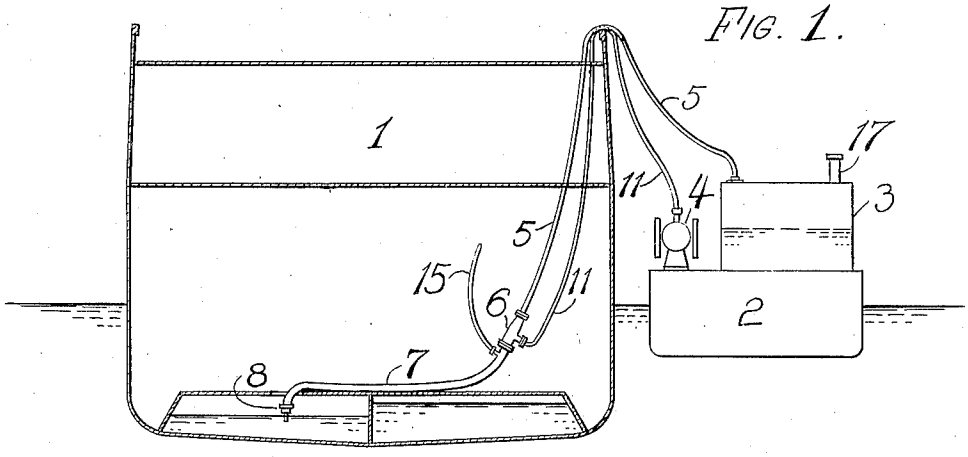
May 14, 1929. G. C. ENGSTRAND 1,712,694

PUMPING APPARATUS

Filed Feb. 12, 1924

FIG. 1.



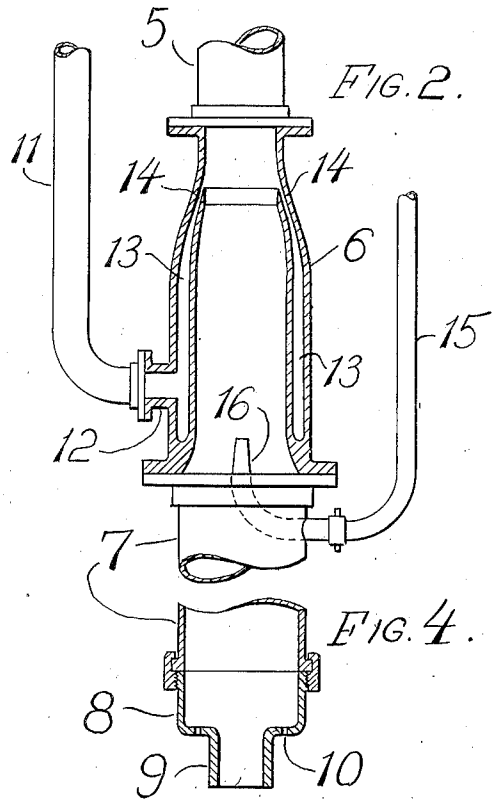


FIG. 2.

FIG. 4.

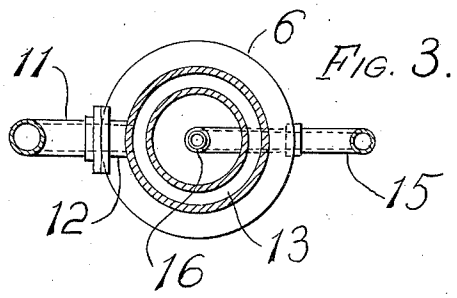


FIG. 3.

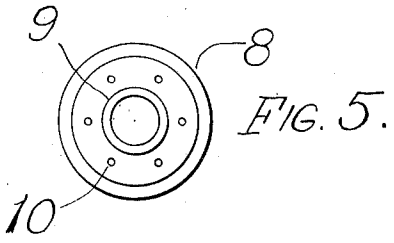


FIG. 5.

WITNESSES

Chas. A. G. Armstrong

Chas. J. Pearson

Inventor

Gunnar C. Engstrand

Patented May 14, 1929. 1,712,694

UNITED STATES PATENT OFFICE.

GUNNAR C. ENGSTRAND, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SALVAGE PROCESS CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PUMPING APPARATUS.

Application filed February 12, 1924. Serial No. 692,291.

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 can not be pumped either in a solid column or in an aerated one, but it has to be transmitted in a high velocity air stream in a broken up condition.

My invention has for its object to divide the air transmission line into two parts of different cross sections viz, a vacuum transmission intake line and a compression transmission discharge line, which is of a smaller diameter than the intake line.

My invention has also for its object to furnish an air ejector which draws the air from the vacuum intake line to afterwards discharge it as well as the propelling air into the reduced pressure discharge line.

My invention has for a further object to break up the viscous material at its entrance into the vacuum intake line into suitable fragments to be carried away by the air stream set up by the ejector.

My invention has also for an object to furnish a jet of steam at the entrance of the pressure discharge line to overcome the cooling effect of the expanding compressed air and to boost the discharge.

In the drawing:—

Figure 1 shows the general pumping arrangement.

Figures 2 and 3 show the detail construction of the ejector.

Figures 4 and 5 show the detail construction of the suction nozzle.

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 a barge 2 is moored and an oil storage tank 3 as well as an air compressor 4 are located on the deck of the barge 2.

The air compressor 4 is connected to the air pressure line 11 which feeds the ejector 6.

The vacuum line 7 and the discharge line 5 are connected to the ejector and form together the air transmission line which empties into the storage tank 3.

The vacuum line 7 has an intake nozzle 8 which is supplied with a reduced neck 9 to be inserted into the material to be pumped and a number of small holes 10 through which atmospheric air is admitted.

The air hose 11 is attached to a side intake 12 of the ejector 6 which intake leads to the annular chamber 13 from which the compressed air will discharge at a great velocity into the pressure line 5 through the reduced annular nozzle 14.

A steam hose 15 ending in a reducing nozzle 16 is connected to some convenient steam supply.

A vent 17 is located on the storage tank 3 from which tank the pumped material may be extracted in a convenient manner. During the pumping, the air ejector 6 acting together with the steam jet 16 creates a vacuum in the line 7 which vacuum is sufficient to draw up a restricted quantity of viscous material through the restricted neck 9.

This vacuum is also sufficient to draw in the atmospheric air through the air holes 10 with a sufficient velocity to break up the viscous material into fragments which can be carried away first by the attenuated air stream in the suction line 7 and afterwards over the ship side in the compressed air stream in the pressure line 5.

The compressed air furnished by the compressor 4 is the main propelling agent, the main object of the steam which emits from nozzle 16 being to prevent an excessive cooling of the discharged air with accompanying decrease of air velocity and viscosity increase of the viscous material.

The discharge air line is made considerably smaller than the vacuum air line in order to keep up the necessary air stream velocity required for transmission without unduly increasing the air compressor.

The discharged compressed air also serves together with the steam to still further break up the viscous material.

It is to be noted that the steam is admitted at the end of the pressure line in order not to reduce the existing vacuum in the line 7.

It is also to be noted that a perfect ventilation of the ship's tanks is effected by the ejector as the withdrawn air and vapor must of necessity be replaced by fresh air.

I do not wish to be understood to limit myself to the pumping of fuel oil from ships.

I claim:—

1. Apparatus for transmitting viscous material, comprising a pipe line, means permitting air to mix with and break up the viscous material into fragments as it enters the pipe, means for introducing a stream of compressed air into the line in the direction of flow to draw in the material, to discharge it under pressure and to further break it up as it comes in contact therewith, and means for heating the material just prior to its contact with the stream of compressed air.

2. Apparatus for transmitting viscous material, comprising a pipe line, means permitting air to mix with and break up the viscous material into fragments as it enters the pipe, and means for introducing a stream of compressed air into the line in the direction of flow to draw in the material, to discharge it under pressure, and to further break it up as it comes in contact therewith, and a steam jet for heating the material just prior to its contact with the stream of compressed air and to assist the drawing action of the air stream.

3. Apparatus for transmitting viscous material, comprising a pipe line, an inlet nozzle at one end thereof, air holes around said nozzle, means intermediate the end of the pipe line to introduce a stream of compressed air thereinto in the direction of flow of the material toward the discharge end of the pipe, the pipe from the point of introduction of the compressed air to the discharge end being reduced in diameter, and means for introducing a jet of steam into the pipe line in the direction of flow of the material at a point just prior to the introduction of the compressed air.

GUNNAR C. ENGSTRAND.