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METHOD FOR PRODUCING ASPHALT

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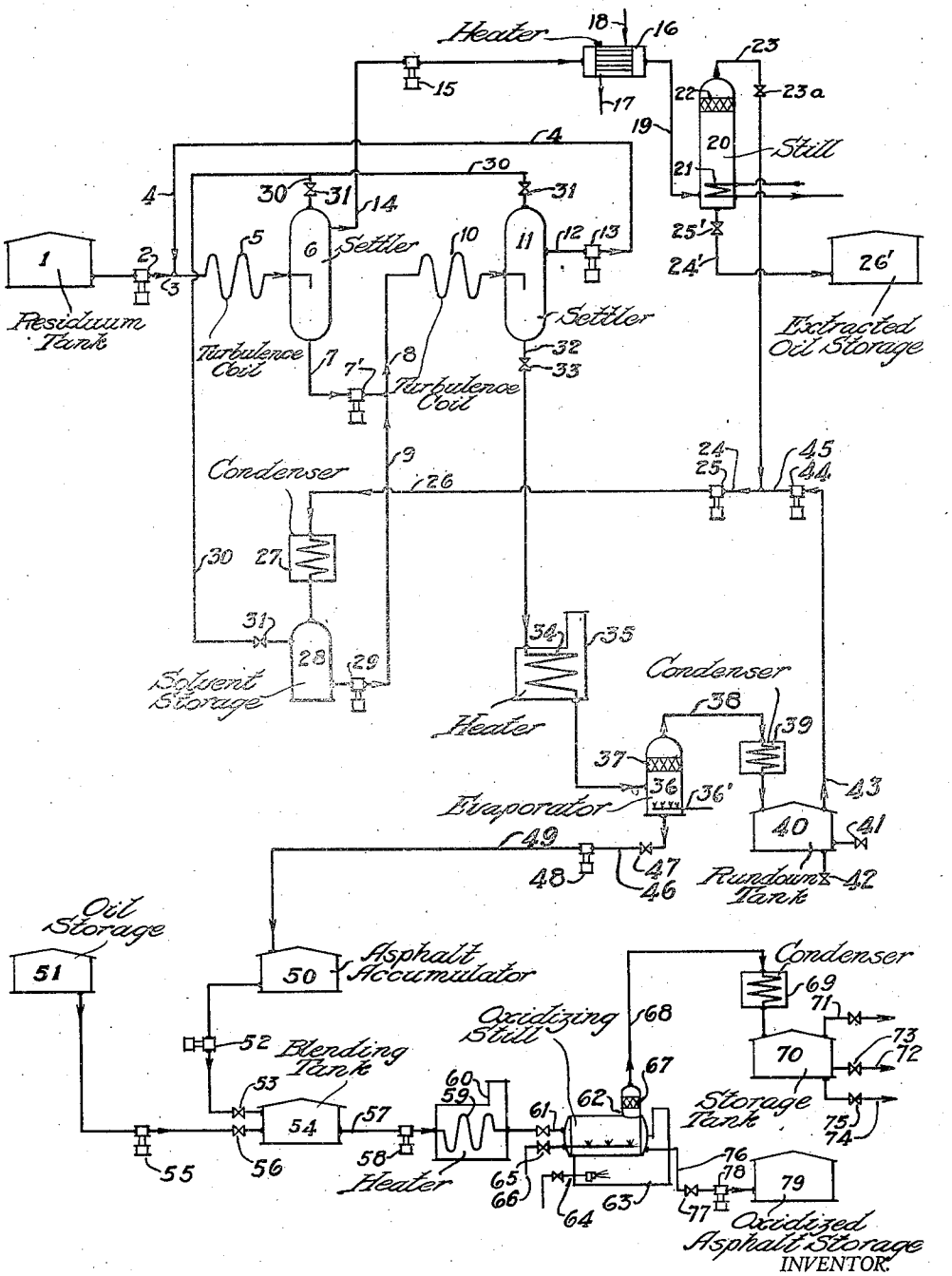

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METHOD FOR PRODUCING ASPHALT

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9 Claims. (Cl. 196—74)

It has been discovered that asphalt produced from crude oils, i. e., asphalt containing oils which have not been subjected to excessive temperatures yield pure bitumens on separation from the oil. These bitumens may be separated from the oil by solvents which have the function of dissolving the oil but which do not dissolve the bitumens. Such solvents are light petroleum hydrocarbons, such as naphtha, casinghead gasoline, light petroleum fractions composed of propane, butane and isobutane, certain alcohols, ether and mixtures thereof, acetone, etc. It has been discovered that bitumens so separated, when fluxed with the proper oils yield, on oxidation, superior asphalts.

It is an object of this invention, therefore, to produce separated bitumens from the oil by solvents, co-mingling said bitumen with oils and oxidizing the mixture.

The preferred solvent for this process is a light hydrocarbon, normally vaporous under normal temperatures and pressures, obtained by the rectification of casinghead gasoline. A typical analysis of such fraction is 2.5% methane, 6.5% ethane, 76.2% propane and 12.8% isobutane and 2.0% normal butane. This mixture is liquid at ordinary temperatures, i. e., 75° F. at about 125 lbs. pressure. It will be understood that the composition of the solvent may vary within wide limits and that the particular example is merely by way of illustration.

The extraction of the bitumen leaves it substantially free of oil. If the crude from which the bitumen has been extracted also contains wax the bitumen is also freed of the wax which is dissolved in the solvent with the oil. Mixed base crudes, i. e., those containing both asphaltic and paraffine wax constituents have not been used as a source of asphalt, especially as a source for oxidized asphalt. The wax causes the asphalt to be inferior since it produces low melting, but brittle asphalts. It has therefore been necessary to make asphalts from wax-free crudes. This process makes available a whole class of crudes, i. e., mixed base crudes not heretofore available for asphalt manufacture by separating the wax from the asphaltic constituents and processing the asphalt.

It is, therefore, another object of my invention to make asphalt from a crude oil containing asphalt or bituminous materials and wax by separating the asphaltic from the waxy materials and processing the bituminous materials to produce an oxidized asphalt of desirable constituents.

Another distinct advantage of this process is that it permits the control of the character of the oil that is oxidized with the bituminous material. I have discovered that the character of the asphalt produced depends not only on the bituminous fractions, but also on the oily fraction. In the processes heretofore available the asphalt is oxidized in the presence of material percentages of the oil originally present in the parent crude. It is conventional to distill the oil to an asphaltic residuum and to oxidize the residuum. This limits the results obtainable, since it is not possible to control the oily fractions at will. I have found that by controlling the character of the oily fractions we may obtain asphalts of any desired characteristic as to melting point, ductility and penetration. Thus by separating the bitumen in a substantially pure state the type and amount of oil to be mixed with the bitumen prior to oxidation can be accurately controlled and the desired properties of the oil obtained.

It is, therefore, a further object of my invention to control the character and amount of the oil constituent of the asphalt to be oxidized. More specifically, it is an object of my invention to separate the bituminous material from an asphaltic oil, blend the material with an oil of predetermined character in a predetermined amount by fluxing the bituminous material with an oily fraction or flux and to oxidize this mixture.

The invention will be better understood by reference to the accompanying drawing which shows diagrammatically one method of carrying out this invention. The following is merely illustrative of the invention and indicates a preferred embodiment but should not be understood to limit the invention.

In the drawing, 1 represents a tank in which is contained topped residuum resulting from the distillation of crude oil containing asphalts. This distillation is carried on at such temperatures as will separate the light oils, such as gasoline, kerosene, gas oil and light lubricating oil. The temperature is not carried too high. Thus, the temperature should not, preferably, exceed 650° F. Steam distillation may be employed.

The residuum thus formed is collected in tank 1, pumped by pump 2 through line 3 where it meets the liquid solvent, i. e., at about 125 lbs. pressure. The solvent was previously described and in this case I will call the solvent propane for convenience. The solvent and the oil passing

from the extractor 11 passes through turbulence coil 5 for the purpose of mixture, and then passes into settler 6. In 6 the bitumen settles as a slurry together with some propane and oil and the extract consisting of propane and extracted lubricating oil, passes through line 14 to be processed, as will be described later. The slurry of bitumen and propane is pumped through line 7 by pump 7' into line 8 where it meets fresh propane passing through line 9 and the mixture is passed through turbulence coil 10 for the purpose of more intimate mixture and then passed into extractor or settler 11. The extracted material is pumped by pump 13 through line 12 to be passed through line 4 into line 3 where it is mixed with fresh topped residuum.

The oil, removed together with propane from extractor or settler 6, is pumped by pump 15 via line 14, through the heater 16 where it is heated by steam entering at 18 and exiting at 17. If the topped residuum is obtained from a mixed base oil, the bitumen will be substantially free of wax and the solution passing through 14 will contain the wax originally present in the topped residuum. The heated propane and oil are then passed through line 19 to still 20 where they are further heated by closed steam coil 21 and the vaporized propane passes through mist extractor 22 through line 23 into line 24 to the suction of compressor 25 through line 26 into cooler 27 to be condensed and collected in tank 28. Pump 29 directs the solvent material in 28 through line 9 for further treatment of more residuum. The pressures in 6, 11 and 28 are maintained sufficiently high to keep the propane liquid in the extractors and the storage tank 28, i. e., at about 125 lbs. The still 20 is kept at a slightly lower pressure, say 100 lbs., but sufficiently high temperature to vaporize the propane. It will be observed that in still 20 the propane is evaporated under pressure. Additionally it will be observed that extractors 6 and 11 and tank 28 are connected by an equilibrium line 30 controlled by valves 31 so as to maintain units 6, 11 and 28 at substantially the same pressure. The pressure in still 20 is controlled by valve 23*a*, 25' and by compressor 25. The object of distilling the extract under pressure is to limit the amount of recompression of propane necessary to liquefy it.

The extracted oil freed of the propane is reduced to atmospheric pressure through valve 25' and line 24' into tank 26'. The oil may be dewaxed and treated in any manner. The bituminous material settling in extractor 11 which has been freed of all its oil, is flashed through line 32 controlled by valve 33 through the heater coils 34 in the furnace 35 and into evaporator 36 where the entrained propane is vaporized, and freed of mist by mist extractor 37. The pressure in 36 is substantially atmospheric. The propane passes through line 38 into condenser 39 to be cooled and the condensate is collected in rundown tank 40. In evaporator 36 steam is introduced through spray 36' to aid in the removal of propane and any entrained oil in the asphalt slurry. The temperature in the condenser 39 is such as to leave the propane uncondensed but to condense steam and oil. The uncondensed propane passes through line 43 to the suction of compressor 44 which is used to boost the pressure and then the propane is passed to the suction of compressor 25. The compressed propane is condensed in 27 and collected in 28. The condensed oil is removed through line 41 and the water through line 42.

The melted bitumen in 36, substantially freed of oil, is removed through line 46 controlled by valve 47 by pump 48 and pumped through line 49 into the insulated accumulator 50. Tank 51 contains the oil which it is desired to blend for the process, i. e., the oil to be used as a flux. This fluxing oil may be either gas oil, light or ordinary lubricating distillate, fuel oil or a liquid aphalt or road oil, depending upon the desired characteristics of the resulting material. Thus the ductility of the asphalt produced by this process will be improved by the use of lubricating oil and liquid asphalt, but a higher melting point may be obtained from gas oil. This oil may be heated by means of heater, not shown.

The melted asphalt in 50 is pumped by pump 52 through valve 53 into tank 54. The oil in 51 is pumped by pump 55 through valve 56 into tank 54. The amount of oil flux and bitumen introduced will depend upon the final characteristic which it is desired to impart to the asphalt. This will depend also on the character of the oil and the degree of oxidation to which the blend is to be exposed. As a specific example and merely by way of illustration, 50% of a lubricating oil having a viscosity which may range from 400–1000° Saybolt at 100° F. may be blended with the asphalt. These are pumped in correct proportion into tank 54 for blending. The blended bitumen and oil is pumped through line 57 by pump 58 into heating coil 59 positioned in furnace 60. The heated oil raised to the desired temperature, i. e., 400–600° F., is passed through valve 61 into still 62 set in a furnace 63 and heated by burners 64, air is introduced through spider 66, controlled by valve 65. The temperature of the oil is controlled by controlling heating in furnace 60 and is also controlled by burner 64 and by controlling the amount of in-put of air. As a usual rule, after the process has started the burner in furnace 60 may be discontinued and the burner 64 shut off and the temperature maintained by merely the introduction of air. The temperature will vary from 350–650° F., depending on the characteristics desired. However, it will be found that if the process is made continuous some heating may be maintained in furnace 60 and by burner 64. The vaporized material passes through still head 67, through line 68, is condensed in condenser 69 and collected in tank 70. Excess air is removed in 71. Condensed oil is removed through 72 controlled by valve 73 and condensed water is removed in 74 controlled by valve 75. The oxidized material which is asphalt of the desired characteristics may be continuously withdrawn through line 76 controlled by valve 77 by means of pump 78 and collected in tank 79.

The disclosure is to be considered not as limiting, but as merely illustrative of one method of carrying out my invention, and many variations which will be apparent to those skilled in the art may be made within the scope of the following claims.

I claim:

1. Method of producing asphalt from an oil containing asphaltic bituminous material which comprises extracting the oil with a solvent to separate the asphaltic bituminous material from the oil, then blending said separated asphaltic

bituminous material with an oil, and then oxidizing the mixture.

2. Method of producing asphalt from an oil containing asphaltic bituminous material and wax which comprises extracting the oil with a solvent to separate the asphaltic bituminous material from the oil and wax, mixing the asphaltic bituminous material with oil and oxidizing.

3. Method of producing asphalt from oil containing asphaltic bituminous material which comprises commingling said oil with a solvent capable of dissolving the oil but not the asphaltic bituminous material, separating the undissolved asphaltic bituminous material from the solvent solution of oil and subsequently oxidizing the separated asphaltic bituminous material.

4. Method of producing asphalt from oil containing asphaltic bituminous material which comprises commingling said oil with liquid propane, separating the undissolved asphaltic bituminous material from the propane solution of oil and subsequently oxidizing the said separated undissolved asphaltic bituminous material.

5. Method of producing asphalt from oil containing asphaltic bituminous material which comprises commingling the said oil with liquid propane, separating the undissolved asphaltic bituminous material from the propane soluton of oil, blending the separated asphaltic bituminous material with oil and ozidizing the blended mixture.

6. Method of producing asphalt from an oil containing asphaltic bituminous material and wax which comprises commingling said oil with liquid propane, separating the undissolved asphaltic bituminous material from the propane solution of oil and wax, blending the separated asphaltic bituminous material with an oil and oxidizing the blended mixture.

7. A method for producing asphalt which comprises commingling an oil and asphalt mixture with a liquefied normally gaseous hydrocarbon solvent to separate asphalt, removing the asphalt from the oil and solvent and blending said separated asphalt with oil to produce an asphalt oil mixture having characteristics different from said first mentioned oil asphalt mixture.

8. A method for producing wax free blended asphalt from an oil containing asphalt and wax which comprises commingling said oil with a liquefied normally gaseous hydrocarbon to separate asphalt from the oil and wax dissolved in said solvent, removing the asphalt from the oil, wax and solvent and blending said separated asphalt with oil to produce wax free blended asphalt.

9. A method of producing asphalt from oil containing asphaltic bituminous material which comprises commingling said oil with a liquefied normally gaseous hydrocarbon solvent to separate a substantially oil free asphaltic bituminous material from said oil, removing said separated asphaltic bituminous material from the oil and solvent and oxidizing the separated asphaltic bituminous material.

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