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RECOVERY APPARATUS

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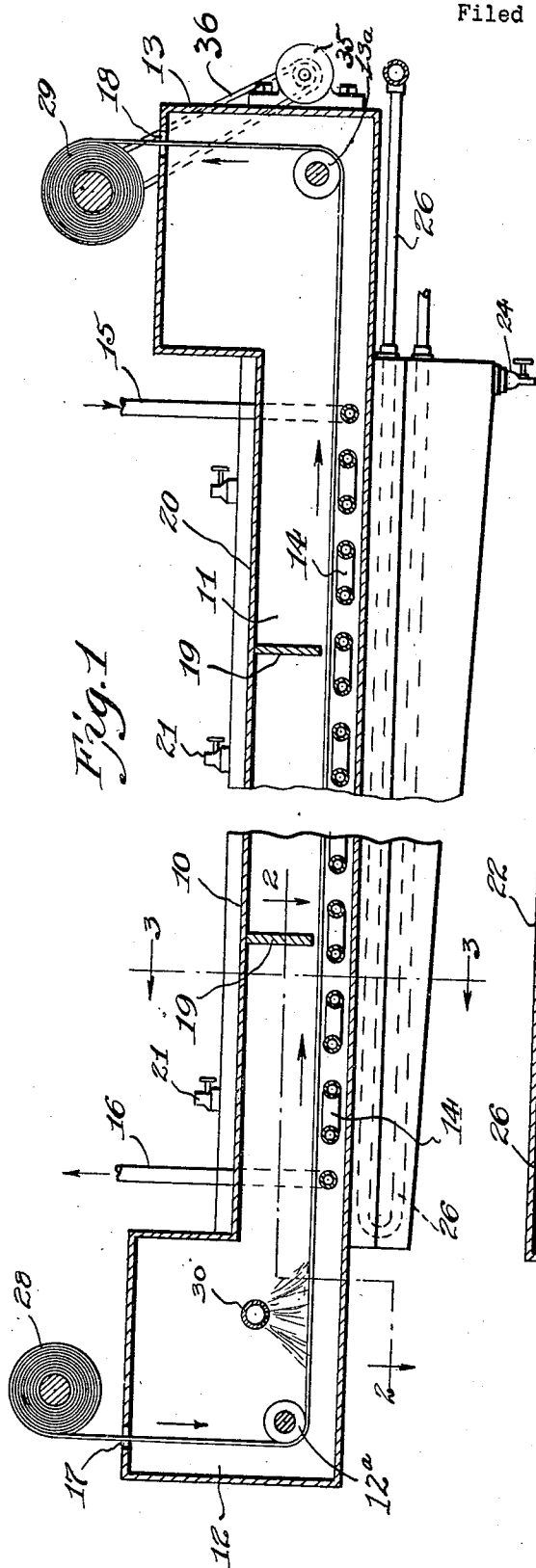


Fig. 1

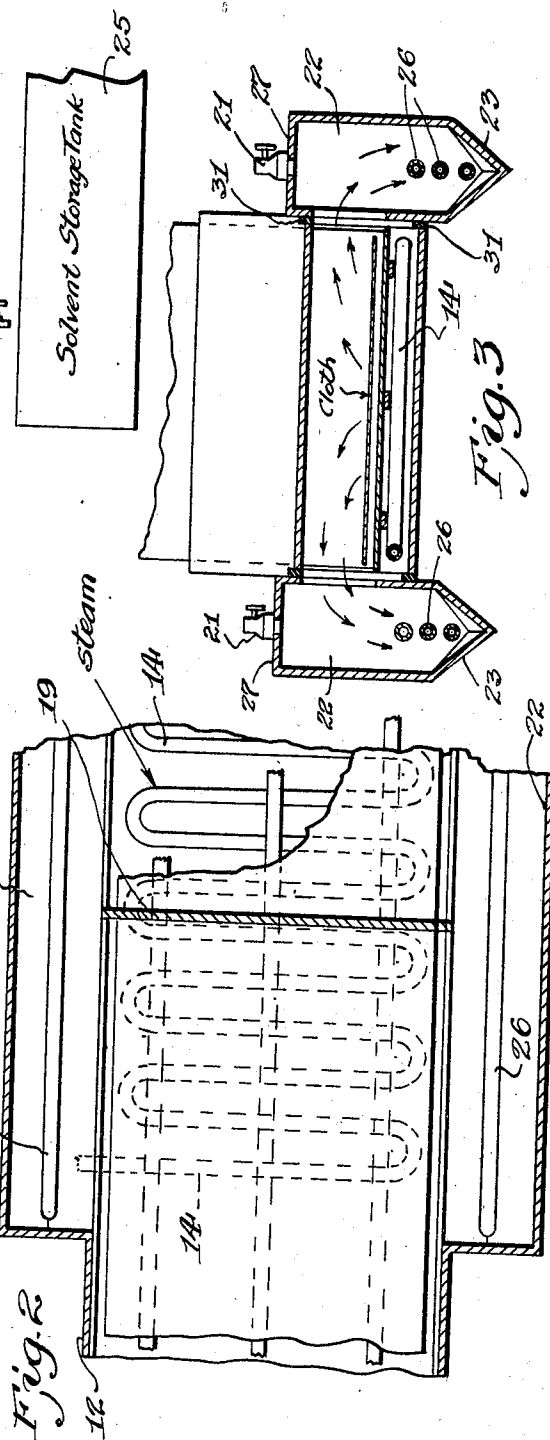


Fig. 2

Fig. 3

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RECOVERY APPARATUS

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2 Claims. (Cl. 34—73)

This invention relates to the recovery of solvents from substances or materials treated with a solution of a resinous substance in such solvents.

More particularly the invention relates to the recovery of halogenated hydrocarbon solvents, such for example as carbon tetrachloride, tetrachlorethylene and trichlorethylene. These solvents possess the common characteristics of a relatively low heat of vaporization and a specific gravity considerably higher than that of water. Their non-inflammability and the facility with which they may be condensed, without the use of absorption apparatus, make them particularly desirable for general use.

It has been found that the apparatus herein described permits the recovery of these solvents by direct condensation without any substantial admixture of air. The percentage of solvent recovered by my apparatus is relatively high and the simplicity of construction and ease of operation make it particularly desirable for use in connection with standard commercial apparatus, such for example as textile finishing apparatus.

Referring to the drawing for a detailed description of one embodiment of my apparatus;

Fig. 1 is a longitudinal section of a recovery apparatus embodying the features of invention,

Fig. 2 is a fragmentary section taken on the line 2—2 of Fig. 1 and showing a plan view of portions of the apparatus on an enlarged scale, and

Fig. 3 is a transverse section through the apparatus taken on the line 3—3 of Fig. 1.

Broadly speaking, my apparatus comprises an elongated tank or chamber through which the treated material passes over a heating source such as steam coils, and a condensing device or coils disposed on either side of the treated material for condensing the vaporized solvent by the use of a suitable coolant such as water. The top side or roof of the chamber is relatively low so that air is displaced and the chamber is substantially filled with solvent vapors which tend to flow in divergent directions from the center of the chamber toward the respective condensing coils disposed in wells on opposite sides of the vaporization chamber. The condensing wells are provided with sloping bottom walls so that the condensed solvent may be drained therefrom to a suitable storage tank or tanks for re-use.

The entrance and exit ports for the treated material are located considerably higher than the heating or vaporizing coils. By this construction I take advantage of the relatively high

weight of the solvent used to preclude the necessity of a tight seal at these ports.

Referring to the drawing, 10 designates the apparatus generally. A longitudinally extending chamber 11 is disposed between entrance and exit tanks 12 and 13 respectively. A suitable source of heat such as steam coils 14 extends along the lower portion of chamber 11 and provides a means for vaporizing the solvent from the treated material. 15 and 16 designate the inlet and outlet respectively for the steam pipes 14.

A port or slot 17 is provided in the upper wall of the entrance tank 12 for permitting entrance of the material to be treated, and a similar port or slot 18 is provided in the upper wall of exit tank 13 to permit withdrawal of the treated material from which the solvent has been removed. It should be noted that these ports or slots 17, 18 are located at a considerable height above the level of the vaporizing chamber 11 and the steam coils 14. By this construction I take advantage of the relatively heavy weight of the halogenated solvent and its low specific heat to prevent escape of the solvent from the tanks 12 and 13; and it is therefore unnecessary to have a gas tight seal at the places of entrance and exit of the material as would be the case with a lighter and more volatile solvent.

It is preferable to provide baffles 19 depending from the roof 20 of the vaporizing chamber 11 toward the heating coils 14. The purpose of these baffles is to break up longitudinal circulation through the chamber 11 and to retard or prevent the mixing of air with the solvent vapors.

A pair of condensing chambers 22 are disposed on opposite sides of the vaporization chamber 11. These chambers are preferably tapered at their bottoms as indicated at 23, and the bottom of each condensing chamber slopes toward a valve or cock 24 from which the condensed solvent is discharged into a suitable storage tank in receptacle 25. Condensing coils 26 are disposed in the lower portion of each condensing chamber 22. These coils carry any suitable condensing medium, and for most solvents ordinary tap water is satisfactory.

Valve controlled vents 21 are provided at spaced intervals along the top wall 27 of each condensing chamber 22. These vents, which may be provided with ordinary stop cocks, are opened when the system is started in operation and are left open until substantially all the air in the vaporizing chamber has been expelled, after which they are closed.

In the operation of my device, the material to

be treated, such as cloth on a roll 28 is threaded through the apparatus as shown in Fig. 1 through the inlet chamber 12, the vaporizing chamber 11 and the outlet chamber 13 to a wind-up roll 29. Supporting rolls 12a and 13a are located in chambers 12 and 13 respectively. A motor 35 drives a belt 36 connected to wind-up roll 29. Inside the inlet chamber 12 is a suitable device such as a spray 30 for applying treating materials, such as resins dissolved in volatile organic solvents to a surface of the fabric or cloth. As the treated material passes over the heating coils 14, the solvent is vaporized and passes in the general direction indicated by the arrows in Fig. 3 into the two condensing chambers 22 where the solvent is condensed by the coils 26. When in operation the solvent vapors substantially fill the vaporizing chamber 11 and the condensing chambers 22, and as the system is substantially closed, the pressure inside the apparatus is slightly greater than that of the atmosphere so that there is no leakage of air into the system and the solvent vapors are liquefied by direct condensation. This arrangement provides a very efficient system of condensation, particularly when the solvents used have a high specific gravity, as do the chlorinated solvents which I preferably use.

The efficiency of the system may be materially increased by the use of suitable insulation, such as non-metallic packing 31 between the hot and cold parts of the apparatus.

While I have shown a specific embodiment of the invention, it is apparent that other forms might be adopted, all coming within the scope of the appended claims.

I claim:

1. In a solvent recovery apparatus for recovery of chlorinated hydrocarbons from material which has been subjected thereto, entry and exit chambers spaced from each other, means for passing a continuous sheet of liquid treated material between said chambers, and a recovery apparatus

connecting and disposed substantially at the bottom of said chambers, said recovery apparatus comprising a relatively long and shallow vaporization chamber, heating means disposed in said vaporization chamber adjacent the lower wall thereof and a relatively short distance below the liquid treated material, recovery chambers at each side of said vaporization chamber and having portions disposed below said vaporization chamber but open thereto, cooling means in the lower portion of each of said recovery chambers, whereby a heavier-than-air vapor derived from the heating of said treated sheet material will flow by gravity to the lower portions of said recovery chambers and be condensed by said cooling means, and outlet means in the lower part of said recovery chambers for draining off the condensed liquid, and means on the upper portion of the recovery chambers for permitting the discharge of air from the apparatus when the apparatus is initially operated.

2. A solvent recovery apparatus comprising a central vaporization chamber, a heating means disposed in said central chamber, walls defining a pair of substantially closed end chambers connected to opposite ends of the central vaporization chamber, said end chambers comprising exit and entry chambers for the apparatus, some of the walls of each of said end chambers extending substantially above the vaporization chamber, means for causing a material to be passed horizontally through said vaporization chamber, a port disposed in a wall of each end chamber adjacent the top thereof, each of said ports being located at a level substantially above the central vaporization chamber, said ports providing for the passage of material therethrough, condensing means associated with the vaporization chamber for condensing vaporized solvent, and means provided in the lower part of the condensing means for withdrawing condensed solvent from the apparatus.

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