March 21, 1933. L. KIRSCHBRAUN 1,902,305

METHOD OF PRODUCING ASPHALT

Filed May 14, 1930

Fig. 1.

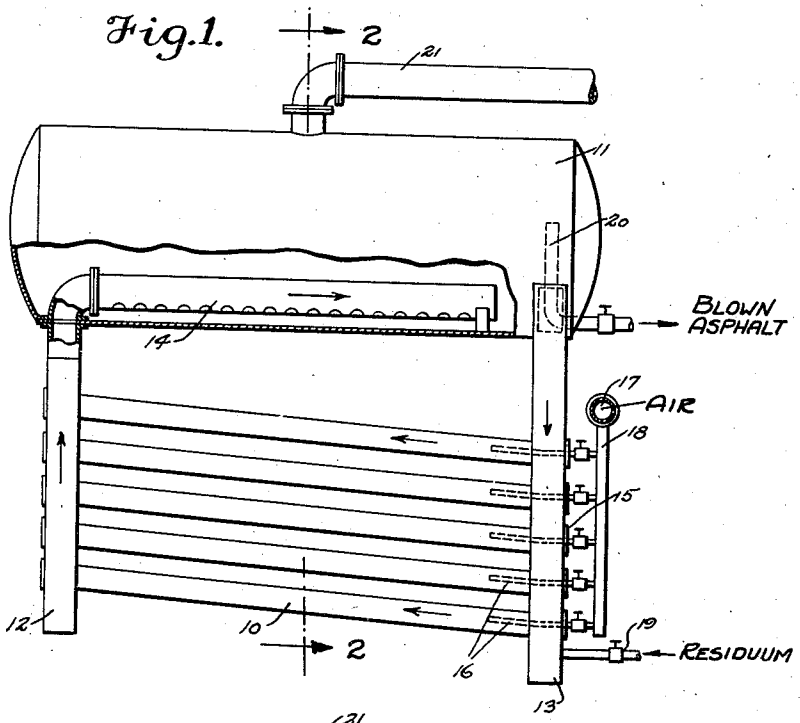
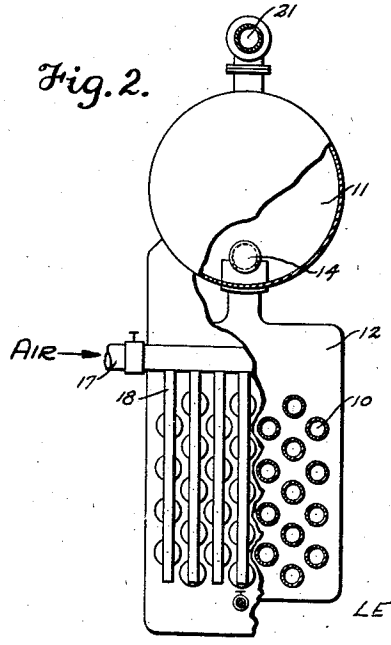


Fig. 2.



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UNITED STATES PATENT OFFICE

LESTER KIRSCHBRAUN, OF LEONIA, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE FLINTKOTE CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

METHOD OF PRODUCING ASPHALT

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This invention relates to a method of producing oxidized or blown asphalt in a continuous system.

The present commercial practise of producing air blown asphalt consists essentially of a batch treatment of asphalt bearing petroleum residuum in an enlarged tank or shell, with air, the air being fed into the body of the residuum or flux through perforated conduits arranged in the shell near the bottom thereof so as to permit the air issuing from the perforations to bubble up through the body of the material being treated, the latter being maintained at a relatively high temperature. In actual practise the time required to complete the desired oxidizing reaction varies from five hours to fifty hours or more, depending upon the character of the stock being treated, the amount of air being introduced, temperature, intimacy of contact and upon the desired melting point and hardness in the finished product.

In order to lessen the cost of production of air blown asphalt I have heretofore devised a continuous system of blowing asphalt, such system being set forth in my earlier issued Patent #1,715,069. According to the system described in said patent and the method of operating said system, the petroleum residuum admixed with air is passed through a relatively narrow coil or tube of considerable length, and then into an enlarged chamber where a bulk supply of the material is maintained. During the travel of the material through the long coil, heat is applied thereto, and the intimate contact between air and oil under the pressure prevailing in the tube as the material is progressively heated, results in a rapid reaction between the oxygen of the air and the residuum.

The bulk supply in the enlarged chamber is preferably subjected to agitation and the relative proportions of air and residuum are regulated in order to control the hardness and other characteristics of the finished product. Since in the system as thus described the oil under treatment is subjected to a single pass through the continuous coil or tube, all of the air necessary for oxidation of the oil body must be present initially with the oil, and hence considerable care is required in raising the temperature of the stream of mixed air and hydrocarbon to avoid danger of explosion. Furthermore, the single pass through the long continuous coil of the system requires the use of considerable pressure for conducting or forcing the oil under treatment through the coil, due to the length thereof, and also the use of compressors instead of low pressure blowers for forcing the required amounts of air through the system.

As an alternative to the use of a single pass through a continuous coil, it is feasible to have the oil pass through the coil with an insufficient quantity of air for complete oxidation, so that more than one pass through the coil is required. This makes it necessary to pump the partially oxidized material back through the heating zone so that the material may be recycled many times. This of course requires the continuous action of a pump for recycling the material, with its attendant power consumption. Further, such a system also necessitates the use of a compressor rather than a low pressure blower for introducing the air and forcing it through the system. This adds considerably to the cost of the installation. Moreover, in any of the coil systems, owing to the length of the coil and the friction generated by the passage of the oil therethrough, considerable back pressure is built up, making it necessary to construct the system expensively in order safely to withstand this pressure.

The primary object of my present invention is to provide an improved system of blowing asphalt continuously, such that the operation lends itself to more simplified control and reduction in cost of installation. According to the invention I employ a still of a construction similar to a Heinie type tube boiler. By using a still of this type, the material in the system can be recycled in parallel streams and the operation can be carried on without the use of high pressure air.

Other objects and advantages of the invention will more readily appear to those skilled in the art from the detailed descrip-

tion to follow and from the accompanying drawings, in which:

Figure 1 shows the arrangement of the still partly in side elevation and partly in cross-section, and in which

Figure 2 is a similar view showing one end of the still.

The still consists essentially of a bank of inclined tubes 10, mounted in vertical and horizontal rows, and a drum or shell 11 surmounting the bank of tubes. The tubes may be from 20 to 30 feet in length and say 4 to 6 inches in diameter. At their opposite ends the tubes are connected with parallel headers 12 and 13 disposed vertically adjacent the opposite ends of the shell. The rear header 12 is preferably connected at its upper end with a perforated pipe 14 extending horizontally into the shell and lying near the bottom thereof.

In the header plates 13, and passing through the clean-out plugs 15, opposite each of the tubes, are connected small air pipes 16 extending into some or all of the tubes and each preferably formed with a constriction in the outlet so as to function as an aspirator or injector, the construction of which is well known. The air pipes 16 may be connected by means of a main header 17 and sub-headers 18 to a suitable source of air supply (not shown) as for example a blower capable of operating up to ten pounds more or less of pressure. A feed inlet pipe 19 for the stock to be treated is connected to the forward header 13 near its lower end, and an overflow or outlet pipe 20 for the finished product is mounted in the shell 11. A vapor conduit 21 may be connected to the shell for carrying away whatever gases may be evolved during the operation of the still. The still of course is mounted in a suitable fire-box for applying gentle heat to the tubes, as for example, 375 to 500° F. depending on the character of material being treated.

In the operation of the still for the production of oxidized asphalt, the oil or residuum to be blown is fed into the system through the pipe 19. By means of the induced thermal-circulation, combined with the influence of the air injected into the tubes through the pipes 16, a rapid cyclic circulation of the material in the system is set up. The oil passes from the forward header 13, through the tubes 10, and upwardly through the rear header 12, from where it is discharged into the shell 11 through the perforated pipe 14. In this way, the contents of the shell are maintained under more or less violent and sustained agitation, so that the oxygen remaining in the air injected into the system is utilized to the largest possible extent.

Instead of the perforated pipe 14, the shell 11 may be supplied with a false bottom so that the combined air and oil from the tubes may be discharged under the liquid level maintained in the shell.

The circulation set up in the still, as indicated by the arrows in Figure 1, is downward through the forward header 13, up through the tubes and up through the rear header 12, the mixture of air and oil being discharged, as indicated, into shell along the bottom thereof. It will be seen therefore, that owing to the lack of frictional resistance in the parallel tubes, and to the relatively small head of liquid in the shell 11, a low pressure blower may be employed for injecting the air into the system, and that the injecting effect of the air introduced in the manner indicated, tends to accelerate the thermal-circulation which would normally be set up. Further, due to the upward inclination of the tubes throughout their length, relatively long contact of the air with the oil is maintained. It is apparent that the time of contact would be prolonged many times over that prevailing in the present commercial batch operations.

In carrying out the process, the system is operated initially as a batch until material of the desired final melting point is obtained in the system. Thereupon, fresh residuum oil is fed continuously into the system through the pipe 19, while finished product is withdrawn through the outlet or discharge pipe 20, the incoming oil being fed at such a rate that the desired final melting point can be maintained in shell 11 while the oxidizing conditions prevail therein.

While numerous advantages of my invention, other than those hereinabove set forth, will be apparent to those skilled in the art, it may be noted that less air is required by this system to produce an asphalt of given characteristics from a given petroleum stock than is required by the present commercial batch methods. Thus, whereas in the latter methods only about one or two percent of oxygen is taken out of the air, the continuous system of my invention makes it possible to take out as much as ten percent of oxygen, or substantially fifty percent of the oxygen content of the air. This more complete utilization of the oxygen content of the air results in the use of less air, the removal of less vapors from the stock in the form of difficultly condensable fume and their consequent retention in the stock, and with certain kinds of oil, in a generally improved product.

Although the system is essentially intended to be operated as a continuous one, it will be evident that it may, if desired, be operated as a batch system with considerable advantage over the present commercial batch processes.

While I have illustrated a construction in which a relatively large number of tubes of narrow cross-section are utilized, it is apparent that they may be substituted by a

smaller number of tubes of somewhat larger diameter.

Having thus described my invention it will be apparent to those skilled in the art that numerous variations and changes may be made therein without departing from the spirit of the invention as set forth in the appended claims.

I claim as my invention:

1. A process of producing oxidized asphalt in a continuous system which comprises establishing thermal-circulation of petroleum residuum from a relatively large bulk supply in parallel flow through a plurality of passageways, injecting air into said passageways for oxidizing the residuum and accelerating thermal-circulation of the material through said passageways, continuously supplying fresh residuum to the system and withdrawing oxidized asphalt from said bulk supply.

2. A process of producing oxidized asphalt in a continuous system which comprises establishing thermal-circulation of petroleum residuum from a relatively large bulk supply in parallel flow through a plurality of narrow passageways, injecting air at a plurality of points into said passageways, discharging the material from said passageways into said bulk supply under conditions to maintain said bulk supply under agitation.

3. A process for producing oxidized asphalt comprising cyclically circulating heated residuum from a bulk supply externally thereof in parallel flow through a plurality of passageways back to said bulk supply, and injecting air into the residuum in said passageways during said circulation.

4. A method of producing oxidized asphalt which comprises externally circulating heated petroleum residuum through a bank of tubes to and from a bulk supply and supplying air in separate parallel streams to said residuum in said streams during said circulation.

5. A method for producing oxidized asphalt comprising cyclically circulating heated petroleum residuum from a bulk supply externally thereof in parallel flow through a plurality of passageways, injecting an oxidizing gas into a plurality of said passageways and passing the mixed oil and gas back to said bulk supply.

Signed at Rutherford in the county of Bergen and State of New Jersey this 9th day of May A. D. 1930.

LESTER KIRSCHBRAUN.