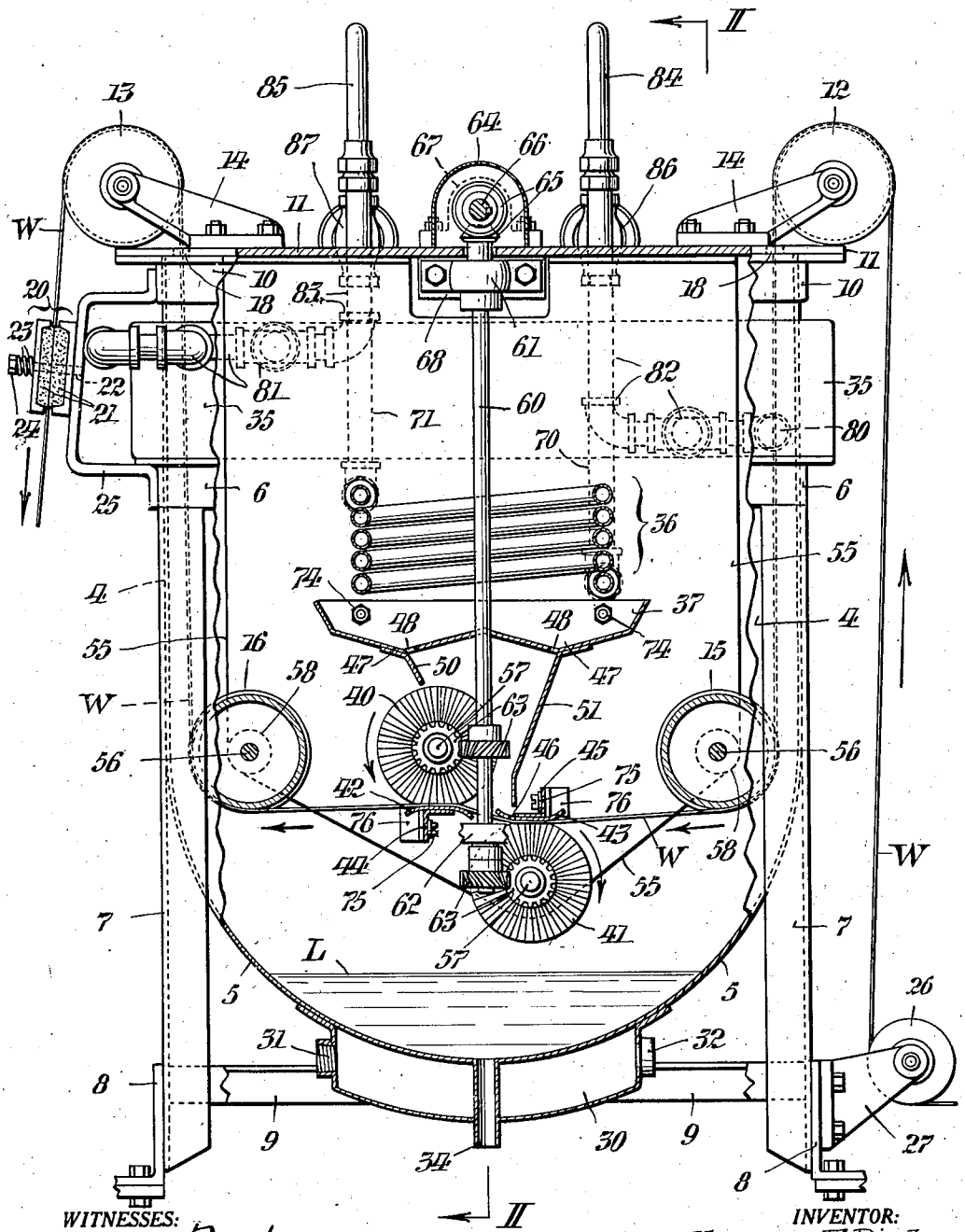
Oct. 22, 1935. C. F. DINLEY 2,018,648

APPARATUS FOR CLEANING WITH SOLVENTS

Filed Oct. 1, 1932 2 Sheets-Sheet 1

FIG. I



WITNESSES:

Hubert Fuchs

William Bee, Jr.

INVENTOR:

Clarence F. Dinley,

BY Fraley & Paul

ATTORNEYS.

Oct. 22, 1935. C. F. DINLEY 2,018,648

APPARATUS FOR CLEANING WITH SOLVENTS

Filed Oct. 1, 1932 2 Sheets-Sheet 2

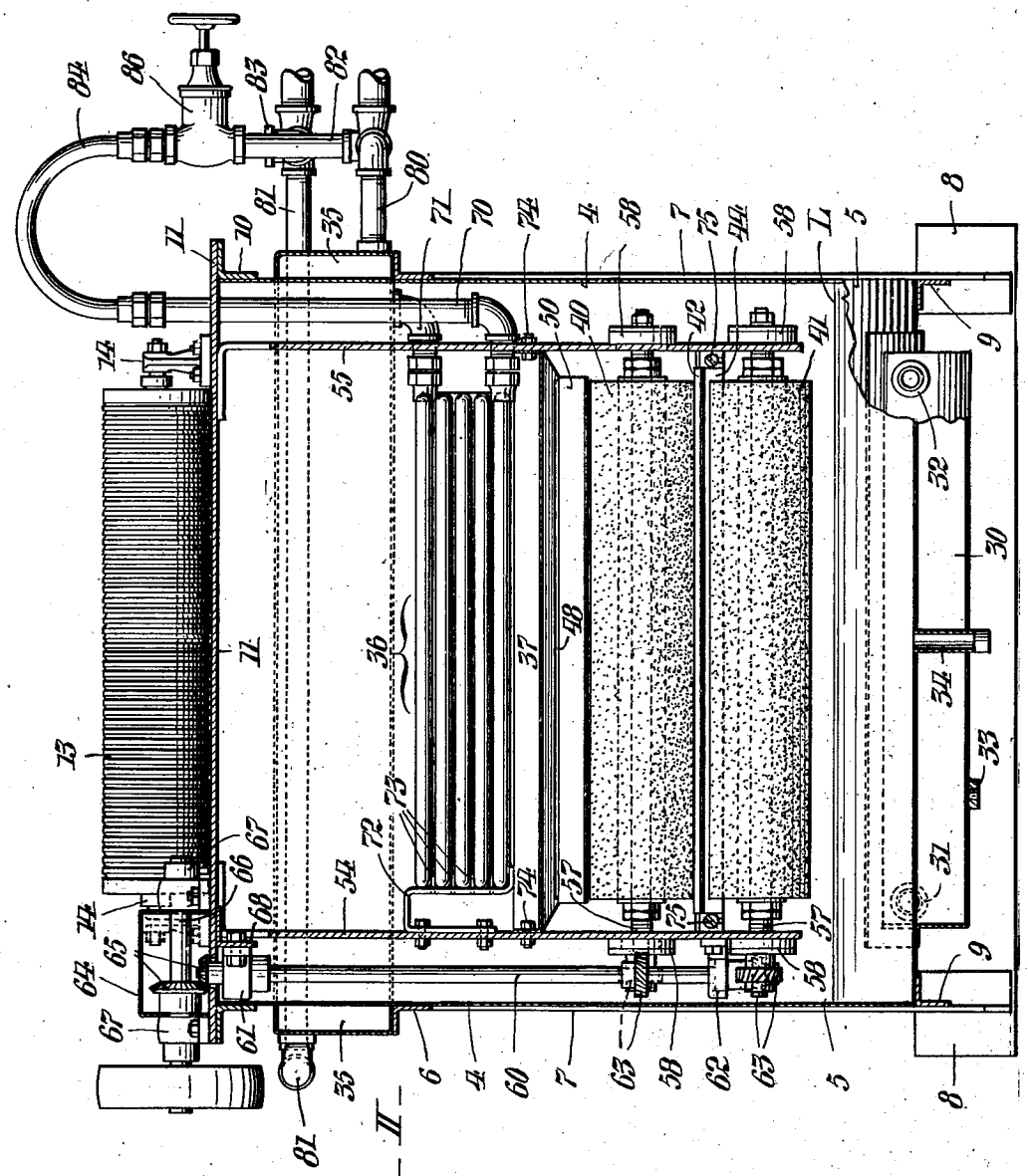


FIG. II

WITNESSES:
Herbert Fuchs
William Bee, Jr.

INVENTOR:
Clarence F. Dinley,
BY Fraley & Paul
ATTORNEYS.

Patented Oct. 22, 1935 2,018,648

UNITED STATES PATENT OFFICE

2,018,648

APPARATUS FOR CLEANING WITH SOLVENTS

Clarence F. Dinley, Detroit, Mich., assignor to James H. Bell, Philadelphia, Pa.

Application October 1, 1932, Serial No. 635,791

3 Claims. (Cl. 87—6)

My invention relates to treatment with solvents for such purposes as cleaning and degreasing, etc., and particularly to the use of volatile solvents. An apparatus for this purpose is set forth in U. S. Patent No. 1,771,698, granted July 29, 1930, to George Wolff as inventor, wherein the use of volatile solvents whose vapors are heavier than air is described, such as benzine, benzol, and particularly chlorinated solvents like carbon tetrachloride and trichlorethylene, whose vapors are entirely uninflammable. I aim to improve and facilitate such treatment with solvents, making it more convenient and effective, and better adapting it to industrial use. Another object of my invention is to provide advantageously for the cleaning of wire, preferably with solvents such as indicated above. When my apparatus is used for wire, a number of separate lengths or "ends" of wire can be drawn directly and continuously through it without any provisions for conveyance except guiding means such as grooved rolls, while for cleaning other articles or material, a conveyor system (as of sprocket chains and work carriers or containers) may be used.

I have hereinafter explained the invention with particular reference to an apparatus or form of embodiment specially adapted for treating wire, and particularly for cleaning copper or steel wire in preparation for enameling. In such work, trouble in the enameling bath is frequently encountered because cleaning methods used have not been thorough enough to remove from the wire all the oil remaining on it from the drawing operation, and the enameled product has not been uniform, either in diameter or in dielectric strength of the enamel coating. By my invention, however, the wire can be thoroughly cleaned very easily and inexpensively; troubles in enameling are avoided; and the final product is very uniform.

In the drawings, Fig. I is a side view of the apparatus, partly in elevation and partly in vertical section, with the front tank wall broken away and one of the internal frame plates removed, but with the brush-driving connections intact; and,

Fig. II is a side view at right angles to Fig. I, with most of the parts broken away or in section, as indicated by the line II—II in Fig. I.

As here shown, the apparatus comprises a treating vessel in the form of a rectangular tank 4 with semi-cylindrical bottom 5. This tank 4 is supported by framework comprising a horizontal rectangular angle frame 6 extending around it, angle uprights or legs 7 at its corners, with their upper ends engaged under the angle 6, and a rectangular base frame of horizontal angles 8 and 9. The upper edge of the tank 4 has an external angle rim 10 on which a cover plate 11 may be mounted and secured, partially closing its top and minimizing access of air to the interior of the tank, as well as opportunity for escape of solvent vapor therefrom. The work to be treated, such as the wire W, may be passed through the tank 4 in a course (of general U-shape) defined and guided by external devices or (grooved) rolls 12, 13 above, rotatably mounted in bearing brackets 14 on the cover 11, and by internal devices or (grooved) rolls 15, 16 within, mounted in bearing supports or frames preferably depending from the cover. The work or wire W enters and leaves the tank 4 through suitable openings or slots 18 in its cover 11. From the exit guide 13, the wire W is shown passing downward (on its way to the enameling equipment, not shown) through supplemental cleaning means 20 adapted to have a scraping or wiping action: e. g., between hard wool-felt pads 21, 21 held in channeled pressure plates mounted on guide studs 22 and pressed together by helical compression springs 23, acting against abutment nuts 24 on said studs. The studs 22 and the whole device 20 are supported by U-brackets 25 mounted on the side of the tank 4, and secured to its rim 10 and frame 6.

There is also shown an external guide device or roll 26 rotatably mounted in bearing brackets 27 on a base member 8, receiving a horizontal run of the wire W (as from the drawing equipment, not shown), and directing it upward to the entrance guide 12. During its passage through the tank 4, and especially during its run across the interior between the guides 15 and 16, the work W is treated and cleaned with the solvent, as hereinafter described. No special provisions for drawing the wire through the apparatus are shown, since this may be done by nip rolls or the like in the enameling plant.

Solvent or cleaning fluid in the tank 4 may be heated (and vaporized) by any suitable heating means, such as a steam jacket 30 on its bottom 5, with steam inlet and outlet connections 31, 32, and condensation drip connection 33. The tank 4 also has a drainage outlet connection 34 extending down through the jacket 30. Around the upper portion of the tank 4 is a cold-water-jacket condenser 35, mounted on the supporting frame 6. The vapor evolved from the heated liquid in the tank bottom 5 fills the interior of the apparatus up to the lower portion of the jacket 35,

which condenses it and prevents it from accumulating to the point of overflow and escape at the cover openings 18. There is also a condenser 36, consisting of an elongated helical coiled cold water pipe coil, arranged in the midst of the tank, preferably below the condenser 35 but above the horizontal run of the work W across the tank, which likewise serves to prevent vapor from accumulating to the point of overflow. In addition, the pure condensate from this condenser 36 is delivered or supplied for treating the work W. By means of a horizontal drip pan or tray 37 interposed between the condenser 36 and the horizontal run of the work W, the condensate may be caught and collected, and directed to the work W as desired.

In the present instance, the condensate is applied to the wire W not merely by allowing it to flow over the wire, or immerse the latter, but by also rubbing or brushing it in contact with the wire. For this purpose, there are revolving wire brushes 40, 41 above and below the horizontal run of the wire W, and corresponding guide and supporting plates or bars 42, 43 below and above the wire opposite the brushes. The edges of these guide plates 42, 43 are reduced or rounded away from the wire W, as by bending back their margins, and the guides are mounted on angle bar supports 44, 45. The active faces of the guides 42, 43 are so located vertically, relative to one another and to the guides 15, 16, that each of them deflects the wire W somewhat from its path as otherwise determined. The upper guide 43 has longitudinal slot openings 46 to allow solvent to pass therethrough to the wire W and the subjacent brush 41. As shown, the drip pan 37 has in its bottom double trough depressions 47, 47 parallel to the guides 42, 43, with longitudinal slot openings 48, 48 through which the condensate drips and runs down inclined shed plates 50, 51 (welded to the pan 37) to the upper brush 40 and the opening 46 in the upper guide 43.

As shown more especially in Fig. II, the parts inside the tank 4 are preferably supported from the cover 11, and freely removable with it, all as one unitary structure. For supporting the parts, side frames 54, 55 are provided, consisting of metal plates having the outlines shown in Fig. I, and having at their upper edges inturned flanges secured against the cover plate 11. Accordingly, the shafts or trunnions 56, 57 for the guide rolls 15, 16 and for the brushes 40, 41 are mounted in (anti-friction ball) bearings 58 in the side-frames 54, 55. For driving the brushes 40, 41, there is shown an upright shaft 60, mounted in (anti-friction ball) bearings 61, 62 outside the frame 54, connected to the brush shafts 57 by helical gearing 63, and extending up through the cover 11 into a gear box 64 on the cover, where it is connected by bevel gearing 65 to a drive shaft 66 mounted in (anti-friction ball) bearing brackets 67, 67 on the cover. The shaft 66 may be driven by any suitable means or source of power (not shown). The shaft 60 is located between the brush shafts 57, 57 to drive the brushes 40, 41 above and below the wire W in opposite directions, so that they both brush the wire contrary to its direction of movement as indicated by the arrows in Fig. I. The upper (thrust) bearing 61 for the shaft 60 is mounted on an angle bracket 68 fastened to the cover, while the lower bearing 62 is mounted directly on the side frame 54.

The horizontally elongated condenser coil 36 is mounted and supported between the side frames 54, 55 by water supply and discharge pipe connections 70, 71 extending down through the cover 11 and inward through the frame 55, and by a bracket 72 secured (bolted) to the plate 54, and provided with spacing lugs 73 to engage between the coil convolutions. The drip pan 37 may have its end walls or flanges bolted directly to the side frames 54, 55, as at 74. The guide-plate supporting angles 44, 45 have their ends secured to the side frames 54, 55 by clamping bolts 75 extending through elongated slots in the vertical flanges of the angles and through inward projecting lugs or brackets 76 on the frames: this allows for vertical adjustment of the brushing guide plates 42, 43 to compensate for wear on the brushes.

As best shown in Fig. II, water supply and discharge pipes 80, 81 are rigidly connected to opposite sides (and corners) of the tank condensing-jacket-ring 35, the former at its bottom and the latter at its top. Branches 82, 83 of these pipes 80, 81 extend upward to serve the inner condenser 36, and are connected to its inlet and outlet pipes 70, 71 by flexible tube connections 84, 85, readily detachable to facilitate removal of the cover 11 and the associated parts when desired. Control valves 86, 87 in the connections 82, 83 permit this to be done without shutting off the supply and discharge of the outer condensing jacket 35; so that if steam is left on the solvent-heater jacket 30 when the cover 11 is removed, the solvent vapor will still be prevented from overflowing out of the tank 4 while the cover is off.

A mode of operation of the apparatus is as follows:

The cover 11 and associated parts having been removed, the wires W are rove through, around the rolls and between the brushes 40, 41 and their guides 42, 43; and solvent to about the depth indicated by the line L is placed in the tank 4. The cover 11 having then been replaced, steam is supplied to the jacket 30 and water to the condensers 35, 36. The solvent vapor fills the apparatus above the condenser 36, and the pure condensate drips into the pan 37 and runs down on the brushes 40, 41, guides 42, 43, and wire W. The brushes 40, 41 have been started, and the wire W being drawn through the apparatus by any suitable means (not shown), the wire W is brushed with the pure solvent and thus thoroughly cleaned of grease and dirt; and any dirt or solid particles that may remain on it as it emerges from the apparatus are scraped or wiped off at 20. Thus the wire enters the enameling operation thoroughly clean; and an even, adherent enamel coating of uniform quality is secured without difficulty.

When an objectionable amount of dirt had accumulated in the tank 4, its contents would be drawn off at 34, and the solvent purified (as by distillation) before reuse.

The apparatus can also be used with an aqueous solvent solution instead of a chlorinated or other such solvent. In this case, the condenser 36 and pan 37 and associated parts would be superfluous, and could be omitted or disused, as well as the condenser 35. The aqueous cleaning solution would be used in greater quantity, so as to stand above the lower brush 41. Revolving felt rollers would preferably be substituted for the simple felt pads at 20, and a clean water rinse tank might be interposed between them and the exit guide 13.

Having thus described my invention, I claim:—

1. Apparatus of the character described, for treating wire with volatile solvent whose vapor

is heavier than air, closed to exclude air and retain the vapor, but open for the continual passage of the wire into and out of the same, and comprising a vessel for the solvent, means for guiding the wire therethrough as aforesaid, with an intermediate pass or run across the interior of the vessel, means for condensing the solvent vapor in the vessel and delivering the condensate upon said intermediate run of the wire, revolving brushes above and below said intermediate run for brushing it with the solvent, and a common upright drive shaft for said brushes extending down from the vessel top between the brush shafts and directly geared to both of them, so as to drive them oppositely.

2. Apparatus of the character described, for treating wire with volatile solvent whose vapor is heavier than air, closed to exclude air and retain the vapor, but open for the continual passage of the wire into and out of the same, and comprising a vessel for the solvent, means for guiding the wire therethrough as aforesaid, with an intermediate pass or run across the interior of the vessel, deflectors above and below said intermediate run of the wire, each so located as to deflect the wire from its path as otherwise determined, means for condensing the solvent vapor in the vessel and delivering the condensate upon the wire at each of said deflectors, and a revolving brush opposite each deflector for brushing the wire against the same in contact with the solvent.

3. Apparatus of the character described, for treating wire with volatile solvent whose vapor is heavier than air, comprising an open vessel for the solvent; a removable cover for said vessel; external guide means on said cover for guiding the wire downward and upward into and out of the vessel; side frames extending down from said cover within the vessel; guide means for the wire mounted between said side frames, and affording the wire a run across the interior of the vessel; means between said side frames for condensing the solvent vapor and delivering the condensate for treating the wire; revolving brushes for brushing said run of the wire with the solvent mounted between said side frames; and an upright drive shaft for said brushes mounted on the outer side of one of said side frames and extending up through the cover.

CLARENCE F. DINLEY.