

July 20, 1943.

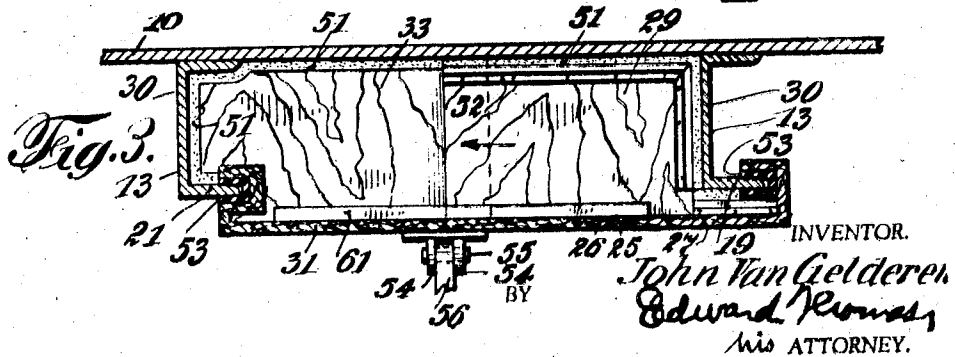
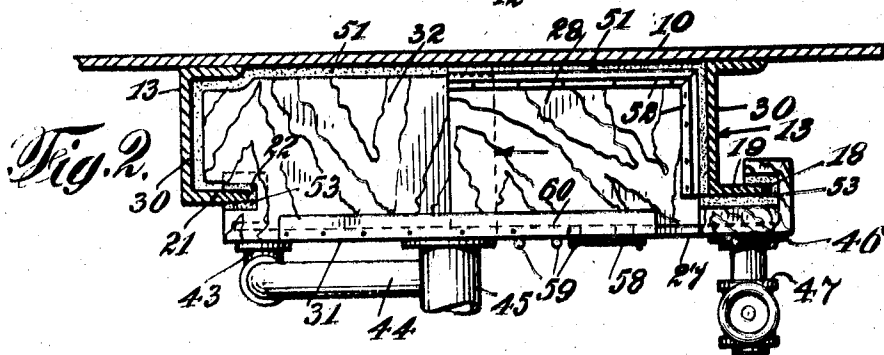
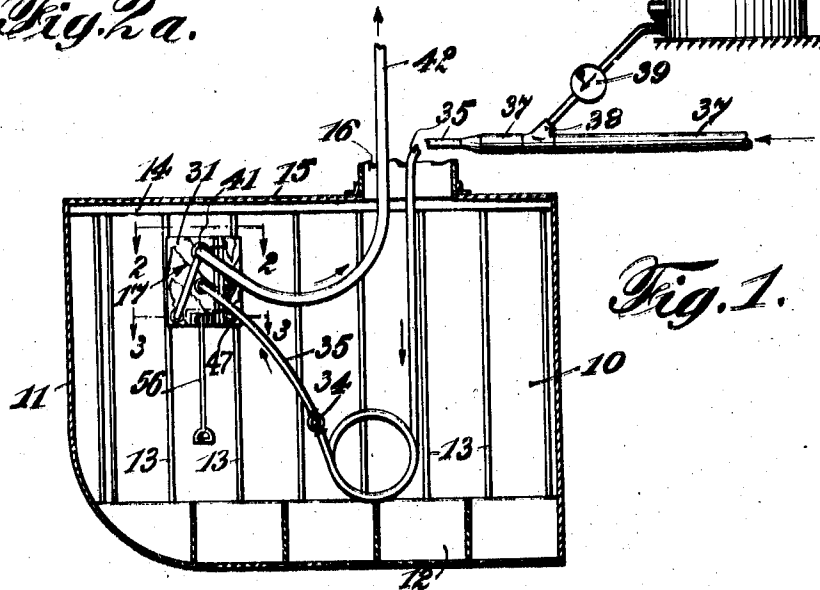
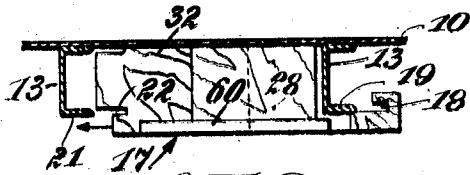
J. VAN GELDEREN

2,324,804

APPARATUS FOR CLEANING TANKS

Filed July 11, 1942

2 Sheets-Sheet 1



INVENTOR.

John Van Gelderen
Edward Thomas,
his ATTORNEY.

Edward Thomas,
his ATTORNEY.

his ATTORNEY.

July 20, 1943.

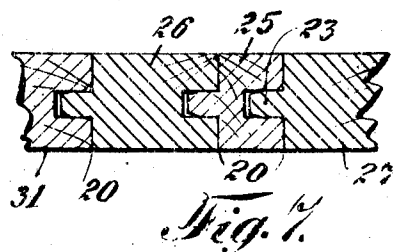
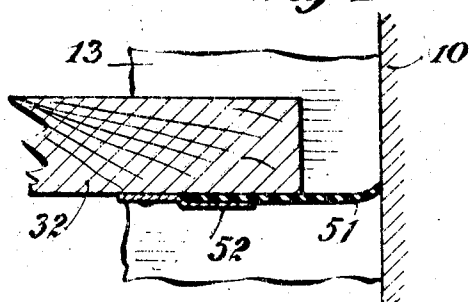
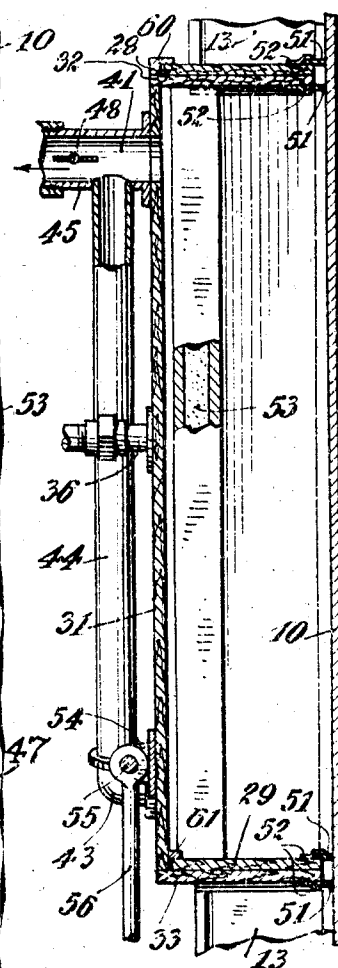
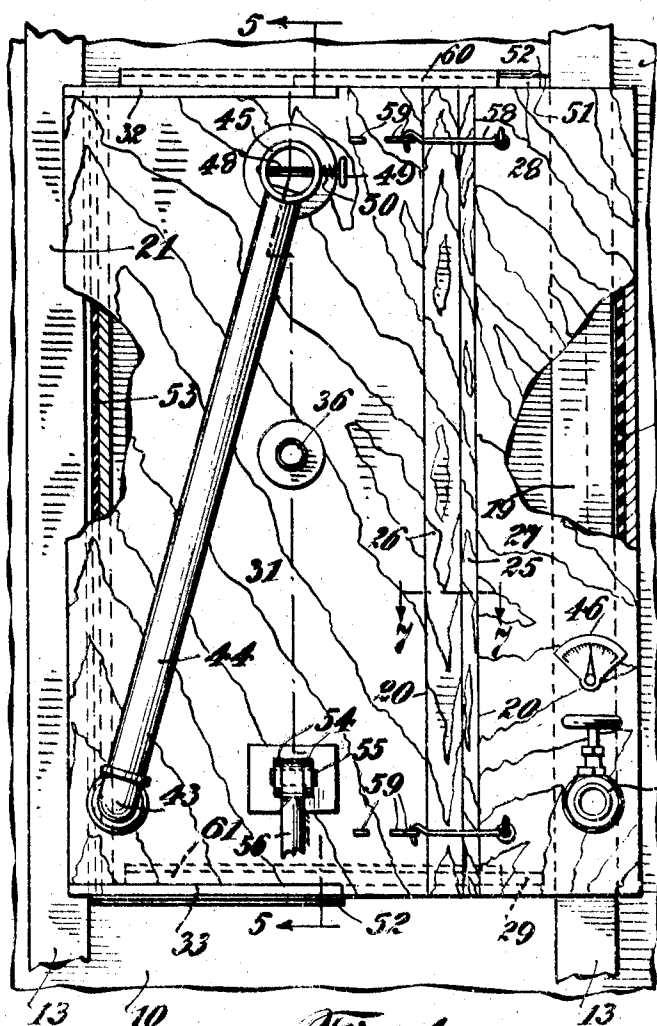
J. VAN GELDEREN

2,324,804

APPARATUS FOR CLEANING TANKS

Filed July 11, 1942

2 Sheets-Sheet 2



INVENTOR.

John Van Gelderen

BY

Edward Thomas

his ATTORNEY.

UNITED STATES PATENT OFFICE

2,324,804

APPARATUS FOR CLEANING TANKS

John Van Gelderen, Union City, N. J.

Application July 11, 1942, Serial No. 450,564

8 Claims. (Cl. 141—1)

This invention relates to apparatus for cleaning tanks such as oil tanks, and is herein illustrated in some detail as embodied for the cleaning of oil cargo tanks on sea-going vessels.

Such tanks may carry any of several kinds of oil, such as fish oil, tung oil, petroleum products varying from the heavy lubricating oil used for cylinder oil to gasoline, linseed oil, and many others, such as tar, asphalt and crude oil.

At the end of a voyage it is usually necessary to clean the tanks after emptying them, for almost always a deposit clings to the metal of the tank which will contaminate another oil put into the tank and will soil the packings or body of other cargo packed into the tank.

To remove these contaminating coatings it has been customary to scrape the interior of the tanks by hand, employing unskilled labor, although sometimes the tanks have been steamed out by high pressure steam, say upwards of seventy-five pounds pressure, and both scraping and steaming often have been found needful.

For removing many oils the steaming out is very unsatisfactory, and attempts have been made to make a more efficient process by heating some volatile solvent for the oil or gum which coats the walls of the tank. The best solvents for this purpose, in many cases, would seem to be the very hot ethylene chlorides, but these are objectionable for many causes. For example they hydrolyze and form corrosive free hydrochloride acid in the presence of steam formed by water present and this acid rapidly attacks the iron of the tanks.

Moreover, the tanks expand under the heat of high pressure steam, and are seriously strained thereby, often even expanding enough to shear off the heads of rivets which hold parts that expand to a less extent. Such strains, resulting in sheared rivets and sprung seams, seem more frequently to result in cold weather, due to violent contrasts of temperature between the walls of the steam heated tanks and the near-by outer wall or hull of the vessel.

In addition to all these difficulties, the large numbers of men required to scrape a large tank rapidly, introduce ventilating difficulties, rendering it almost impossible for them to safely use volatile solvents, because of the danger of asphyxiation or of actual poisoning by the vapor given off.

According to the present invention the foregoing difficulties and objections are overcome and a relatively simple device is provided for clean-

ing oil tanks, easily operable, and the device is inexpensive to build.

In the form herein illustrated the wall of the tank is cleaned by steam, which may be low pressure steam, carrying a suitable chemical or solvent, kept in the stream by delivering the steam under low pressure yet enough to give it substantial velocity as it impinges on the tank wall.

In the form illustrated, a solution of a suitable chemical is delivered into the flowing current of steam, and the steam flowing through a hose is delivered through a cover lying against the tank wall but spaced from it by closed in sides. This cover limits heating, at any one time, to a small area. The entering steam flows on, impinging with its entrained chemical or solvent upon the wall of the tank, heats it and loosens the gum, scale and oil. The steam reflected away from the tank wall is illustrated as passing off through a base having an opening through the cover and delivering the steam and vapors to the air outside the tank.

According to the present invention the channel beams or other ribs of the vessel may be utilized to hold the cover in place and serve as guides for it, thus enabling the pressure of the steam to be utilized in part as an impinging stream without imposing a heavy burden upon the workmen in holding the cover in place.

Other features and advantages will herein-after appear.

In the accompanying drawings:

Figure 1 is a sectional side view, largely diagrammatic, showing one form of the invention employed in cleaning a cargo oil tank of a vessel.

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

Figure 2a diagrammatically shows the same parts when removing or applying the cover.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a face view of the cover in use on a larger scale, and with some parts broken away.

Figure 5 is a sectional view on the line 5—5 of Figure 4.

Figure 6 is an enlarged detail showing one form of rubber flap.

Figure 7 is a sectional view on the line 7—7 of Figure 4.

The invention is illustrated in Figure 1 as employed in cleaning the inside wall plates 10 of a tank in a vessel shown as including hull plates 11, water ballast tanks 12 and vertical channel

bars or ribs 13, as well as top stringers 14, all beneath the deck 15.

Access to the tank formed by the plates 10 is had through a hatch or manhole 16.

To clean the interior of the tank the workman descends into the tank through the hatch 16 carrying with him a cover device 17. He fits the cover device 17 over to one of the channel bars 13 by setting a recess 18, shown at the right hand side of the cover, opposite the projecting lip 19 on the far side of one channel bar 13, for this purpose the cover top being divided lengthwise along a line 20, and also sets opposite the projecting lip 21 of the other adjacent channel iron 13 a recess 22 in the left hand side of the cover device top. This brings a fixed end 32 on the left hand section 31 of the cover device adjacent the plate 10, and the slidable end 28 of the right hand section 27 of the cover device adjacent the plate 10. The two sides of the top are then pushed until their recesses 18 and 22 fit over the lips 19 and 21 of the channel beams, and the slidable ends 28 and 29 pushed against the right hand channel bar 13. Then the empty space between the tongue 23 on section 27 and the rabbet on section 31 is filled with strips 25, 26, tongued and rabbetted to match. Other details will be more fully explained later.

When the workman has fitted both the sections 27 and 31 in place with their end pieces, he turns on the cleaning steam through a valve 34, so that the steam flows through a flexible hose 35 into a metal half-inch discharge opening 36 near the center of the section 31 and allows the steam to impinge upon the facing plate 10.

The steam he admits preferably carries cleaning or detergent or solvent materials or all three which are shown as introduced into a two inch steam line 37 to which the one inch hose 35 is attached. The chemical or other material is shown as introduced into the line 37 through one branch of a Y 38 into which it is forced by a piston pump or suitable injector which draws the material from a mixing and dissolving tank 40.

When the workman turned the valve 34 the impinging steam under the cover device 17 cleaned the plate 10 and the unused and waste steam passed off through a two-inch discharge opening 41 near top of the section 31, and was carried off through a canvas hose 42 to the outer air through the hatch 16.

In order to carry off condensed water, dirt, oil, and particles of scale there is provided near the bottom of the section 31 a discharge opening 43, and the waste material flowing into the opening 43 is shown as continuously removed by suction.

For this purpose it has been found sufficient to connect the discharge opening 43 by a hose or pipe 44 to the upper discharge opening 41 in its nipple 45 so that the suction of the outflowing waste steam continually carries off the waste in the opening 43 and through the pipe 42, delivers it outside the vessel.

In order to hold the temperature within the cover device 17 at the best working point there is shown a pointer-type thermometer 46 which may be mounted in the section 27, preferably rather remote from the steam opening 36, so that the entering steam does not directly affect the thermometer 46.

The temperature may be regulated by a valve 48 in the opening 41, shown as a butterfly valve with a handle 49 and a friction spring 50. Partly

closing the valve holds a pressure of steam in the cover device, raising the temperature.

It has been found that a solution of trisodium phosphate of soda fed in at the Y 38, and showing a temperature of 90° F. on the thermometer at 46, will satisfactorily remove some lubricating oils from an oil cargo tank. More rapid results were obtained when some pine oil was added with the tri-sodium phosphate.

Sodium meta-silicate was also found useful. A higher temperature, say 125° F., was needed with other oils. Stronger alkalis could be used, and for special purposes sodium bichromate was useful.

Where speed was essential it may be advisable to use the "surface action materials" known as "wetting agents" either alone or in combination.

For obtaining the most rapid and cheap results preliminary tests must be made to determine the amount and kind of chemical agent best adapted for any given set of conditions, varying with the kind of oil, age of the coating, and temperatures.

There may also be provided a valved opening 47 near the bottom of the cover device for blowing in air if needful to carry off gases.

Under the conditions of working it is found that the steam is properly applied, and controlled, if confined by soft rubber curtains 51 extending from the edges of the ends 28, 29, 32, 33, which face the plate 10, so that the free three-quarter inch of curtain bends where it lies against the plate 10. The curtains 51 have been found satisfactory when about $\frac{1}{8}$ inch thick and held to the respective ends by metal strips 52 along the inner edges of the curtains, see Figure 6. The curtains 51 are shown on the outer faces of the overlapping sliding ends 28, 32 and 29, 33 so that the strips 52 are on the opposite sides of the sliding ends and do not hit an oncoming end.

It is found that a substantial overlap of the curtains 51 sufficiently holds the steam. The curtains 51 also extend around the ends of the ends 28, 32, 29, 33, where they face the webs 30 of the channel irons 13, and are found to be satisfactory there also.

The recesses 18 and 22 are shown as lined with soft rubber packing 53 to prevent undue escape of steam and cleaner. The packing 53 need not fit closely however, because the steam pressure is very low within the cover device 17 as a result of the opening through the off bearing pipe 42, and some escape of steam cleanses the flanges 19 and 21, thus making it unnecessary to scrape them clean.

The top of the cover is provided with a pair of ears 54 carrying a bolt 55 on which swings a handle 56 to enable a man on the floor of the tank to manipulate it on the roof and upper walls where higher than his head.

In the form shown the recesses 18 and 22 in the cover device are preferably channelled out of solid wood timbers and the rest of the cover device built principally of wood to hold the heat. The wooden filler members 25 and 26 which are shown are respectively $\frac{1}{2}$ and 1 inch wide, thus accommodating the cover to all standard spaced channel bars, the cover 17 being 25 inches wide and somewhat longer. A hook 58 may be pivoted on section 27, at each end, lying flat on its surface to engage any one of eyes 59 set to be engaged according to the spacers 25, 26, employed.

The slidable end 28 is shown lying above the cooperating fixed end 32, and is held against it

by a guide 60, shown as nailed to the section 31 and extending over the major length of the slide 28. The slide 29 similarly slides in a guide 61 nailed along the edge of the section 31 and covering the major length of the slide 29.

It will be noted that the cover device 17 fits channel bars projecting to the right. A reversely constructed device 17 will be used on channel bars projecting to the left.

It has been found that three minutes steaming of any one point in a tank plate with the device of the present invention is adequate to clean it if the most effective chemicals are used. Thus straining of the whole tank at any time by heat is avoided because the heated spot is small and is seldom heated through.

Having thus described certain embodiments of the invention, what is claimed is:

1. The combination with a cover, of sides having flexible sheet rubber margins adapted to yieldingly bear against an oil-bearing surface, a connection through which steam carrying a chemical is delivered within the cover, a separate off-bearing duct for the waste steam well above the lower edge of the cover, a second off-bearing duct near the lower edge of the cover, a suction pipe leading from the second duct to the first duct so that condensed steam carrying solids is sucked out of the second duct and carried off by the first duct connection.

2. The combination with a cover having flexible sheet rubber margins adapted to bear yieldingly against an oil-bearing surface, devices insertible to form part of the cover to vary its width, a connection through which steam carrying a chemical is delivered within the cover, a separate off-bearing duct for the waste steam well above the lower edge of the cover, a second off-bearing duct near the lower edge of the cover, a suction pipe leading from the second duct to the first duct so that condensed steam carrying solids is sucked out of the second duct and carried off by the first duct connection.

3. The combination with a cover, of projecting ends adapted to bear against a flat oil-bearing surface, sides adapted to fit on beams projecting above said surfaces, flexible margins on the sides and ends adapted to form yielding contacts with the oil-bearing surface, a connection through which steam carrying a chemical is delivered within the cover, a separate off-bearing duct for the waste steam well above the lower edge of the cover,

4. The combination with a cover, of projecting ends adapted to bear against a flat oil-bearing surface, sides adapted to fit on beams projecting above said surface, flexible margins on the sides and ends adapted to form yielding contacts with the oil-bearing surface, a connection through which steam carrying a chemical is delivered within the cover, and a separate off-bearing duct for the waste steam well above the lower edge of the cover, a second off-bearing duct near the lower edge of the cover, a suction pipe leading from the second duct to the first duct so that condensed steam carrying solids is sucked out of the second duct and carried off by the first duct connection.

5. The combination with a cover, of projecting ends and sides adapted to lie against oil-bearing surfaces, flexible margins on the sides and ends which form yielding contacts with the surfaces, a connection supplying steam through the cover, an off-bearing duct for waste steam, and a pump for forcing a chemical agent into the connection, a second off-bearing duct near the lower edge of the cover, a suction pipe leading from the second duct to the first duct, so that condensed steam carrying solids is sucked out of the second duct and carried off by the first duct connection.

6. The combination with a cover, of projecting ends and sides adapted to lie against oil-bearing surfaces, flexible margins on the sides and ends which form yielding contacts with the surfaces, a connection supplying steam through the cover, an off-bearing duct, for waste steam and a pump for forcing a chemical agent into the connection, and devices for altering the width of the cover.

7. The combination with a cover device of a connection for supplying steam thereto carrying oil-removing material, an off-bearing conduit, and devices whereby the cover device may be attached to channel bars of a metal tank to hold the device against the plates of the tank.

8. The combination with a cover device of a connection for supplying steam thereto carrying oil-removing material, an off-bearing conduit, and devices whereby the cover device may be attached to channel bars of a metal tank to hold the device against the plates of the tank, and flexible margins on the sides and ends of the cover device to form yielding contacts with the plate and channel bars.

JOHN VAN GELDEREN.