June 8, 1937. R. A. EASTWOOD 2,083,012

DEGREASING APPARATUS

Filed Feb. 15, 1935 3 Sheets-Sheet 1

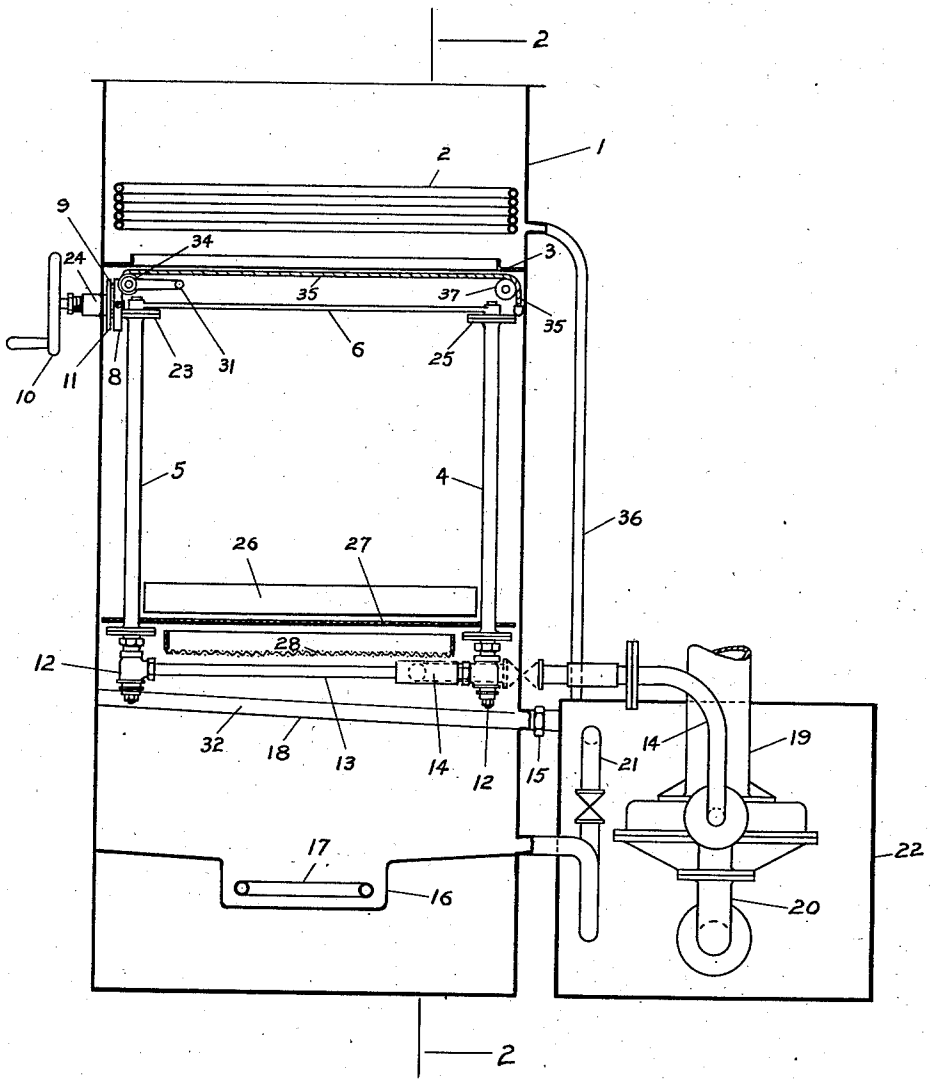


FIG. 1.

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DEGREASING APPARATUS

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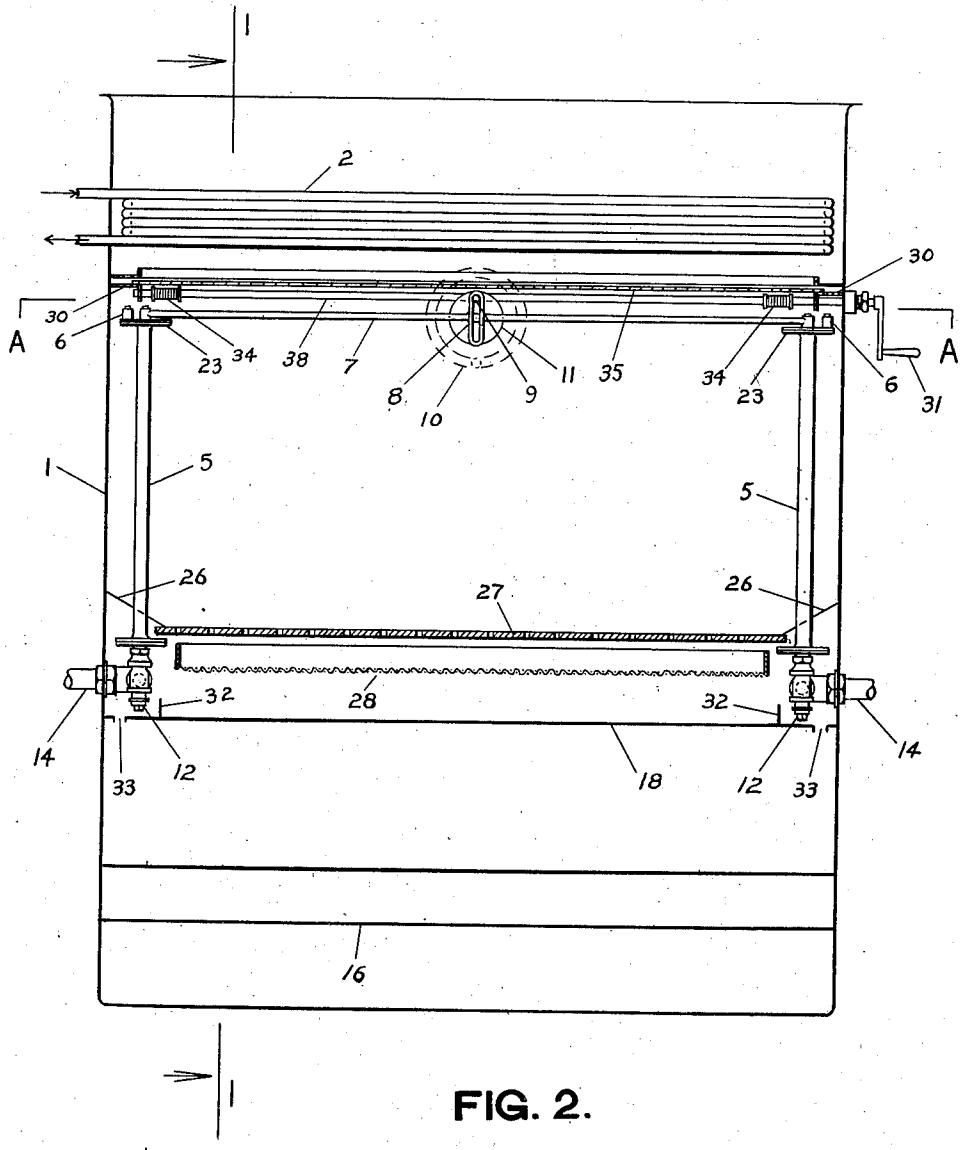


FIG. 2.

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DEGREASING APPARATUS

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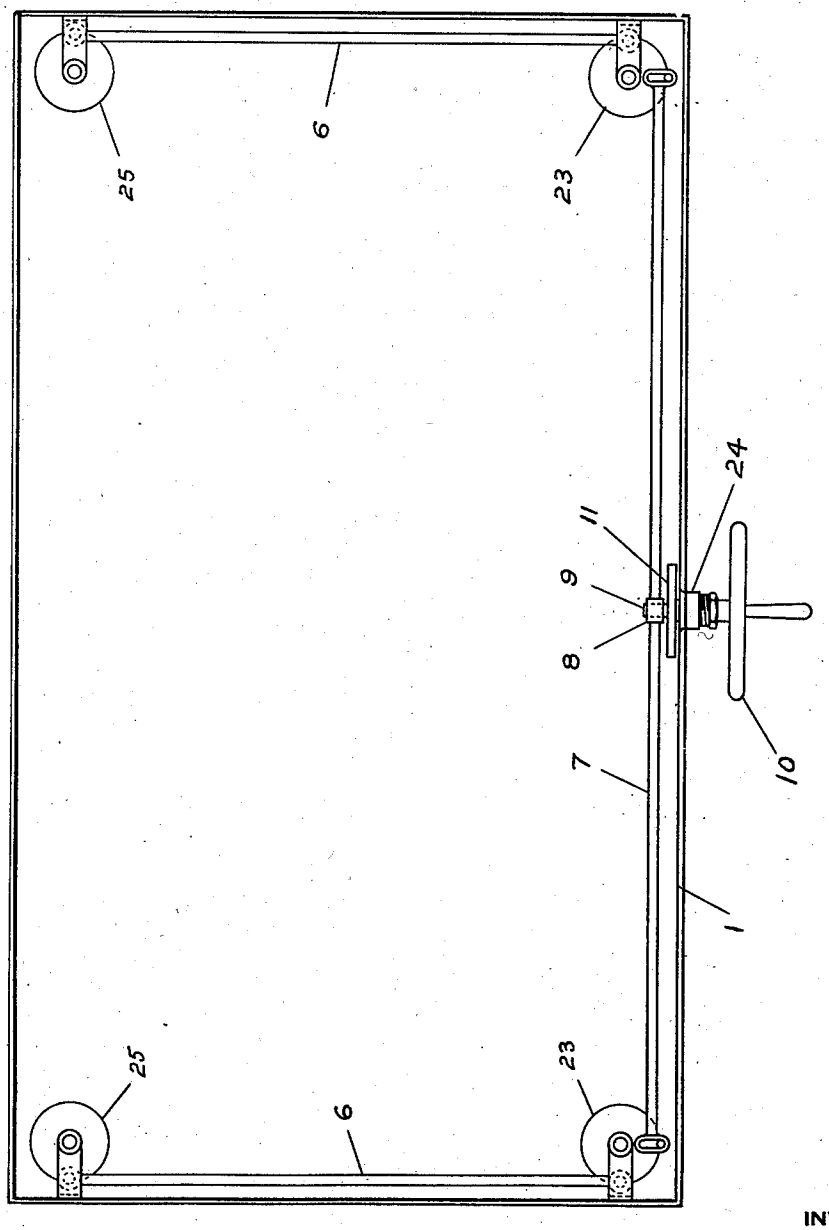


FIG. 3.

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Patented June 8, 1937 2,083,012

UNITED STATES PATENT OFFICE

2,083,012

DEGREASING APPARATUS

Robert Anderson Eastwood, Weston, near Runcorn, England, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain

Application February 15, 1935, Serial No. 6,743
In Great Britain February 15, 1934

4 Claims. (Cl. 87—6)

This invention relates to an improved apparatus for the degreasing of metal and other non-absorbent articles by means of volatile grease solvents and for the removal of finely divided insoluble matter adherent to the metal.

The use of volatile grease solvents such as trichlorethylene for the removal of grease and oil, etc. from metal goods is well known. In a large number of cases the oily film which is removed in the degreasing process contains fine particles of solid matter which are insoluble in the grease solvent and which still adhere to the metal article after the oil has been dissolved and removed by the solvent. It has been realized that the non-removal of these insoluble particles constitutes a disadvantage and it is usually proposed to agitate the metal in contact with a volume of liquid solvent to effect the mechanical removal of the particles. For the same purpose it has been proposed to pass materials continuously through a spray of solvent. In many cases it is not possible to apply either of these methods, either because of the construction of the article to be treated or because there is an insufficient volume of work to enable a continuous process to be operated.

A well-known type of apparatus for degreasing comprises a tank fitted with condensing surfaces round the walls in the upper part, to prevent escape of solvent vapor, and provided with means for vaporizing solvent, usually from a sump in the lower part of the tank, the sump being heated in any desired manner, such as a gas burner, steam coils, or an electrical heater.

According to the present invention I carry out the vapor and liquid treatment in the same apparatus and preferably at the same time by providing below the cooling coils in the upper part of such a degreasing tank, means for subjecting the materials to be treated to streams of grease solvent delivered at high velocity from a series of jets. These jets are conveniently carried by a pipe or pipes situated close to a wall of the degreasing tank, and preferably the jets are arranged to traverse an arc of about 90°. To enable this to be done the carrying pipe or pipes may be passed through the wall of the tank through a suitably packed joint and the movement actuated from outside the tank by a handle, or by the driving mechanism of the pump to be subsequently described. Alternatively, with a number of series of jets the carrying pipes are mounted completely within the tank in order to have a reduced number of feed pipes passing through the walls. Preferably at least two series of jets are provided carried by pipes on opposite walls of the tank. When more than two series of jets are used they are spaced at regular intervals round the walls of the tanks. By this means the articles being degreased may be subjected simultaneously on all sides to the action of the jets and all parts treated at the same time. The solvent may be supplied to the jets by a small pump which draws its supply of solvent from a storage tank preferably provided with cooling means and situated close to the base of the degreasing tank. In order to maintain a supply of solvent in the storage tank, a sloping floor may be placed inside the degreasing tank underneath the articles being degreased to collect the used solvent, which is then returned to the storage tank by pipes from the lowest part of the sloping floor. In this way a powerful and copious spray may be maintained with only a limited amount of solvent. The spraying is preferably performed while the vapor degreasing is proceeding, but it is most satisfactory to complete the operation with vapor degreasing alone since the liquid solvent becomes contaminated with grease after a time. This is not a serious objection provided that the amount of grease is not large, since the purpose of those jets of liquids is mainly the mechanical removal of grit and similar solid matter. The articles being treated may be suspended by suitable means inside the tank or may be carried on a perforated plate which is arranged above the sloping floor. Preferably the perforated plate also carries a straining device to retain the solid impurities washed down by the solvent. By this means it is possible to avoid blockages in the pipes. Alternatively, a strainer of known form can be incorporated in the suction pipe of the pump.

The supply of solvent in the sump in the bottom of the degreasing tank may be maintained by condensation from the coils in the upper part of the tank, but preferably I so arrange the plant that baffles or collecting gutters deliver all the solvent condensed inside the degreasing tank, together with the solvent used for spraying, through the strainer to the sloping floor feeding the storage tank, and then provide for an overflow from the storage tank to feed the sump in the base of the degreasing tank.

In treating the goods by means of the jets it will be obvious that considerable agitation of the air and vapor will take place inside the degreasing tank, with consequent risk of the escape of solvent-laden air to the atmosphere. The cover which is normally used for preventing the escape

of vapor while the plant is standing idle, may be used to prevent its escape during working. Preferably, however, I provide inside the tank a second lid which is situated between the spraying device and the cooling coils in the upper part of the tank. By placing the second lid in this position I am able to ensure that substantially all the solvent splashed on the lid during the operation of the jets will subsequently be recovered as condensate from the coils when the hot solvent vapor has heated the inner lid sufficiently to vaporize the solvent thereon. This does not occur when the normal plant lid is used.

Figures 1–4 show diagrammatically one form of apparatus according to the invention.

Figure 1 shows the apparatus partly in elevation and partly as a section on the line 1—1 of Figure 2.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a plan showing a method of traversing the jet pipes.

The tank 1 in which the articles are to be degreased, is divided from the sump 16 in which solvent, e. g. trichlorethylene, is vaporized by a sloping floor 18, and the jet pipes 4, 4, 5, 5, by means of which the articles are to be sprayed, are situated one in each angle of the tank between the sloping floor 18, and the cooling coils 2. A distillate trough 3 collects the condensed solvent falling from the coils 2, and the trough is provided with a cock (not shown) to draw off the distilled solvent if required; normally, the solvent in the trough is allowed to overflow into the tank 1.

The solvent in the sump 16 is vaporized by steam heating coils 17 or equivalent means, and the vapor of the solvent rises into the degreasing zone through two series of ports 33, 33, in the sloping floor 18, disposed near the walls of the tank 1 along the line of greatest slope of the floor 18. Baffles 26, 26 prevent, grit-laden solvent from falling through the ports 33 by diverting the liquid on to a plate 27 perforated to allow the liquid to fall through a strainer 28 on to the floor 18, whence it is delivered by pipe 15 to the storage tank 22. Partitions 32 prevent the liquid solvent from flowing into the sump via the ports 33, and thereby impeding the egress of solvent vapor. Similarly, plate 27 may be provided with a rim.

The solvent is supplied to the jets by a pump 19 which pumps the solvent from tank 22 through pipes 20 and 14 to pipes 13, connecting each pair of jet pipes 4, 5. The junctions 12 between pipes 13 and jet pipes 4, 5, are constructed so as to allow rotation of the jet pipes without interfering with the supply of liquid solvent.

The sump 16 is supplied with liquid from tank 22 by an overflow pipe 21, which is J-shaped, so that liquid solvent in the bend prevents access of vapor to the container 22. If desired, extra means may be provided whereby liquid is delivered to the sump by pump 19 when the supply from the overflow pipe 21 is insufficient. An air vent 36 allows vapor-laden air displaced from the container by in-flowing liquid to be transferred to the tank 21 below coils 2, so that no escape of vapor into the atmosphere can occur.

Means for rotating the jet pipes about their axes through approximately 90° consist of a rod 7, connecting the end plates 23, 23, of jets 5, 5; this connecting rod is provided with a link 8 which engages with a pin 9 on a disc 11 rotated by a handle 10 outside of the tank; the common axle of the handle and the disc passes through a solvent-tight gland 24 in the wall of the tank. The motion of the jet pipes 5, 5, is communicated to jet pipes 4, 4, by rods 6 connecting the end plates 23, 25 of the corresponding jet pipes 4, 5. These pipes are held in position by suitable brackets (not shown) fixed to the wall of the tank 1.

A flexible shutter 35 of steel or other suitable material impervious to the solvent, is provided which in its normal position hangs between the wall of the tank 1 and the jet pipes 4. Loss of solvent during the spraying operation can be prevented by drawing this shutter over rollers 37, along guides 30 into the position shown in the figure by wire ropes which are wound round drums 34 on an axle 38 rotated by the handle 31. The edge of the shutter remote from the axle 38 is weighted to facilitate the return of the shutter to its vertical position as the handle 10 is unwound.

Although the above is the preferred form of my invention, many alterations are possible without departing from the spirit of the invention, the scope thereof being fixed solely by the appended claims. Thus, instead of rotating the pipes, the wide arc over which solvent is sprayed may be produced by having several series of holes in the same pipe; or the tank may be provided with an inner perforated wall, and the solvent may be pumped into the space between the two walls.

In another form of the invention the solvent is forced through spraying devices on a pipe which is rotated by the reaction of the issuing liquid. Also, provision may be made for heating the solvent which is forced through the jets.

I claim:

1. Apparatus for degreasing metals and other non-absorbent articles by means of volatile grease solvents which comprises an open top vessel adapted to receive the materials to be degreased, means for supplying solvent vapor to said vessel to establish a vapor degreasing zone therein, condensing surfaces disposed near the top of said zone adapted to condense solvent vapors and to limit thereby the upward extent of said zone, and spraying means for projecting a spray of liquid solvent on the articles to be degreased, said spraying means comprising a plurality of substantially vertical jet pipes rotatable on their longitudinal axis and peripherally disposed within said vessel.

2. Apparatus for degreasing metals and other non-absorbent articles by means of volatile grease solvents which comprises an open-top vessel adapted to receive the materials to be degreased, means for supplying solvent vapor to said vessel to establish a vapor degreasing zone therein, condensing surfaces disposed near the top of said zone adapted to condense solvent vapors and to limit thereby the upward extent of said zone, spraying means for projecting a spray of liquid solvent on the articles to be degreased, said spraying means comprising a plurality of substantially vertical jet pipes rotatable on their longitudinal axes and peripherally disposed within said vessel, and actuating means operable from the exterior of the apparatus for simultaneously rotating said jet pipes.

3. Apparatus for degreasing metals and other non-absorbent articles by means of volatile grease solvents which comprises an open-top vessel adapted to receive the materials to be degreased, means for supplying solvent vapor to said vessel to establish a vapor degreasing zone therein, condensing surfaces located near the top

of said zone adapted to condense solvent vapors and to limit thereby the upward extent of said zone, spraying means for projecting a spray of liquid solvent on the articles to be degreased, and a movable shutter situated between said spraying means and said condensing surfaces, said shutter being adapted to be closed during the degreasing operation.

4. Apparatus for degreasing metal and other non-absorbent articles by means of volatile grease solvents which comprises an open-top vessel adapted to receive the materials to be degreased, means for supplying solvent vapor to said vessel to establish a vapor degreasing zone therein, condensing surfaces disposed near the top of said zone adapted to condense solvent vapors and to limit thereby the upward extent of said zone, spraying means for projecting a spray of liquid solvent on the articles to be degreased, said spraying means comprising a plurality of substantially vertical jet pipes rotatable on their longitudinal axes and peripherally disposed within said vessel, actuating means operable from the exterior of the apparatus for simultaneously rotating said jet pipes, and a movable shutter situated between said spraying means and said condensing surfaces, said shutter being adapted to be closed during the degreasing operation.

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