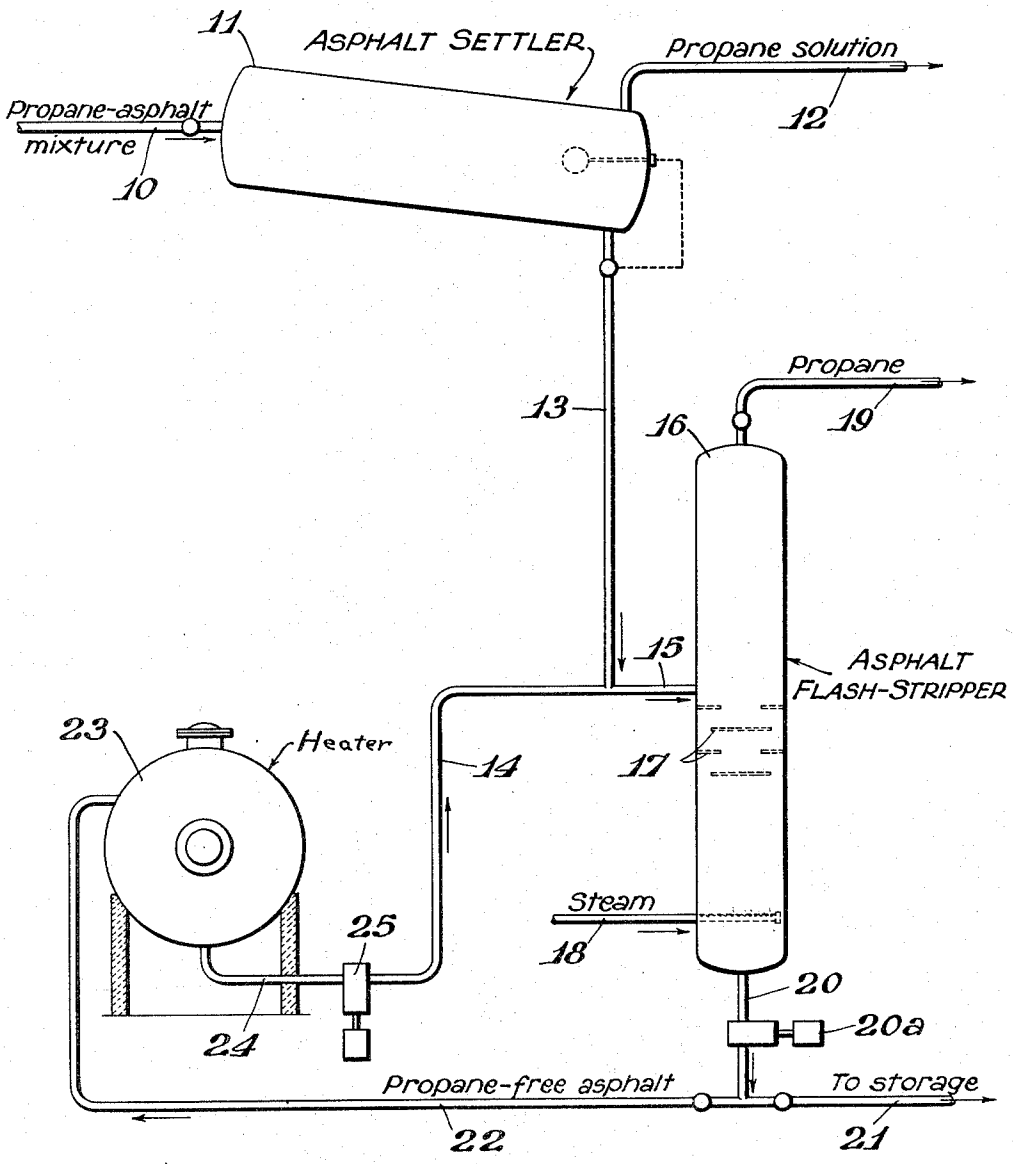
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DEPROPANIZING ASPHALT

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DEPROPANIZING ASPHALT

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This invention relates to the separation of propane from asphaltic or resinous materials separated from lubricating oils in the so-called propane deasphalting process.

In processes where propane is employed to fractionate mineral oils or related products by selective solution and precipitation it becomes necessary to recover the propane from each of the separated fractions. We have found that unforeseen difficulties arise in the recovery of propane from asphaltic materials, partly due to the behavior of the propane solutions or mixtures when subjected to high temperatures in heater tubes, and partly because of the serious problem of foam prevention. In the first commercial deasphalting plant for the preparation of bright stocks it was found that the foaming in the asphalt flash tower and stripper was a most difficult problem since this foaming caused the asphalt to be carried through the propane lines to all parts of the system, plugging up the compressors, contaminating the propane storage and causing the shut-down of the whole plant. An object of our invention is to overcome this foaming difficulty and at the same time provide a simple and efficient method for recovering propane from precipitated asphalt.

We discovered that if a propane asphalt mixture is heated to temperatures above 400° F. the foam subsides, but the application of this discovery to the commercial deasphalting plant was not so simple, and the plant finally had to resort to the addition of a gas oil or residual oil flux to the upper part of the flash tower to break the foam and permit the plant to operate. The addition of this flux is objectionable from the standpoint of the finished asphalt since it impairs the flash point and the desired penetration, ductility, viscosity and other characteristics. An object of our invention is to avoid the necessity of adding a gas oil or other fluxing oil at the top of a flash chamber or stripper for breaking the asphalt foam.

For safety reasons all open fires must be kept away from the propane deasphalting plant and it therefore appeared that if the asphalt were to be heated to the 400° F. minimum it would be necessary to employ extremely high pressure steam (or possibly some other agent as electricity, hot oil, etc.) Even this type of indirect heating would be objectionable because of the peculiar properties of the propane-asphalt mixture when subjected to high temperatures,—the tubes tending to become fouled and the asphalt tending to pass therethrough in a solid core or foam of extremely low heat transfer rate. A further object of our invention is to avoid exchange heaters for propane-asphalt solutions and to avoid the use of high pressure steam for effecting the necessary minimum temperature of 400° F.

We have discovered that the heating and foaming difficulties may both be overcome by the simple expedient of heating depropanized asphalt to a temperature about 400° F. or some higher temperature, depending on the viscosity of the extracted asphalt, and then mixing this heated asphalt with the propane asphalt solution on its way to the asphalt recovery tower. The sensible heat of this heated asphalt furnishes the necessary heat for vaporizing the propane, and makes possible the use of a sufficiently high temperature to prevent foaming difficulties. We have discovered that while it was heretofore deemed necessary to employ both a flash tower and a stripper, we may employ a single tower for effecting both the flashing and stripping of the asphalt when our heating system is employed.

This invention will be more clearly understood by reference to the accompanying drawing which forms a part of this specification and which diagrammatically illustrates an elevational view of our propane-asphalt heating and recovery system.

While the invention is primarily designed for the separation of propane from asphalt, it should be understood that it is applicable to the removal of propane from the pseudo-asphaltic resins or color materials occurring in Pennsylvania crudes, from synthetic oils obtained by the polymerization of hydrocarbons or products resulting from the condensation of aromatics with hydrocarbons or hydrocarbon compounds, and from sulfonated, sulfurized, chlorinated, oxidized, hydrogenated or otherwise modified hydrocarbons per se or soaps, salts or other compounds thereof. In our preferred example we will describe the separation of propane from an asphalt made from a residuum of about 400 seconds Saybolt viscosity at 210° F. produced by noncracking pipe still distillation of Mid-Continent crude.

About 3 to 5 volumes of propane are mixed with one volume of the residual stock and introduced through line 10 into asphalt settler 11 at a temperature of about 80° to 150° F., preferably about 110 to 115° F., and a pressure up to about 400 pounds gauge. It should be understood that our invention contemplates the use of other normally gaseous hydrocarbons admixed with propane or used in place of propane, but we prefer to employ propane and the conditions and temperatures

herein cited may require some modification if substantial quantities of other hydrocarbons are employed.

The propane-oil solution is continuously withdrawn from the upper part of the asphalt settler through line 12 to an acid treating, solvent extraction, dewaxing, claying and/or propane recovery systems. The asphalt is withdrawn from the lower part of the settler through a liquid level controlled valve through line 13 and after admixture with hot asphalt it is introduced through line 15 into flash-stripper tower 16. The amounts and temperature of hot asphalt introduced through line 14 are sufficient to raise the temperature of the mixture above 350° F. and preferably above 400° F.

The asphalt flash-stripper tower is preferably provided with a plurality of baffle plates 17 in the lower part thereof to insure intimate contact of the asphalt with stripping steam which is introduced through line 18 at the lower part of the tower. The upper part of the flash-stripper tower is preferably open, although means may be employed for introducing a foam-breaking flux or hot asphalt should this expedient be necessary.

Propane and steam are removed from the top of the tower through line 19 to a condenser and propane recovery system. Depropanized asphalt is withdrawn from the base of the tower through line 20, a portion of it being transferred through line 21 to storage and another portion being transferred through line 22 to a shell or pipe heater 23. A pump 20a may be employed in line 20 or line 22 if required. The portion going to storage through line 21 can be heat exchanged with suitable material (propane-oil solution, etc.) for heat economy.

Shell still or pipe still 23 is preferably located several hundred feet from the rest of the deasphalting plant so that there will be no fire or explosion hazard due to the open flame of the still furnace. The lines between this still and the deasphalting plant should, of course, be heavily insulated. Asphalt flash-stripper tower 16 can be located either at the deasphalting plant, or near the still 23. In shell still or pipe still 23 the asphalt from line 22 is heated to a temperature upwards of 400° F., then passed through line 24 and pump 25 to line 14 for admixture with the propane-asphalt solution from line 13.

We prefer to circulate through still 23 about 2 to 10 times as much asphalt as is introduced from settler 11 into the flash-stripper tower, and we prefer to raise its temperature in the still at about 450 to 500° F. As above stated, the preferred temperature of materials entering the flash-stripper tower is about 400° F.

We may maintain the flash-stripper tower at about atmospheric pressure, or perhaps about 20 pounds to 35 pounds per square inch gauge. We prefer, however, to effect the propane removal at about 150 to 200 pounds per square inch so that the propane may be directly condensed with ordinary cooling water and without having to be compressed. While our invention does not require the use of separate flash and stripper towers, it should be understood that we may use separate towers maintaining a bottom temperature in the flash tower of about 300 to 350° F., by the use of steam at customary pressures of 90–150 lb./sq. in. gauge, and a bottom temperature in the stripper of about 230° to 400° F., the pressure on the flash tower being about 200 pounds per square inch and on the stripper being about atmospheric to 35 lbs./sq. in. gauge. A heater may be required between the flash tower and the stripper if the latter is maintained at the high temperature.

While we have described in detail a preferred embodiment of our invention, it should be understood that we do not limit ourselves to this specific embodiment except as defined by the following claims.

We claim:

1. A method of avoiding foam difficulties in the separation of propane from asphalt which comprises increasing the temperature of a propane-asphalt mixture to at least 400° F., introducing said mixture into a separating zone and separately withdrawing propane and asphalt from said zone.

2. The method of claim 1 which includes the step of stripping the asphalt in the separating zone with steam.

3. The method of heating a propane solution to temperatures above 400° F. without substantial fouling of tubes, which comprises heating a propane-free heat transfer agent to a temperature of about 450 to 500° F. and admixing said heat transfer agent with the propane solution in such proportions as to raise the temperature of the mixture to about 400° F.

4. The method of removing propane from a propane-asphalt solution which comprises heating substantially propane-free asphalt to a temperature above 400° F., admixing said heated asphalt with sufficient propane-asphalt solution to obtain a resultant temperature of about 400° F., and introducing the mixture at about 400° F. into a separation zone at a pressure of from atmospheric to about 200 pounds per square inch.

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