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HANDLING TAR AND ASPHALT

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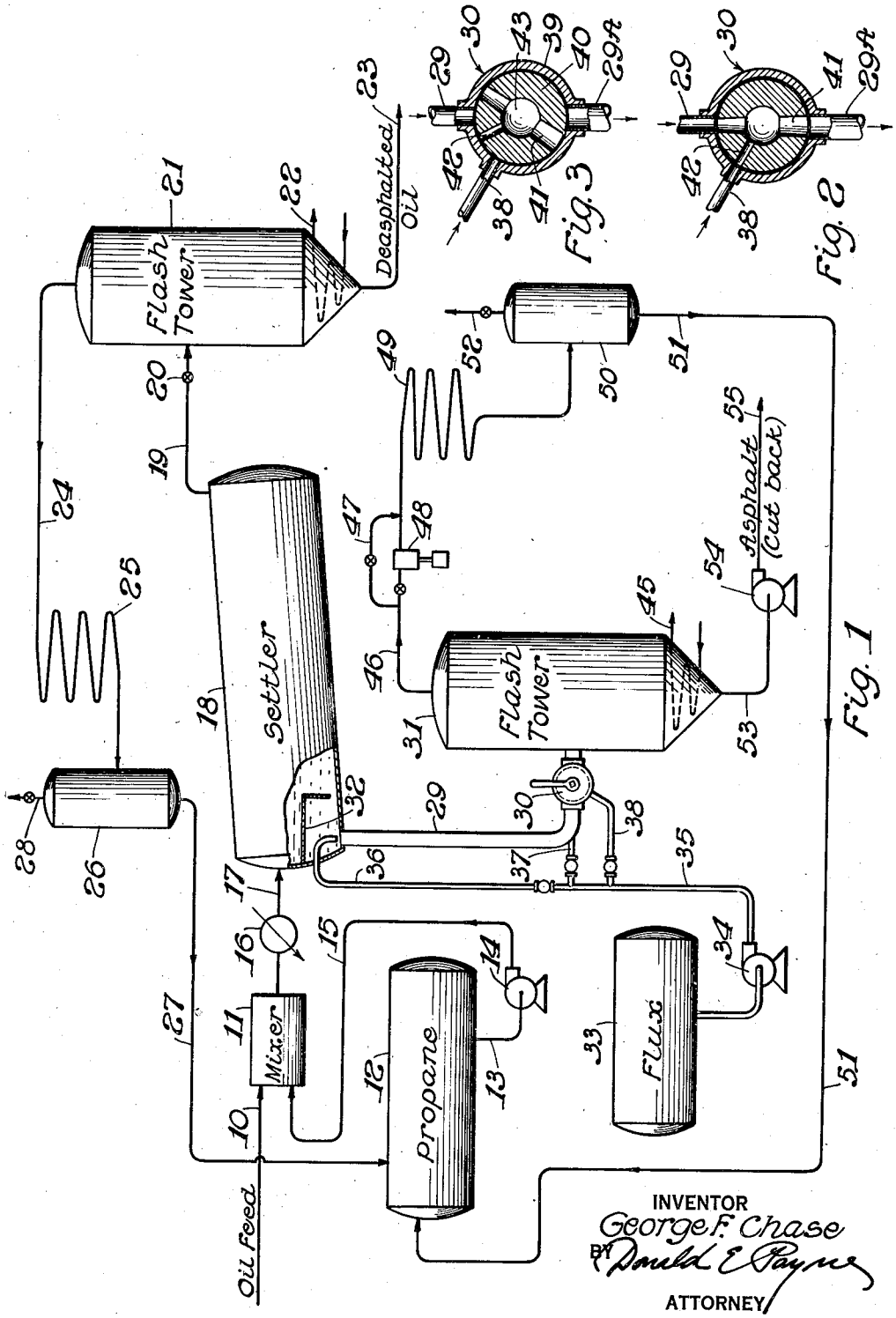

Fig. 3

Fig. 2

Fig. 1

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HANDLING TAR AND ASPHALT

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1 Claim. (Cl. 196—22)

This invention relates to an improved method and apparatus for handling tar and asphalt and it pertains more particularly to the method and means for discharging these materials from a propane deasphalting system.

It is modern petroleum refinery practice to precipitate asphaltic, resinous and tarry matter from viscous lubricating oil stocks or from other oils containing the same by means of liquefied, normally gaseous hydrocarbons such as propane. For instance, a 25% Mid-Continent petroleum residuum may be mixed with 6–8 volumes of propane and subjected to a temperature of about 165° F. at a pressure of about 650 pounds, under which conditions the asphalt will separate out as a lower layer which may be continuously withdrawn from the system. The asphalt is fluid at this temperature and pressure, partly because of its melted condition at high temperature and partly because of the presence of diluent propane. However, when this asphaltic material passes through a pressure release valve there is an instantaneous vaporization of propane which not only removes the diluent, but which effects instantaneous cooling, the net result of which is to cause the asphalt to solidify in a hard mass, which plugs the valve and the discharge pipe and which can only be handled with great difficulty. The object of my invention is to provide a method and means for preventing solidification of asphaltic material in the release valve and discharge pipe, to prevent the cooling of the pressure release valve, and o avoid all difficulty in the handling of this oil-fr :e asphaltic, tarry or resinous material.

In practicing my invention, I inject a relatively non-volatile asphalt solvent or diluent in the high pressure line on the high pressure side of the release valve or through the release valve itself. The introduction of the solvent into the relief valve itself has certain advantages in that less solvent may be required and the heat of the solvent may be utilized more effectively. The particular flux employed may depend upon particular conditions, upon the method of its introduction, and upon the subsequent use which is to be made of the asphalt. When the asphalt is to be employed as a road oil or as a cut-back material, I prefer to employ auto tar distillate, coke still distillate, pitch distillate, gas oil, naphtha, etc., and to use the resulting mixture so that the flux may be left in the asphalt when it is marketed and/or used. The invention will be more clearly understood from the following detailed description.

In the accompanying drawing which forms a part of the specification and in which similar parts are designated by like reference characters in the several views,

Figure 1 is a flow diagram of a high temperature propane deasphalting system showing the introduction of flux prior to or at the pressure release valve;

Figure 2 is a cross section of a pressure release valve in open position showing the auxiliary means for introducing flux; and

Figure 3 is a similar cross section of the same valve in closed position.

I will describe my invention as applied to the propane deasphalting of a 25% residue from the distillation of Mid-Continent petroleum crude from which 75% of the oil has been distilled under non-cracking conditions by the use of steam and/or vacuum distillation. It should be understood, however, that the invention is equally applicable to other viscous stocks containing asphaltic, tarry or resinous materials whether they are residual or distillate and treated or untreated.

In practicing my invention, I prefer to use propane as the asphalt precipitating medium, but it should be understood that the invention is also applicable to other normally gaseous diluents such as ethane, butane, ethylene, propylene, etc. and it is also applicable to the use of normally gaseous solvents such as sulfur dioxide. The oil is introduced through line 10 to mixer 11 where it is intimately mixed with propane from storage tank 12, line 13, pump 14 and line 15. Oil is preferably introduced at a relatively high temperature, but the mixture may be further heated by passing it through heat exchanger 16 in line 17 on its way to settler 18. I prefer to use about 2 to 8 volumes of propane per volume of oil, but it should be understood that this ratio may be varied throughout very wide limits.

The settler 18 may be a horizontal cylindrical pressure vessel about 8' in diameter by 30' long and it may be mounted in a slightly inclined position, as shown in the drawing. However, I may use a vertical countercurrent treating apparatus, in which case a vertical tower is employed, the hot oil is introduced near the top of the tower, and the propane is introduced at or near the base of the tower. In the horizontal vessel I prefer to use a temperature within 100° of the critical temperature of the normally gaseous precipitating medium while in the vertical tower the high temperature may be limited to the upper part of the tower and the temperature may be gradually lowered toward the base of the tower. In the present example the asphalt is precipitated at a

temperature of about 165° F. and at a pressure of about 650 pounds per square inch.

The propane solution of deasphalted oil is withdrawn through line 19 through pressure release valve 20 and introduced into flash chamber 21 which is heated by steam coils 22. The deasphalted oil is withdrawn through line 23 to suitable storage tank or for further treatment. It should be understood, however, that this oil may be dewaxed, acid-treated, solvent-extracted, clayed or given any other treatments in the propane solution prior to its introduction into flash chamber 21. Propane from chamber 21 is conducted through line 24 and condenser 25 to gas trapout tank 26 and the liquid propane from the base of this trap is conducted by line 27 to storage tank 12. Any ethane or relatively noncondensible gases may be bled from the system through line 28.

The asphalt from the lowest point in the settler tank 18 is withdrawn through line 29 and pressure reducing valve 30 to flash chamber 31. In order to prevent "short circuiting" I may employ a suitable baffle 32 between the outlet leading to pipe 29 and the inlet on line 17.

The precipitated asphalt, under the conditions hereinabove set forth, is very fluid and may be readily handled in line 29, but when the pressure is released at valve 30 there is an immediate vaporization of propane which causes a substantial drop in temperature and which deprives the asphalt of its solvent or thinner. The result is that the reducing valve and the short nipple beyond it are likely to become plugged with solid asphalt having a melting point of perhaps 150–170° F. In order to prevent the difficulties incident to the vaporization of propane in the pressure release valve, I introduce a flux from storage tank 33, pump 34, line 35 and branch line 36, 37, or 38 to the asphalt solution which is being withdrawn. Branch line 36 introduces the flux at the point at which the asphalt solution leaves the settling tank and this modification is particularly desirable when line 29 is relatively long or of narrow cross section and/or when there is likelihood of shutdown. Branch 39 introduces the flux immediately prior to the pressure release valve and this modification offers the advantage of minimizing the tendency for any of the flux to find its way into the settler tank 18 where it might contaminate the propane-oil solution. Branch 38 introduces the flux directly into the valve and this modification will be more readily understood by reference to Figures 2 and 3.

Valve 30 may consist of a cylindrical casing 39 containing a rotatable core 40 provided with a passage 41 which may be aligned with pipe 29 and nipple 29A. In view of the evolution of propane in this valve and in view of the tendency of the valve to become plugged, I prefer to have this opening slightly tapered from pipe 29 to nipple 29A, and to employ a nipple which is of slightly larger diameter than pipe 29. Another hole 42 is drilled in the core for alignment with pipe 38 when opening 41 is in alignment with pipe 29 and hole 42 communicates with opening 41. Thus the fluxed liquid is mixed with the asphalt solution directly in the valve itself. This flux is preferably introduced in a heated state so that it overcomes the chilling effect of the vaporization of the propane. It also may be said to act as a lubricant to facilitate the ejection of the asphalt core through this pressure release valve.

I may provide an enlarged chamber 43 at the center of the core (by boring a transverse hole and plugging up the ends) so that, in effect, the cylindrical plug of asphalt which moves through opening 41 is surrounded part by a jacket of flux liquid which insures the fluxing of the asphalt, at least on its peripheral surfaces, and thereby facilitates its discharge into nipple 29A and flash chamber 31. On the other hand, the enlarged opening 43 may merely serve as a mixing chamber for the solvent or flux and the asphalt. Figure 2 shows the valve in open position and Figure 3 shows the same valve in closed position.

As a flux liquid I prefer to employ a light hydrocarbon oil such as gas oil, pressure for flash distillate, acid sludge distillate, pitch distillate, or other cracked distillates. I may, however, employ ordinary naphtha or light mineral oils and I may employ benzol or other aromatic solvents. In some cases, it may be desirable to employ well known tar solvents such as carbon tetrachloride and other halogenated light hydrocarbons, carbon disulfide, etc. As hereinabove stated, however, I prefer to employ highly cracked and/or oxidized hydrocarbon flux oils because such oils are readily available in ordinary refineries and they are highly desirable constituents in road oils, cut-back asphalts, and the like.

The fluxed asphalt from pressure valve 30 is introduced into propane still 31 which is in turn provided with steam heating coil 45. The propane is removed through line 46, then through bypass 47 or compressor 48 to condenser 49 and trap 50. Liquid propane is returned through line 51 to the propane storage tank 12 and relatively non-condensible gases are discharged when necessary through line 52. The fluxed or cut-back asphalt is withdrawn from the base of the propane still or flash tower 31 through line 53, pump 54 and line 55, which leads to suitable storage tanks.

While I have described a preferred embodiment of my invention, it should be understood that I do not limit myself to any of the details hereinabove set forth except as defined by the following claim which should be construed as broadly as the prior art will permit.

I claim:

In a system for transferring a hot asphalt-propane mixture from a high pressure zone to a low pressure zone through a pressure reducing valve, the method of preventing solidification of asphalt in the valve due to vaporization of propane at that point, which comprises injecting a hot fluxing liquid into said valve.

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