May 10, 1932. W. E. PETERSON 1,857,766

TANK CLEANING DEVICE

Filed Aug. 8, 1928

FIG. 1.

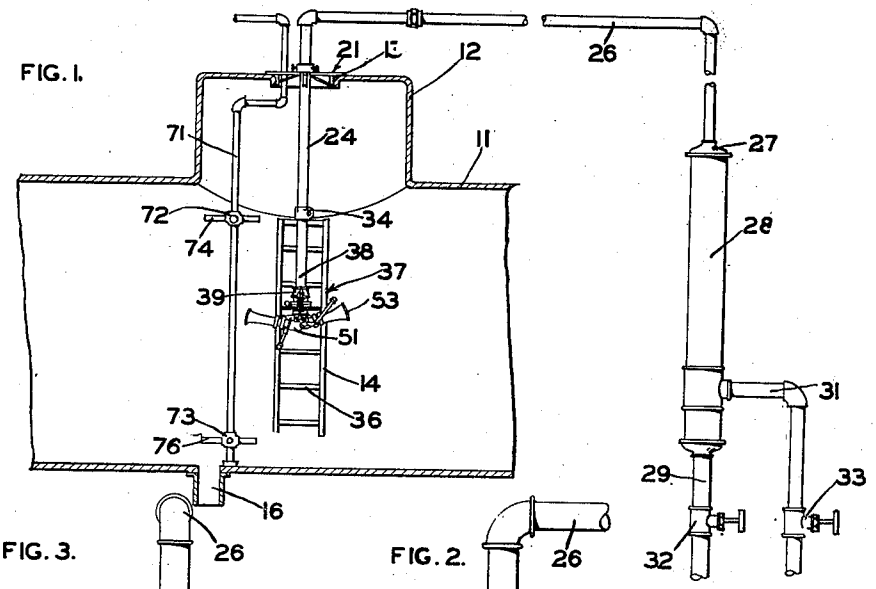


FIG. 3.

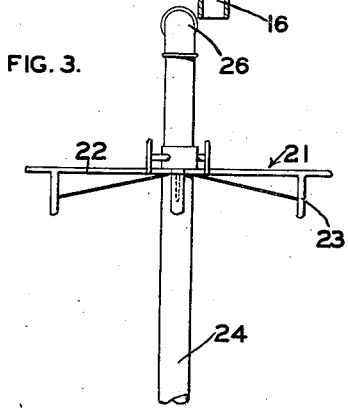


FIG. 2.

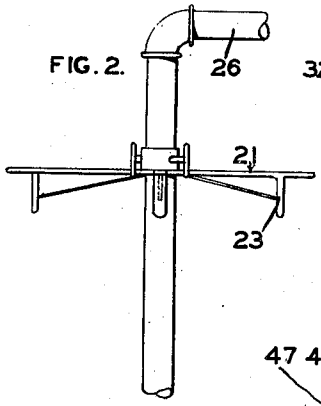
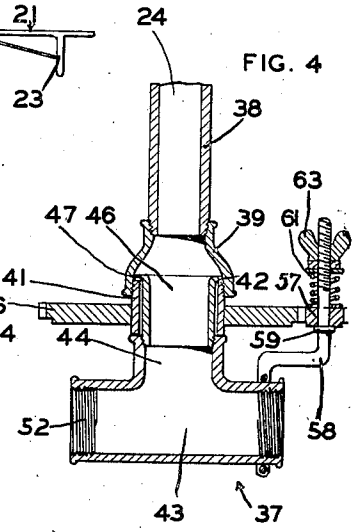
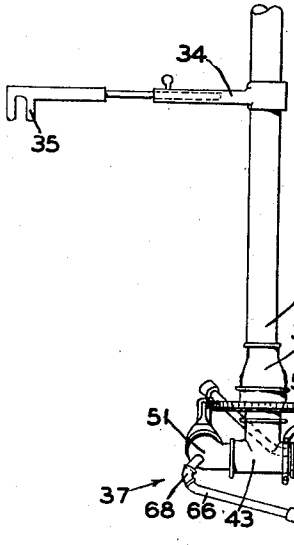
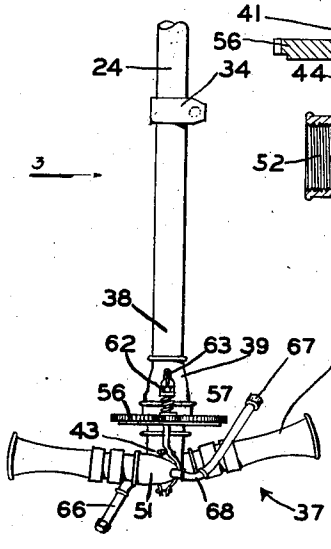


FIG. 4







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Patented May 10, 1932 1,857,766

UNITED STATES PATENT OFFICE

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TANK CLEANING DEVICE

Application filed August 8, 1928. Serial No. 298,259.

This invention relates to tank-cleaning devices.

An object of the invention is the provision of a tank-cleaning device adapted to effectively cleanse the inside of receptacles of various types, but which is particularly adapted for cleaning the inside of tank cars such as those used for transporting petroleum and its derivatives.

A more detailed object is the provision of a tank-cleaning device comprising a plurality of nozzles arranged tangentially and journalled upon a fluid-conducting pipe which is adapted to be positioned with the head disposed within the tank. Thus when fluid is supplied to the pipe under pressure, the head will be rotated upon the pipe, with the result that the jets from the nozzles, travel in circular paths therearound, striking the walls of the tank to effectually cleanse them.

A further object is the provision of a cleaning device as described, provided with means for retarding the speed of rotation of the head so as to gain the maximum cleansing efficiency of the jets.

A further object is the provision of a cleaning device as described, wherein the jets are capable of adjustment to vary their degree of angularity with the plane of rotation of the head, so that all portions of the interior of the tank may be cleaned.

A still further object is the provision of a cleaning device having a nozzle adapted to direct fluid against the interior of the tank, and a mixing chamber in communication with the nozzle wherein water and steam may be combined to raise the temperature of the water supplied to the nozzle, so that the cleansing efficiency of the jet may be increased.

A still further object is the provision of means for warming the interior of the tank during the cleansing process, so that such materials as crude oil may be reduced in tenacity to permit more ready removal thereof from the interior of the tank.

The invention possesses other objects and advantageous features, some of which, with these enumerated, will be set forth in the following description or the invention's particular embodiment which is illustrated in the drawings accompanying and forming a part of the specification.

The form of construction herein disclosed, has in actual use, proven to be very efficient, capable of facile and rapid operation, and generally desirable in other respects. For these reasons, the details herein disclosed may be considered as preferred. It should be mentioned however, that while these details will hereinafter be specifically described, variations may be effected within the scope of the invention as claimed.

Referring to the drawings:

Figure 1 is a sectional view of a portion of a tank car, showing the cleansing device of my invention in operative position therein. The fluid heating means are shown diagrammatically; and portions of the figure are broken away to reduce its length.

Fig. 2 is an enlarged side elevation of the cleansing device of Fig. 1. Portions of the figure are broken away to reduce its length.

Fig. 3 is an enlarged side elevation of the cleansing device, the direction of view being indicated by the arrow 3 of Fig. 2. Portions of the figure are broken away to reduce its length.

Fig. 4 is a still more highly enlarged view of a portion of the device showing the connection between the rotatable head and the stationary support therefor, as well as the means for retarding rotation of the head.

My invention comprises the provision of a device capable of thoroughly cleansing the interior of such receptacles as tank cars, without the necessity of employing detergents, chemicals, or the like. While it is herein described in connection with a tank car, I wish it to be understood that the device is also of utility when employed for cleansing the interior of other receptacles. Its use in connection with tank cars is described, because of the fact that the cleansing of the interior of such containers oftentimes is a problem difficult of solution, owing to the fact that these cars are used in the transportation of crude oil and its derivatives, and other substances exceedingly tenacious and difficult to remove

from any surface with which they have come in contact.

I have found it expedient to provide means for raising the temperature of the tank and those portions of the contents thereof which it is desirable to remove from the tank, until the material becomes sufficiently fluid to permit washing thereof by high-velocity jets of hot water. A portion of my invention comprises the provision of a plurality of such jets rotating at a predetermined speed so as to strike the entire interior surface of the container.

With this broad conception of the invention in view, I have described the device as employed for cleansing the interior of a tank 11 such as that commonly employed by tank cars for the transportation of liquids and semi-liquids of various characters. These tanks 11 are commonly supplied with a dome 12 having an aperture or "manhole" 13 permitting access to the interior of the tank; and a ladder 14 is frequently permanently attached to the tank 11 to facilitate entrance to the tank. An outlet 16 is provided, through which the tank 11 may be drained, it being understood that the outlet 16 may be closed by any suitable type of valve (not shown).

One portion of my cleaning device comprises a spider 21 adapted to be positioned upon the top of the dome 12 over the manhole 13. Each of the arms 22 of the spider, is provided with a flange 23 extending downwards therefrom to engage the sides of the manhole 13 and retain the spider 21 centrally thereof. A fluid-conducting pipe 24 is slidable within a central aperture through the spider 21, permitting vertical adjustment of the pipe 24 in respect thereto. The pipe 24 is adapted to be connected by a conduit 26, to the outlet end 27 of a mixing chamber 28; and a water pipe 29 and a steam pipe 31 are adapted to discharge into the mixing chamber 28. The pipes 29 and 31 are provided with valves 32 and 33 respectively, by means of which the flow of water and steam to the mixing chamber 28 may be controlled. This provides a convenient and efficacious means for heating water to be supplied to the cleansing device.

An adjustable bracket 34 is secured to the pipe 24, preferably adjacent its lower end, and has a pair of fingers 35 dependent from its outer end adapted to engage one of the rungs 36 of the ladder 14 to brace the pipe 24 and hold it rigidly against inadvertent displacement. A head indicated in its entirety at 37 is revolubly mounted upon the lower end 38 of the pipe 24. For the support of this head 37, a bell reducer 39 is threaded to the lower end 38 of the pipe 24, and has a nipple 41 threaded into its lower end. The internal diameter of the nipple 41 is sufficiently less than that of the lower end of the bell reducer 39, to provide a shoulder 42 for the support of the head 37.

The head 37 comprises a T-fitting 43 into the inlet 44 of which a sleeve 46 is threaded. The sleeve 46 is provided with an annular flange 47 seating upon the shoulder 42 provided by the nipple 41. Thus it may be seen that the head 37 is permitted rotary movement in respect to the pipe 24, but is withheld against moving longitudinally thereof.

An L-fitting 51 is threaded into each of the runs 52 of the T-fitting 43; and a nozzle 53 is threaded into the outlet of each of the L's 51. The L's are turned so that their nozzles are directed toward opposite sides of a diameter of the pipe 24, with the result that the nozzles 53 are directed tangentially in respect to the axis of rotation of the head 37, so that when fluid is forced through the nozzles 53, the counterthrust from the jets, rotates the head 37 in a plane perpendicular to the axis of the pipe 24.

By turning the L-fittings 51 within their respective runs of the T-fitting 43, the degree of angularity of the nozzles 53 with the plane of rotation of the head 37, may be varied so as to direct the jets of the two nozzles to different portions of the interior of the tank.

Since the tangential arrangement of the nozzle 53 results in rotating the head 37 at a relatively high rate of speed, I have found that the efficiency of the device is increased if means are provided for retarding the rotation of the head 37. One effective means of accomplishing this end is to mount a gear 56 rigidly upon the nipple 41 in position to be enmeshed with a planetary gear 57 journalled upon an arm 58 which is secured to the T-fitting 43, so that as the head 37 rotates, the gear 57 travels about the gear 56 in planetary motion. The gear 57 rests upon a shoulder 59 and is engaged by a spring 61 which is under compression between the gear 57 and a nut 62 threaded to the arm 58. Accordingly, resistance is offered to the rotation of the head 37 in respect to the pipe 24, the amount of this resistance being readily varied by shifting the nut 62 upon the arm 58 to alter the degree of compression of the spring 61. A lock-nut 63 is also threaded upon the arm 58 above the nut 62, to lock the parts in adjusted position against inadvertent displacement.

Each of the L-fittings 51 is also provided with an auxiliary nozzle 66. Preferably each of the nozzles 66 is made up of a tip 67 and a plurality of pipe fittings 68, so that the nozzles 66 can be directed in predetermined direction. However, it is desirable that they point in the opposite direction from that of the associated primary nozzle 53 in respect to the direction of rotation of the head 37, so that they aid in retarding rotation of the head 37 as well as in washing those portions of the

interior of the tank 11 which are not reached by the jets from the primary nozzles 53.

Since oftentimes the tanks 11 to be cleansed, have contained viscous and sticky materials such as crude oil, the cleaning thereof is facilitated by raising the temperature within the tanks until the material is in a more fluid state. Accordingly, I have provided a steam line 71 adapted to extend into the tank 11 through the manhole 13 and supply the interior of the tank 11 with steam, at the same time that the cleansing device above described is being employed. The pipe 71 is provided with a plurality of sets 72 and 73 of nozzles 74 and 76 respectively, adapted to direct the steam in all directions within the tank 11.

It is believed that the operation of my improved tank-cleaning device is readily understood from the above description of the constituent parts thereof. The revolving head 37 is positioned within the tank 11 to be cleaned and held rigid therein by means of the spider 21 and bracket 34. The steam pipe 71 is then positioned, and steam supplied thereto to raise the temperature of the tank 11 and render more fluid the remainder of the contents of the tank, which it is desired to remove.

Then, by opening the valves 32 and 33, cold water and steam may be admitted to the mixing chamber 28, with the result that the water may be heated to any desired degree of temperature, depending upon the relative openings of the valves. Thus hot water under pressure is supplied to the head 37 to be ejected from the nozzles 53 and 66. As above described, the reaction from the nozzles will result in the rotation of the head 37 in a horizontal plane, and the speed of this rotation may be predetermined by properly positioning the nuts 62 and 63 to impose the desired degree of spring tension upon the planetary gear 57.

In their preferable form, the nozzles 53 are provided with orifices which are elongated to deliver flat jets of high velocity, since I have found by experimentation that this type of jet has the maximum scrubbing action.

I claim:

1. In a tank cleaner, a fixed member and a rotatable member, a nozzle arranged tangentially upon said rotatable member, means for supplying fluid under pressure to said nozzle, a gear fixed to one of said members, a gear revolubly mounted upon the other member and enmeshed with the fixed gear, and means for retarding the rotation of said revolubly mounted gear.

2. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, a nozzle carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzle, a gear mounted coaxially upon said pipe, a gear mounted upon said head eccentrically of and enmeshed with said first mentioned gear, one of said gears being fixed against rotation upon its supporting structure, and means for retarding the rotation of the other gear.

3. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, a nozzle carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzle, a gear fixed coaxially to said pipe, a gear enmeshed with said fixed gear and journalled on said head eccentrically in respect to said fixed gear, and means for retarding the rotation of said second mentioned gear.

4. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, a nozzle carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzle, a gear fixed coaxially to said pipe, an arm rigid with said head, a planetary gear journalled upon said arm and enmeshed with said fixed gear, and means for retarding rotation of said planetary gear upon the arm.

5. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, a nozzle carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzle, a gear fixed coaxially to said pipe, an arm rigid with said head, a planetary gear journalled upon said arm and enmeshed with said fixed gear, a nut threaded upon said arm, and a spring under compression between said planetary gear and said nut.

6. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, a nozzle carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzle, a gear fixed coaxially to said pipe, a gear enmeshed with said fixed gear and rotatably carried by said head for planetary movement about the fixed gear, means for retarding the rotation of said planetary gear, and a secondary nozzle arranged tangentially upon said head to direct its jet rearwards in respect to the direction of rotation of the head, said nozzles being disposed at different degrees of angularity with the axis of rotation of the head.

7. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, a nozzle carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzle, a gear fixed coaxially to said pipe, an arm rigid with said head, a planetary gear jour-

nalled upon said arm and enmeshed with said fixed gear, and a secondary nozzle arranged tangentially upon said head to direct its jet rearwards in respect to the direction of rotation of the head, said nozzles being disposed at different degrees of angularity with the axis of rotation of the head.

8. A tank cleaner comprising a fluid-conducting pipe, said pipe having an annular shoulder extending inwards adjacent its end, a sleeve revoluble in respect to said pipe and having a complementary shoulder in engagement with the first mentioned shoulder, a T-fitting carried by said sleeve, an L-shaped nozzle secured to each of the runs of the T-fitting, a gear rigid with the pipe and arranged coaxially thereof, an arm rigid with the T-fitting, a planetary gear journalled upon said arm and enmeshed with the first mentioned gear, a nut threaded on said arm, and a spring under compression between said nut and said planetary gear.

9. In a tank cleaner, a fluid-conducting pipe, a head revolubly mounted upon the pipe, nozzles carried by the head and directed tangentially thereof, there being a passageway through the head establishing communication between the pipe and the nozzles, a gear fixed coaxially to said pipe, a gear enmeshed with said fixed gear and carried by said head for planetary movement about the fixed gear, and means for retarding the rotation of said planetary gear, said nozzles being adjustable in respect to the head to vary the degree of angularity of said nozzles with the plane of rotation of said head.

In testimony whereof I have signed my name to this specification.

WALTER E. PETERSON.