Aug. 17, 1937. G. EDHOFER 2,090,191

MACHINE FOR CLEANING AND DEGREASING METAL ARTICLES

Filed July 15, 1933 4 Sheets-Sheet 1

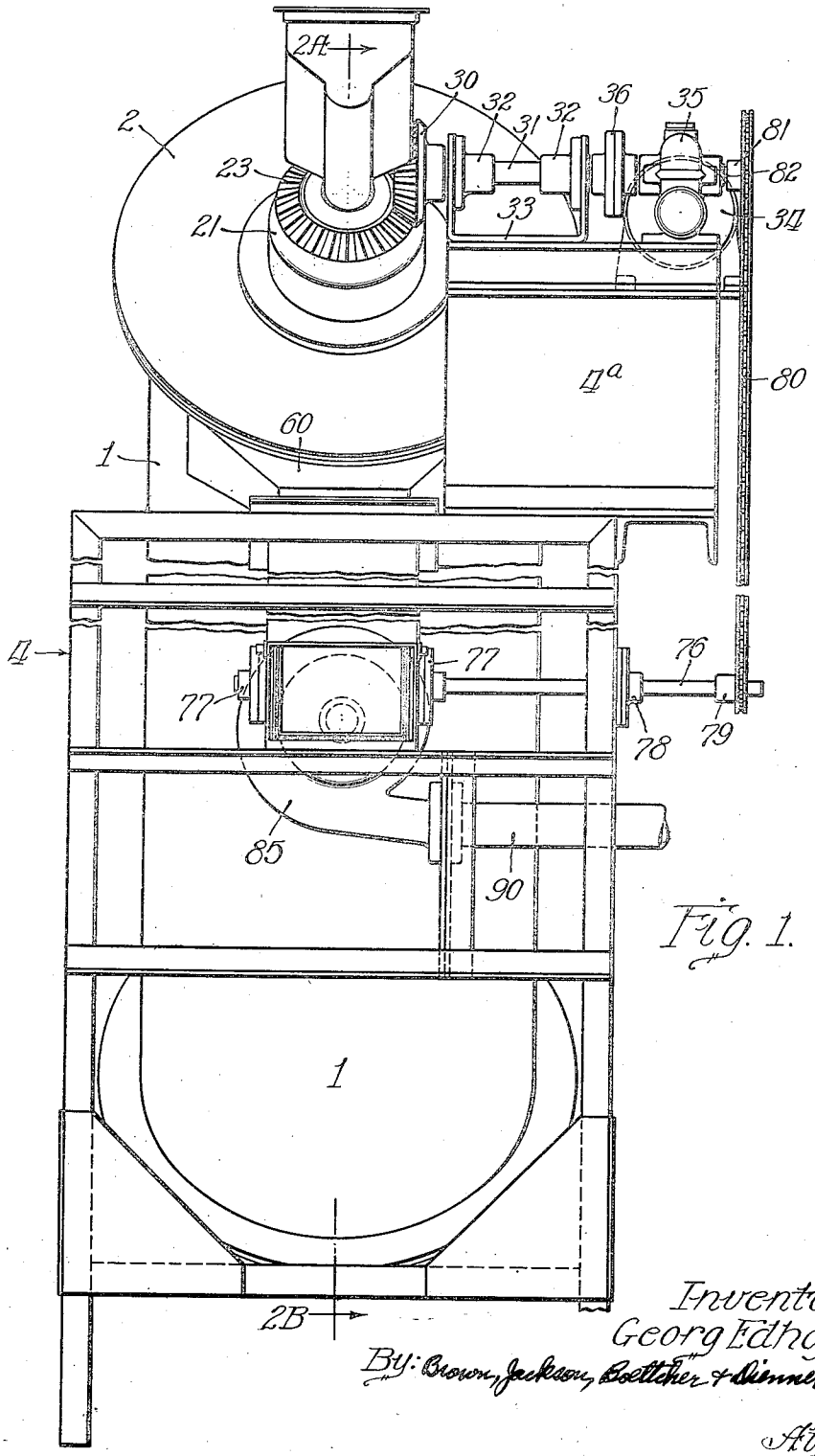


Fig. 1.

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Fig. 2A.

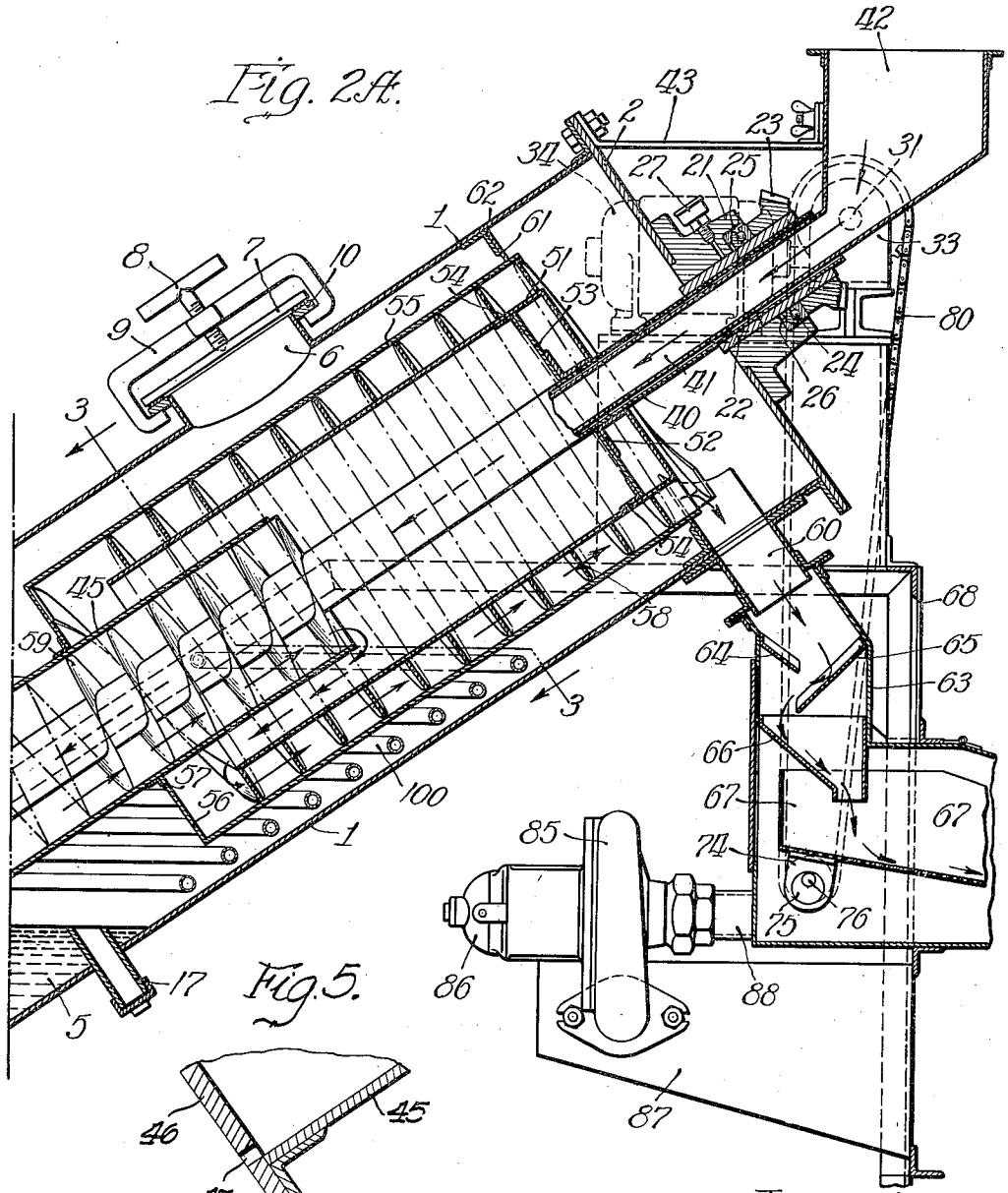


Fig. 5.

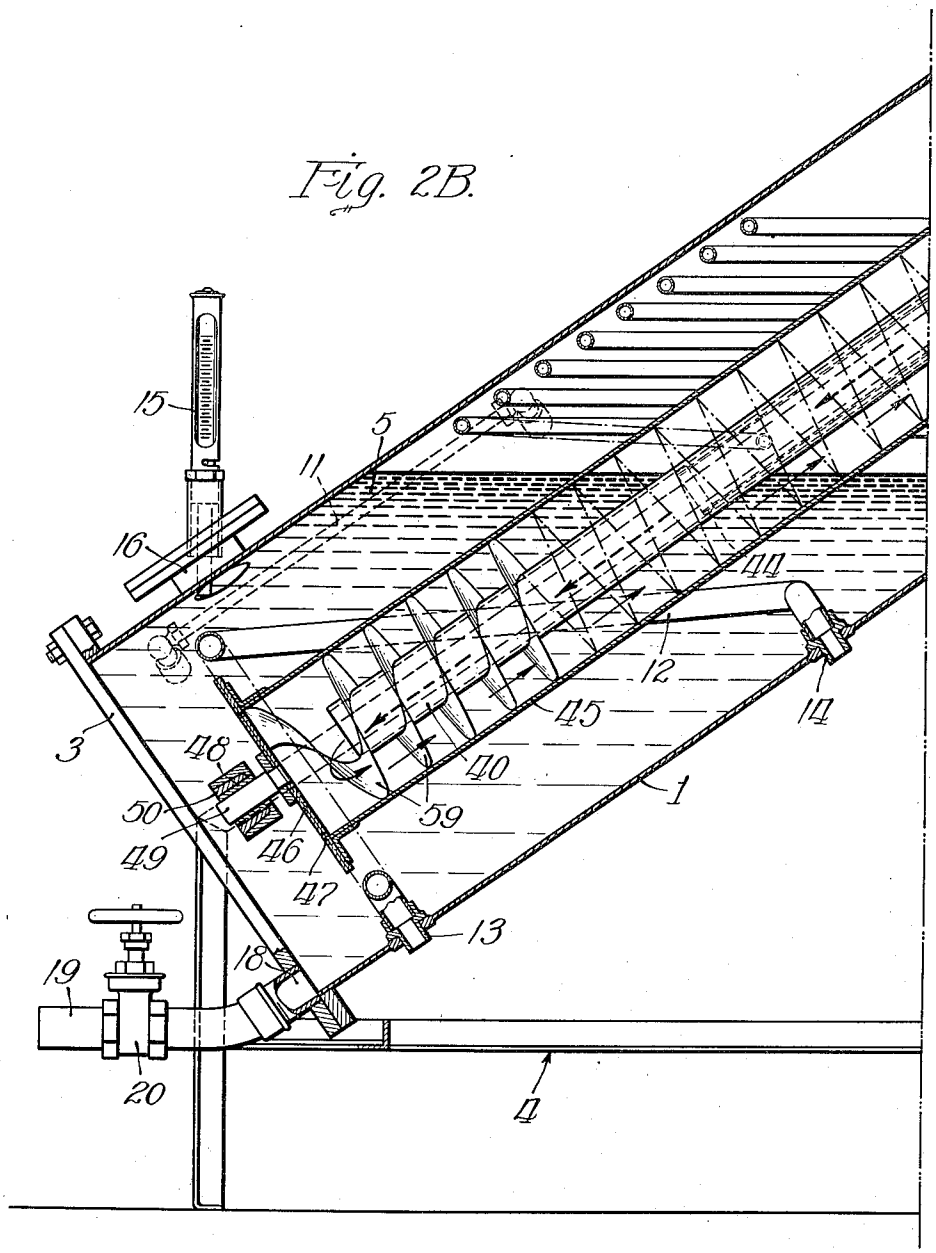
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MACHINE FOR CLEANING AND DEGREASING METAL ARTICLES

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Fig. 2B.



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MACHINE FOR CLEANING AND DEGREASING METAL ARTICLES

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Fig. 3.

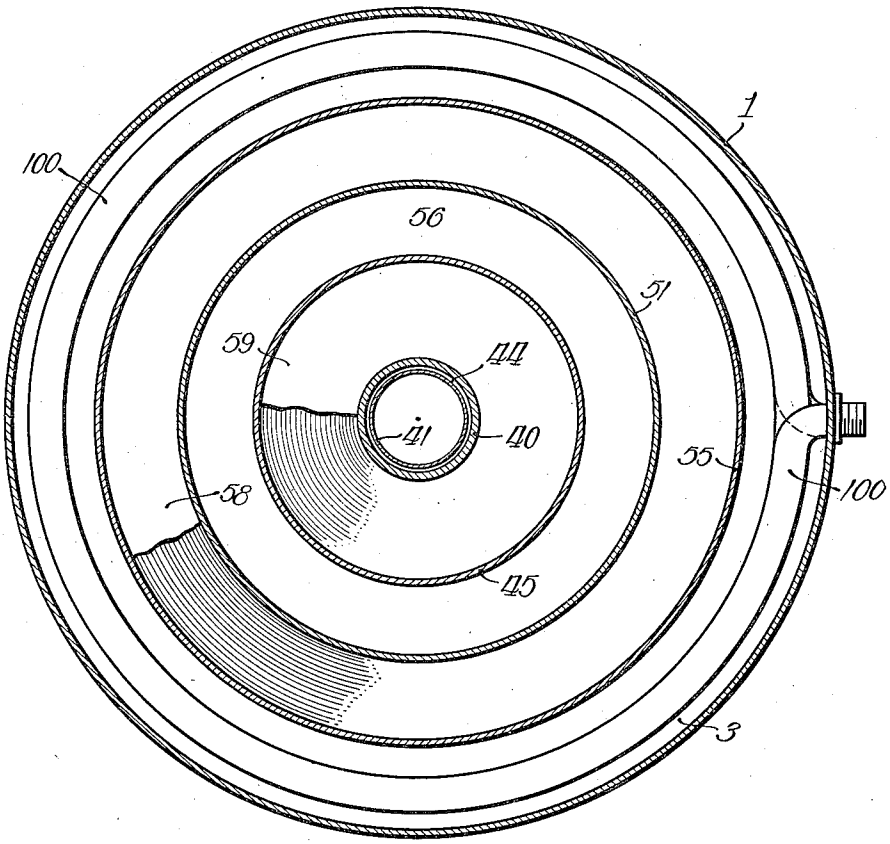
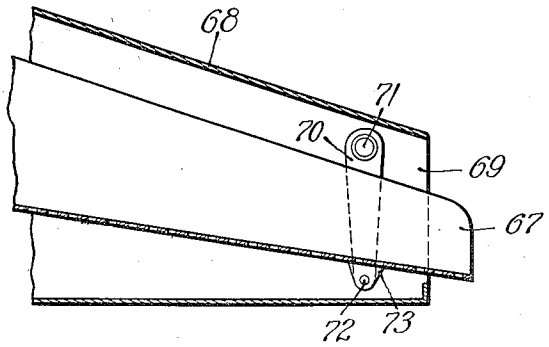


Fig. 4.



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UNITED STATES PATENT OFFICE

2,090,191

MACHINE FOR CLEANING AND DEGREASING METAL ARTICLES

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Application July 15, 1933, Serial No. 680,525

5 Claims. (Cl. 87—6)

This invention relates to cleaning apparatus, and has to do with a machine for cleaning and degreasing metal articles by subjecting them to the action of a liquid solvent.

One of the main objects of my invention is to provide a machine of the character stated capable of handling small metal parts expeditiously and with facility, the machine being continuous in operation and adapted to handle considerable numbers of parts to be cleaned. A further object is to provide a machine of comparatively simple construction and operation in which the parts being cleaned are thoroughly agitated or tumbled in the cleaning liquid. It is also an object of my invention to provide a machine of this character in which escape to the atmosphere of vapors of the cleaning liquid, in objectionable quantity, is effectively avoided. Further objects and advantages of my invention will appear from the detail description.

In the drawings:—

Figure 1 is a front view of a cleaning machine constructed in accordance with my invention, parts being broken away;

Figures 2A and 2B constitute a sectional view through the machine taken substantially on line 2A—2B of Figure 1, parts being shown in elevation;

Figure 3 is a transverse sectional view through the machine taken substantially on line 3—3 of Figure 2A;

Figure 4 is an enlarged fragmentary sectional view through the discharge hopper and associated parts;

Figure 5 is a fragmentary sectional view of the lower end of the innermost casing, on an enlarged scale.

The machine comprises a cylindrical tank 1 closed at its upper and lower ends by heads 2 and 3, respectively, secured to the ends of the tank in a suitable manner. Tank 1 is supported at an inclination by means of a frame 4 of suitable construction. The tank is adapted to contain, in the lower portion thereof, a suitable quantity of a cleaning liquid 5. Any liquid suitable for the purpose may be employed, though I preferably use trichlorethylene, which I have found to be highly efficient for degreasing and cleaning metal articles and other materials. This liquid may be introduced into the tank in a suitable manner, as by means of a neck 6 extending from the upper side of the upper portion of the tank and defining a manhole, this neck normally being closed by a suitable cover 7 held closed under pressure by a screw 8 which screws through a C-shaped member 9, the fingers of which engage beneath a flange 10 secured to the upper end of neck 6. This neck also gives access to the interior of the tank 1 for cleaning, repair or replacement of parts. The cleaning liquid may be introduced into the tank in any other suitable or preferred manner.

A gauge glass 11 is suitably connected to the lower portion of the tank for indicating the level of the liquid therein, as indicated in Figure 2B. A heating coil 12, preferably of copper, is disposed in the lower portion of the tank for heating the liquid, this coil being provided with terminal nipples 13 and 14 extending through the wall of the tank, nipple 13 being intended for connection to a suitable source of supply of steam or other heating fluid under pressure, nipple 14 being connected to an exhaust conduit. A suitable thermometer 15 is mounted in a fitting 16 extending from the upper side of the tank adjacent the lower end thereof, the lower portion of this thermometer being immersed in the liquid for indicating the temperature thereof. An overflow tube 17 extends through the lower side of the tank for preventing rise of the liquid therein above a predetermined level, and this tube may be connected to a suitable conduit or container for receiving liquid escaping from the tank through tube 17. A nipple 18 is secured through head 3 at the lower side of the tank and receives a drain pipe 19 controlled by a suitable valve 20.

A flanged fitting 21 is suitably secured to head 2 so as to form a fluid tight closure therewith. This fitting rotatably receives a bushing 22 of considerable wall thickness, this bushing being disposed coaxially with tank 1. A bevel gear 23 is suitably secured upon the upper end of bushing 22 and rests upon the upper ring of a ball bearing structure 24 disposed in a suitable annular recess 25 formed in the upper end of fitting 21. This ball bearing seats upon a thrust ring 26 disposed between the same and the bottom of recess 25. Lubricant may be supplied to bushing 22, below the ball bearing, by means of an oil cup 27, in a known manner.

Gear 23 meshes with a bevel gear 30 secured upon a shaft 31 rotatably mounted in bearing sleeves 32 carried by a bracket 33 suitably secured to an upwardly extending portion 4a of frame 4. Shaft 31 is driven from an electric motor 34 of suitable type, mounted upon upward extension 4a of frame 4, through a speed reducing unit 35 of known type, there being a flexible coupling 36, also of known type, interposed between this unit and shaft 31. Any other suitable

or preferred means may be employed for driving shaft 31 and gear 30, for rotating the gear 23 and bushing 22.

Bushing 22 is shrunk or otherwise suitably secured upon the upper end portion of a tubular shaft 40 which extends upward through fitting 21. The upper end of this shaft is open for reception of a tubular neck 41 extending downward from the bottom of a hopper 42 connected to the upper end of the tank by a brace 43. A collar 44 (Figures 2B and 3) is mounted on the lower end of neck 41 and serves, in conjunction with brace 43, to hold the neck in concentric spaced relation to shaft 40. The hopper 42 and neck 41 thereof provide means for delivering to the shaft 40, from the upper end thereof, the articles to be cleaned.

Shaft 40 extends downward within a cylindrical sheet metal casing 45 which is disposed concentrically with the shaft. The lower end of casing 45 is closed by a head 46 secured thereto in a suitable manner, this head being provided with restricted openings 47 (Fig. 5) for admitting the cleaning liquid from the lower portion of the tank into the casing 45, these openings being sufficiently small to eliminate possibility of escape therethrough of the articles being treated. A stud shaft 48 is suitably secured in head 46 centrally thereof, and is rotatably mounted in a bushing 49 carried by a cross bar 50 secured across tank 5, adjacent lower head 3 thereof, this cross bar being secured in position in any suitable manner. The casing 45 is thus mounted for rotation coaxially with shaft 40, and this casing extends upward within the tank 1 for a considerable distance above the liquid level therein.

A cylindrical casing 51, conveniently formed of sheet metal and closed at its upper end, is secured to shaft 40, remote from the upper end of casing 45, by means of an angle ring 52 which is secured to the shaft, and a supporting member 53 secured to this angle ring and to an angle ring 54 within and secured to casing 51. Casing 51 extends downward about the upper end of casing 45 and is open at its lower end. A third and outer casing 55, which may be formed of sheet metal and is closed at its lower end at 56, is secured to casing 45 by means of an angle ring 57, a short distance below the lower end of casing 51. This casing 55 is open at its upper end and a helical vane 58, which constitutes a screw member, is disposed between casings 51 and 55 and suitably secured thereto, this screw member extending from the bottom 56 of casing 55 to the top thereof, the upper terminal of the screw member preferably being disposed a slight distance above the top of casing 55. A screw member 59 extends about shaft 40 and between the latter and the inner face of casing 45, this screw member extending from the bottom 46 of casing 45 to the top thereof and being suitably secured to the casing and to the shaft. The three casings and the shaft, and the two screw members, are thus connected together to rotate as a unit on the axis of shaft 40. Shaft 40 terminates a short distance above the lower end of casing 45, as shown in Figure 2B, and is open at its lower end for discharging into the lower portion of casing 45 the articles to be cleaned, which articles are delivered to the shaft by means of the hopper 42 as previously described.

Screw member 58 extends a short distance above the upper end of casing 55 (Figure 2A) and a discharge trough 60 extends from the upper end of casing 55, at the lower side thereof, and through the lower side of tank 1. The space between tank 1 and casing 55, adjacent the upper end of the latter, is closed by an annular strip 61 of sheet metal which fits snugly about casing 55 and is secured to tank 1 by an angle ring 62. The upper portion of trough 60 is flared upward, as in Figure 1, and the bottom of this trough forms a continuation of the annular closure strip 61. Trough 60 discharges into an outlet member 63 within which are disposed suitable baffles 64 and 65. A delivery chute 66 is secured in the lower end of member 63 and discharges into a tray 67, the back and the bottom walls of which are perforated. The perforations of this tray are sufficiently small to eliminate possibility of passage therethrough of the articles being treated.

The member 63 and tray 67, and associated parts, are disposed within a suitable housing 68 conveniently formed of sheet metal. This housing is open at its forward end, at 69, and the forward end of tray 67 is also open and extends slightly outward beyond the housing for discharge of the articles. Tray 67 is supported for reciprocating movement, near its forward end, by links 70 pivoted at their upper ends, at 71, to the side walls of housing 68, these links being pivoted at their lower ends, at 72, to tabs 73 extending downward from the tray at the sides thereof. An angle member 74 is secured to the bottom of tray 67 at the inner end and adjacent each side thereof, and receives an eccentric disc 75 suitably secured on a shaft 76 rotatably mounted through the housing 68 in bearing sleeves 77 suitably secured to the side walls of the housing. The shaft 76 also extends through a bearing sleeve 78 secured to frame 4. A sprocket wheel 79 is suitably secured on the outer end of shaft 76 and receives a sprocket chain 80 which passes about a sprocket wheel 81 secured upon a shaft 82 driven from the reducer unit 35. The chain 80 establishes driving connection between the sprocket wheels 79 and 81 for rotating shaft 76, and during rotation of this shaft the tray 67 is reciprocated both vertically and longitudinally for thoroughly agitating and tumbling articles therein and discharging the latter from the tray.

A blower 85, of known type and driven by a suitable electric motor 86 associated therewith, is mounted upon a bracket 87 suitably secured to frame 4. The intake of this blower is connected by a short conduit 88 to the back of housing 68 adjacent the bottom thereof. The discharge of the blower is connected to a conduit or pipe 90 which may extend to any suitable receptacle or point of discharge. In the operation of the machine, the blower is effective to cause a considerable volume of air to flow inwardly of the housing 68 over the articles in the trays 67, this air and any vapors entrained thereby being discharged through the conduit 90. This assures complete drying of the articles before discharge thereof from the tray 67 and also prevents escape to the atmosphere of vapors of the cleaning liquid used.

A cooling coil 100, preferably of copper, is disposed within the tank 1 above the liquid level therein and extends about the upper portion of casing 45 and the lower portions of casings 51 and 55. This coil is suitably connected to a source of supply of cooling fluid, cold water being suitable in most cases. The cooling coil 100 is effective to condense vapors from the cleaning liquid 5, which may be heated to approximately the boiling point of water to facilitate the clean-

ing operation. This coil is also effective to cool the interiors of the casings **55**, **51** and **45** in the zone of the coil, so as to condense any vapors which may tend to rise within these casings, particularly casing **45**. The condensate flows back into the lower portion of casing **45** and the lower portion of tank **1**. In this manner, I effectively prevent the escape of objectionable quantities of vapors of the cleaning liquid to the atmosphere. The rotation of the casings and the shaft imparts a tumbling motion to the articles being cleaned, which is advantageous as assuring thorough cleaning of the articles, and has the further advantage that, in the case of hollow articles, any liquid contained within the articles is discharged therefrom, such discharge of the liquid usually occurring before the articles are discharged from the upper end of the casing **45**. During continued tumbling and travel of the articles upward in casing **55**, the articles are usually thoroughly dried and discharged through trough **60** in a dry and thoroughly cleaned condition. In the event that any of the cleaning liquid remains on the articles, this liquid is discharged from the articles during travel thereof downward through the member **63** and through the tray **67**, the air flowing inward over the articles to the blower **35** serving to carry off any cleaning liquid or vapors thereof and also assuring that the articles are delivered from the tray in a completely dried condition. The machine is particularly adapted for handling large quantities of small parts and cleaning and drying the parts as a continuous operation, and has an exceptionally high output.

What I claim is:—

1. In combination in a cleaning machine of the character described, an inclined tank, an inclined casing mounted for rotation within the tank and communicating at its lower end with the lower portion of said tank, said casing being open at its upper end for discharge therefrom of cleaned articles, a second casing secured to and extending about the upper portion of the first casing, said second casing being closed at its lower end and open at its upper end for discharge therefrom of cleaned articles, a third casing secured to and within the second casing and extending downward about the upper portion of the first casing in spaced relation thereto, a discharge trough extending from the lower side of the upper end of the second casing and through the lower side of the tank, a tubular shaft extending through said casings coaxially therewith for delivering articles to be cleaned to the lower portion of the first casing, and screw means cooperating with said casings and said shaft for delivering the articles from the first casing to the second casing and thence to the trough during rotation of the casings.

2. In combination in a cleaning machine of the character described, an inclined tank, an inclined casing mounted for rotation within the tank and communicating at its lower end with the lower portion of said tank, said casing being open at its upper end for discharge therefrom of cleaned articles, a second casing secured to and extending about the upper portion of the first casing, said second casing being closed at its lower end and open at its upper end for discharge therefrom of cleaned articles, a third casing within the second casing secured to and extending downward about the upper portion of the first casing in spaced relation thereto, a discharge trough extending from the lower side of the tank, a tubular shaft extending through said casings coaxially therewith for delivering articles to be cleaned to the lower portion of the first casing, screw means cooperating with said casings and said shaft for delivering the articles from the first casing to the second casing and thence to the trough during rotation of the casings, and a condensing coil within the tank and extending about the upper portion of the first casing and the lower portion of the second casing.

3. In combination in a cleaning machine of the character described, an inclined tank, a tubular shaft rotatably mounted through the upper end of the tank, three casings within the tank and disposed in concentric spaced relation to each other and to the shaft and with their adjacent ends in telescoping relation, the innermost casing extending into the lower portion of the tank in communication therewith and being open at its upper end for discharge therefrom of cleaned articles, said innermost casing being otherwise closed to escape of the articles therefrom, the outermost casing being closed at its lower end and open at its upper end and the intermediate casing being open at its lower end, said casings and the shaft being connected to rotate as a unit and the shaft being open at its lower end for delivering to the lower portion of the innermost casing articles to be cleaned, means for rotating the shaft, means cooperating with said casings and said shaft for discharging the cleaned articles from the upper end of said outermost casing, and a trough extending from the lower side of the upper end of the outermost casing and through the lower side of the tank.

4. In a machine for cleaning and degreasing articles, an inclined tank adapted for containing a body of volatile liquid solvent and provided adjacent its upper end with a discharge opening, said tank being otherwise closed, an imperforate tubular shaft open at both ends rotatably mounted through the upper end of said casing coaxially therewith, three casings disposed within the tank in concentric spaced relation to each other and to said shaft with their adjacent ends in telescoping relation, the innermost casing extending into and communicating with the lower portion of said tank beyond said shaft, said innermost casing being open at its upper end and otherwise closed to escape therefrom of articles being treated, the outermost casing being closed at its lower end and open at its upper end and the intermediate casing being open at its lower end and closed at its upper end, screw means connecting said shaft to said innermost casing, screw means connecting said intermediate and said outermost casings, means for heating the liquid within said tank, and means for cooling the interior of said tank above the liquid level therein.

5. In a machine for cleaning and degreasing articles, an inclined tank adapted for containing a body of volatile liquid solvent and provided adjacent its upper end with a discharge opening, said tank being otherwise closed, an imperforate tubular shaft open at both ends rotatably mounted through the upper end of said casing coaxially therewith, three casings disposed within the tank in concentric spaced relation to each other and to said shaft with their adjacent ends in telescoping relation, the innermost casing extending into and communicating with the lower portion of said tank beyond said shaft, said innermost casing being open at its upper end

and otherwise closed to escape therefrom of articles being treated, the outermost casing being closed at its lower end and open at its upper end and the intermediate casing being open at its lower end and closed at its upper end, screw means connecting said shaft to said innermost casing, screw means connecting said intermediate and said outermost casings, heating means within the lower portion of said tank, and a cooling coil within said tank above the liquid level therein and extending about said outermost casing.

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