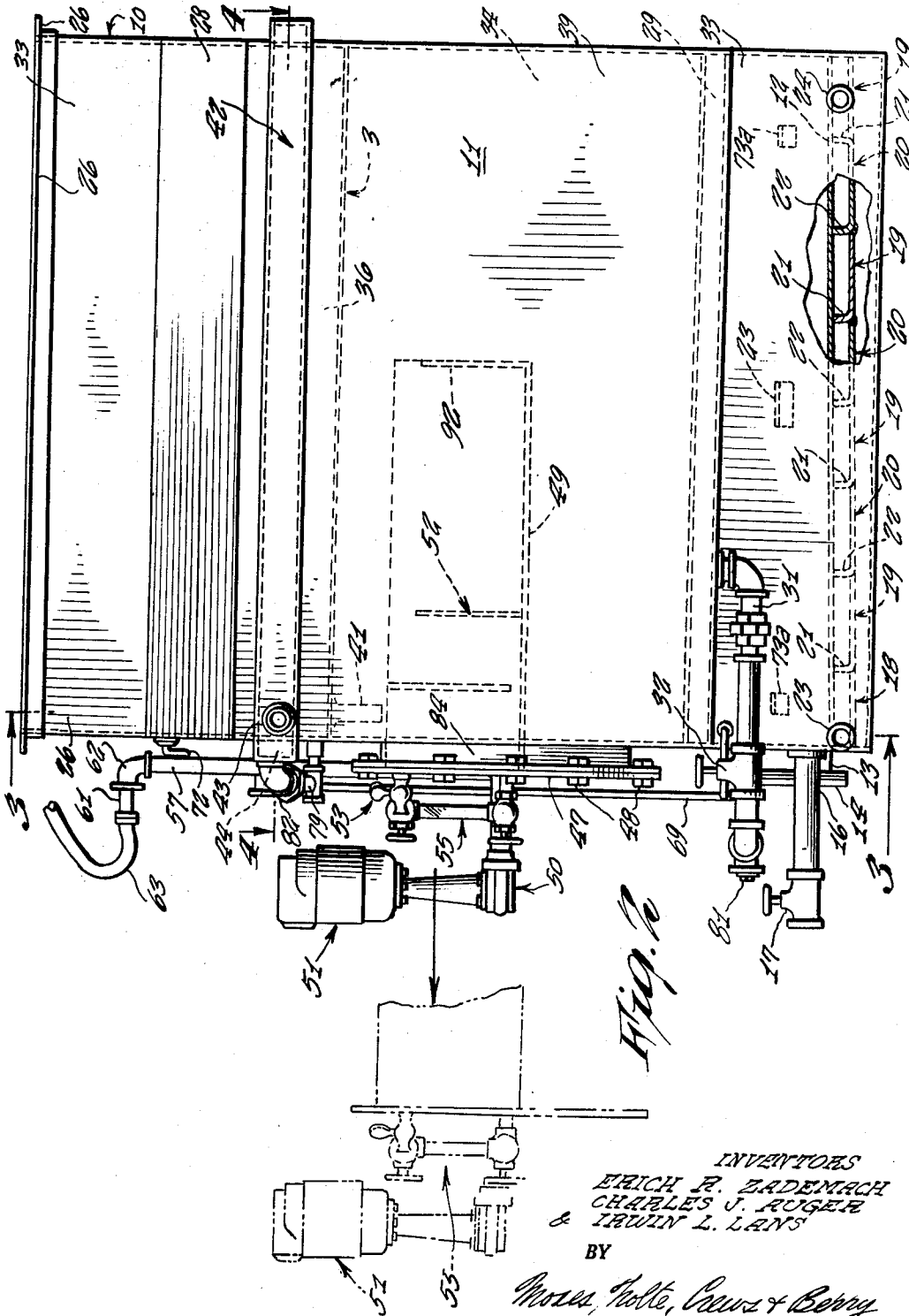


Fig. 2

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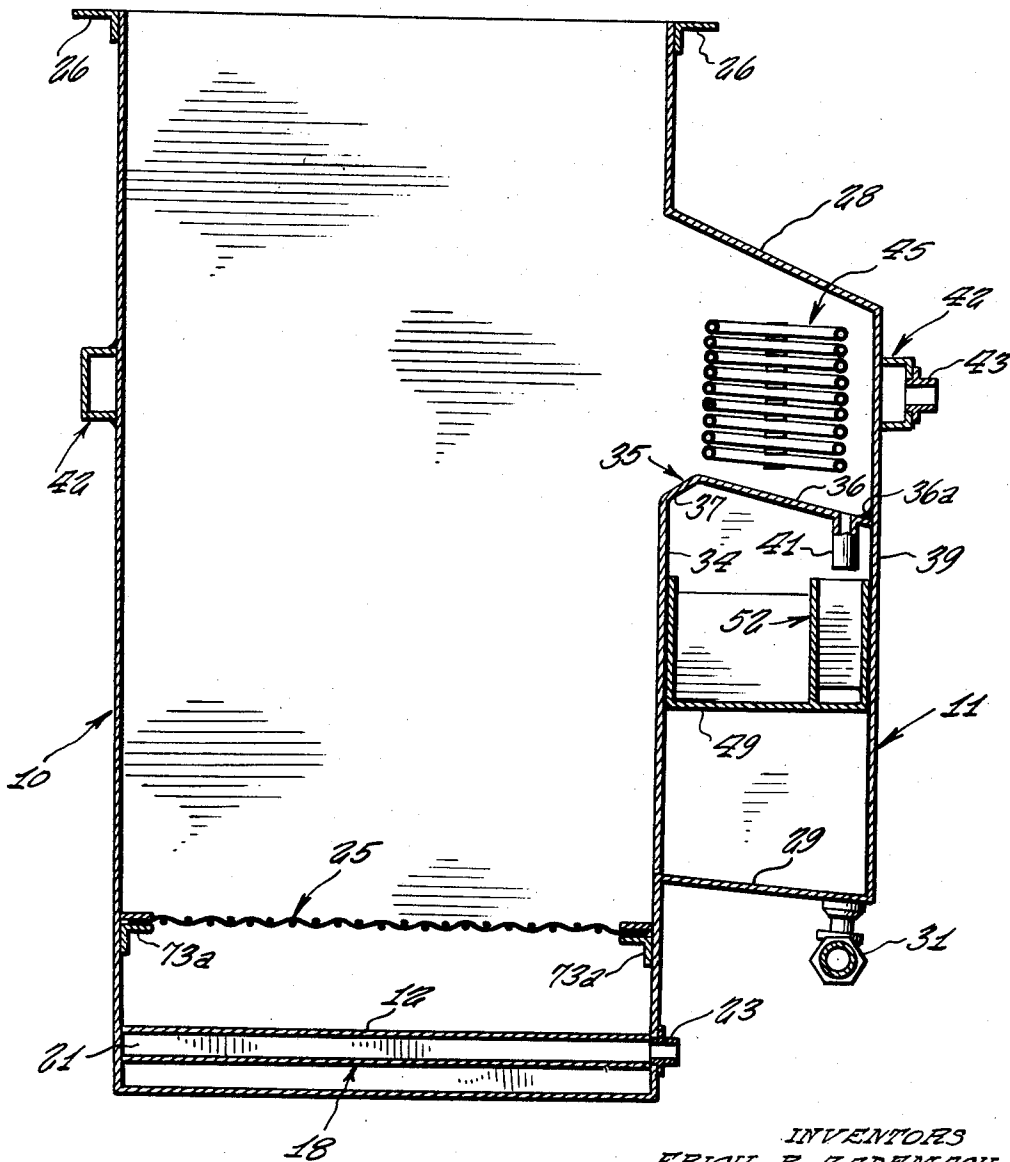
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4 Sheets-Sheet 3

Fig. 3



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4 Sheets-Sheet 4

Fig. 4

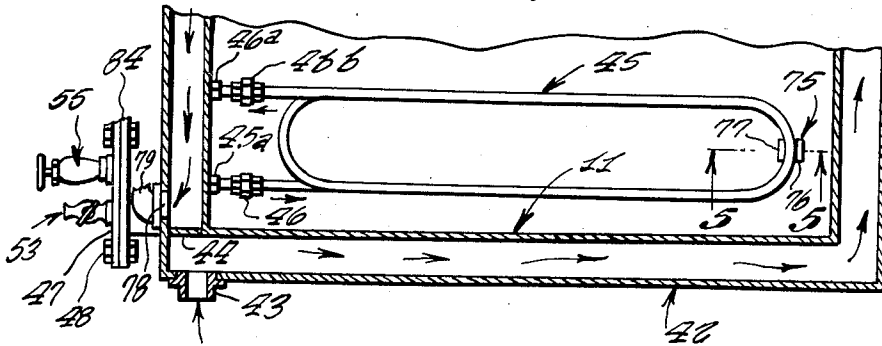


Fig. 5

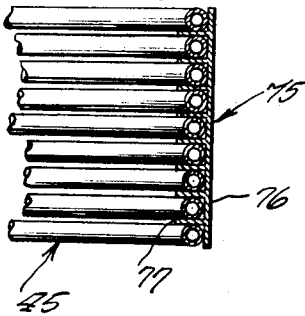


Fig. 6

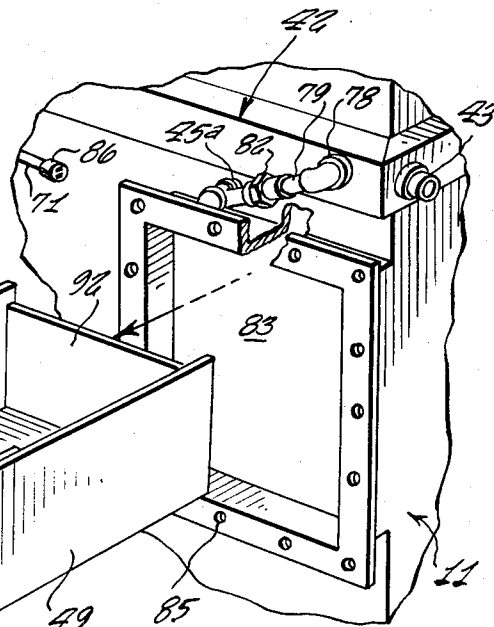
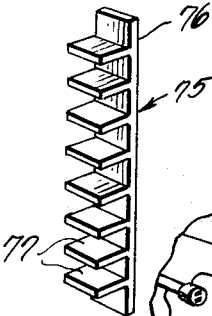
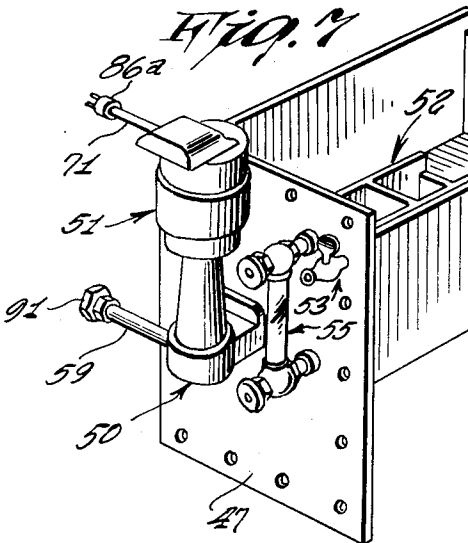


Fig. 7



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2,867,225

DEGREASER

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Application October 26, 1953, Serial No. 388,396

25 Claims. (Cl. 134—109)

This invention relates to vapor spray degreasers.

In vapor spray degreasers now in use, it is customary to condense the solvent vapors as they pass upwardly past the work to be degreased by means of condensing coils extending around and just below the open top of the apparatus, the condensed vapors returning to a water separator and then being reheated. However, the position of these condensing coils within the open mouth of the apparatus is objectionable as it greatly decreases the working area. Furthermore, these coils are damaged by contact with the work to be degreased, the work being lowered through the open top of the apparatus within the coils.

It is accordingly a principal object of the present invention to provide a vapor spray degreaser having an unrestricted work area due to the relocation of the condensing coils.

It is another object of the present invention to provide a vapor spray degreaser wherein novel, more compact and readily removable condensing coils are provided in offset relation to the work area.

It is still another object of the present invention to provide a vapor spray degreaser of the above type having a drain plate below the offset condensing coils leading to a water separator located within a pump sump which is in turn located within a solvent storage tank, the pump sump, pump and water separator being easily and readily removable as a unit for purposes of repair and replacement.

Other objects of the present invention are to provide a vapor spray degreaser bearing the above objects in mind which is of simple construction, inexpensive to manufacture, has a minimum of parts, is durable, easy to use and efficient in operation.

For other objects and a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a perspective view of a vapor spray degreaser embodying the features of the present invention and shown partly broken away to show the interior construction thereof;

Figure 2 is a front elevational view thereof looking from the right of Figure 1;

Figure 3 is a vertical sectional view taken along the line 3—3 of Figure 2;

Figure 4 is a fragmentary, transverse sectional view taken along the line 4—4 of Figure 2;

Figure 5 is a fragmentary vertical sectional view taken along the line 5—5 of Figure 4;

Figure 6 is a perspective view of the condensing coil spacer element, shown alone, and

Figure 7 is a perspective view of the pump, pump sump and water separator being removed as a unit from the apparatus.

Referring now more in detail to the drawing, wherein similar reference numerals identify corresponding parts throughout the several views, 10 represents an upstand-

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ing rectangular tank open at the top and having a side tank 11, substantially as illustrated.

The bottom of the housing 10 is provided with an inclined bottom wall 12 (Fig. 2) freely spaced above the lower edges of the tank 10 proper, the bottom wall 12 being inclined downwardly toward a side opening surrounded by a flanged member 13 to which is secured a removable cleanout door 14 by means of bolts 15.

The tank 11 at one side adjacent one end of door 14 is provided with an outlet 16 controlled by a valve 17.

As a means of heating solvent disposed above bottom wall 12, a plurality of steam heating jacket elements 18, 19 and 20 are welded to the undersurface of the bottom wall 12 (Fig. 2), the element 18 comprising a rectangular plate, the element 19 being identical with element 18 except for the provision of vertical baffle 21 provided along one longitudinal edge thereof and terminating short of the entire length of the plate, while the element 20 is similar to element 18 except that it is provided with a vertical baffle 22 along one longitudinal edge, the vertical baffle 22 terminating short of the entire length of the plate and being offset from the vertical baffles 21. The front wall of the housing 10 is provided with an outlet 23 communicating with the space intermediate an end element 18 and bottom wall 12, and an inlet 24 communicating with the space between an end element 19 at the other end and bottom wall 12. The inlet 23 is connected to a suitable source of live steam.

The steam will be circulated through steam heating jacket elements 18, 19 and 20, below bottom wall 12, in substantially a zig-zag path starting at the inlet 23 and progressing to the outlet 24. This is substantially similar to that set forth in application Serial No. 355,947, filed May 19, 1953, now abandoned, for a Heating Jacket, owned by the assignee of the instant invention.

A removable grill 25 (Figs. 1 and 3) is mounted above and in vertically spaced relation to the bottom wall 12 and supports thereon the work to be degreased, the grill 25 resting on L-shaped brackets 73 and 73a mounted on the inside of main tank 10. The grill 25, it will be noted, is adapted to permit the passage therethrough of solvent vapors and may be easily and readily removed for cleaning purposes.

Flanges 26 are provided at the open upper end of the housing 10 at four sides thereof and are adapted to support thereon a flat cover, not shown.

The side tank 11 includes a top wall 28, which may be inclined as shown, and a bottom wall 29, which may also be inclined as shown. The bottom wall 29 of side tank 11 is provided with an opening 30 which communicates with the bottom of main tank 10 by means of a U-shaped pipe line 31, a valve 32 provided in the latter controlling the flow of solvent from the storage tank 11 into the main tank 10.

The pipe line 31 includes a T 80 at one corner thereof, the T being provided with a removable plug 81. Thus, when it is desired to fill tank 10, the valve 32 is closed and the plug 81 removed, whereupon the tank may be fed by gravity through T 80, as will be obvious.

The front wall 33 of the main tank 10 extends downwardly and terminates at the top of the side tank top wall 28 (Figs. 1 and 3) and starts again extending downwardly at the bottom wall 29, permitting solvent vapors from the bottom of main tank 10 to pass into the side or storage tank 11 below the top wall 28 thereof. The top portion of the storage tank 11 is sealed off from the main bottom portion thereof by means of a back wall 34 (aligned vertically with the front wall 33 of main tank 10) and a drain plate 35. The drain plate 35 consists of a downwardly and outwardly inclined plate

36 (Figs. 1 and 3), and a downwardly and inwardly inclined plate 37, the inner longitudinal edge of plate 37 being integral with the upper edge of the back wall 34. The outer longitudinal edge of the plate 36 extends to the front wall 39 of the storage tank 11 and extends from end to end of the latter, being welded thereto, as at 36a. Thus, the upper portion of the side tank 11 is sealed off from the main lower portion thereof, this upper portion communicating with the interior of the main tank 10.

A nipple 41 is provided near one outer corner of plate 36, permitting condensate on plate 36 to drain into the top of water separator 52.

An external cooling jacket 42 extends around the four sides of the apparatus just below the top wall 28 of the side tank 11, the cooling jacket 42 being provided with an inlet 43 connected to a suitable source of cooling water, not shown. A baffle or dam 44 closes off the cooling jacket 42 at the corner thereof adjacent the inlet 43, forcing the cooling liquid to flow in the direction of the arrows of Fig. 4.

An improved, more compact and readily removable condensing coil is provided and consists of continuous copper tubing 45 located directly above plate 36 (Fig. 3). The inlet of tubing 45 is connected to an inlet 45a provided in the end wall of side tank 11 by means of a union 46, the outlet of tubing 45 being connected similarly to an outlet 46a, provided in the end wall of side tank 11 above jacket 42 by means of a union 46b.

Thus, by simply disconnecting the unions 46 and 46b the coil 45 may be readily removed through the open top of tank 10 for purposes of cleaning and replacement.

The successive layers of coil 45 are retained in proper spaced relation to each other by means of a spacer element 75 (Figs. 5 and 6) made up of a vertical plate 76 and vertically spaced shelves 77 adapted to fit between successive layers of coil 45. This spacing is important for complete circulation of the vapors through the coil and maximum efficiency of the condenser coil.

An outlet 78 provided on the side of dam 44 remote from inlet 43 is connected to the inlet 45a of coil 45 by suitable piping 79 the latter including a pipe union 82. The outlet 46a of coil 45 is connected to a drain or sewer by suitable piping, not shown. Thus, the cooling water will enter inlet 43 and flow completely around the apparatus before leaving through outlet 78, from where it enters the coil 45 to leave by outlet 46a.

One end wall of side tank 11 is provided with a large square opening 83 (Fig. 7) surrounded by a flanged member 84, the member 84 being provided with spaced bolt openings 85. A removable rectangular stainless steel plate 47 is mounted across opening 83 and secured to flanged member 84 by means of bolts 48.

The inner face of plate 47 mounts a stainless steel pump sump 49, a pump 50 being suitably mounted on the outer face of the plate 47 and including an electric motor 51 for driving the same.

A stainless steel water separator 52 is located within one corner of the pump sump 49 below the nipple 41, the separator 52 being provided with a cock 53 mounted in the outer face of plate 47 for removing the separated water.

A sight level gauge 55 is mounted on the outer face of plate 47 alongside the pump 50.

A vertical pipe 57 is secured to the outer face of the cooling jacket 42 by means of a bracket 58, the bottom of vertical pipe 57 being connected to the outlet pipe 59 of pump 50 by means of an elbow 60. A pipe union 91 is provided in pipe 59 and permits the ready disconnection of pump 50 and pipe 57 when the pump is removed from tank 11. The top of pipe 57 is connected to an adaptor 61 by means of an elbow 62, the adaptor 61 being connected to flexible tubing 63 terminating in a hollow handle portion 64 to which is connected a rigid tubing 65 provided at its outer end with a nozzle 66. The nozzle 66 will normally be employed to spray the

top of the work being degreased, the pump 50 supplying solvent thereto under pressure.

A temperature gauge 67 is provided, the temperature gauge 67 communicating with the interior of the bottom of tank 10 by means of a line 69.

A control box 70 is mounted above the cooling jacket 42 near one corner of the apparatus and contains a switch, not shown, connected in the circuit of the motor 51 by means of the line 71. Complementary male and female plugs 86a and 86 are provided in line 71. The control box 70 also includes a line 72 entering the top of the side tank 11 and terminating in a temperature bulb, not shown, for controlling the level of the vapor within the main tank 10 in a manner well known to those skilled in the art.

In operation, with the valve 32 open, the boiling sump of the main tank 10 is filled with a cleaning solvent, for example, trichlorethylene, up to the removable grill 25. Steam is then supplied through inlet 24 of the steam jacket, whereupon the generated solvent vapors will rise to the mid point of the condensing coil 45 (and the surrounding channel jacket 42). The solvent condensate drops onto the drain plate 36 and flows into water separator 52 through drain pipe 41. This condensate fills water separator 52 and flows over into pump sump 49. This solvent condensate then fills pump sump 49 and flows over the baffle 92 into the storage tank 11. With valve 32 open, the condensate will then flow back to main tank 10 through return line 31. Thus, solvent placed in the boiling sump is vaporized, the vapors completely filling the degreasing tank to the level of the condensing coil 45. Water circulating through the condensing coil 45 at a temperature below the vapor temperature causes the hot vapors to condense on the coil, controlling the height of the vapor level.

The vapors condense as clean solvent which drips from the coil 45 to the pitched plate 36 and then flows into the water separator 52. Any water introduced into the tank during the degreasing operation is thus removed from the solvent. To remove this water, it is only necessary to open the cock 53 to permit the water to drain out.

From the water separator 52, the clean solvent flows into the pump sump 49 which, when full, overflows into the storage tank 11 and then returns to the boiling sump of the degreaser, completing the solvent cycle.

To reclaim or distill the dirty solvent, it is only necessary to close valve 32 in the solvent return line 31, while the degreaser is operating, thus trapping the clean solvent in the storage tank 11.

When the main tank 10 is to be emptied for cleaning purposes, the valve 32 is closed and the condensate is trapped in the storage tank 11. The remaining sludge is cleaned out of the bottom of the main tank 10 through the removable clean out door 14.

Recycled pure solvent will be supplied under pressure by the pump 50 to the nozzle 66 to be sprayed onto the top of the work.

By removing the bolts 48 and disconnecting the pipe union 91 and male and female plugs 86a and 86, it will be apparent that the plate 47 may be easily and readily removed from the flanged member 84, carrying along with it the pump 50, pump sump 49 and separator 52 as a unit for convenience in repairing and cleaning these parts. This construction also permits easy and ready access to the interior of storage tank 11 for inspection and cleaning. It will be noted that the pipe union 91 and male and female plugs 86a and 86 in lines 59 and 71, respectively, facilitate the disconnection of pump 50 from pipe 57 and control box 70 when the plate 47 is removed as described above.

Then the pump 50, sump 49 and separator 52, which are formed of stainless steel, may be quickly removed as a unit when desired, and replaced by a new such unit

with a minimum of effort, as can the condenser coil 45 by means of pipe unions 46 and 46b.

It should now be apparent that there has been provided a vapor spray degreaser having an unrestricted work area and wherein an improvised, more compact and readily removable condensing coil has been provided in offset relation to the tank proper to avoid damaging of the coil by insertion and removal of the work. It should also be apparent that there has been provided an improved vapor spray degreaser of the above type having a pump sump and water separator located below the offset condenser coil, the pump sump, pump and water separator being readily and easily removed as a unit.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What is claimed as new is:

1. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, a removable pump sump within said side tank, said water separator means being mounted within said sump and removable therewith, pump means mounted on the outer face of the external end of said sump and removable therewith, and spray means releasably connected to said pump means.

2. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, an external cooling jacket extending around the outside of said main and side tanks, an inlet in said jacket, means for supplying cooling fluid to said inlet, and an outlet in said jacket connected to said condenser means.

3. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, an external cooling jacket extending around the outside of said main and side tanks, an inlet in said jacket, means for supplying cooling fluid to said inlet, an outlet in said jacket connected to said condenser means, said cooling jacket being substantially aligned horizontally with said condenser means and including a closed internal wall, said jacket inlet being adjacent one side of said wall, said jacket outlet being adjacent the other side of said wall.

4. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, an external cooling jacket

extending around the outside of said main and side tanks, an inlet in said jacket, means for supplying cooling fluid to said inlet, an outlet in said jacket connected to said condenser means, said condenser means comprising a removable, continuous coil of tubing mounted above said drain plate, the inlet of said tubing being releasably connected to said cooling jacket outlet.

5. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, a removable pump sump within said side tank, said water separator means being mounted within said sump and removable therewith, pump means mounted on the outer face of the external end of said sump and removable therewith, spray means releasably connected to said pump means, said pump means, pump sump and water separator means being formed of stainless steel.

6. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, said condenser means including tubing substantially co-extensive with the width of said side tank, partition means sealing off said side tank below from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, said partition means comprising a substantially vertical wall separating said side and main tanks, the top edge of said wall terminating below said condenser means, said drain plate comprising an outwardly and downwardly inclined plate extending from end to end of said side tank, said condenser means being disposed directly above said outwardly and downwardly inclined plate, the outer longitudinal edge of said plate being secured to the front wall of said side tank, and an inwardly and downwardly sloping plate connecting the inner longitudinal edge of said first plate with the top edge of said wall.

7. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, a removable pump sump within said side tank, said water separator means being mounted within said sump and removable therewith, pump means mounted on the outer face of the external end of said sump and removable therewith, spray means releasably connected to said pump means, and a stop cock alongside said pump means, said cock being connected to said separator means.

8. In a degreaser as in claim 2 wherein said main tank includes a downwardly sloping bottom wall, and a clean-out door removably mounted at the bottom of said main tank adjacent the lowermost edge of said bottom wall.

9. In a degreaser as in claim 2, work supporting means including horizontally aligned, substantially L-shaped brackets mounted on the inner faces of said main tank, and a removable grill supported at its edges on said brackets.

10. In a degreaser, a main tank having unobstructed

side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, and pipe means connecting said side tank with said main tank, said side tank at one end having a large opening below said condenser means, a flanged member surrounding said opening on the outside of said side tank, a plate adapted to close said opening disposed across said flanged member, releasable means for securing said plate to said flanged member, a pump sump mounted on the inner face of said plate and adapted to pass through said opening, said water separator means being mounted within said pump sump, pump means mounted on the outer face of said plate and spray means releasably connected to said pump means.

11. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, said condenser means including a vertically disposed helically wound continuous coil of tubing extending substantially the full horizontal dimension of said side tank, an outlet and inlet mounted in the end wall of said side tank, and means for releasably connecting the inlet and outlet of said tubing to said inlet and outlet.

12. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, partition means sealing off said side tank below said condenser means from said main tank, said partition means including a drain plate below said condenser means, water separator means within said side tank below said drain plate, said drain plate opening on to said water separator means, pipe means connecting said side tank with said main tank, said condenser means comprising a continuous coil of tubing, an outlet and inlet mounted in an end wall of said side tank, and means for releasably connecting the inlet and outlet of said tubing to said inlet and outlet, and a spacer element mounted on an end wall of said side tank adapted to retain the superimposed layers of said tubing in proper spaced relation, said spacer element comprising a vertical plate substantially equal in length to the height of said tubing, and vertically spaced, substantially parallel shelves mounted on one face of said plate, each of said shelves being adapted to fit between a pair of superimposed layers of said tubing.

13. In a degreaser, a main tank having unobstructed walls, a side tank offset from said main tank, condenser means substantially at the top of said side tank, said condenser means including a vertically disposed helically wound coil of tubing extending substantially the full horizontal dimension of said side tank, water separator means within said side tank, a drain plate below said condenser means opening into said water separating means, partition means separating said main and side tanks, the top of which terminates at said drain plate.

14. A degreaser in accordance with claim 13, wherein said partition means comprises a substantially vertical wall.

15. A degreaser in accordance with claim 13, wherein said drain plate includes an outwardly and downwardly inclined plate extending from end to end of said side tank.

16. In a degreaser in accordance with claim 13, fluid connecting means connecting said water separator with said main tank.

17. A degreaser in accordance with claim 14, wherein the drain plate includes an outwardly and downwardly inclined plate extending from end to end of said side plate.

18. In a degreaser, a main tank, a side tank offset from said main tank, condenser means at the top of said side tank, a removable pump sump within said side tank, water separating means within said sump below said condenser removable therewith, pump means mounted on the outer face of the external end of said sump and removable therewith, spray means releasably connected to said pump means and pipe means connecting said side tank with said main tank.

19. In a degreaser, a main tank having unobstructed side walls and an open top, a side tank offset from said main tank, condenser means at the top of said side tank, means within said side tank to support said condenser means, said condenser means including a vertically disposed helically wound continuous coil of tubing extending substantially the full horizontal dimension of said side tank, an inlet and outlet connection mounted in one end wall of said side tank and means for releasably connecting the inlet and outlet of said tubing to said inlet and outlet connection, respectively.

20. In a degreaser as in claim 19, wherein said tubing support means includes a spacer element mounted on an end wall of said side tank adapted to retain the superimposed layers of said tubing in proper spaced relationship, said spacer element comprising a vertical plate substantially equal in length to the height of said tubing, and vertically spaced, substantially parallel shelves mounted on one face of said plate each of said shelves being adapted to fit between a pair of superimposed layers of said tubing.

21. In a degreaser as in claim 20, wherein a portion of said vertically disposed helical coil is in the vapor zone of said degreaser and a portion of said helical coil is disposed in the free board zone of said degreaser.

22. In a degreaser, a vertically elongated main tank, means to support a work piece in said tank in the lower portion thereof, said tank being unobstructed thereabove, wall means defining a laterally offset chamber in communication with said main tank and a partition wall separating a portion thereof from said main tank, closed conduit means in said chamber extending above said partition wall to circulate a condensing fluid, said partition wall together with said wall means also defining a condensate separating chamber below said conduit means, and drain means connecting the portion of said offset chamber containing the closed conduit means to said condensate separating chamber, water separating means within said separating chamber connecting said drain means and said separating chamber, and said conduit means connecting said main tank and said separating chamber.

23. A degreaser according to claim 22 wherein said separating means includes a sump portion and a pump arranged to suck liquid from said sump.

24. A degreaser according to claim 22 wherein said water separating means is removable.

25. In a degreaser, a vertically elongated main tank, wall means defining a laterally offset chamber in communication with said main tank including a partition separating said tank and a portion of said chamber, condenser means in the upper portion of said offset chamber extending above the top of said partition, said wall means together with said partition defining a condensate separating chamber below said condenser means, drain means connecting the portion of said offset chamber containing the condenser means to said condensate separating chamber, water separating means in said separating chamber connecting said drain means and said separating chamber,

and conduit means connecting said main tank and said separating chamber.

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