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DISTILLING PETROLEUM RESIDUUM

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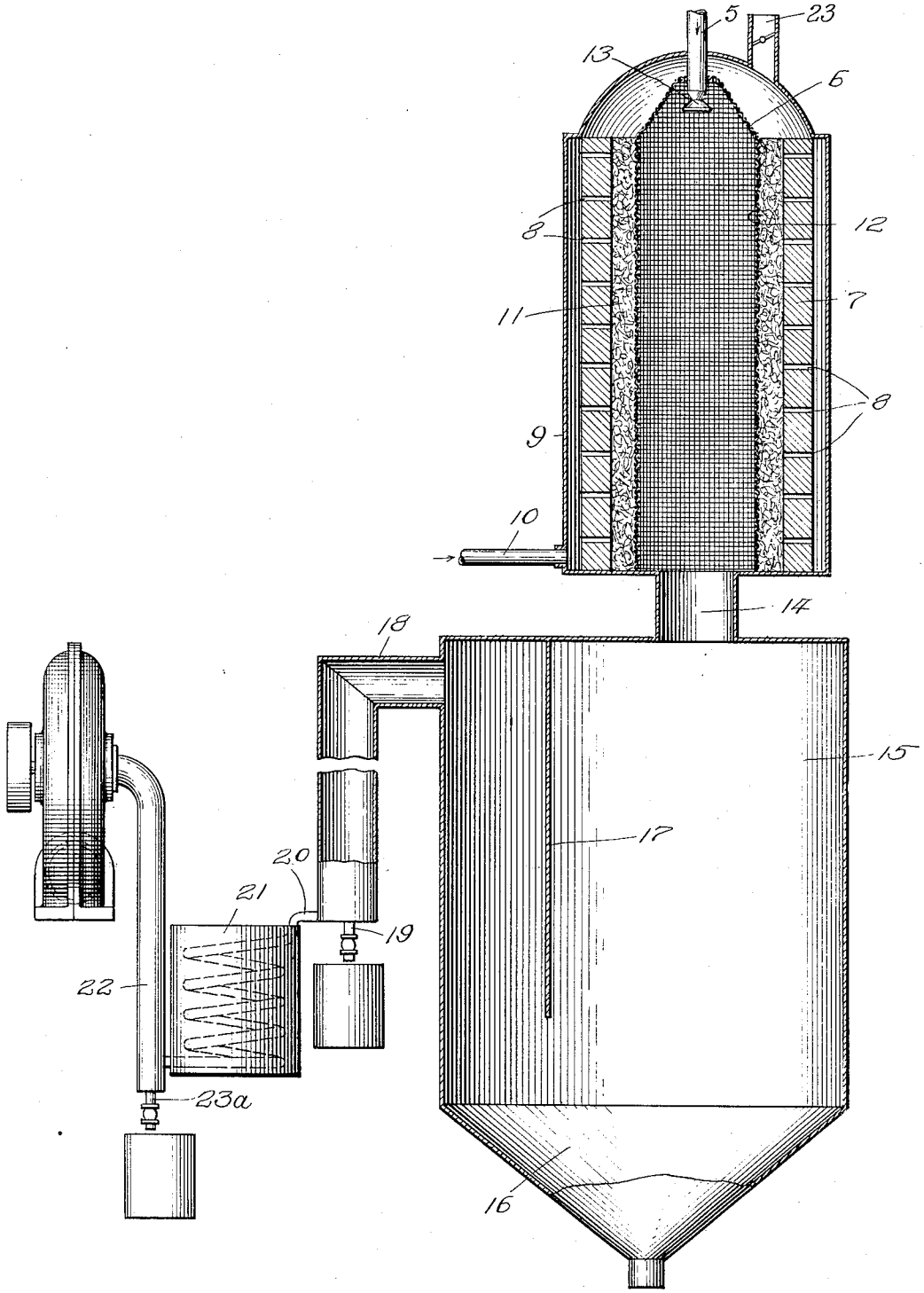

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DISTILLING PETROLEUM RESIDUUM

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This invention relates to the production of useful hydrocarbon oil products from heavy residual pitches derived, for example, by the steam distillation of crude petroleum oils.

The present invention is particularly useful in the handling of the heavy pitch residues resulting from a continuous steam distillation of crude or reduced crude oils to bottoms corrresponding, for example, to about 15% or less than 15% on oils of the character of Mid Continent crude oils. Such residues are normally very viscous or solid at ordinary temperatures, have a flash point above 500° F, and their further decomposition by destructive distillation is attended by many practical difficulties. In the specific embodiment of this invention hereinafter fully disclosed, the coking or dry distillation of such residues is effectively and economically accomplished by a continuous process. The invention will be more fully understood by the reference to the accompanying drawing, in which is shown somewhat diagrammatically, and partly in section, apparatus suitable for carrying the invention into effect.

Referring more particularly to the drawing, the numeral 5 indicates a supply pipe, by means of which the residue to be treated is brought into the apparatus, being preferably preheated. The supply pipe 5 enters the chamber of a combustion furnace 6, which may suitably have a cylindrical masonry or fire brick wall section 7 through which extend numerous spaced openings 8. Surrounding the masonry wall section is a jacket 9, an inflammable gas mixture being introduced into this jacket through a pipe 10. The perforated wall section 7 is lined by broken refractory material, for example, broken fire brick, providing a perforate refractory lining, this lining 11 being held in position by a lining of a grid or perforated sheet, of a suitable resistant metal, e. g. nichrome, etc., gauze or cloth 12. The brick section 7, lining 11 and gauze 12 collectively provide the defining wall of the aforesaid chamber of the combustion furnace 6. The inflammable mixture introduced at 10 passes through the perforations 8 in the wall of the furnace and undergoes surface or flameless combustion in the refractory lining 11, the rate of supply being preferably so controlled as to keep the zone of combustion as near as possible to the inner surface of this layer of material. The gaseous mixture may be ignited in any suitable manner, such as by introducing a flaming torch through the flue 23 to the interior of the chamber and through a suitable opening in the screen 12. The mixture of combustible gases may then be introduced through the line 10, the velocity of the mixture being such that surface combustion will occur in the small spaces in the lining 11. It is readily apparent that other heating means than that above described may be employed; thus the lining 12 in the form of a suitable metallic grid, may be employed as an electric heating element and an inert gas, such as flue gas, nitrogen, carbon dioxide, superheated steam or the like may be forced in from the jacket 9. The preheated oil, introduced through the pipe 5, is broken up or atomized by the spray head 13, and in a finely subdivided form, is brought to a high temperature, say 800 to 1000° F., by the heat applied and is likewise intermixed with the combustion gases entering the space within the furnace lining 12. The passage of the gases through this furnace lining prevents adherence of coke thereto. The coke and products of distillation, together with admixed combustion gases, pass through the short conduit 14 into the settling chamber 15, which is diagrammatically shown, and may be constructed as any suitable effective form of separator. Coke deposited in this separating chamber collects in its conical lower portion 16, a baffle 17 being provided to prevent its passage through the vapor exit 18. Vapors and gases pass out through the vapor pipe 18, condensate or entrained liquid deposited therein being drawn off through the draw-off pipe 19, for example, for examination or testing. Vapors and condensate pass out of the vapor passage 18 through pipe 20 and pass through a suitable condenser 21, which may be water cooled if desired. From the condenser 21 the products pass into a riser or gas separator 22, condensates passing out

through pipe 23a and uncondensed gases being withdrawn from the top.

In carrying out the process, it has been found convenient to control the heating in the furnace or heating chamber by the temperature conditions prevailing at its exit, that is, in the passage 14 or substantially at the inlet to the chamber 15. It has been found that satisfactory yields of distillation products may be obtained when this temperature is from 800 to 1200° F. The oil may suitably be preheated before injection into the furnace 6 to a temperature of 500 to 700° F. The atomizing or spray nozzle 13 is so constructed that the column of spray thrown by it does not impinge upon the interior walls of the furnace, that is, upon the lining 12. If it is not desired to employ the entire body of combustion gases in the manner described, a portion thereof may be diverted, for example, through an outlet 23, directly through the stack (not shown).

The distillation of the finely subdivided residuum is very rapid and the coke formed as a result of its distillation is in finely divided form, the greater portion thereof separating out in a separator 15.

The following example illustrates a method of carrying out the present invention. The residuum handled may be, for example, a 14° Bé. Mid Continent crude residuum having a flash point of about 525° F. The oil, preheated, for example, to a temperature of about 600° F., is sprayed into the furnace through the pipe 5 and the nozzle 13. The combustion chamber is heated by inflammable gas introduced through the pipe 10, inert combustion gas being mixed with the finely divided oil in the interior of the furnace within the lining 12 and passing out through the vapor passage 14, where a temperature of 1000 to 1100° F. is produced. Liquid distillate products are formed to the extent of about 60 to 65%, these products having a viscosity of about 128 sec. Saybolt at 210° F. and a Baumé gravity of 18 to 20°. An average product shows an initial boiling point of 380 to 400° F. and approximately 80% off at 750° F.

I claim:

1. The method of distilling and decomposing heavy petroleum residues for the production of coke and lower boiling oils therefrom, which comprises spraying such residues in finely divided form through a coking chamber having a perforated wall, internally heating the body of the perforated wall of the chamber, introducing inert gases into the chamber through the perforations in said heated wall into the chamber, whereby the gases are heated and impart heat to the oil residues therein sufficient to effect coking of the individual finely divided portions of such residue and the production of lower boiling oils in vaporous form, passing the finely divided coke and vaporous products to an independent, separate, unheated chamber, separately withdrawing the vaporous products from said second chamber, and cooling the vapors to condense low boiling oils therefrom.

2. The method of distilling and decomposing heavy petroleum residues for the production of coke and lower boiling oils therefrom, which comprises spraying such residues in finely divided form through a chamber, effecting combustion of fuel within combustion spaces comprising a material part of the area of the body of the wall of said chamber, introducing the gases produced by such combustion into said chamber, whereby the gases impart heat to the oil residues therein sufficient to effect coking of the individual finely divided portions of such residues and the production of low boiling oils in vaporous form, passing the finely divided coke and vaporous products to an independent, separate, unheated chamber, separately withdrawing the vaporous products from said second chamber, and cooling said vapors to condense low-boiling oils therefrom.

3. The method of distilling and decomposing petroleum residues for the production of coke and low boiling oils therefrom, which comprises spraying such residues in finely divided form through a chamber, introducing highly heated gaseous products of combustion into said chamber through perforations distributed over substantially the entire interior area of the walls of said chamber to heat said finely divided residues to between about 800° F. and about 1200° F. and effect a coking of such residues and the production of low boiling oils in vaporous form, passing the coke and vaporous products to an independent, separate, unheated chamber, separately withdrawing the vaporous products from said chamber, and cooling said vapors to condense low boiling oils therefrom.

4. The method of distilling and decomposing heavy petroleum residues for the production of coke and low boiling oils therefrom, which comprises spraying such residues in finely divided form through a chamber, effecting combustion of fuel within the body of the wall of said chamber and introducing into the chamber the highly heated gaseous products of combustion through minute perforations occupying a substantial part of the inner aea of said walls, to heat said finely divided residues to between about 800° F. and 1200° F. to effect coking of the said residue and the production of low boiling oils in vaporous form, passing the coke and vaporous products to an independent separate unheated chamber, separately withdrawing the vaporous products fom said second chamber, and cooling said vapors to condense lower boiling oils therefrom.

5. In apparatus for distilling and decomposing heavy oil residues for the production of coke and lower boiling oils, a chamber hav-

ing a perforate wall, means for passing finely sub-divided oil residues through said chamber, means for internally heating the body of the perforated wall of said chamber, means for forcing heated inert gases into said chamber through the perforations in the wall of the said chamber whereby the gases impart heat to the oil residues within the said chamber to effect coking of the finely divided particles of residues passing therethrough and the production of lower boiling oils in vaporous form, an independent unheated separating chamber, means for passing the finely divided coked residues and vaporous products from said coking chamber to said separating chamber, means for separately withdrawing vaporous petroleum products from said separating chamber, and means for condensing said withdrawn vaporous products.

6. In apparatus for distilling and decomposing heavy oil residues for the production of coke and lower boiling oils, a coking chamber provided with a plurality of combustion spaces in a material part of the inner area of its wall which communicates with the interior of said chamber, means for passing finely sub-divided oil residues through said chamber, means for supplying suitable combustible material into said combustion spaces to produce combustion therein, whereby the products of combustion flow from said combustion spaces into the chamber and impart heat to the oil residues passing therethrough to effect coking of said residue and the production of lower boiling oils in vaporous form, an independent unheated separating chamber, means for passing the coked residues and said vaporous products to said separating chamber, means for separately withdrawing vaporous products from said separating chamber, and means for condensing the withdrawn vaporous products.

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