May 6, 1924. **1,492,742**

H. H. NORTON ET AL

SYSTEM FOR HANDLING VISCOUS FLUIDS

Filed Nov. 22, 1922

Fig. 1.

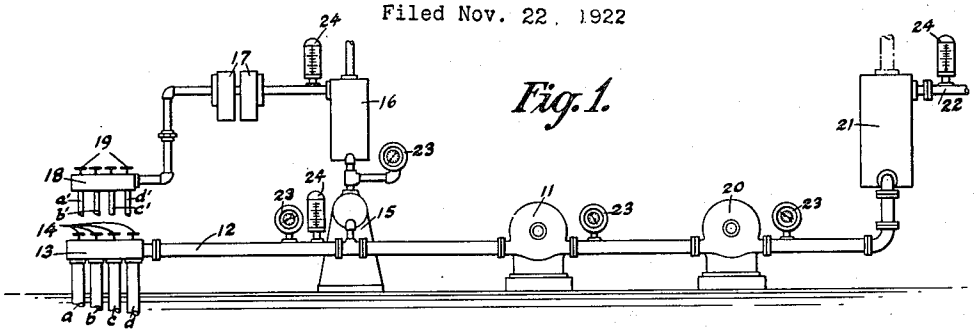


Fig. 2.

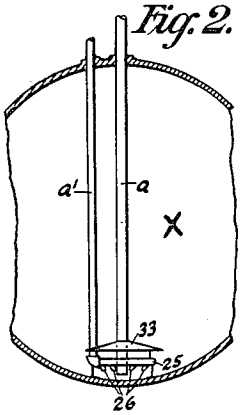


Fig. 3.

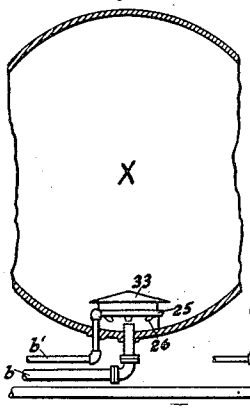


Fig. 4.

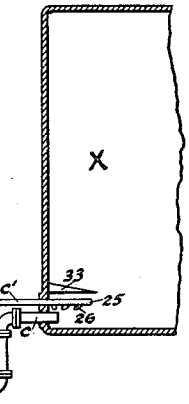


Fig. 5.

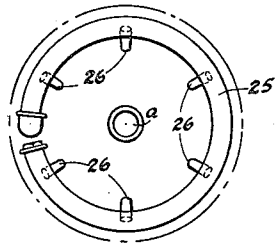
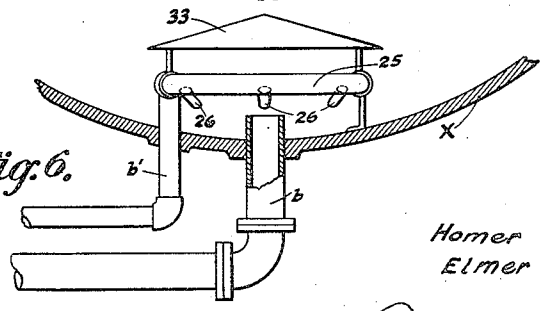


Fig. 6.



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UNITED STATES PATENT OFFICE.

HOMER H. NORTON AND ELMER E. HOBBS, OF PHILADELPHIA, PENNSYLVANIA.

SYSTEM FOR HANDLING VISCOUS FLUIDS.

Application filed November 22, 1922. Serial No. 602,632.

To all whom it may concern:

Be it known that we, HOMER H. NORTON and ELMER E. HOBBS, citizens of the United States of America, and both residing at Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in a System for Handling Viscous Fluids, of which the following is a specification.

Our invention relates broadly to a means for withdrawing viscous fluids from reservoirs and more particularly to a preheating arrangement whereby the viscosity of said fluid is reduced to permit flow.

An object of our invention is to provide a means for reducing the consistency of a non-flowing fluid to that of a flowing fluid.

Another object is to arrange said means within the fluid reservoir so that heating of the fluid may be concentrated at the suction outlet of the reservoir.

A further object is to superheat a portion of the fluid withdrawn from the reservoir and inject it back into the reservoir for heating the viscous fluid adjacent the reservoir suction outlet.

With the above and other objects in view the invention consists in the construction, combination and arrangement of parts as will be hereinafter more fully described.

Reference is to be had to the accompanying drawings forming part of this specification, in which like reference characters indicate corresponding parts throughout the several views, and in which:

Figure 1 shows the pumping and heating arrangements,

Fig. 2 is a sectional view of a reservoir with withdrawal of fluid through the top thereof,

Fig. 3 is a similar view with withdrawal through the bottom,

Fig. 4 is a similar view with withdrawal through the side,

Fig. 5 is a plan view of the heater nozzle ring,

Fig. 6 is an enlarged view of the heating and outlet arrangement of Fig. 3.

By placing a nozzle or system of nozzles at or near an outlet of a reservoir containing a viscous fluid, which fluid may be difficult to move because of its high viscosity, and by introducing a heated fluid, which may or may not be of a composition similar to that of the main body of fluid in the reservoir, under pressure through the nozzle or system of nozzles, the viscosity of the fluid in the vicinity of the outlet is quickly reduced and by ejecting the heated or less viscous fluid in the direction of the outlet of the reservoir, the jet action resulting therefrom tends to maintain a steady flow of the reservoir contents towards the outlet.

Referring more particularly to Figure 1 of the drawings, 11 is a suction pump for withdrawing the fluid from a reservoir through a conduit 12 which connects to a manifold 13 from which suction pipes *a*, *b*, *c* and *d* lead to respective reservoirs. Fluid may be drawn through any desired pipe through control given by manifold valves 14. As any desired type of valve may be employed it is not thought necessary to more than indicate the same, and it will also be understood that while we have illustrated four suction pipes, either a less or greater number may be used. Located between the pump 11 and manifold 13 there is a fluid circulating pump 15 which draws fluid from the conduit 12 and forces it under pressure through a heater 16, which may be of any desired type, thence through filters 17 to a manifold 18, from which pipes *a'*, *b'*, *c'* and *d'* lead to respective reservoirs, corresponding to pipes *a*, *b*, *c*, and *d*. Valves 19, similar to valves 14, open and close any desired passage. The construction of filters 17 forms no part of this invention. In series with and on the side opposite the fluid circulating pump there is a service pump 20 which forces the fluid through a second heater 21 and thence to the burner system (not shown) through pipe 22. Pressure gauges 23 and thermometers 24 are conveniently located throughout the system. The description in this paragraph illustrates the use of this system in connection with the burning of heavy fuel oils.

In Figs. 2, 3 and 4 we show a number of different types of reservoirs X, all of which, if desired, may be connected to the pumping system, or a number of any one type may be connected. In the first of these figures the withdrawal of the fluid is from the bottom through the top of the reservoir. Pipe *a* coming from the manifold 13 extends to within a short distance of the bottom of the reservoir and is surrounded by a nozzle ring 25, shown more in detail in Fig. 5, connected to the superheated fluid pipe *a'* leading from manifold 18. A plurality of nozzles 26 are so connected to the ring 25 that they

are inclined towards the mouth of pipe *a*, resulting in a jet action. Fig. 3 shows a method of withdrawing the fluid through the bottom of the reservoir, the details of the the nozzles and ring being similar to those of Fig. 2, as may be seen from the enlarged detail view, Fig. 6, while in Fig. 4 the withdrawal is made through the side of the reservoir. In some instances the necessary location of the reservoirs may prevent the suction and superheated fluid pipes from extending through the top, making it necessary to carry them through the side or bottom of the reservoir, and further, if more than one reservoir is used, it may be necessary to so place them that it becomes necessary to use two or more types of withdrawal.

In operation: Suction pump 11 withdraws fluid from reservoir X through pipe *a*, manifold 13 and conduit 12, then pump 15 is cut in extracting a portion of the fluid from conduit 12 and forcing it through heater 16, where it is heated to the desired temperature and discharged under suitable pressure through manifold 18 and pipe *a'* to the system of nozzles 26 which are directed towards the suction outlet of the reservoir from which the fluid is being pumped. This superheated fluid dissipates its heat to the colder fluid with which it comes in contact, thus causing a reduction in the viscosity of the fluid in the vicinity of the outlet and the jet action caused by discharging the fluid under pressure in the general direction of the outlet tends to maintain a steady flow of the heated fluid in the reservoir towards the outlet. The heated fluid has a tendency to rise and collect near the surface because of its lesser density, and to prevent this upward movement of the heated fluid, a hood 33 is placed above the suction point of the outlet pipe. Pump 20 passes the less dense fluid through the heater 21 where it is further heated before passing through the line 22 to the burners in a fuel oil burner system.

In starting up a system of this kind from a cold condition the fluid remaining from the last operation in heater 16 can be heated and with pump 15 forced against the cold fluid in the piping *a'*. If this piping is not made too small the heated fluid will gradually trickle through the piping and arrive in the reservoir from which fluid is desired and thus slowily bring the system into operative condition. Or if a parallel system is in operation, heated fluid from the operating system can be introduced into the cold system through manifolds 13 and 18 until the cold system is brought into operation.

Our invention possesses the advantage of heat economy over present systems of heating whole reservoirs of viscous fluid with steam coils or recirculated heated fluid where much heat is lost from the great body of heated fluid before it is finally pumped out. The local application of heat permits its useful employment so fast as the fluid is needed. The jet action also permits of usefully employing some of the energy being consumed by the pump. Saving in cost of installation results, as elaborate piping and heating coils in reservoirs are not necessary.

Having fully described our invention what we desire to obtain by Letters Patent is:

1. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for withdrawing the contents thereof through said outlet, means for extracting a portion of said withdrawn contents, means for heating said portion only, and means for returning said heated portion to the vicinity of said outlet.

2. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for withdrawing the contents thereof through said outlet, means for heating said withdrawn contents, means for returning heated fluid to the vicinity of said outlet, and means delivering said fluid in said vicinity in the form of a plurality of jets directed towards and surrounding said outlet.

3. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for delivering hot fluid into the body of said viscous fluid in the vicinity of said outlet, and means obstructing the rise of the resulting heated mixture from said vicinity.

4. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for delivering hot fluid into the body of said viscous fluid in the vicinity of said outlet, and a baffle covering said vicinity.

5. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for delivering hot fluid into the body of said viscous fluid in the vicinity of said outlet, and a cone-shaped baffle covering said vicinity.

6. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, and means for delivering hot fluid into the body of said viscous fluid including a series of nozzles directed towards and surrounding said outlet.

7. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for withdrawing said fluid through said outlet, means for separating the withdrawn fluid into two portions, means for heating one portion independently of the other, and means for returning said heated portion to the vicinity of said outlet.

8. In a system for handling viscous fluid, a reservoir for said fluid, an outlet therein, means for withdrawing said fluid through said outlet, a heater, a pump for extracting a

portion of said withdrawn fluid and forcing said portion through said heater to the exclusion of the main body of said withdrawn fluid, and returning said portion after heating under pressure independent of the pressure of said main body to the vicinity of said outlet.

9. In a system for handling viscous fluid, the method of rendering mobile congealed fluid of storage tanks which comprises forcing heated fluid into the tanks at high velocity in direct contact with the congealed fluid to render mobile a portion of the latter, removing the mobile mixture thus obtained, separating the removed mixture into two portions, heating one of said portions and returning it to the storage tank to render mobile a further amount of the congealed fluid.

10. In a system for handling viscous fluids, the method of progressively rendering mobile congealed fluid of storage tanks which comprises forcing heated fluid into the tanks in direct contact with the congealed fluid to render mobile a portion of the latter, obstructing upward movement of the mobile mixture thus obtained, forcibly removing the mixture, heating a portion of the mixture and returning it to the storage tank to render mobile a further amount of congealed fluid.

11. In a system for handling viscous fluids, the method of progressively rendering mobile and removing congealed fluid of storage tanks which comprises continuously forcing heated fluid into the tank at the point of removal to render mobile the congealed fluid, preventing the escape of the mobile fluid from the point of removal, and forcibly removing the mixture at the rate it becomes mobile.

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