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PROCESS OF REFINING OILS AND THE LIKE BY STEAM TREATMENT

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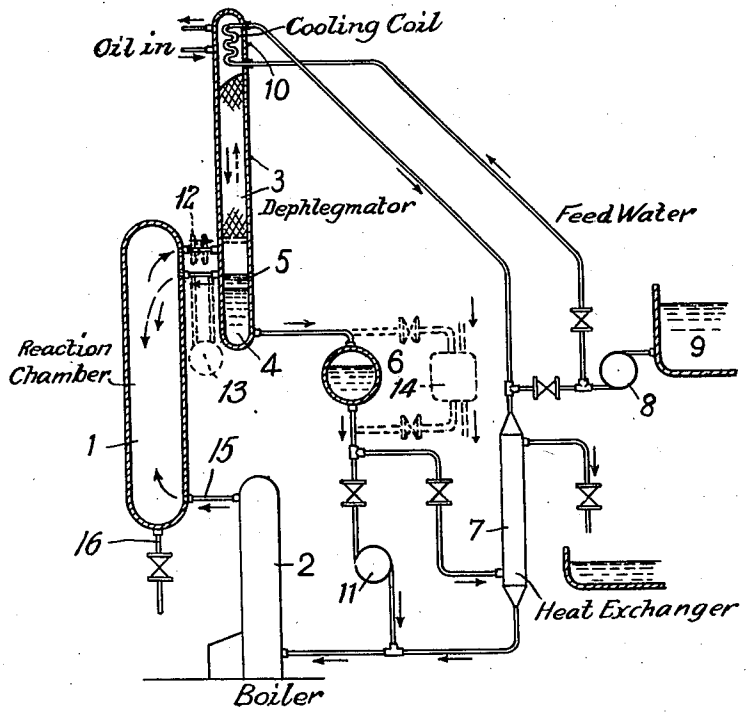

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PROCESS OF REFINING OILS AND THE LIKE BY STEAM TREATMENT

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3 Claims. (Cl. 196—63)

This invention relates to a process of refining mineral oils, tar oils and similar substances by treatment with superheated steam under pressure, and its object is to obtain a more economical utilization of the heat than is ordinarily achieved.

With this object in view the invention consists in treating the materials with superheated steam in pressure stages allowing the steam to be condensed under pressure by the withdrawal therefrom of heat in the refining process.

In carrying out the process, steam is generated at a pressure of about 200 atmospheres and superheated to a temperature of about 500° C. This steam is employed, for instance for the cracking of heavy oils, the heat being transferred to the latter. Owing to the high pressure, the transference of heat can be effected up to the saturation temperature, in this case about 364° C. At this comparatively high temperature it is possible to utilize most if not all of the heat of vaporization in the process itself so as to convert the steam into hot condensate which can easily be withdrawn from the apparatus. The hot water under pressure can be employed in a heat exchanger for preheating the fresh water used for the steam generation, the entire heat being thereby recovered. Alternately the condensate can be returned to the steam generator for renewed conversion into steam.

The condensation of the steam during the process can be effected in various manners, for instance by the preheating of materials with the steam or by dephlegmation, cooling or the like according to the result aimed at.

The invention is illustrated in the accompanying drawing which represents a diagrammatic view of an apparatus whereby the process can be carried out.

The device comprises a reaction chamber 1 wherein the materials, for instance heavy oils, are treated by direct heat interchange with steam produced in a generator 2 at a pressure of about 200 atmospheres and superheated to about 500° C. This steam, after having transferred its excess heat to the materials, is led into a second, upright pressure vessel 3 wherein oil is treated by the steam before it is fed into the chamber 1. By the further transfer of heat in the vessel 3, the steam is condensed, and the condensate, still under pressure, is collected at the bottom 4 of the vessel. The oil is mostly incapable of mixing with the water and forms, on the surface of the latter, a layer 5 whence it can be fed into the chamber 1. The hot condensate under pressure is fed into an intermediary collector 6 whence it can be returned by means of a pump 11 into the generator 2 for renewed conversion into steam. Alternately, the highly heated water can be passed through a heat exchanger vessel 7 for preheating fresh water fed by means of a pump 8 from a tank 9 into the steam generator 2.

Under the influence of the condensing steam, the oil in the dephlegmator acquires a temperature which renders its decomposition in the reaction chamber by the superheated steam extremely easy. This favourable temperature is obtained owing to the high pressure of the steam. The pressure may be lowered somewhat, and the oil may be retained for a longer period in the dephlegmator than in the reaction chamber if a particularly refined product is aimed at. For rapid cracking, however, the oil is retained for a longer period in the reaction chamber. For hydrating purposes, the pressure must be as high as possible, the work being carried on with an excess of steam as compared with the oil.

The water soluble substances contained in the materials and carried away with the condensate, are removed from the latter before its re-introduction into the steam generator 2. This can be effected in a vessel 14 in known manner, for instance by lixiviation with suitable known reagents capable of dissolving the phenols and oxides or by a fractional cooling in which the oil is automatically disengaged. This treatment of the water can be effected after it has passed through the heat interchanging vessel 7 and before it is actually withdrawn from the refining process.

Unvaporized oil is withdrawn at 16 from the reaction chamber. Favourable combinations of working methods may be obtained. For instance the process can be carried out in two different pressure stages. For instance a lower pressure may be produced in the vessel 3 than in the reaction chamber 1 by throttling the steam at 12, in which case a pump 13 must be used for feeding the oil from the vessel 3 into the chamber 1, or part of the cold water under pressure may, for condensing the steam in the vessel 3, be passed through the latter at 10. It is not necessary to carry out the process in two vessels in succession, since the heat interchange and condensation of the steam under pressure can be effected in a single vessel.

The above described process can be employed in all cases when the materials are to be subjected to high pressure and to temperatures between 250° C. and 600° C. Coal paste may be treated together with hydrogen containing ma-

terials for liquefaction, and hydrocarbons and tar oils may be refined in this manner. Various hydration processes can be carried out in this manner, in which case the steam is used not only as a heating medium but also as a reagent in known manner.

The employment of the highly superheated steam according to the present invention, does not exclude the simultaneous use of different, chemically acting gases and vapours such as air, oxygen, hydrogen, carbon oxide, ammonia, sulphur dioxide and the like which may be introduced together with the steam through a pipe 15.

The time of reaction is determined, as is usual in the art, by the nature of the raw material under treatment.

The process according to the invention has many technical advantages. By the employment of superheated steam a large yield of heat can be obtained from camparatively small apparatus, and the saving of heat by carrying out the process according to the present invention is considerable.

I claim:

1. A process of cracking mineral tar oils and similar substances, comprising feeding the initial substance through a dephlegmating zone into a reaction zone, generating steam at a pressure of about 200 atmospheres, feeding said steam at such pressure and at a temperature of about 500° C. through the reaction zone into the dephlegmating zone, condensing the major portion of the steam in the dephlegmating zone into water under pressure, and utilizing said water under pressure in the steam generation.

2. The process claimed in claim 1 including the step of feeding chemically reacting gases together with the steam into the reaction zone.

3. The process claimed in claim 1 including the step of separating from the condensate substances dissolved in the latter during the cracking process.

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