

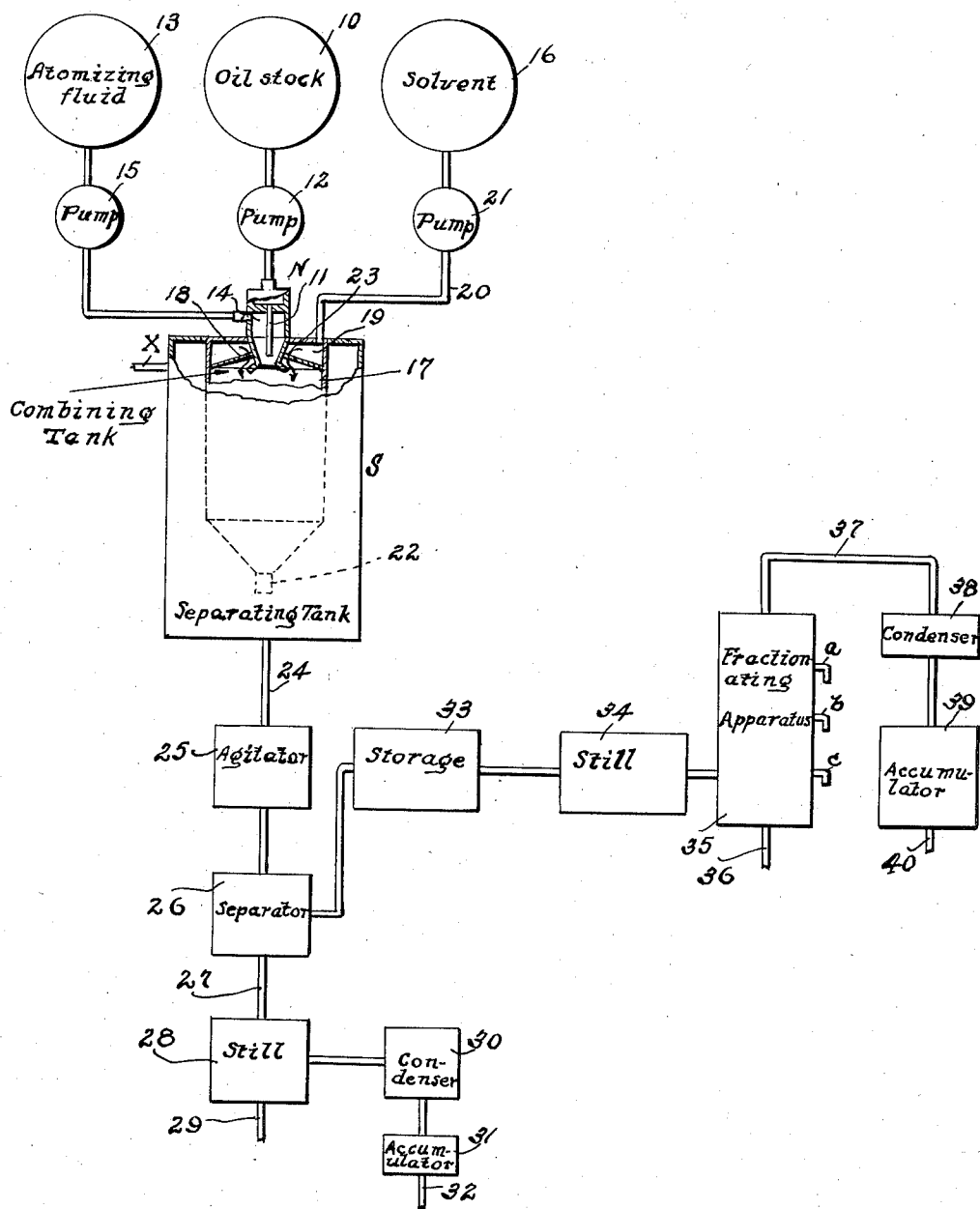
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PROCESS OF TREATING LUBRICATING OIL

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PROCESS OF TREATING LUBRICATING OIL

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This invention is a process of separating lubricating oil stocks from the waxes and asphalts or other detrimental constituents which are normally inherent thereto, and which will be hereinafter designated by the general term "waxes".

One of the objects of the invention is to economically and efficiently accomplish a complete separation of the oil and the waxes, and a maximum recovery of both. A further object is to effect an initial separation of the waxes from the oils and to subsequently purify the separated wax of any oil constituents which may be retained by the separated wax particles. A further object is to provide for the fractionation of the residual oil remaining after separation of the wax from the original stock.

The process of the present invention is particularly useful when the stock to be treated carries a large percentage of amorphous wax, but is also useful when a crystalline wax is present.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawing:—

The figure is a diagrammatic view illustrating an apparatus for carrying out the steps of the process, with parts shown in section.

The process here involved contemplates the solidifying of the wax content, or a mixture of wax and lubricating stock while in an atomized condition. This effect is produced by bringing the atomized constituents of the stock being treated into contact with a cooling medium during the atomizing stage, and in such manner as to chill or freeze each minute particle of wax to an impalpable solid or semi-solid state.

The atomizing and cooling or chilling medium may be air, or a gas, or it may be a substance which under normal atmospheric conditions is a gas, but that is liquefied under pressure. The primary essential is that it must be capable of effecting the atomizing of the mixture, the cooling, chilling, freezing, or solidifying of the atomized particles due to the release of pressure and the temperature drop caused thereby, or due to its own temperature, substantially at the moment of contact with the lubricating stock.

Referring to the drawing, 10 designates a tank for containing a supply of the stock to be treated, which is connected by a suitable conduit with the central bore 11 of an atomizing nozzle or conveyor N. A pump 12 is interposed between the tank and the nozzle, so as to insure a positive feed of the stock to the nozzle at any predetermined pressure, obtained by controlling the speed of the pump in a well known manner. Located in the

vicinity of tank 10 is a second tank 13 for supplying a chilling medium, such for instance as air, under pressure to the outer chamber 14 of the nozzle N, through a suitable conduit. An atomizing pressure may be applied to the chilling medium in any desired manner, as by a pump 15. Chilling of said medium to any desired temperature may be accomplished in any suitable manner, not shown. Also adjacent to the other tanks is a third tank 16 adapted to contain a solvent 10 for dissolving the oil constituents of the stock.

It is to be understood that the solvent used must be selective, due to its temperature. That is to say, it must be capable of dissolving the oily constituents of the stock, or to mix with them, and not attack the wax at operating temperatures. The solvent may also be selective, due to its nature, that is it may be capable of dissolving only certain hydrocarbons or groups of hydrocarbons, although mixing, or being miscible with all of the oil fractions of the treated stock. It must, however, be of sufficient strength at the selected operating temperature, to carry a large enough percentage of oil to insure economy of recovery. It is preferred to use a solvent of one of the alcohols in which there are from three to five atoms of carbon for each molecule, or a mixture of these alcohols, because they possess the necessary selective properties and solvent powers for the effective practice of the present process. An example of such a solvent consists of a mixture of 80% butyl alcohol and 20% diethyl carbinol, but the invention is not limited to this particular proportioning, it having been selected for illustrative purposes because it represents an excellent compromise between the selective and the dissolving properties required in the practice of the present invention. Diethyl carbinol is selected from the numerous amyl alcohols, because its boiling point is substantially identical to that of normal butyl alcohol, and mixtures of the two can be distilled without fractionation or change of proportion. The proportions may be varied, as may be desired.

The nozzle N is so positioned as to discharge into a combining chamber 17, which is preferably located within a separating chamber S. The chamber 17 is of general cylindrical form and provided at its top with a frusto-conical member 18, which cooperates with an extension of said chamber to provide a solvent reservoir 19, which is supplied with solvent by means of a conduit 20 leading from the tank 16. A pump 21 may be provided to insure proper flow of solvent from tank 16 to reservoir 19. Chilling of the solvent

to any desired temperature may be accomplished in any suitable manner, not shown. The frusto-conical member 18 is provided with openings 23 so arranged as to permit solvent to overflow in such manner that the solvent will adhere to the underside of the frusto-conical member, and to drop into the chamber in such a manner as to intercept the atomized materials which are being discharged by the nozzle N.

The mixture of atomized wax, oil and solvent, together with the entrained air, are discharged from the lower end of the chamber 17 through the conduits 22 into the separating chamber S, which is maintained at atmospheric pressure, the air being drawn outwardly through an exhaust pipe x, and returned to the supply tank 13. The mixture of atomized waxes, and oil laden solvent are then drawn off through the outlet pipe 24 of the separating chamber S into an agitator 25, which may be of any desired construction and which performs the function of effecting the dissolving, mixing or washing of the oil from the solidified wax particles. The oil laden solvent and the solidified particles may then be separated in any desired manner in a separating device of any suitable or preferred construction, indicated at 26, and the solid wax particles then withdrawn through discharge pipe 27 into a distilling apparatus 28, for the purpose of drying off any free solvent. The wax is then discharged into pipe 29, and the volatile solvent material is carried off through a condenser 30 and an accumulator 31 in a well known manner, the latter having an outlet 32 for clean solvent, which may be returned to the tank 16.

If the solvent used is selective due to its nature, but has mixed with or entrained other oils, a period of separation should be allowed between the step of separating the oil laden solvent from the chilled particles of wax and the step of distillation for the recovery of the solvent. Therefore, the oil laden solvent is conducted from the separator 26 to a storage tank 33, where it is allowed to stand for a sufficient period to permit the oils and solvents to separate into two layers, one of which would consist of the solvent and oil solution and the other of the oils that had been "washed out". From the storage tank 33 the oil laden solvent is conducted to a suitable distilling apparatus 34 of any preferred construction, and from the latter is discharged into a fractionating tower 35 of well known type, so arranged that the heaviest fractions may be discharged through pipe 36, the solvent will be carried out through the top by pipe 37 to a condenser 38 and an accumulator 39, and the purified oil free solvent will be carried from the accumulator by means of pipe 40 to the tank 16. The fractionating device is so arranged that fractions of the recovered oils may be separated gravitationally at different levels in the apparatus and discharged respectively through the outlets a, b, and c.

With certain types of waxes contained in lubricating stocks, the sudden chilling or freezing practiced in the present process will cause a separation of the wax from the lubricating oil, and the chilled particles may then be separated from the oils by shooting the finely atomized jet in a horizontal direction. The difference in the specific gravities of the wax and the oils will affect the distance traveled by the particles, and the separation may thus be effected, suitable means being provided to gather the separated constituents.

The advantages of the invention will be clearly

understood by those skilled in the art to which it belongs. For instance, it will be readily perceived that a very effective and complete separation of the oils and waxes is possible, together with a maximum recovery of both. Another advantage is that by regulating the temperature of the cooling medium and the solvent, the solvent can be rendered inert relative to the wax particles, and may be rendered selectively inert as to different fractions of the oil constituents of the stock. That is to say, the higher the temperature of the solvent, the greater number of the oil fractions that it will attack, thereby insuring a very close control of the operation of the solvent. The temperature of the chilling agent and the solvent must be low enough however, so that the finely divided particles of chilled wax will remain separate and not stick together. Otherwise, the contact surfaces between the wax and solvent would be greatly reduced, and the separation of the oil laden solvent from the wax would be more difficult. A further advantage is that the various fractions of oil which may be taken up by the solvent may be substantially separated in an effective and economical manner.

Having thus explained the nature of the invention and described an operative manner of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the forms of its use, what is claimed is:—

1. A process of treating wax-carrying oil stock comprising causing a stream of cooling medium to flow under an atomizing pressure, causing a stream of the oil stock to be treated to flow simultaneously with the flow of the cooling medium, bringing the two streams together within an atomizing zone and atomizing them within said zone, causing an oil solvent to entrain atomized oil constituents as they leave the atomizing zone, and separating the oil-laden solvent from the wax particles.

2. A process of treating wax-carrying oil stock comprising causing a stream of cooling medium to flow toward an atomizing zone under an atomizing pressure, causing a stream of oil stock to be treated to flow toward said atomizing zone, bringing the two streams together within said atomizing zone and atomizing them within said zone, maintaining a solvent at a temperature below the melting temperature of the wax constituents of said stock and causing said solvent to entrain atomized oil constituents as they leave the atomizing zone, and separating the oil-laden solvent from the wax particles.

3. A process of treating wax-carrying oil stock comprising causing a stream of cooling medium to flow under an atomizing pressure, and maintaining said stream at a temperature below the melting temperature of the wax constituents of the stock, causing a stream of the stock to be treated to flow simultaneously with the flow of said stream of cooling medium, bringing the two streams together within an atomizing zone, and atomizing them within said zone, causing an oil solvent to entrain the atomized oil constituents as they leave the atomizing zone, and separating the oil-laden solvent from the wax particles.

4. A process of treating wax-carrying oil stock comprising cooling a flowing stream of oil stock by intermingling the same with a flowing cooling medium moving under an atomizing pressure, conducting the intermingled cooling medium and oil stock to an atomizing zone and simultaneously atomizing both within said zone, causing an oil

solvent to entrain atomized oil constituents as they leave the atomizing zone, and separating the oil-laden solvent from the wax particles of said stock.

5 5. A process of treating wax-carrying oil stock comprising cooling a flowing stream of oil stock by mixing therewith a stream of cooling medium caused to flow under an atomizing pressure and conducting them to an atomizing zone, atomizing
10 them within said zone and discharging the atomized constituents into a moving oil solvent which is inert with respect to the solid constituents of the oil stock, and separating the oil-laden solvent from said solid constituents.

15 6. A process of treating wax-carrying oil stock comprising commingling a stream of oil stock to be treated with a stream of cooling medium, said cooling medium moving under an atomizing pressure, causing an oil solvent to fall through
20 space, atomizing the commingled streams and discharging the atomized particles into said space so as to contact with the oil solvent, and separating any oil-laden solvent from the solids.

25 7. A process of treating wax-carrying oil stock comprising commingling a stream of cooling medium with a stream of oil stock to be treated, said cooling medium being subjected to an atomizing pressure, atomizing the commingled streams by discharging them into space under said atomizing pressure and in such manner as to effect a
30 mechanical separation of the oil and the sus-

ended solid constituents of the stock, mixing the oil constituents with an oil solvent as the mechanical separation is effected, and separating the oil-laden solvent from the solids.

8. A process of treating wax-carrying oil stock
5 comprising commingling a stream of oil stock to be treated with a stream of cooling medium which is subjected to atomizing pressure, discharging the commingled materials into space while subjected to said atomizing pressure so as
10 to effect a mechanical separation of the oil and the suspended solid constituents, mixing the oil constituents with a solvent having a temperature below the melting temperature of the solids simultaneously with the effecting of said mechanical separation, and separating the oil-laden solvent from the solids.

9. A process of treating wax-carrying oil stock comprising commingling a stream of oil stock to be treated with a stream of cooling medium
20 which is subjected to atomizing pressure, discharging the commingled materials into space while subjected to said atomizing pressure so as to effect a mechanical separation of the oil and the suspended solid constituents, projecting the
25 atomized constituents into a flowing stream of oil solvent as said mechanical separation is effected so that the solvent will entrain the oil constituents, and separating the oil-laden solvent from the solids.
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