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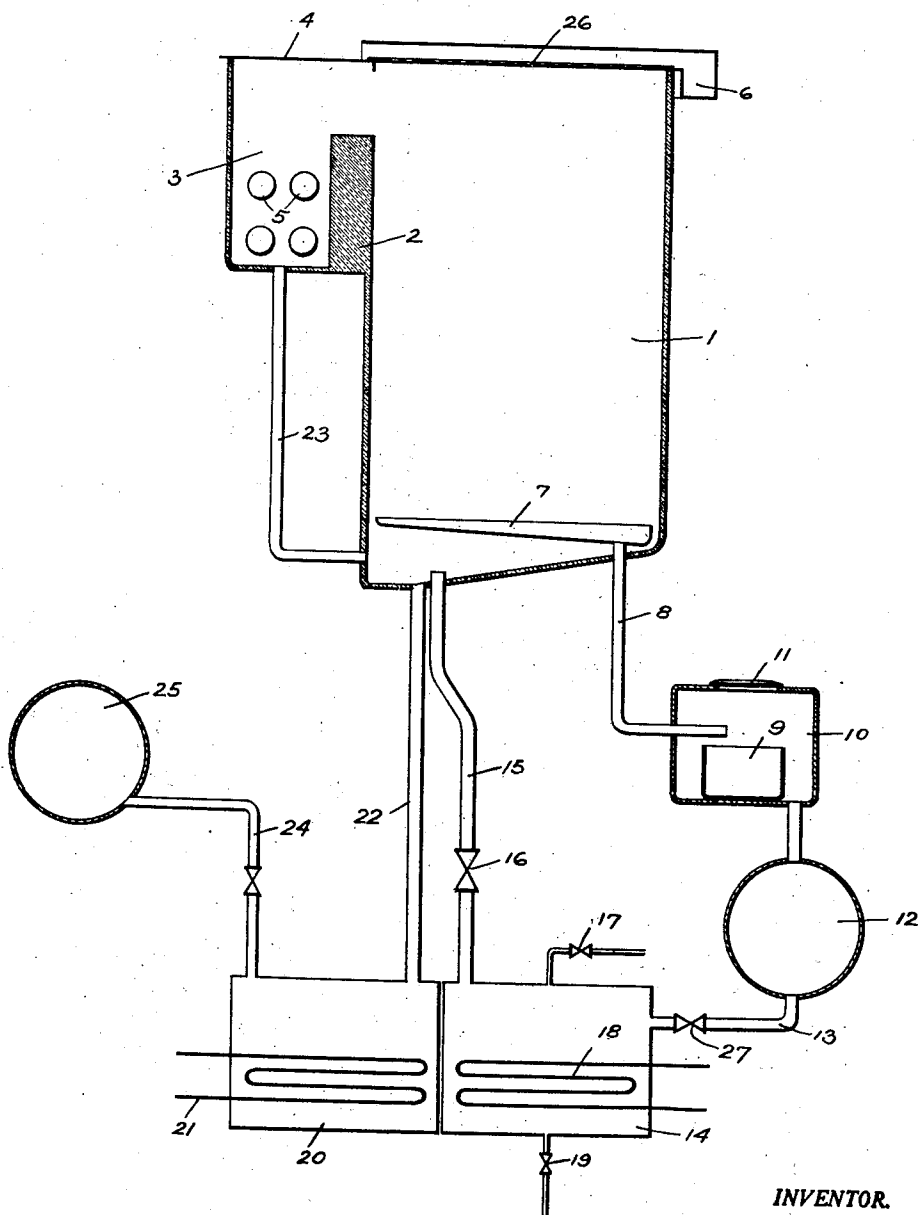
A. L. KOCH
DEGREASING SYSTEM

1,938,841

Filed Jan. 9, 1930

2 Sheets-Sheet 1

Fig. 1.



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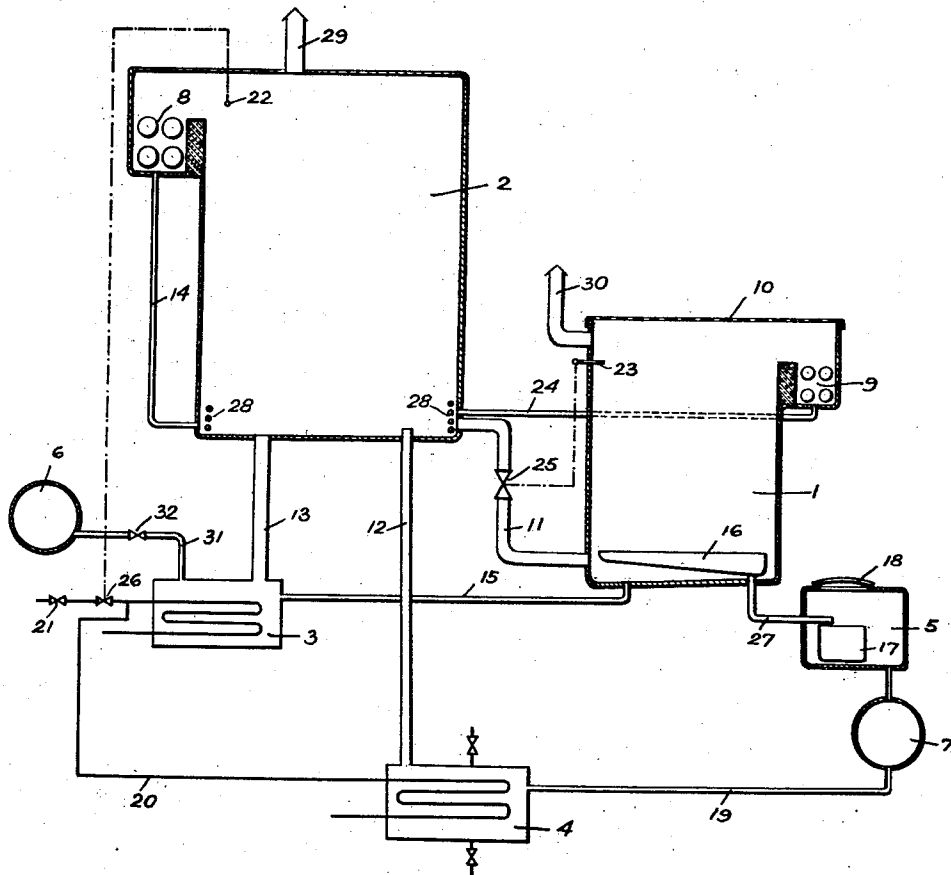
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Fig. 2.



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DEGREASING SYSTEM

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14 Claims. (Cl. 87-5)

This invention relates to the removal of grease and similar substances from surfaces of materials, as, for example, metal castings, and more particularly to processes and apparatus for carrying on degreasing operations with economy and dispatch.

The general object of the invention is to provide a system of degreasing in which a vapor bath is provided for speedily effecting a condensing action on the surface to be cleaned. In order to effect maximum condensation it is desirable to plunge the part to be cleaned into the vapor bath and to take advantage of the maximum difference in temperature between the part and the bath. The condensing action causes the vapor, during its liquefaction stage, to absorb grease and oily material on the surfaces of the part to be cleaned. The greater the condensation, the more efficient the cleaning action, due to the effective slushing action produced by movement of the liquid over the surface of the part. However, regardless of the slushing action, the grease and oil is entirely absorbed by the solvent, with the result that when the part is dried, it may be brushed or similarly treated and the dry residue remaining removed the same as dust.

A feature of the invention therefore resides in the provision of a vapor bath equipped with means for maintaining a desired level of vapor and permitting continuous plunging of parts within the bath to effect speedy degreasing.

A further feature of the invention assures a rate of evaporation of a solvent used in the degreasing operation, sufficiently speedy to submerge the parts to be cleaned and prevent slow heating up of the parts. By the arrangement provided the parts are immediately covered, and since there is no pre-heating prior to complete submergence, the condensing action is immediate and productive of a great volume of liquid over the exposed surfaces.

In order that the vapor be retained within the apparatus, regardless of the rate of evaporation, and to prevent its overflow and loss, means are provided for conserving the solvent and maintaining a substantially constant vapor level regardless of rate of operations. Another feature of the invention therefore covers the use of overflow means, integral with a vapor bath to prevent overflow of the vapor, and to permit re-use and maximum conservation of the solvent. Since the vapor, after it has once been used for degreasing, may still be valuable, even though it may be dirty, provision is made for its maximum re-use during the cycle of operations.

Other objects and features covering advantages in construction and operation will be apparent from the following descriptions of typical forms of the invention to be read in connection with the accompanying drawings in which

Fig. 1 is a diagrammatic illustration of an arrangement for degreasing incorporating applicant's invention, and

Fig. 2 is a modification adapted particularly for the degreasing of heavy parts and incorporating a modified form of vapor bath and reserve vapor chamber.

Considering the drawings, similar designations referring to similar parts, numeral 1 refers to a vapor chamber in which the degreasing operation takes place. The chamber may be suitably insulated and variously constructed to meet differing engineering requirements of design and capacity. Side 2 of the chamber, as shown, is lower than the other three sides and forms a partition between the chamber 1 and condensing chamber 3. The condensing chamber may be made integral with chamber 1 or may be a separate unit connected therewith. The condensing chamber has a cover 4 and cooling coils 5. Ventilating duct 6 is located around the vapor tank at its upper extremity.

Drip pan 7 has a drain 8 leading to chamber 10. Strainer 9 receives the liquid from pipe 8. By removing cover plate 11 the strainer may be taken from the chamber and cleaned. Chamber 10 empties into tank 12 which drains through pipe 13 into evaporator 14. Vapor supply pipe 15 leads from the evaporator 14 to chamber 1. Shut-off valve 16 is located in this vapor supply line. The evaporator 14 is provided with a valve 17 serving an air supply line leading thereto and is equipped with heat element 18 and drain pipe and valve 19.

While evaporator 14 receives its solvent from the condensations in chamber 1, evaporator 20 is provided for new solvent. Evaporator 20 has heat element 21 and vapor supply pipe 22 leading therefrom to chamber 1. Drain 23 leads from the condensing chamber 3 to the vapor chamber 1 and thence through pipe 22 to the evaporator. Supply tank 25 feeds evaporator 20 through supply line 24.

The cover 26 is provided for chamber 1.

In the operation of the arrangement of Figure 1 solvent from tank 25 is fed through 24 to evaporator 20, where it is heated, the vapors passing through pipe 22 to chamber 1. As the vapor rises in chamber 1 it forces the air out. This air will contain a small percentage of

vapor which will in part be reclaimed by condensing coils 5, the remainder being removed at the top of the tank by duct 6. The cover 26 may be used if desired while the vapor level is rising and would direct the air in the vapor chamber to exhaust duct 6. However, the natural draft will usually be sufficient to pull the air to the duct. When the vapor chamber is filled the cover 26 is removed and the chamber is ready for degreasing operations. It may be noted that overflow of vapor from chamber 1 will be condensed by the cooling coils in the condensing chamber and be returned in liquid form for re-use.

When an object to be degreased is plunged into the chamber, the difference in temperatures between its surface and that of the bath will cause the vapors to condense. The plunging may be variously accomplished as by placing a group of objects within a net and dropping it within the bath, or by conveying objects on an endless belt with an arrangement for dipping the objects as they are conveyed over the bath, or by dropping objects within the bath and removing them by hooks, pliers or the like. The manner of effecting immersion within the vapor bath is immaterial so long as the plunging action is brought about to cause sudden contact between the cold object and hot vapor with resulting condensation. This condensing action causes the clean liquid to come in contact with the grease on the surface and completely absorb it. The condensation action is sufficient to produce a considerable quantity of liquid which flows and drains from the part. As a result the condensing action produces a slushing action which removes the greater part of the dirt or dust on the oily surface. It is evident therefore that there is not only a degreasing action but a cleaning action as well.

The condensed vapors fall to pan 7 which drains into chamber 10 through strainer 9. After the straining action the solution passes to tank 12 and thence into evaporator 14. The solution may then be re-used by application of heat through element 18. Since the boiling point of the solvent used is lower than that of the oil removed from the part, the vapors from the solvent will be driven off while the oil will remain in evaporator 14. As shown, the vapors will then feed to chamber 1 for use in further degreasing operations.

The oil in evaporator 14 may be removed by introducing compressed air within the evaporator and forcing the oil out through pipe 19. During this operation the valves in lines 13 and 15 would naturally be closed. When the apparatus is started and the sides of tank 1 are cold, the vapors will condense and this clean solvent drained back through pipe 22 to evaporator 20. It cannot drain back to evaporator 14 because supply pipe 15 extends above the bottom of tank 1. So also, the clean vapors spilling over side 2 into the condenser will also drain back into evaporator 20.

By closing valve 27 the re-used solution may be collected in tank 20 and prevented from draining directly into evaporator 14. Thus, by controlling valve 27 it is possible to maintain a substantially positive level of liquid in evaporator 14.

The size of the chamber 1 may be designed to accommodate parts of any desired size or weight and still provide a reserve amount of vapor sufficient to keep the parts covered at all times.

Engineering expediency will determine the rate of evaporation in order to prevent escape of vapor over the top of the vapor chamber and assure proper condensing action to take care of overflow from chamber 1 to chamber 3. The chamber 3, as shown, is well insulated from the vapor chamber so that the cooling effect of the condensers will not be affected by the heat in chamber 1.

Any desired solvent may be used, such as trichlorethylene. The heat requirements for the evaporation of the solvent may be varied to meet different demands, although it has been found in practice that a steam pressure not above twenty-eight pounds, or heating equipment using a temperature not greater than that of steam at twenty-eight pounds pressure, gives satisfactory results.

Considering Fig. 2, a modified arrangement is shown in which vapor chamber 1 is operatively associated with vapor storage tank 2. Evaporator 3 supplies vapor to tank 2 while evaporator 4 is used for re-generating the re-used solvent. Chamber 5 receives the drained solvent, as shown, and empties it within storage tank 7. Tank 6 provides solvent for evaporator 3. Condenser 8 serving chamber 2 and condenser 9 adjacent chamber 1, takes care of excess vapor as in the arrangement of Fig. 1. Cover 10 for chamber 1 is removable and may be positioned in any suitable manner. The chamber 2 need not be provided with a cover but has a vent 29, if desired. Chamber 1 may similarly be vented by means of 30. Supply line 11 admits vapor from tank 2 to chamber 1. Supply pipes 12 and 13, in turn, supply generated vapor to chamber 2. To take care of condensation drain pipes 14 and 24 are provided, whereas drain pipe 15 admits condensed liquid in chamber 1 to evaporator 3. This condensed liquid drops from the walls usually and is clean. The dirty liquid is removed from pan 16 through pipe 27 to strainer 17 within chamber 5. By removing cover 18 the strainer may be taken out and cleaned. As indicated, the liquid from chamber 5, after entering tank 7 where it may be stored, is admitted to evaporator 4 through pipe 19. Steam line 20 which serves evaporators 3 and 4 may be controlled by valve 21. Thermostat 22 within chamber 2 is arranged to shut off the steam through valve 26 responsive to conditions within the chamber. Thermostat 23 in chamber 1 controls valve 25 to regulate the admission of vapor in chamber 1. The chamber 2 may also be provided with a cooling coil 28 to assure retaining in liquid state the solvent returned from condenser 8 in its course to evaporator 3 and for emergency condensing. The solvent from chamber 6 enters evaporator 3 through pipe 31 controlled by valve 32.

Solvent from tank 6 is evaporated in 3 and passes through pipe 13 as a vapor to fill chamber 2. Excess vapor, if any, will spill into condenser 8 and drain back into chamber 2 through pipe 14. Vapors from chamber 2 will flow through pipe 11 to chamber 1. When a sufficient level is attained, thermostat 23 will shut off 25 and hence stop the flow of vapor. Similarly, when the vapor reaches a sufficient level in chamber 2, thermostat 22 will act to stop evaporation of the solvent. Due to condensation in both chambers 1 and 2 the vapor level in each chamber may drop, especially when operation is first started. However, thermostats 22 and 23 operate to control and maintain the levels. The

excess vapor in chamber 1 will be condensed in chamber 9 and drained back through pipe 24 to chamber 2. In degreasing materials or parts, the plunging action in chamber 1 may cause the vapor level to fall, especially when heavy objects are degreased. Valve 25 will immediately open and allow vapor from chamber 2 to enter and keep the part completely covered. The condensed vapors draining from the part will be received by pan 16 and passed through pipe 27 within strainer 17. The strained liquid then proceeds to tank 7 and then to evaporator 4 for re-use. As in Fig. 1, the solvent will boil off and pass from evaporator 4 to chamber 2, whereas the oil, which is of a higher boiling point, will stay at the bottom and can be drained off in any suitable manner.

While applicant shows specific arrangements of apparatus for accomplishing his objects, it should be understood that the invention is not limited thereto and any analogous means capable of carrying out the invention, are deemed within the purview hereof.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A degreasing system having a vapor reservoir, a vapor chamber connected to said reservoir, means for generating vapor for supplying the reservoir, means including cooling coils located behind a partition at a desired distance above the bottom of the reservoir for maintaining a desired level of vapor in the reservoir and means including cooling coils located behind a partition at a desired distance above the bottom of the chamber for maintaining a desired level of vapor in the chamber.

2. In a system of the character described means for generating vapor, a chamber for collecting said vapor, a second chamber connected to the first chamber and open to the atmosphere for receiving vapor from said first chamber, first control means for regulating the supply of vapor fed to the first chamber and second control means for regulating the supply of vapor fed from the first chamber to the second chamber.

3. A degreasing system having means for generating a solvent into vaporious form, a chamber for collecting the vapor, a second chamber for receiving vapor from the first chamber, one of said chambers being uncovered, and means including cooling coils to which the vapors in said chambers have access for retaining desired vapor levels in both chambers, the vapor in one of said chambers being subjected to speedy condensation at intervals.

4. A degreasing system of the character described, having a chamber, means for vaporizing a supply of solvent to produce a vapor in the chamber, a compartment adjacent and insulated from the chamber and located a desired distance above the bottom of the chamber, condensing means within the compartment, said compartment being arranged to receive an excess of vapor spilling over a side of the chamber, means for receiving condensed vapor from said compartment, means for separating foreign matter from said condensed vapor and means for reusing the condensed vapor for vapor generation for supplying the chamber.

5. A degreasing system of the character described having a vapor chamber, a condensing chamber integral with the vapor chamber and located a desired distance above the bottom of the vapor chamber, cooling means within the condensing chamber, a partition between said

chambers serving as a wall of each of the chambers, the remaining sides of said chambers extending to a level above the top edge of the partition.

6. A degreasing system of the character described having a vapor chamber, another chamber located a desired distance above the level of the bottom of the vapor chamber and connecting with the vapor chamber adjacent the upper extremity thereof, condensing means in the other chamber for liquefying vapor entering therein, both of said chambers being open to the atmosphere.

7. A degreasing system of the character described having a vapor chamber, a vapor condensing chamber, containing cooling means therein, adjoining the vapor chamber, the walls of said chambers being arranged so that vapor from the vapor chamber will spill within the vapor condensing chamber after it reaches a predetermined level within the vapor chamber, means for removing condensate from the condensing chamber, a vapor generator for receiving said condensate, and means for removing condensate from the vapor chamber for regeneration.

8. In a degreasing system of the character described a vapor chamber, a vapor condensing chamber, containing cooling means, connected with the vapor chamber to receive an overflow of vapor therefrom, means for removing condensate from both chambers for regeneration, and means for segregating the condensate received from one chamber from the condensate received from the other.

9. In a degreasing system of the character described, a plurality of vapor generators, means for supplying vapor from one of said generators to a vapor chamber, means for removing condensate from said vapor chamber and returning it to the other of the generators, a condensing chamber, including cooling means, contiguous to the vapor chamber for receiving vapor overflowing from the vapor chamber and means for returning condensate from said condensing chamber to the first generator.

10. In a degreasing system of the character described, a vapor chamber, another chamber having cooling means and connecting with the vapor chamber for receiving vapor overflowing from the vapor chamber, a pan in the vapor chamber for receiving condensate and foreign matter precipitated during cleaning operations within the vapor chamber, means for removing the condensate and foreign matter to separating means, said separating means comprising a container for receiving the foreign matter and another container for receiving liquid, means for withdrawing said liquid to a vapor generator and means in combination with the vapor generator for removing materials other than solvent, and means for supplying vapor from said generator to the vapor chamber.

11. A system of the character described comprising a chamber open to the atmosphere, means for vaporizing a liquid solvent, the vapor filling the chamber to a desired level, a partition integral with the chamber, condensing coils on one side of the partition, the vapor being adapted to spill over said partition and be condensed by said condenser coils, so that the vapor in the chamber will not rise above the desired level.

12. A degreasing system having a vapor chamber, means for vaporizing a solvent to produce a vapor in the chamber, cooling coils and a

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partition for separating the chamber from said coils, said cooling coils being at a desired level above the bottom of the chamber and at a desired distance below the top of the chamber, the chamber being open to the atmosphere.

- 5 13. A system for degreasing articles, comprising a chamber, means for vaporizing liquid solvent and producing a vapor in the chamber, means for preventing the vapor from rising above a certain level in the chamber, said last means including cooling coils and a partition between the cooling coils and the chamber, the top of the partition establishing the vapor level in the chamber, the top of the partition being a desired dis-
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tance above the bottom of the chamber and a desired distance below the top of the chamber.

14. In combination, a chamber open to the atmosphere, means for vaporizing liquid solvent and accumulating the generated vapor in the chamber, cooling coils located a desired distance above the level of the bottom of the chamber, a partition separating the vapor within the chamber from the cooling coils, and means for draining condensate from the cooling coils upon an overflow of vapor from the chamber, across said partition to the coils.
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