Sept. 15, 1925.

1,554,076

G. C. ENGSTRAND

PUMPING APPARATUS

Filed Nov. 11, 1924

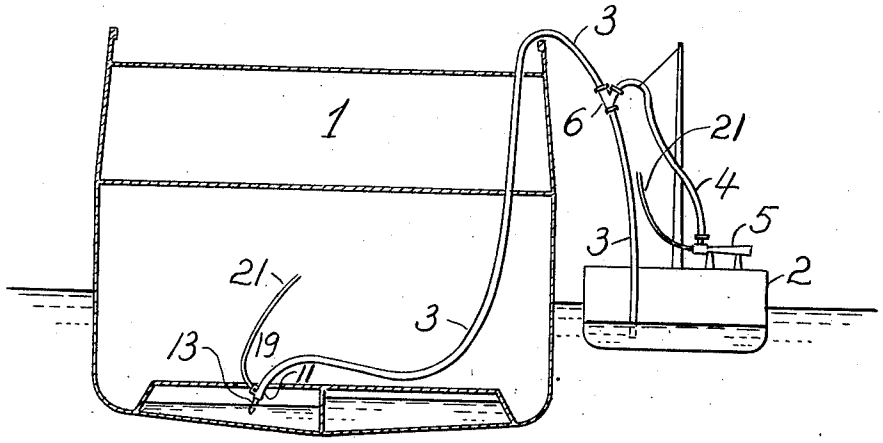

FIG. 1.

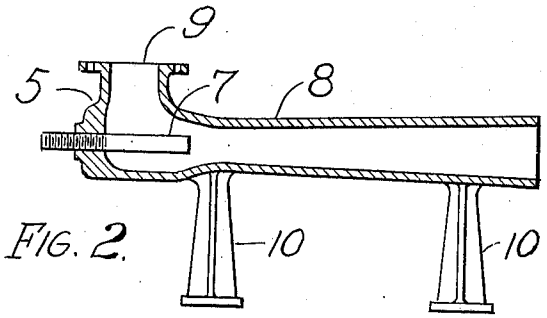

FIG. 2.

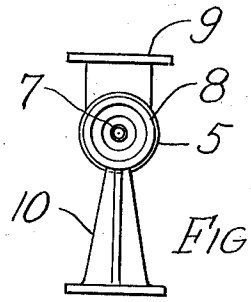

FIG. 3.

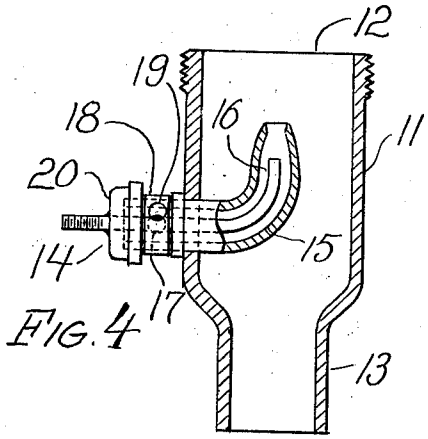

FIG. 4

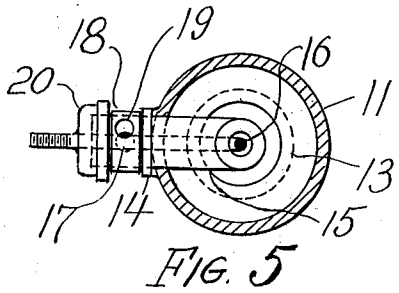

FIG. 5

WITNESSES

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Patented Sept. 15, 1925. 1,554,076

UNITED STATES PATENT OFFICE.

GUNNAR C. ENGSTRAND, OF BROOKLYN, NEW YORK, ASSIGNOR TO OIL PUMPING & RECLAIMING COMPANY, INC., A CORPORATION OF NEW YORK.

PUMPING APPARATUS.

Application filed November 11, 1924. Serial No. 749,195.

To all whom it may concern:

Be it known that I, GUNNAR C. ENGSTRAND, a subject of the King of Sweden, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pumping Apparatus, of which the following is a specification.

My invention relates to a pumping apparatus and method for the withdrawal of fuel oil and residue from the tanks of a vessel.

This liquid material is viscous, sticky and in cold weather almost jelly-like, and due to its nature it cannot be pumped either in a solid column or in an aerated one.

In order to pump such material it has been found necessary to transmit it by means of an air stream in a broken up condition through the transmission hose. Such an arrangement requires spacious vacuum tanks and large capacity vacuum pumps. I have discovered that by means of doing away with the spacious vacuum receptacles hitherto used and connecting the vacuum pump or exhauster to the transmission line by means of a by-pass, I am able to reduce the required capacity of vacuum pump to about one fifth of the size required when receptacles are used.

I have also discovered that by so arranging the transmission line that the discharge end of the transmission forms an air sealed leg I am able to make the by-pass connection at a point above the height to which a vacuum can lift liquids like oil and water. By this arrangement it is possible to deviate practically all the air into the by-pass of the exhauster while the pumped material is by its momentum carried past the by-pass and forcibly ejected against the atmospheric pressure, into the receiving barge.

In the drawing:—

Figure 1 shows the general pumping arrangement.

Figures 2 and 3 show the detail construction of the steam exhauster.

Figures 4 and 5 show the detail construction of the suction nozzle in my preferred apparatus.

Referring to the drawing in which like reference characters designate corresponding parts, 1 represents the vessel from which the fuel oil is pumped. Alongside the vessel an ordinary receiving barge 2 is moored.

A flexible hose 3 is shown connecting the ship tank with the receiving barge and this hose transmission line has a lateral by-pass line 4 at the end of which the steam exhauster 5 is attached.

The lateral by-pass connection is made by means of a Y 6 so placed that the entrained liquid material will separate from the air assisted by gravity.

The steam ejector 5 comprises a steam pipe nozzle 7 which is directed into a properly designed throat piece 8 to which the air inlet 9 leads.

The steam ejector is shown supplied with legs 10 adapted for horizontal mounting.

The intake end of the transmission line 3 is supplied with a nozzle 11 having the upper part 12 of the same diameter as the line and a lower restricted neck part 13 to be inserted in the material to be pumped.

The upper part 12 is provided with a steam air blower 14 comprising in combination the air conductor 15 inside which the steam pipe nozzle 16 ends.

The air conductor 15 is provided with several openings 17 and a turntable sleeve 18 is provided with an equal number of registering openings 19, thus permitting a perfect air control.

A cap 20 closes the outside end of the air conductor 15 to which cap the steam pipe nozzle 16 is welded.

The drawing shows the steam blower welded to the intake nozzle 11.

The discharge end of the transmission line is shown submerged in the liquid material in the barge.

Proper steam hoses 21 are connected to the steam exhauster 5 as well as the steam air blower 14 and are conveniently hooked up to the steam supply either on the vessel or on the barge.

The method of procedure is as follows:

Steam being admitted to the steam air exhauster 5, a suction is created in the transmission line 3 and the liquid in the barge will rise in the outboard leg a corresponding height.

Care must be taken that the Y 6 is placed so high that the liquid column in the air sealed discharge leg of the transmission will not at any time reach the bypass line 4.

Steam is also admitted to the blower 14 and atmospheric air is sucked in through the registering openings 17 and 19.

The nozzle neck 13 is now inserted into the liquid material, whereupon the liquid is sucked up into the hose forming a more or less aerated liquid column into which the steam condenses after having injected the air therein.

With the intake end sealed in this manner a vacuum is being built up in the transmission line more quickly than the frictional resistance of the ascending column, which resistance is in direct proportion to the height of the column.

A vacuum will soon be reached at which the ascending column will part at the air admittance, and this aerated column part will be propelled by the air and steam filling in behind and the aerating bubbles will, in expanding, break up the column more or less into a gush rushing through the hose. It is to be noted that the main body of the air is not confined inside the gush, but passes by and around the gush during its passage through the hose. Due to this condition the air is readily separated from the gush and sucked into the aspirator line 4, while the gush due to the momentum, which the passing air stream has imparted, will not only rush past the lateral by-pass inlet but also forcibly strike and depress the sealing liquid column in the discharge end of the transmission hose which discharges into the receiving barge.

It is also to be noted in this connection that the nozzle neck 13 shall not be too deeply inserted into the liquid material as it has been found that the amount of air which passes through the registering openings 17 and 19 is inadequate to fill in behind the gushes. Therefore, the extra amount of air needed at this instant will have to be admitted through the intake end proper.

It is also to be noted that the amount of air admitted to the line at this instant is much larger than the amount of air which the air exhauster is able to suck out and the vacuum is accordingly reduced in the transmission hose. With the vacuum lowered another aerated column gets a chance to form at the intake end whereupon the operation is automatically repeated.

I claim:—

1. In a vacuum pumping apparatus, a transmission line comprising a suction leg and a discharge leg connected so as to form a continuous transmission, said discharge leg having a hermetically sealed discharge end, a steam operated air exhauster by-passed from said discharge leg at a plane substantially above the level to which the liquid material may be caused to ascend in said discharge leg when acted upon by the vacuum necessary for the transmission.

2. In a vacuum pumping apparatus, a transmission line comprising a suction leg and a discharge leg connected so as to form a continuous transmission, said discharge leg having a hermetically sealed discharge end, an air exhauster by-passed from said discharge leg at a point substantially above the level to which the liquid material may be caused to ascend in said discharge leg when acted upon by the vacuum necessary for the transmission.

3. An air transmission line for liquids comprising a suction leg and a discharge leg aligned so as to form a continuous transmission and having a by-passed steam exhauster creating an air current therein, and means for preventing the liquid material from entering and passing through the steam exhauster.

4. In a vacuum pumping apparatus, a transmission line substantially U-shaped comprising a suction leg and a discharge leg aligned so as to form a continuous transmission, said discharge leg having a hermetically sealed discharge end, a steam operated air exhauster by-passed from said discharge leg at a plane substantially above the level to which the liquid material may be caused to ascend in said discharge leg when acted upon by the vacuum necessary for the transmission.

5. In a vacuum pumping apparatus, a transmission line substantially U-shaped comprising a suction leg and a discharge leg alined so as to form a continuous transmission, said discharge leg having a hermetically sealed discharge end, an air exhauster by-passed from said discharge leg at a point substantially above the level to which the liquid material may be caused to ascend in said discharge leg when acted upon by the vacuum necessary for the transmission.

6. In a vacuum pumping apparatus, a transmission line comprising a suction leg and a discharge leg alined so as to form a continuous transmission, said discharge leg having a hermetically sealed discharge end, an air exhauster by-passed from said discharge leg at a point substantially above the level to which the liquid material may be caused to ascend in said discharge leg when acted upon by the vacuum necessary for the transmission.

GUNNAR C. ENGSTRAND.