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UNITED STATES PATENT OFFICE

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PROCESS FOR DEGREASING THE INTERIOR OF HEAT EXCHANGE APPARATUS

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This invention relates to an improved method of and apparatus for removing oil, grease and the like foreign matter from the interior surfaces of steam condensers or other structures, which are not easily accessible. This operation will be termed degreasing for brevity.

The interior surface of condensers, and particularly the heat transmitting surfaces with which the steam to be condensed is in contact, become in time coated with oil or grease, or with these substances changed in character by the action of the steam; in the case of reciprocating engines the oil or grease used for cylinder lubrication is carried with the steam to the condenser notwithstanding any precautions adopted to avoid this, and the deposition thereof materially reduces the efficiency of the heat transmitting surfaces and in this way lowers the efficiency of the condenser; in addition to this the presence of certain classes of oil on the condenser surfaces is undesirable for other reasons; further, although in the case of condensers employed with steam turbines this deposition is, by reason of the different mode of lubrication, not so pronounced, oil is even in these cases carried from the auxiliary machinery and its deposition is sufficient to give trouble and to lower the efficiency of the condenser; and the object of the invention is to provide a method and apparatus whereby any oil on the interior surfaces of the condenser may be removed cheaply expeditiously, with certainty and without dismantling the condenser even to the extent of removing the end covers.

According to the present invention the vapour of a volatile solvent is condensed upon the surfaces to be cleaned in such manner that the condensed liquid washes away the greasy matter. It is thus possible to effect degreasing in a very simple manner without dismantling the apparatus.

The invention may be carried into practice in various ways, preferably by using oil or grease solvents of low inflammability particularly chlorinated hydrocarbons such as trichlorethylene.

The solvent vapour can be produced by evaporating the solvent either in an external vessel or within the structure to be cleaned. In most cases, the structure will be at a sufficiently low temperature at any rate when using a high boiling solvent, to condense sufficient liquid upon the surfaces to be cleaned to remove the greasy matter therefrom but especially when cleaning condensers the water may be circulated through the condenser tubes for this purpose. In any case, however, when the surfaces have been cleaned, it is desirable to effect final condensation of the vapour filling the interior of the structure and this may be done by the use of cooling devices, situated either within or without the structure or in the case of a condenser by using the condenser tubes themselves.

In one form of the invention as applied to cleaning steam condensers, a door at or near the bottom of the steam space may be removed or a special opening may be provided there. The eduction pipe from the condenser may be closed and if desired air may be removed therefrom, though these measures are not essential.

An external evaporating apparatus containing liquid trichlorethylene preferably situated below the opening is connected with the opening and the hot surface heavy vapour is caused to rise within the steam space of the condenser until it has displaced the air and has reached the top level of the surfaces to be cleaned. If desired, means may be provided for ascertaining the height to which the vapour has risen but in most cases this can be ascertained by a rise in temperature of the condenser walls.

Partial condensation of the vapour is effected by the condenser tubes and final condensation is then effected by circulating cooling water through the water space of the condenser after which the oil or grease solution is removed whereupon it may be distilled to recover the pure solvent in known manner.

The trichlorethylene to be used in the manner described is stored in the engine room in suitable receptacles and as it has valuable fire-extinguishing properties, said receptacles are so constructed that it may be readily be used for fire-extinguishing purposes.

In a further form of the invention the final condensation of the vapour is effected by a cooling coil external to the structure. If desired, the external still from which vapour is generated may be caused to serve both as an evaporator and a condenser by providing a coil through which steam may be circulated to evaporate the solvent and through which water may be circulated to condense the vapour. Separate coils may, however, be provided if desired. It may be added here that it is not necessary to heat the still by steam since electrical heating can be used or even direct heating by fire.

In a further form of the invention the bottom of the condenser or structure may serve as the still. The liquid solvent is introduced therein and evaporated therein by the aid of a removable heating coil or other means. In this modification of the invention final condensation may be effected either by the condenser tubes or by a removable cooling coil.

Thus, distillation of the solvent may be effected either by heat supplied from within the structure or by external heat. The final condension of the vapour may be effected by the structure itself or there may be a supplementary removal of heat, for example, by the use of a removable cooling coil to bring the vapours to a temperature below that which they reach by contact with the structure itself.

Either air or water may be used as cooling medium. If time is not of importance, the whole of the condensation can be performed by the structure itself in conjunction with the cooling effected by the external atmosphere.

The invention may also be applied to the treatment of other structures whose interior surfaces are difficult of access, for example, heat exchanging surfaces of evaporators, heaters, coolers and the like or the interior surfaces of transformers or other electrical machinery.

It will be seen that according to the present invention it is possible to clean these inaccessible surfaces by using a relative very small quantity of solvent which can be recovered for further use. The treatment by condensation liquid is much more satisfactory, thorough and economical than would be any treatment in which a cold liquid was caused completely to fill the interior space of the structure.

We are aware that it has been proposed to degrease metal castings, bones and other materials by placing them inside a space provided with cooling coils to condense hot solvent vapour but such a method of treatment is obviously impracticable for the large structures which are treated by the simple process of the present invention.

An improved feature of the invention consists in the fact that the speed of the operation is kept high by the use of heat since hot condensed liquid is very efficient for the purpose of rapidly washing off the grease or like matter.

I declare that what I claim is:

1. A process for degreasing the interior of heat exchange apparatus, which consists in supplying vapor of a volatile oil solvent to the interior surfaces to be cleaned, maintaining said surfaces below the condensation point of the volatile solvent, whereby the solvent is condensed by contact with the surface to be cleaned, and removing the condensed liquid containing dissolved grease.

2. A process for degreasing the interior of heat exchange apparatus, which consists in supplying vapor of a non-inflammable volatile oil solvent to the interior surfaces to be cleaned, maintaining said surfaces below the condensation point of the volatile solvent, whereby the solvent is condensed by contact with the surface to be cleaned, and removing the condensed liquid containing dissolved grease.

3. A process for degreasing the interior of heat exchange apparatus, which consists in supplying trichlorethylene vapor to the interior surfaces to be cleaned, maintaining said surfaces below the condensation point of the trichlorethylene, whereby the vapor is condensed by contact with the surface to be cleaned, and removing the condensed liquid containing dissolved grease.

In witness whereof, I have hereunto signed my name this 11th day of April, 1929.

STERRY BAINES FREEMAN.