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March 24, 1925. 1,530,647

A. R. CARLYLE

SYSTEM FOR TRANSPORTATION OF LIQUID

Filed Feb. 2, 1921

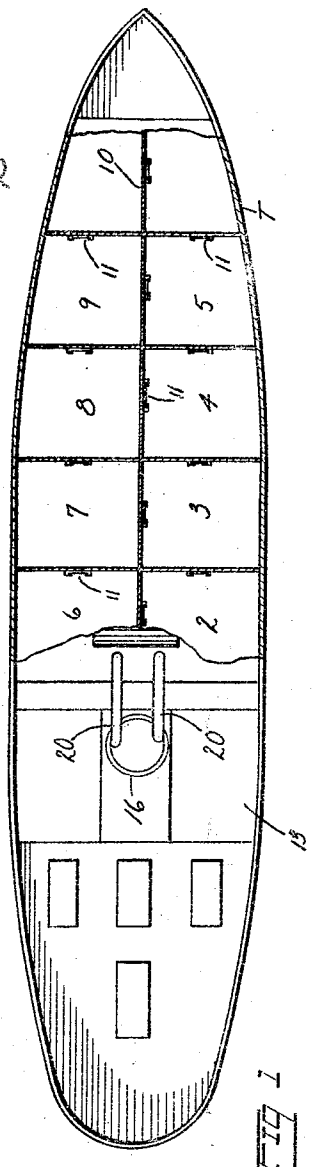


Fig 1

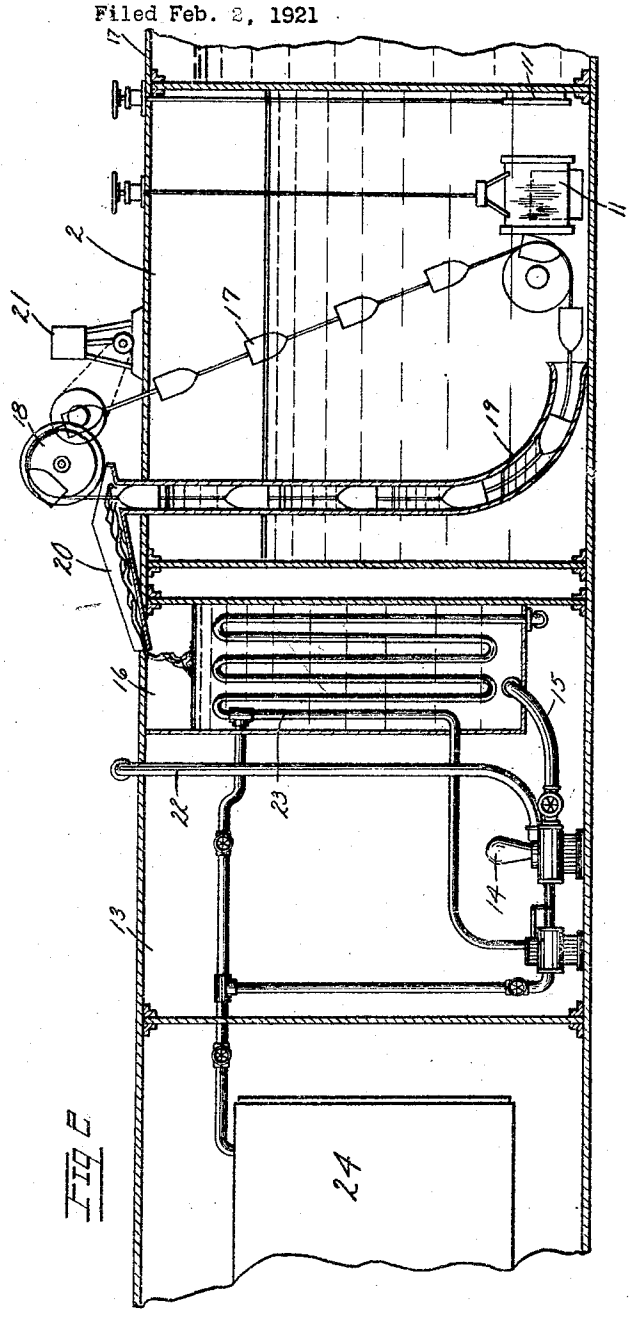


Fig 2

WITNESS
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his ATTORNEYS

137. Water Distribution.
Mains and Pipes Systems.

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Patented Mar. 24, 1925.

1,530,647

UNITED STATES PATENT OFFICE.

ARTHUR R. CARLYLE, OF LOS ANGELES, CALIFORNIA.

SYSTEM FOR TRANSPORTATION OF LIQUID.

Application filed February 2, 1921. Serial No. 441,802.

To all whom it may concern:

Be it known that I, ARTHUR R. CARLYLE, a citizen of the United States, and a resident of Los Angeles, Los Angeles County, and State of California, have invented a certain new and useful System for Transportation of Liquid, of which the following is a specification.

The invention relates to a system of transporting thick, viscous liquids, such as crude oil or heavy lubricating oil, from tanks, such as the tanks in an oil carrying steamship or tanker. Many oils and oil products are so thick and viscous that they cannot be discharged practically from a tanker, through a pipe line, by means of force pumps and must be heated to reduce their viscosity before they can be pumped. The present practice comprises fitting the tanks of the tank vessel with heating coils, through which steam is passed to heat the oil in the tanks. This system of heating the cargo oil is very inefficient due to the large amount of radiation and conduction of heat to the water in which the vessel is floating, and with some very thick crude oils, the system is not productive of practical results.

An object of my invention, therefore, is to provide an improved system for transporting liquids which at normal temperature are of such viscosity that they cannot be practically transported through pipe lines by means of a force pump.

Further, as the oil is withdrawn from the cargo tanks of the vessel, the head of oil in the tanks gradually falls, reducing the head on the suction side of the pump so that the amount of oil pumped per unit of time, gradually decreases as the pumping operation continues. It is a further object of my invention to provide a system of transporting oil or other thick liquid, in which the head on the intake side of the pump is maintained substantially constant, so that the pumps discharge the liquid at a uniform rate, regardless of the fall in the level of the liquid in the storage tanks. Besides accomplishing these savings in heat and time, the system of my invention materially reduces the cost of the tank steamer, by eliminating the heating coils which are now employed for heating the whole bulk of the oil in the cargo tanks of the vessel.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be made manifest in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood that it is not intended to limit the invention to the embodiment shown by the said drawings and description, as variations may be adopted within the scope of the invention as set forth in the claims.

Referring to the drawings:

Fig. 1 is a plan view of a "tanker" or tank vessel for carrying liquid cargoes and showing a form of apparatus by which the present system may be practiced.

Fig. 2 is a vertical section longitudinally of the hull of the vessel showing a form of apparatus for transferring the liquid from the tanker hull to an intermediate receiver leading to a force pump.

The common method now generally practiced for unloading liquid cargoes contained in bulk in compartments, or tank chambers of an oil carrying vessel, necessitates the drawing of liquid from the different compartments of the hull by a pump or pumps having suction connections with the several compartments and as the volume of oil in each compartment gradually falls while pumping there is a gradual and constant reduction of head on the suction side of the pump, which obviously materially varies the rate of discharge from the pump.

By the present invention it is preferred that the hull of the vessel be divided into tanks or compartments, the bulk-head walls of which have suitable valves, or gates adjacent the bottom of the tank, so that the gates all may be concurrently open to permit the uniform lowering of the level of the bulk of liquid in all of the tanks, and facilitating keeping the vessel on an even keel.

In the system of this invention the pumps, instead of drawing the bulk liquid from the individual compartments of the tanker, draw the oil or other liquid from an intermediate receiver in which the liquid is maintained at a constant head by any suitable means operating to transfer the liquid from the hull tanks.

Instead of utilizing the great quantity of heat necessary ordinarily to heat a bulk of liquid in the several compartments of the vessel or container, as the case may be, in the present system the liquid is heated in in-

termediate receiver which is preferably directly connected to the pump or pumps.

There is a direct two-fold advantage obtained by this method; first, it maintains a constant head of liquid at the suction side of the pump, thus insuring a uniform rate of discharge by the pump and, secondly, by heating the liquid to reduce its viscosity immediately preceding its passage through the pump, the liquid is at its highest temperature as it enters the pump.

Various apparatus may be utilized for the practice of the present method and, in the accompanying drawings, the system is shown as utilized in the unloading of a cargo of oil from a tanker, the hull of which is divided into a number of compartments or individual tanks as, for instance, 2, 3, 4, 5, etc.; some of the tanks being shown as separated by the longitudinal bulk head 10. In the lower portion of the bulk-head wall separating each of the tanks from the other, there is arranged a suitable valve or gate 11, that may be operated by a device which may be extended to the deck 12. When all of the gates or valves 11 are opened then the bulk liquid will assume a uniform level throughout the tanker chambers, and as the liquid is drawn from any one of the chambers the level of the entire bulk uniformly lowers.

In the pump room 13, preferably arranged immediately adjacent the aft cargo tanks, there is provided a pump or set of pumps 14, having an inlet pipe 15 connected to the lower end of an intermediate receiver 16, that may be conveniently arranged in the pump room. The receiver is preferably arranged in a position above the suction side of the pump and a substantially constant level or charge of liquid is maintained in the receiver 16 by the transference of the liquid, for instance oil, from the tanker chambers or compartments by any suitable means.

As all of the tanks or compartments of the hull may be placed in intercommunication for the free flow of oil, any suitable transferring apparatus may be placed in one of the tanks, as 2, contiguous to the pump room 13, for transferring the liquid from the hull to the receiver 16. A simple, practicable, efficient and suitable form of apparatus for transferring the oil to the receiver 16 is shown as comprising a mechanical elevator including a chain of members 17 passing successively around suitable guide pulleys 18, and entering the bottom of an elevator tube 19 having a mouth opening into the bottom of the tank or compartment 2; liquid being entrapped between the consecutive elevator members 17 and carried upwardly in the tube 19, ultimately discharging into a head trough 20, from which the liquid flows into the top of the receiver 16. The elevator mechanism just described may be driven by any suitable means, as for instance, a small steam engine 21 on deck 12.

Not only is the liquid or oil maintained at a constant level in the intermediate receiver 16, but it is heated in the receiver to reduce its viscosity, thus facilitating its transportation by pumping through the pump and the discharge line which may be connected to the discharge pipe 22 of the pump. For this purpose, suitable heating apparatus, as for instance, coils 23, are arranged in the receiver 16 so that when a heating medium, such as steam, is turned into heating coils, the liquid in the receiver will become heated to the necessary degree at a small expense as compared to the common practice of heating the entire bulk of oil in the main hull or container. The steam for heating the oil in the receiver is preferably the exhaust steam from the pump 14 which may be supplemented when desired by steam drawn directly from the boiler 24. The heavy oil, which is too thick to be practically pumped, or too thick to be pumped at all, is thus mechanically raised from the cargo tanks and discharged into the receiver, where it is heated immediately prior to its entry into the pump, so that it enters the pump at its maximum fluidity. Thus, a small, flowing body of the oil is heated, immediately prior to its entry into the pump.

It is understood that the present system is equally useful at "tank farms" and in other plants in which it is desirable not only to transport oil by the pumping system, but where it may be desirable to transport various other normally thick liquids from place to place through pumping means.

As is well known, as the last portion of a cargo of oil is pumped from a vessel into distributing pipe lines, salt or fresh water is then admitted to the pumps and the water is driven through the pipe lines behind the oil to a point of discharge at which there may be located a small test cock to indicate the moment at which the water reaches the discharge end of the system, whereupon the pumping operation is terminated. In this manner the pipes are freed of oil, which on cooling might obstruct them.

I claim:

1. The method of discharging oil which is too thick to be pumped from the cargo tanks of a tank steamer, which comprises mechanically conveying the oil from the cargo tanks to a receiver, heating the oil in the receiver and pumping the heated oil from the receiver through a discharge conduit.

2. The combination with a storage tank adapted to contain liquid which cannot be pumped advantageously at normal tempera-

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tures, of a receiving tank arranged adjacent the storage tank, a mechanical elevator for raising the liquid from the storage tank and discharging it into the receiving tank, means in the receiving tank for heating the liquid therein and a pump connected on its intake side to said receiving tank.

3. The combination with a tank vessel having cargo tanks for the storage of oil, of a pump room adjoining said tanks, a receiving tank in said pump room, means for conveying oil from the cargo tanks to the receiving tank, means in said receiving tank for heating the oil therein and a pump connected at its intake side to said receiving tank.

In testimony whereof, I have hereunto set my hand.

ARTHUR R. CARLYLE.