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APPARATUS FOR CLEANING METAL PIPES

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Fig. 1.

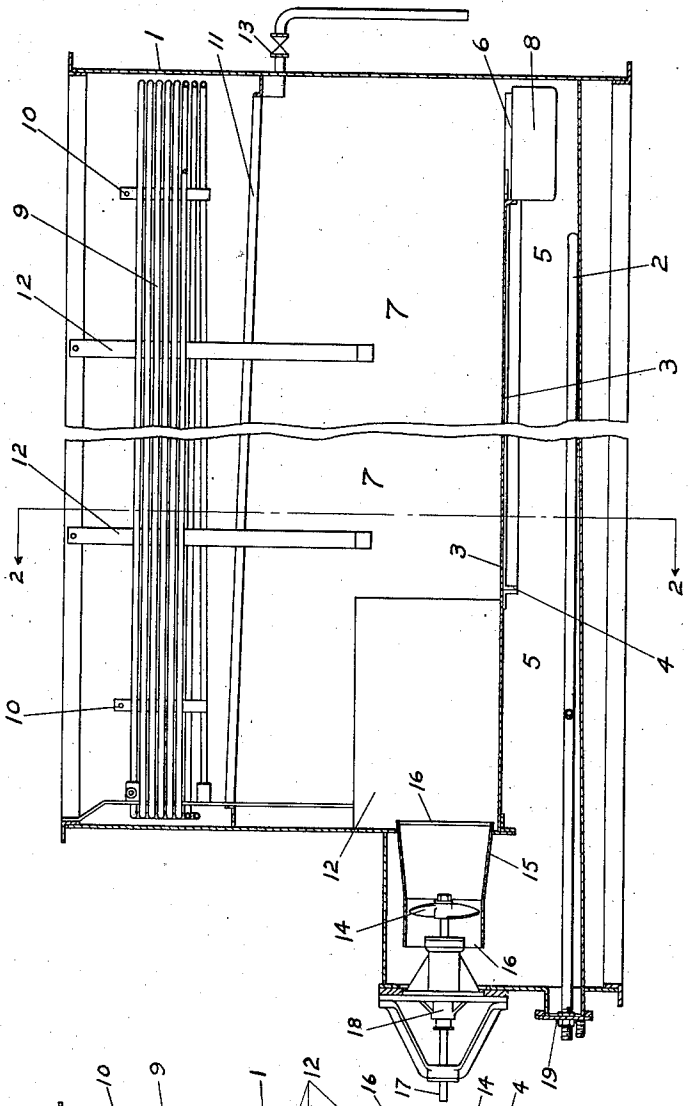
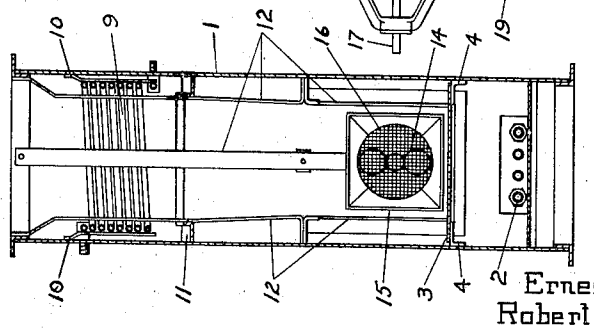


Fig. 2.



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APPARATUS FOR CLEANING METAL PIPES

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3 Claims. (Cl. 87—5)

This invention relates to an improved method and apparatus for cleaning metal pipes, and more particularly to a method and apparatus for treating pipes with a liquid solvent for the removal of oil, grease and the like.

We have found that narrow-bore pipes, if placed longitudinally in a stream of liquid solvent, are freed from oil and grease adhering to the internal surfaces as well as from that on the outside of the pipes. This method of treatment is particularly useful when using a volatile grease solvent, e. g. trichlorethylene, at temperatures in the neighbourhood of its boiling point. Working under these conditions in a suitably designed apparatus the whole of the grease can be rapidly removed in the stream of heated liquid solvent. The pipes are then lifted, drained and allowed to dry for a short space of time within the casing of the apparatus, prior to removal for subsequent treatment, e. g. painting or coating with non-corroding metals.

A suitable apparatus in which the treatment may be carried out comprises essentially a long channel or trough-shaped vessel for holding the liquid, provided with means for causing a flow of liquid from one end to the other and with a return conduit to conduct the liquid from the outlet end of the trough back to the inlet end. The flow of liquid may be secured by means of a propeller at one end of the vessel.

When the apparatus is intended for use with volatile solvents, means may be provided for heating the solvent, together with suitably arranged condensing surfaces to prevent escape of solvent vapour. A convenient arrangement is a long rectangular vessel in the bottom of which are arranged steam heating coils. This vessel is divided by means of one or more vertical partitions, into longitudinal compartments communicating at the ends in order to permit of circulation being established. The pipes may be placed in one or more of the compartments.

In an alternative form a horizontal partition may be used, thus providing an upper compartment to accommodate the pipes and a lower conduit for the return of the liquor. To provide communication between the upper compartment and the conduit, the partition may have perforations for a short distance from each end, or gaps may be left close to the ends of the vessel.

The flow of the solvent is conveniently maintained by means of a propeller. To prevent escape of the vapour of the heated solvent, condensing surfaces, e. g. cooling coils supplied with water, are arranged around and near to the top of the rectangular vessel. Sufficient depth should be left between the top of the bath and the bottom of the coils to permit of the tubes being maintained in the vapour of the solvent while being slightly tilted to allow liquid solvent to drain off.

In operation, the pipes to be cleaned are lowered, preferably in batches suitable to the size of the apparatus, into the heated solvent in the trough, and are kept there for a suitable time while the stream of solvent is passed through and over them. They are then lifted into the vapour space, tilted slightly to permit of draining for a short time and drying prior to removal from the apparatus.

A suitable form of apparatus for use with a volatile grease solvent such as trichlorethylene is illustrated in the accompanying drawing, in which Figure 1 is a longitudinal section and Figure 2 a section on the line 2—2 of Figure 1.

The apparatus consists of a long rectangular sheet metal tank or casing 1 capable of holding a volume of the liquid solvent in the bottom portion, which is provided with steam heating coils 2. The casing is divided by a horizontal partition 3, into a treatment chamber 7 and a return conduit 5. The partition also serves to support the pipes being treated and comprises a series of removable plates resting on brackets 4 attached to the casing 1 at a short distance above the heating coil.

In this manner the space 5 between the partition and the bottom of the casing forms an effective return conduit for the solvent, an opening 6 being left between the end of the partition and the casing to provide for the free flow of solvent from the treatment chamber 7 to the return conduit 5. To avoid undue deposition in the return conduit of solid matter, grit, etc., which is washed away from the pipes by the solvent, we find it advantageous to insert a removable filter 8 in the opening 6, to trap such solid material.

In the upper portion of the casing, condensing coils 9 carried by the supports 10 are arranged round the walls, appropriate inlets and outlets being provided for the cooling water. A sufficient height is left between the bottom of the condensing coils and the partition 3 to permit complete immersion of the batch of pipes to be treated in the liquid, and also to permit of the pipes being lifted out of the liquid and allowed to drain in the vapour space left between the liquid and the bottom of the condensing coils.

A gutter or trough 11 is arranged round the

walls of the apparatus immediately beneath the condensing coils to collect the condensate, which may be drawn off through the cock 13. By the use of this device it is possible to use the apparatus itself as a still for the recovery of the solvent from the used liquor. For this purpose the used liquor, consisting of solvent which has become heavily charged with oil and grease is heated in the bottom portion of the plant and the solvent vapour is condensed on the coils 9. The pure condensate collecting in the gutter is continuously run off through the cock 13 into a suitable container to be stored for recharging the plant after the residual oil and grease have been removed. During the normal operation of the cleaning process the cock 13 is closed and condensate collecting in the gutter merely overflows into the bottom of the tank. In order to protect the coils 9 and to ensure the location of the pipes being treated directly in the stream of solvent liquid, suitable guide plates 12 are provided inside the casing.

To provide the required stream of solvent, a propeller 14 is arranged in a duct 15 leading from the return conduit 5 to the treatment chamber 7. The propeller is driven by the shaft 17 which passes through the gland 18, and draws liquor from the conduit 5 and forces it into the treatment chamber 7. Grids 16 are provided to guard the propeller against accidental damage.

For removal of oil and grease and to facilitate the cleaning of the apparatus, which is necessary from time to time, the door 19 is fitted at one end of the casing. As illustrated in the present arrangement, we find it convenient to attach the heating coils 2 to the cleaning door so that they may be readily removed along with the door. This feature enables the base of the plant to be cleared for cleaning purposes much more rapidly than is otherwise possible.

In operating the process, a volume of liquid solvent sufficient to immerse the pipes to be treated is heated in the bottom of the casing, the propeller is started to draw solvent from below the partition and to force solvent through the treatment chamber above the partition, thus keeping up a continuous circulation. The pipes, which are preferably held in clamps or in a suitably sized basket, are lowered into the liquid and are allowed to remain in the stream of solvent until thoroughly cleansed. They are then lifted out of the liquor but kept below the condensing coils, tilted slightly and allowed to remain until any adherent liquid solvent has drained off or vaporized, after which they are removed from the apparatus.

We claim:

1. An apparatus for cleaning metal pipes, both internally and externally, comprising a relatively elongated tank adapted to contain a body of liquid solvent, means for heating said body of liquid solvent, cooling means for preventing the escape of vapor from the top of said tank, a partition extending longitudinally of said tank to provide on one side thereof a pipe cleaning chamber and to provide on the other side thereof a solvent return conduit, a solvent impeller positioned adjacent one end of said tank adapted to draw solvent from said solvent return conduit and to propel solvent in a longitudinally directed stream through said pipe cleaning chamber, and a passageway adjacent to the opposite end of said tank affording passage of solvent from said pipe cleaning chamber to said solvent return conduit.

2. An apparatus for cleaning metal pipes, both internally and externally, comprising a relatively elongated tank adapted to contain a body of liquid solvent, means for heating said body of liquid solvent, cooling means for preventing the escape of vapor from the top of said tank, a horizontal partition spaced from the bottom of said tank to provide thereabove a pipe cleaning chamber and to provide therebelow a solvent return conduit, a solvent impeller positioned adjacent one end of said tank adapted to draw solvent from said solvent return conduit and to propel solvent in a longitudinally directed stream through said pipe cleaning chamber, and a passage-way adjacent the opposite end of said tank affording passage of solvent from said pipe cleaning chamber to said solvent return conduit.

3. An apparatus for cleaning metal pipes, both internally and externally, comprising a relatively elongated tank adapted to contain a body of liquid solvent, means for heating said body of liquid solvent, cooling coils arranged around the inside of said tank and near the top thereof to prevent the escape of solvent vapor, a horizontal partition spaced from the bottom of said tank to provide thereabove a pipe cleaning chamber and to provide therebelow a solvent return conduit, a solvent impeller positioned adjacent one end of said tank adapted to draw solvent from said solvent return conduit and to propel solvent in a longitudinally directed stream through said pipe cleaning chamber, a passage-way adjacent the opposite end of said tank affording passage of solvent from said pipe cleaning chamber to said solvent return conduit, and vertical guides spaced inwardly from the longitudinal walls of said tank to facilitate insertion of pipes and positioning thereof in registry with said solvent impeller.

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