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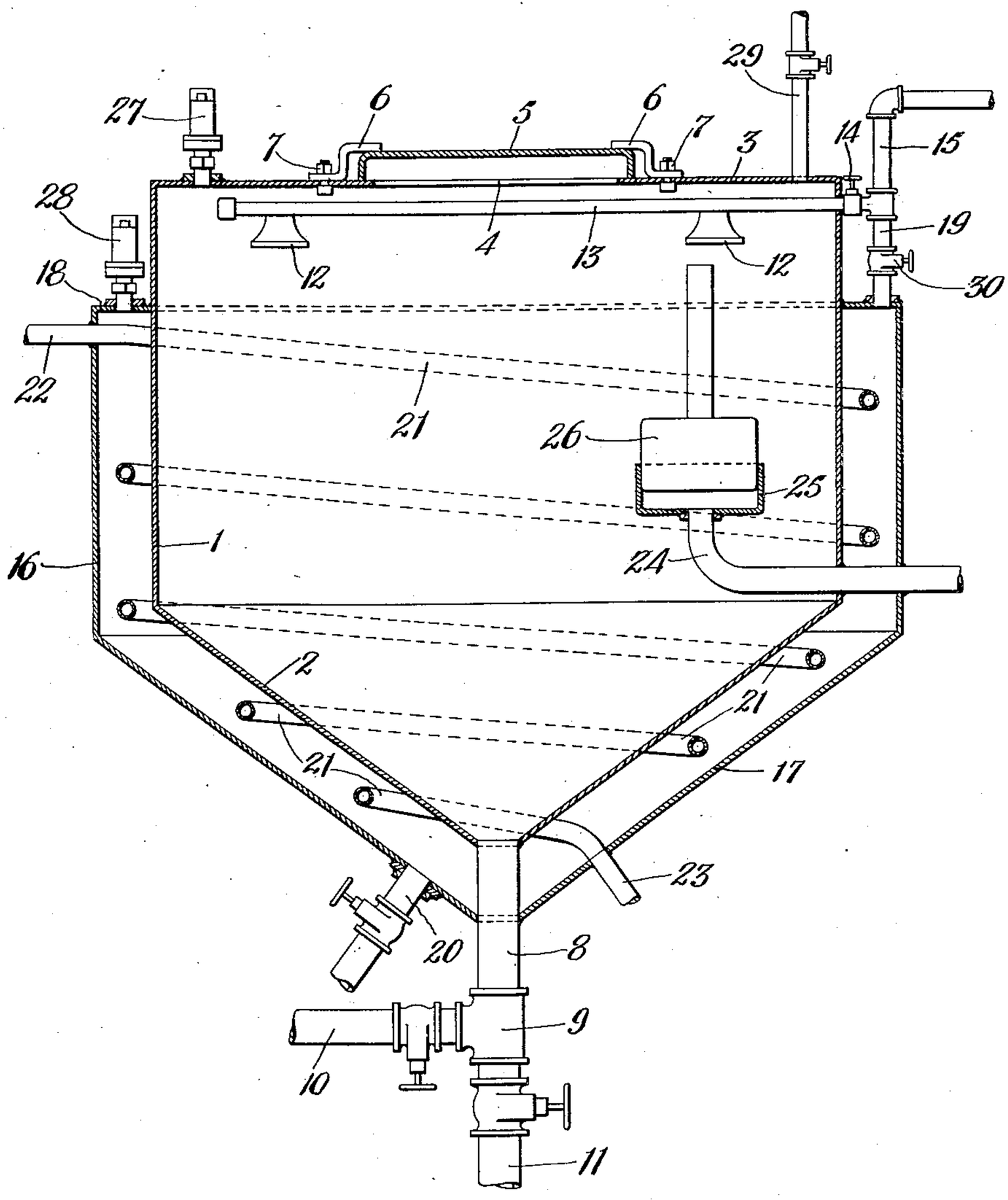

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UNITED STATES PATENT OFFICE

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RECLAMATION OF LUBRICATING OILS

Application filed April 30, 1927. Serial No. 187,991.

This invention relates to a method of and apparatus for reclaiming mineral lubricating oils, particularly to certain steps of a process for chemically breaking water in oil emulsions and for chemically counteracting colloidal conditions in which lubricating oils are often found after they have been in service for a while.

According to the method and apparatus disclosed in my copending application Serial No. 74,949, filed December 12, 1925, of which this application is in part a continuation, I counteract the colloidal condition and break down the emulsion which the oil receives in service by mixing the oil preferably with a solution of caustic soda, or some other like chemical, and by heating the mixture in a water jacketed tank.

The object of the present application is to add certain steps to the process carried out in the "treating tank" disclosed in my application, Serial No. 74,949 and thereby render the method and apparatus disclosed in my application above referred to capable of more efficient and expeditious operation.

The specific objects and advantages will be clear to those skilled in the art from the following description and the appended drawing which shows in vertical cross section a treating tank suitable for accomplishing the objects.

Referring now to the drawing, the reference numeral 1 indicates the treating tank which has a conical bottom 2 and a flat top 3. An opening 4 in the top of the tank is provided with a cover 5 which may be tightly secured in place by the brackets 6 and the bolts 7.

A pipe 8 enters the tank 1 at the apex of the cone at its bottom and communicates with a fitting 9 which has suitable valved connections 10 and 11 for oil inlet and drain, respectively. Adjacent the top of the tank are a number of spray nozzles 12 which are provided with a connection 13 and a valve 14 for admitting water from the water supply connection 15.

A pipe 29 is provided on the tank 1 for introducing air under pressure.

A jacket 16 surrounds the tank 1 and has a bottom 17 conically shaped to correspond with the cone at the bottom of the tank 1. The top of the jacket is closed by an annular cover 18.

Water may be admitted to the jacket 16 from the supply connection 15 through connection 19 and valve 30 and may be drained from the jacket through the pipe 20.

A spiral steam coil 21 is positioned within the jacket and has an inlet 22 and an outlet 23.

The tank 1 is provided with an oil drain 24 which has a bell mouth 25 adapted to receive the stopper 26.

Safety valves 27 and 28 are provided on the tank 1 and the jacket 16, respectively, to safeguard the apparatus in case the pressures should rise abnormally.

The oils which my apparatus and method are adapted to treat are mineral lubricating oils which normally are unfit for further service. They constitute a liquid of a black viscous nature in some degree of emulsion, which may contain water, colloidal dirt, heavy extraneous solids such as particles of metal and silicates, finely divided fibrous material, dye stuffs from the fibrous material and metallic soaps, such, for example, as "lead oleate". One or more of these foreign substances may have been entrained and/or absorbed by the oil according to the nature of the service in which the oil had been used.

In order to recondition oil which may contain any or all of the foreign substances above noted it is necessary to provide a method which will counteract the colloidal condition, break the emulsion, decompose organic matter absorbed from the fibrous material and neutralize any acids present. The method of the present application, as well as that of my application Serial No. 74,949, makes provision for all of these functions but does not provide for the removal of metallic soaps which may be present, as it is desirable that these be retained in oil which is to be used for certain classes of service.

I accomplish the foregoing by the use of some alkaline chemical, such, for example, as caustic soda (NaOH) or caustic potash (KOH). I prefer to use 76% commercial

caustic soda of the flake variety, its characteristics being better adapted for handling, as it is readily soluble and practically dustless.

The operation is as follows:

A solution of caustic soda and water is placed in the tank 1 through the opening 4 and the oil to be treated is passed upwardly through this solution, mixing thoroughly therewith.

The jacket 16 is filled with water from the supply connection 15 and steam at a pressure of about 15 lbs. per square inch is circulated through the heating coil 21. It is to be understood that the pipe 15 communicates with a water supply tank which is subject to atmospheric pressure and while the temperature of the oil and the water in the jacket is being raised the valve 30 remains open thus limiting the temperature rise to approximately 212° F.

At this point the tank 1 is sealed by securing the cover 5 over the opening 4. The valve 30 is now closed and water is drained from the jacket through the pipe 20 until approximately one full turn of the heating coil 21 is exposed. This causes a rise in temperature of the water in the jacket to about 240° F. and, of course, a corresponding rise in the temperature of the oil, as the pressure will be raised in both the jacket and the tank, which are now sealed closed.

Air is now forced into the tank through the pipe 29 till the pressure in the tank above the surface of the oil is raised to about 10 or 15 lbs. per square inch over and above that which would be developed by the sealing and heating of the tank.

The conditions as above outlined are maintained until a sufficient time has elapsed for the chemical to counteract the colloidal condition and break the emulsion of the oil and effect neutralization of any acids present as well as decomposition of organic matter. The normal time necessary for these reactions is about 3 or 4 hours, but this depends, of course, on the condition of the oil. The steam is then cut off and the tank and jacket are allowed to cool, the superimposed air pressure in the tank still being maintained. During the cooling, the mixture in the tank subsides and its constituents separate into various layers in the tank according to their specific gravities. The heavy solids will settle to the bottom, above which will be found the chemical solution with large quantities of extraneous matter absorbed and entrained from the oil and the clear oil will be found above the chemical.

It is to be noted that the pressure which is built up in the tank 1 performs an important function in reducing the agitation of the mixture which would be produced at a temperature of about 240° F.; and the maintaining of this pressure during cooling greatly augments subsidence. The reason for this being that liquids, such as those which constitute the mixture in the tank, will separate much more quickly if they are in a relatively fluid state than if they are in a relatively viscous state, as would be the case if the mass were relatively cool. In order to render the mixture more fluid I raise its temperature to a point well above bubbling or ebullition and then impose a pressure on the surface of the mixture which greatly reduces the bubbling thus allowing the mixture to subside and separate at a higher temperature and in a more fluid state and, consequently, in a shorter period of time.

I also provide for additionally augmenting subsidence of the mixture by terminating the jacket 16 a substantial distance from the top of the tank 1. This allows a thin layer of the oil at the top of the tank to cool more quickly than the body of oil. This layer, being cooler than the body, is more viscous and tends to increase the surface tension of the mixture and thereby reduce bubbling and agitation at the surface with the result that subsidence and separation is further expedited.

After separation has been completed the pressure in the tank is relieved by removing the lid 5. The water jacket is again filled with water and the temperature of the jacket and tank is raised to about 210° F., or just below the boiling point of water. Clear hot water is now sprayed on the surface of the oil from the nozzles 12. This water passes downwardly through the oil, washing traces of treating chemical from the oil, and interposes itself between the clear oil at the top and the chemical solution below.

The stopper 26 is now removed from the bell 25 and the clean oil is drawn off to a point of storage or use, or may be delivered to some suitable apparatus, such as disclosed in my application Serial No. 74,949, for dehydration.

The used chemicals and water are drained from the tank through the outlet 11 and the apparatus is ready to treat another batch.

I claim:—

1. In the art of renovating used mineral lubricating oil, the steps which include mixing the oil with a chemical treating solution, heating the mixture in a sealed container to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., and raising the pressure in the container above that which would normally be produced by the heating and sufficiently to reduce ebullition.

2. In the art of renovating used mineral lubricating oil, the steps which include treating the oil by heating it in a sealed container in the presence of a chemical treating solution to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., raising

the pressure in the container to a point above that which would normally be produced by the heating and sufficiently to reduce ebullition, and then stopping the heating and maintaining the pressure during cooling.

3. In the art of renovating used mineral lubricating oil by mixing the oil with a chemical treating solution and heating the mixture to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., the steps of augmenting subsidence of the mixture by cooling the mixture, first in the upper portion thereof, and by maintaining a superimposed air pressure on the surface of the mixture during cooling.

4. In the art of renovating used mineral lubricating oil, the steps which include mixing the oil with a chemical treating solution, heating the mixture to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., and reducing such ebullition by superimposing air pressure on the surface of the oil.

5. In the art of renovating used mineral lubricating oil, the steps which include mixing the oil with a chemical treating solution, heating the mixture to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., reducing such ebullition by superimposing air pressure on the surface of the mixture, and allowing the mixture to cool while maintaining the pressure.

6. In the art of renovating used mineral lubricating oil, the steps which include mixing the oil with a chemical treating solution, heating the mixture in a sealed container to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., raising the pressure in the container above that which would normally be produced by the heating and sufficiently to reduce ebullition, and at least partially maintaining the raised pressure during subsidence.

7. In the art of renovating used mineral lubricating oil by mixing the oil with a chemical treating solution and heating the mixture to a temperature above that which would normally cause ebullition thereof and preferably in the neighborhood of 240° F., the step of augmenting subsidence by maintaining a superimposed air pressure on the surface of the mixture during subsidence.

In testimony whereof I have hereunto signed my name.

LEONARD D. GRISBAUM.