Jan. 2, 1934. C. F. DINLEY 1,942,355

APPARATUS FOR TREATMENT WITH SOLVENTS

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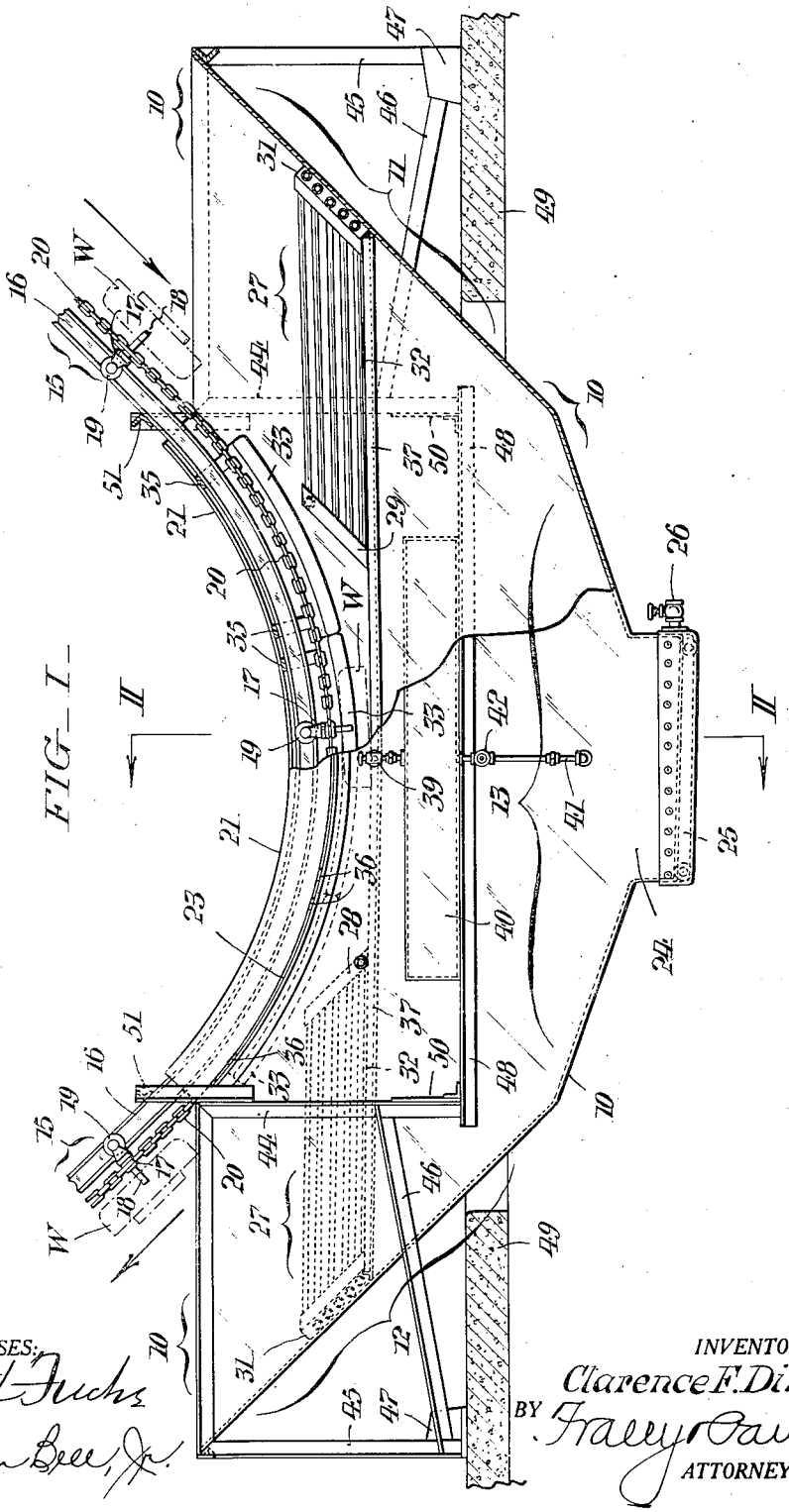


FIG. I.

WITNESSES:
Herbert Fuchs
William Bell, Jr.

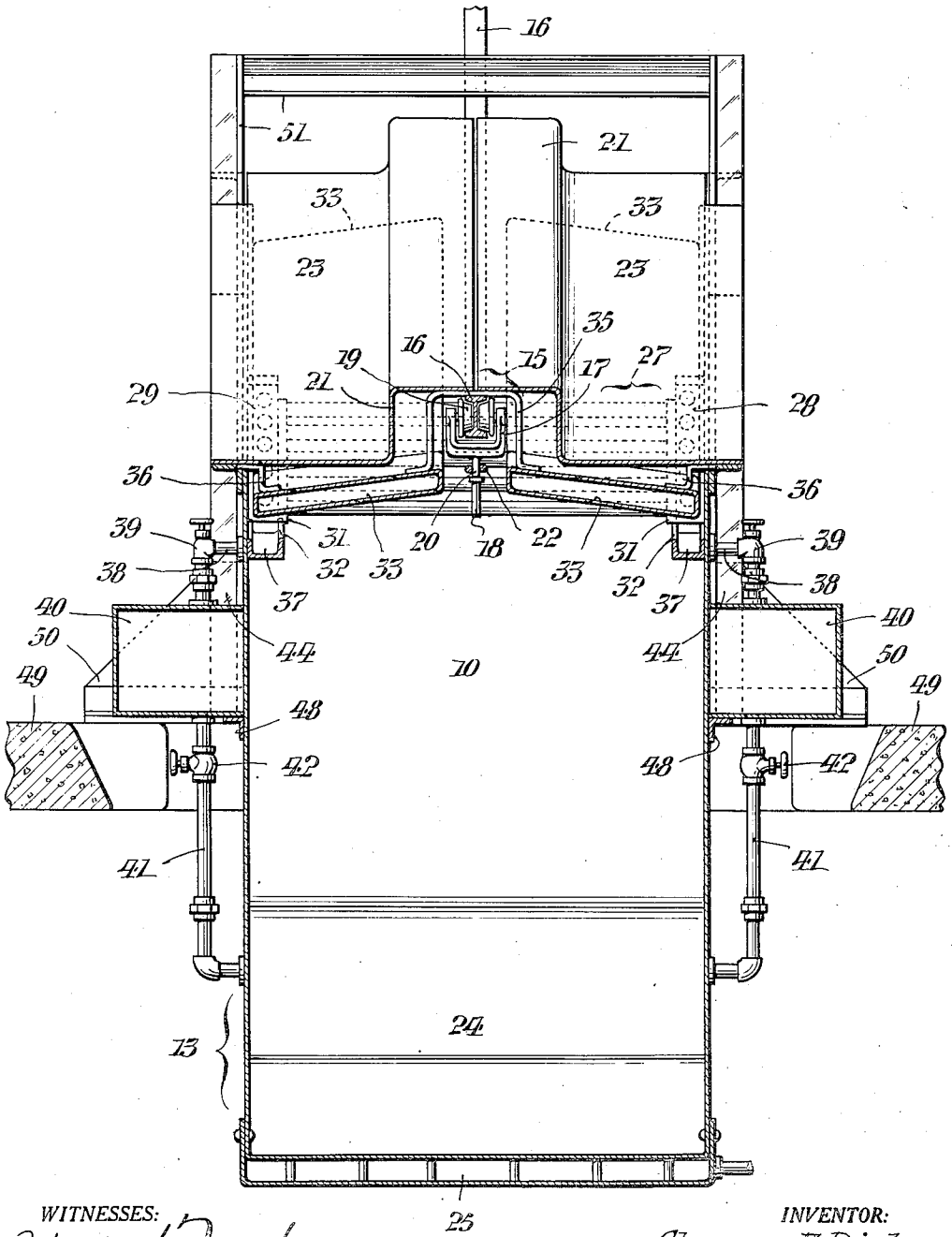
INVENTOR:
Clarence F. Dinley,
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FIG. II.



WITNESSES:
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UNITED STATES PATENT OFFICE

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APPARATUS FOR TREATMENT WITH SOLVENTS

Clarence F. Dinley, Detroit, Mich., assignor to Rex Products & Manufacturing Company, Detroit, Mich., a corporation of Michigan

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11 Claims. (Cl. 87—6)

This invention relates to treatment with solvents for such purposes as cleaning and degreasing, and especially to treatment with volatile solvents in the vapor state, including solvents whose vapors are heavier than air, such as benzine, benzol, and chlorinated solvents like carbon tetra-chloride and trichlorethylene, whose vapors are uninflammable. Many things which are only a little greasy and dirty can be very satisfactorily and quickly cleaned with vapor at the lowest cost, without the greater time consumption and expense involved in spraying with hot solvent, or immersion therein. The invention aims to provide a simple apparatus of large capacity, to prevent or minimize loss of solvent, and to prevent the solvent from interfering with proper lubrication of the mechanism employed. How these and other advantages can be realized through the invention will appear from my description hereinafter of one preferred form of embodiment, which is well adapted for cleaning automobile fenders or mud-guards, hoods, metal running-boards, and a great variety of other parts and articles.

In the drawings, Fig. I is a side view of the apparatus, partly in elevation and partly in longitudinal section.

Fig. II shows a transverse section through the apparatus, taken as indicated by the line and arrows II—II in Fig. I.

As here shown, the apparatus comprises an enclosure or casing 10 open upward for the entry and removal of the things or work to be treated, but closed to exclude air and retain the solvent vapor. The enclosure 10 forms a tunnel-like chamber with upward sloping entrance and exit ends 11 and 12, and an approximately horizontal mid-portion 13. Along the upper portion of the casing 10 is an (overhead) conveyor 15 for the articles or work W, which conveyor 15 is here shown as comprising a monorail track 16 (of I-beam section) with one or more trolleys 17 provided with lugs, hooks, or other supporting means 18 for the suspension of the work W. The trolley 17 has rollers 19 that run on the lower I-beam flanges (Figs. I and II). Means may be provided for moving the trolleys 17 along the track 16 at suitable intervals, such as a conveyor chain 20 below the trolleys, whose lower bracket portions or lugs 18 may be bolted or otherwise secured between the side links 22 of the conveyor chain 20. The conveyor 15 may in practice form part of the general conveyor system of a plant or plant-department where the apparatus is used. The casing top or roof 23 and the track 16 are shown curved downward in the arc of a circle, and the roof or cover 23 has a monitor portion 21 to accommodate the track 16. The bottom of the mid-portion 13 of the casing 10 affords a receptacle or sump 24 for liquid solvent, and has means for heating and vaporizing the solvent, such as a steam jacket 25 on its bottom wall. The sump 24 also has a drainage outlet controlled by a valve 26. The sloping lower walls of the ends 11, 12 drain liquid solvent into the sump 24. The solvent vapor evolved from the heated liquid at 24 fills the interior of the apparatus; and as the cooler work W passes through, the solvent condenses on the work as pure hot liquid, and dissolves the grease and dirt, finally dripping off and running back into the sump 24.

Accumulation of vapor in the apparatus to the point of overflow from the open tunnel ends 11, 12 is prevented by condensing the vapor. For this purpose, a condenser 27 is associated with each tunnel end 11, 12, consisting of cold water pipes connected in parallel between an inlet header 28 and an outlet header 29. As shown, these headers 28, 29 are against opposite side walls of the casing 10, and there are also intermediate headers 31 in the sloping outer corners of the casing, so that each condenser 27 is of a general U-form in plan. The condensers 27, 27 may rest on ledges 32 formed by channels secured against the casing sides.

In addition to these condensers 27, 27, there may be other condensing means 33 in the upper portion of the casing 10, interposed between the conveyor system 15 and the work W suspended therefrom. As shown in Figs. I and II, the condensing means 33 is divided lengthwise of the apparatus, comprising two series of thin, flat arcuate cold-water jacket sections, at opposite sides of (and below) the conveyor 15. The corresponding sections 33 may be interconnected in pairs by inverted U-brackets 35 over the track 16, and may be supported by these brackets 35 and by Z-brackets 36 whose upper and outer ends rest in seats in the upper edges of the casing sides. The casing roof 23 may be divided longitudinally (along the center of the monitor and of the track 16) into separate readily removable halves. When the roof-halves 23 have both been removed, the inner water-jacket unit sections (each consisting of corresponding sections 33 with their interconnecting U-brackets 35) can readily be lifted out, to afford free access to the whole interior of the apparatus.

As best shown in Fig. II, the condenser sections 33 slope outward toward the casing sides,

and there are collecting troughs 37 mounted on the sides under the outer edges of the sections, to catch the dripping condensate. These condensate troughs 37 may be curved lengthwise of the apparatus as shown in Fig. I, in conformity with the curvature of sections 33 and track 16. The condensers 33 practically prevent access of solvent vapor to the conveyor system 15, thus protecting it from being degreased of its lubricant. This not only obviates trouble with the conveyor from lack of lubrication, but also prevents rapid filling up of the sump 24 with the lubricant.

As shown in Figs. I and II, there are drain pipes 38 from the low points of the condensate troughs 37, controlled by valves 39. These pipes 38 deliver into (external) liquid storage tanks 40 at either side of the apparatus. From these tanks 40, the solvent may be returned to the lower portion of the apparatus (into the sump 24) through pipes 41 controlled by valves 42.

In practice, the casing 10 may be of sheet metal construction, with framing of angles 44 fastened to its side walls, to stiffen them and transmit the weight of the apparatus to angle bar column-uprights or end frames 45, and with angle members 46 at the sides to brace the end frames 45 relative to the casing. Gusset plates 47 coact with the end frames 45 and braces 46 to stiffen the framing. Other angles 48 fastened to the casing sides stiffen them in the region of the tanks 40, and help to secure and support the tanks. In the present instance, the apparatus is shown mounted in an opening in a (concrete) floor 49, with its lower portion hanging down through the floor. The weight of the apparatus is transmitted to the floor 49 by the end frames 45 resting thereon, and also by gusset brackets 50 at the lower ends of the upright angles 44 secured against the casing sides. The track 16 is shown as supported by yoke frames 51 consisting of upright angles secured to the casing sides and to the upright angles 44, and horizontal angles connected between the upper ends of the uprights. These track supports 51, it will be seen, are beyond the ends of the cover 23 and of the condensing means 33, so as not to obstruct their removal.

A mode of operation of the apparatus is as follows:

The sump 24 is charged with liquid solvent, and its jacket 25 is supplied with steam, while cold water is circulated through the various condensing units or sections at 27 and 33. The valves 26, 39, 42 are closed. The vapor will fill the interior of the apparatus to a level about the mid-height of the condensers 27. When this condition is established, work may be passed through by means of the conveyor system 15, and cleaned by solvent condensing on it as already described. The solvent condensed by the condensers 27 runs down the sides and the sloping ends of the casing 10, washing down into the sump 24 the dirty drippings from the work. Condensate from the troughs 37 also overflows into the sump 24,—the valves 39 being closed. Access of solvent vapor to the conveyor system 15 is prevented or excluded by the condensers 33 and the conveyor lubrication thus protected, as already explained.

When dirt and grease have accumulated in the sump 24, as much as deemed desirable, the passage of work through the apparatus is stopped, and the valves 39 are opened,—the valves 42 still remaining closed. The supplies of steam and of condensing water being continued, condensate from the troughs 37 drains into the storage tanks 40, until all the solvent in the apparatus has been purified and thus accumulated in these tanks. Then the steam (and cooling water) supply may be shut off, and the drain valve 26 opened to draw off accumulations of oil, grease, and dirt from the sump 24; and if necessary, the cover 23 and condensers 33 may be removed to permit free access and thorough cleaning out of the sump. Thereafter the valve 26 is closed, and the valve 42 is opened to return the purified solvent to the sump 24; whereupon both of the valves 39, 42 are closed, and the apparatus is ready to be restarted in operation as already described.

Having thus described my invention, I claim:

1. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor therein for carrying the work therethrough, and condensing means in the chamber, between the conveyor and work carried thereby, for protecting said conveyor from degreasing by the solvent.

2. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor therein for carrying the work therethrough, and condensing means in the chamber, between the conveyor and work carried thereby, for excluding solvent vapor from said conveyor.

3. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, and condensing means interposed between said conveyor and the work carried thereby for protecting the conveyor from degreasing by the solvent.

4. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, and condensing means along the upper portion of the chamber, between said conveyor and the work suspended therefrom, whereby degreasing of the conveyor by the solvent vapor is prevented.

5. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with a mid-portion and a monitor roof, an overhead conveyor in the monitor for carrying work through the apparatus, and condensing means along the roof below said monitor, for preventing access of solvent vapor to the conveyor in the monitor.

6. Treating apparatus of the character de-

scribed, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, and condensing means below and to either side of said conveyor, between the conveyor and work carried thereby, for preventing access of solvent vapor to the conveyor above said condensing means.

7. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, condensing means along the upper portion of the chamber, between said conveyor and the work suspended therefrom, whereby degreasing of the conveyor by the solvent vapor is prevented, and condensing means associated with upward open ends of the chamber for preventing overflow of vapor from them.

8. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, and condensing means below and to either side of said conveyor, between the conveyor and work carried thereby, arranged to drain toward the chamber sides, and means at the sides for collecting the condensate.

9. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, means for vaporizing liquid solvent in the chamber, condensing means along the upper portion of the chamber, between said conveyor and the work suspended therefrom, means for collecting and storing the condensate, and means for returning the stored condensate to said vaporizing means.

10. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor for carrying the work therethrough, condensing means below and to either side of said conveyor, between the conveyor and work carried thereby, arranged to drain toward the chamber sides, means at the chamber sides for collecting and storing the condensate, and means in the lower portion of the chamber for receiving and vaporizing the liquid solvent.

11. Treating apparatus of the character described, for treating things therein with solvent vapor heavier than air, said apparatus being adapted to exclude air and retain the treating medium, but open for the introduction and removal of things to be treated, and comprising a chamber with an overhead conveyor track for carrying the work therethrough, condensing means below said track comprising separate sections at opposite sides of said track interconnected thereabove, and means for supporting the track beyond the end of said condensing means so as not to interfere with removal of the latter.

CLARENCE F. DINLEY.