Patented June 21, 1938

2,121,437

UNITED STATES PATENT OFFICE

2,121,437

PROCESS OF MAKING ASPHALT

Elliott B. McConnell, Shaker Heights, Ohio, assignor to The Standard Oil Company, Cleveland, Ohio, a corporation of Ohio

No Drawing. Application February 12, 1937, Serial No. 125,428

9 Claims. (Cl. 196—74)

This invention relates to the manufacture of asphalt; and it is among the objects of the invention to provide a process making possible faster operation than that customary in asphalt-making, and capable of giving superior products. Other objects and advantages will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

The raw material may be the stocks customary, in general a petroleum residuum or the residue left after the vaporizable hydrocarbons through the range of lubricating fractions have been taken off. The raw material, in accordance with the invention, is subjected to the action of heat and oxidizing conditions, and while oxygen gas may be used, in practice air is generally more desirable, and such gaseous agent may be introduced into the residuum to accomplish both the oxidation and agitation, as by air-blowing, while at the same time carrying a particular catalyst. In accordance with the invention, the latter is an inorganic gasiform agent, or at least capable of being carried along by an air stream, and containing an acid-forming element such as sulphur or a halogen, and selected from the group consisting of seleno-sulphide, SeS, thionyl perchloride, $SOCl_2$, sulphuric oxyfluoride, SO_2F_2, phosphorus oxychloride, $POCl_3$, phosphorus oxyfluoride, POF_3, phosphorus thiofluoride, PSF_2, and silico-fluoroform, $SiHF_3$. Particularly desirable are the halogen-containing compounds, and especially the phosphorus-halogen compounds.

These catalysts are notably effective, and are employed in small amount, as for instance .0001–1 per cent, and where an air stream is employed as the primary reagent, the catalyst may be proportionally fed along therewith. The temperature of treatment is in general 400 to 550° F.

As a further refinement, particularly advantageous in some instances, the residuum may be air-blown or oxidized by heating at 400–550° F. with oxygen or air alone without the catalyst to partial conversion to desired specifications, and then the catalyst is fed in with the air and the reaction is completed to the final desired specifications of melting point, penetration, etc.

As an example: 1000 barrels of petroleum residuum, obtained by vacuum reduction of Mid-Continent crude, and having a penetration of 200 at 77° F., is charged into a tank which may be suitably equipped with an air spray in the bottom. Air is blown in at the rate of about 50,000 cubic feet per hour. The temperature of the material rises during the oxidation to about 500° F., and the treatment is carried on until the penetration of the material is about 100 at 77° F. At this point, phosphorus oxychloride is admitted along with the air in amount of 0.5 per cent by volume, until the material reaches a penetration of about 50 at 77° F. The air and catalyst is then stopped, and the material is pumped to storage or shipping containers.

As another example: Petroleum residuum similarly is agitated and blown with air containing about 0.5 per cent by volume of phosphorus oxychloride, the temperature being maintained at around 500° F., and the treatment continued until the material reaches a penetration of about 50 at 77° F. The time of treatment may be around eight hours.

As another example: Petroleum residuum is similarly agitated and blown with air carrying phosphorus oxyflouride as catalyst, until the product samples to the desired penetration.

As another example: Residuum similarly is agitated and air blown, with supply of sulphur oxyfluoride as catalyst.

As another example: Residuum similarly is agitated and blown with air carrying phosphorus thiofluoride as catalyst.

As another example: Residuum similarly is agitated and blown with air carrying seleno-sulphide as catalyst.

As another example: Instead of starting with the catalyst as in the immediately preceding examples, the residuum is first air blown without a catalyst, until the penetration is about 100 at 77° F. Then either of the catalysts noted is introduced with the air, and the treatment continued until the product shows a penetration of about 50 at 77° F.

As another example: Residuum is oxidized with air blowing, until the material shows a penetration of 100 at 77° F., then the gaseous catalyst, carried by air, is mixed with the asphalt for a period of about half an hour, the temperature being maintained at around 500° F.

Other types of blowing equipment, aside from the tank mentioned, may be employed, those such as in my Patents Nos. 1,982,920, 1,950,900 and 2,002,670 being especially advantageous.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A process of making asphalt, which comprises heating and agitating petroleum residuum, at a temperature of 400–550° F., in exposure to a gaseous medium providing oxygen, while transmitting with said gaseous medium into contact with the petroleum residuum a small amount of a catalyst containing an acid-forming element selected from the group consisting of seleno-sulphide, thionyl perchloride, sulphuric oxyfluoride, phosphorus oxychloride, phosphorus oxyfluoride, phosphorus thiofluoride, and silico-fluoroform.

2. A process of making asphalt, which comprises heating and agitating petroleum residuum, at a temperature of 400–550° F., in exposure to a gaseous medium providing oxygen, until the penetration-test of the material is about 100 at 77° F., then supplying to the residuum a gaseous medium providing oxygen and carrying a gasiform catalyst containing an acid-forming element selected from the group consisting of seleno-sulphide, thionyl perchloride, sulphuric oxyfluoride, phosphorus oxychloride, phosphorus oxyfluoride, phosphorus thiofluoride, and silico-fluoroform.

3. A process of making asphalt, which comprises heating and agitating petroleum residuum, at a temperature of 400–550° F., in exposure to a gaseous medium providing oxygen, until the material is partly converted to desired specification, and then completing the treatment by further blowing with a gaseous medium providing oxygen and carrying a small amount of a catalyst containing an acid-forming element selected from the group consisting of seleno-sulphide, thionyl perchloride, sulphuric oxyfluoride, phosphorus oxychloride, phosphorus oxyfluoride, phosphorus thiofluoride, and silico-fluoroform.

4. A process of making asphalt, which comprises heating and agitating petroleum residuum, at an oxidizing temperature in exposure to a gaseous medium providing oxygen, while transmitting with said gaseous medium in contact with the petroleum a catalytic amount of phosphorus oxychloride.

5. A process of making asphalt, which comprises heating and agitating petroleum residuum, at an oxidizing temperature in exposure to a gaseous medium providing oxygen, while transmitting with said gaseous medium in contact with the petroleum a catalytic amount of phosphorus thiofluoride.

6. A process of making asphalt, which comprises heating and agitating petroleum residuum, at an oxidizing temperature in exposure to a gaseous medium providing oxygen, while transmitting with said gaseous medium in contact with the petroleum a catalytic amount of seleno-sulphide.

7. A process of making asphalt, which comprises heating and agitating petroleum residuum, at an oxidizing temperature in exposure to a gaseous medium providing oxygen, until the material is partly converted to desired specification, and then completing the treatment by further blowing with a gaseous medium providing oxygen and carrying a catalytic amount of phosphorus oxychloride.

8. A process of making asphalt, which comprises heating and agitating petroleum residuum, at an oxidizing temperature in exposure to a gaseous medium providing oxygen, until the material is partly converted to desired specification, and then completing the treatment by further blowing with a gaseous medium providing oxygen and carrying a catalytic amount of phosphorus thiofluoride.

9. A process of making asphalt, which comprises heating and agitating petroleum residuum, at an oxidizing temperature in exposure to a gaseous medium providing oxygen, until the material is partly converted to desired specification, and then completing the treatment by further blowing with a gaseous medium providing oxygen and carrying a catalytic amount of seleno-sulphide.

ELLIOTT B. McCONNELL.