

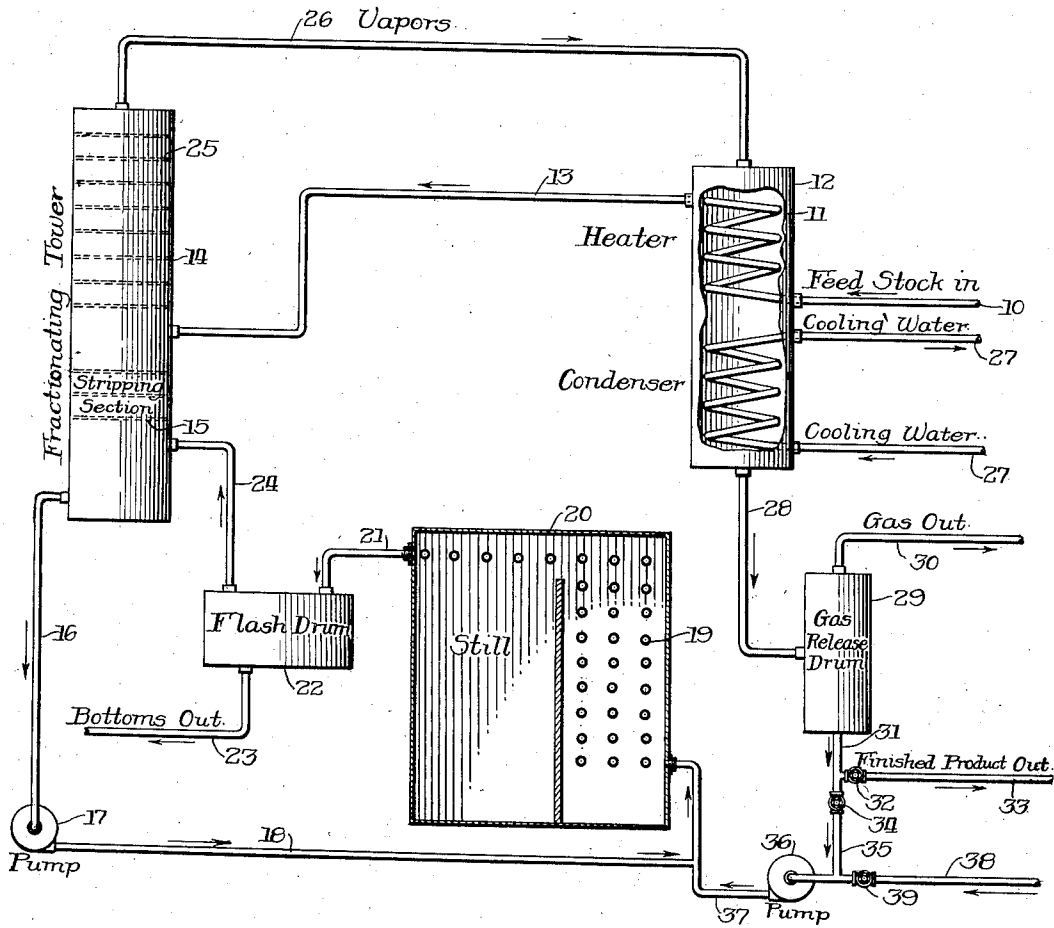
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LIGHT HYDROCARBON DISTILLATION

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# UNITED STATES PATENT OFFICE

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## LIGHT HYDROCARBON DISTILLATION

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5 Claims. (Cl. 196—88)

This invention relates to an apparatus and process for distilling hydrocarbon vapors, and it pertains more particularly to the distillation of pressure distillate by the use of naphtha vapors.

Many oil refineries are located in arid regions where water is scarce. An object of my invention is to provide a process and apparatus for distillation which will avoid the necessity of supplying fresh water and which will avoid the necessity of an extensive investment in steam boilers and accessory equipment for furnishing steam.

A further object is to provide a process in which pressure distillate may be re-distilled at a temperature low enough to obtain a distillate of satisfactory color.

A further object is to utilize the "finishing" distillation of corrosive or discolored naphtha for effecting distillation of cracked gasoline so that the resulting product will be of satisfactory color and stability.

Other objects will be apparent as the detailed description of my invention proceeds.

My invention contemplates a continuous cyclic process wherein preheated pressure distillate is stripped in a fractionating tower by naphtha vapors from a flash drum, the naphtha being mixed with the reflux leaving the fractionating tower before it enters the pipe still. I may use corrosive or "off color" naphtha for this purpose, or I may use a portion of the naphtha which is obtained by condensing the vapors leaving the fractionating tower. My invention will be more clearly understood from the following detailed description:

In the accompanying drawing I have diagrammatically illustrated an apparatus suitable for carrying out my improved process.

The feed stock which is preferably pressure distillate or cracked gasoline is pumped from any suitable source through pipe 10 to preheater coil 11 in condenser 12. The preheated stock is then led by pipe 13 to an intermediate point of fractionating tower 14 at which point the distillate is discharged above a stripping section 15. The stripped feed stock is conducted from the base of the fractionating tower by pipe 16 to pump 17, which forces it through pipe 18 to heating coil 19 in pipe still 20. Before entering the pipe still the feed stock is mixed with naphtha, as will be hereinafter described.

The hot mixture of naphtha and feed stock is conducted by pipe 21 to flash drum 22, which is provided with means for effectively separating the naphtha vapors from the bottoms or residues which are withdrawn through pipe 23. The

naphtha vapors are conducted by pipe 24 to the bottom of fractionating tower 14 wherein they pass counter-current to the incoming feed stock and act as a stripping medium therefor. The non-volatilized feed stock and condensed vapors are re-circulated through the pipe still as above described, and the combined vapors are passed through the upper section of the fractionating tower which may be equipped with suitable bubble plates 25, and are then conducted by pipe 26 to condenser 12. After the vapors have given up substantially all of their heat to the incoming feed stock they are further cooled by coil 27 wherein a cooling fluid is circulated.

The gases and liquids are led by pipe 28 from the condenser to a gas release drum 29, non-condensed gases passing by pipe 30 to a suitable absorption plant or to a furnace, and the finished naphtha being withdrawn through pipe 31.

Part of the finished product may be withdrawn through valve 32 and pipe 33 to a storage tank and part may be re-circulated through valve 34, pipe 35, pump 36 and pipe 37 back to the pipe still for distilling further amounts of incoming feed stock.

If unstable, corrosive, or "off color" naphtha is available, it may be introduced through pipe 38, valve 39, pump 36 and pipe 37. Such unfinished naphtha must be re-run for improving its color, stability or other properties, and its use in my improved process serves the double function of re-running or "finishing" the naphtha and stripping the pressure distillate.

The amount of naphtha introduced will, of course, depend upon the specific distillate; in the particular case of the cracked gasoline refined from Venezuelan crude, a still producing finished gasoline at the rate of 4,000 barrels per day requires about 25 gallons per minute of a naphtha having an initial boiling point of 90° F. and an end point of 385° F. The ratio of stripping naphtha to charging stock is in this case, therefore, about one to six.

In re-distilling cracked gasoline which has been heavily treated with acid for the removal of sulfur, I have found that in order to obtain distillate of satisfactory color the temperature must be kept below 485° F. The methods heretofore used, vacuum distillation or distillation in the presence of steam, require a large amount of apparatus, boilers and other equipment and would require large amounts of fresh water. By my improved process I effect a saving in both of these items and at the same time I obtain a distillate of superior

quality by a process which can be easily and accurately regulated and controlled.

While I have described a preferred embodiment of my invention, it is understood that I am not limited to the details therein set forth except as defined by the following claims, and that well-known expedients such as means to introduce reflux into the top of the tower, means to separate different naphtha cuts, etc. are contemplated, though not described in detail.

I claim:

1. The method of distilling hydrocarbon oils, the preponderating portion of which is in the naphtha range, without the substantial use of steam and under conditions which substantially preclude cracking, which comprises stripping them with volatilized normally liquid naphtha fractions in a tower, condensing the vapors leaving said tower, mixing a portion of the resultant condensate with the stripped oil, heating the mixture in a confined stream to a temperature high enough to effect vaporization of the light fractions without cracking, separating the vaporized fractions from the residuum in a flash chamber, removing the liquid residuum from said chamber, and introducing the separated vaporized fractions as said volatilized normally liquid naphtha into the bottom of the tower and below the surface of the liquid oils therein.

2. The method of distilling hydrocarbon oils, the preponderating portion of which is in the naphtha range, without the substantial use of steam and under conditions which substantially preclude cracking, which comprises stripping said oils with unfinished naphtha vapors, condensing the said naphtha vapors, mixing the stripped oil with a part of the resultant condensate, heating the mixture to vaporize the naphtha, separating the naphtha vapors from the unvaporized residuum, and using said vapors in said stripping step as said unfinished naphtha vapors whereby the finishing of the naphtha is accomplished simultaneously with the distillation of the oil.

3. The method of distilling hydrocarbon oils, the preponderating portion of which is in the naphtha range, without the substantial use of steam and under conditions which substantially

preclude cracking, which comprises introducing said hydrocarbon oils into a stripping tower, condensing the vapors taken overhead from said tower, separately withdrawing the stripped residuum from said tower, mixing a portion of the resultant condensate from the overhead with the stripped residuum and heating the mixture under non-cracking conditions in a confined stream to a temperature high enough to effect vaporization of the light fractions, separating the vaporized fraction from the bottoms by flashing, withdrawing the unvaporized bottoms from the flash zone, separately withdrawing the vapors from the flash zone and introducing said vapors into the stripping tower for stripping the hydrocarbon oils therein.

4. The method of distilling hydrocarbon oils, the preponderating portion of which is in the naphtha range, which comprises stripping said oil with unfinished naphtha vapors, condensing the said naphtha vapors in a zone remote from the zone in which the stripping takes place, mixing the stripped oil with some of the naphtha condensate, heating the mixture in a confined stream without substantial cracking, separating unfinished naphtha vapors from the liquid residuum, and using said vapors as the unfinished naphtha vapors in the stripping step whereby the finishing of the naphtha is accomplished simultaneously with the distillation of the oil.

5. The method of distilling hydrocarbon oils, the preponderating portion of which is in the naphtha range, which comprises stripping them with volatilized normally liquid naphtha fractions in a tower, condensing the vapors after leaving said tower, mixing a portion of said condensed vapors with the stripped oils, heating the mixture in a confined stream in a still without substantial cracking and to a temperature high enough to effect vaporization of the light fractions from the liquid residue in an enlarged chamber, removing the residue from said chamber and introducing the said separated vaporized light fractions as the volatilized normally liquid naphtha into the tower for stripping the hydrocarbon oils therein.

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