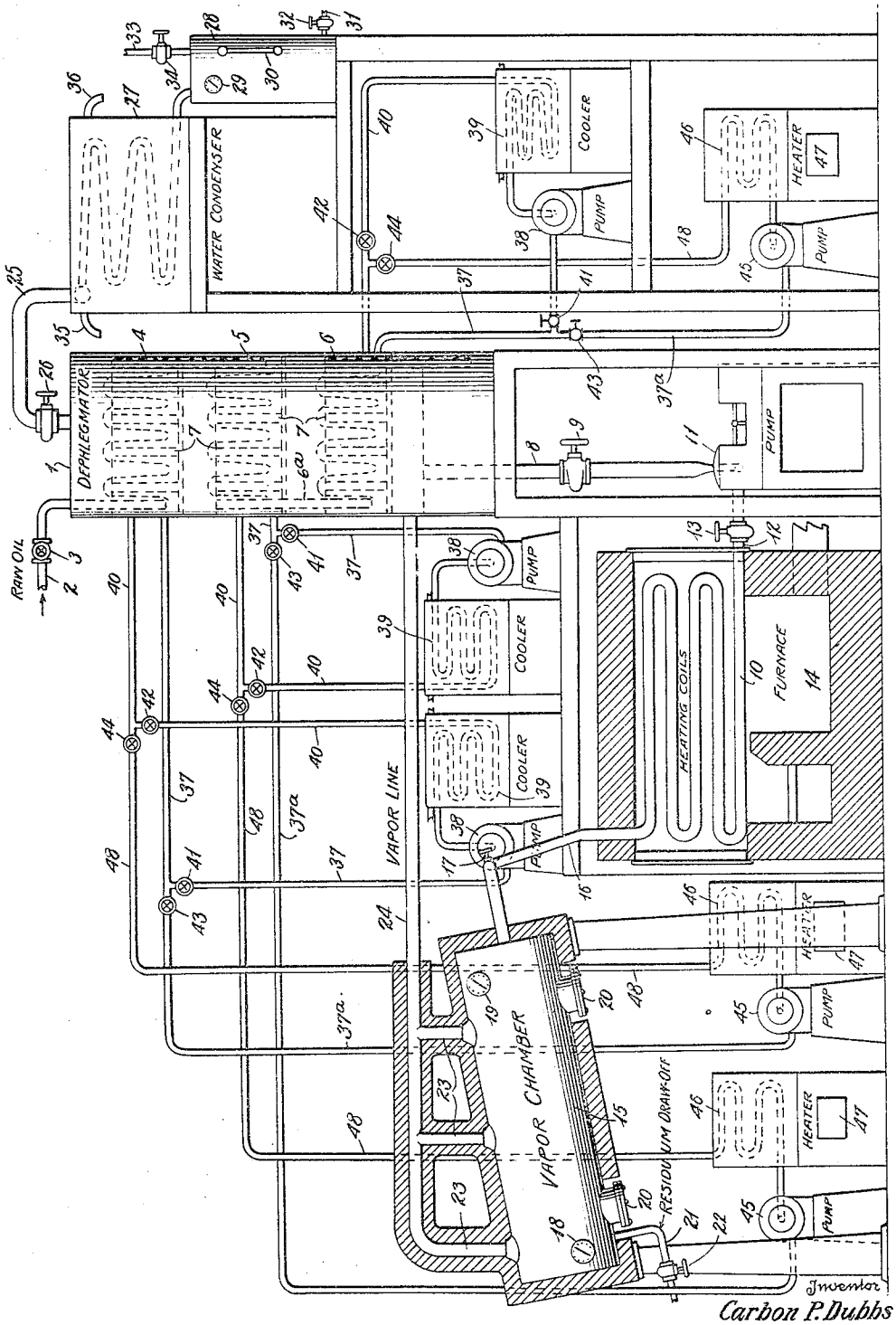
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PROCESS AND APPARATUS FOR PRODUCING LOW BOILING POINT HYDROCARBON OILS

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PROCESS AND APPARATUS FOR PRODUCING LOW BOILING POINT HYDROCARBON OILS

Application filed November 1, 1928, Serial No. 316,565, in turn a continuation of application Serial No. 381,922, filed May 17, 1920. Divided and this application filed March 21, 1930. Serial No. 437,764.

This application is a division of my co-pending application Serial No. 316,565, filed November 1, 1928, in turn a continuation of my application Serial No. 381,922, filed May 17, 1920.

My invention relates to improvements in a process and apparatus for producing lower boiling point hydrocarbon oils and refers more particularly to a process in which the character of the distillate is controlled by regulation of the dephlegmating temperature.

Among the salient objects of the invention, are to provide a process in which the temperature of the dephlegmating or condensing agent is controlled so that either a large or small percentage of the vapors released from the oil body are condensed in passing therethrough; to provide a process in which the temperature of the successive stages of dephlegmation may be varied so that the oil vapors may be treated to produce the greatest possible yield, a more uniform distillate, or so treated that any particular cut or fraction may be extracted from the oil without necessitating the redistilling of the distillate procured; to provide an apparatus for the carrying out of the process and in general to provide an apparatus of the character referred to.

The single figure is a diagrammatic side elevation of the apparatus with parts in section.

In cracking hydrocarbon oils, after the disintegration of the molecules in the reacting chamber, the distillate which is produced by the condensation of these oil vapors is produced in an inversed relation to the way in which they are cracked, that is, with the heating of the oil, the low boiling point hydrocarbons will first be released from the oil body, subsequently as the temperature is increased, the higher boiling point hydrocarbons will come off. So, with the cooling of the vapors, the high boiling point oils will first be condensed and subsequently as the temperature is decreased, low boiling point vapors will be liquefied. From this, it will be seen that the method and means of cooling or condensing the oil vapors is of as much importance as the heating thereof. By the controlling of the temperature at which the cendensation takes place, the character of the distillate may be controlled. The controlling of this condensating temperature is the most important function of the following process.

Referring in detail to the drawing, the raw oil is introduced from any convenient source to the dephlegmator 1 through the inlet pipe 2, which is regulated by valve 3. The raw oil together with condensate condensed in the dephlegmator 1 collects in vertically arranged pools, 4, 5 and 6, the levels of which are controlled by standpipe 6a which convey the surplus oil from each pool to the pool below. The oil, after dephlegmating the oil vapors which bubble up through the pools by means of risers 7, collects in the bottom of the dephlegmator and is drawn off through the line 8, which is controlled by valve 9. This oil containing what condensate it may collect in dephlegmating the vapors is charged to the heating coils 10 through the pump 11, charging pipe 12, controlled by valve 13. The heating coils are mounted above the furnace 14, which is heated by any suitable means (not shown). The heated oil vapors, after being raised to a cracking temperature, are directed to the reacting or vapor chamber 15 through the pipe 16 which is regulated by valve at 17.

One or more of these vapor chambers may be interposed in the system according to the quantity of oil to be treated. The vapor chamber shown at 15 is equipped with pyrometer 18, pressure gauge 19 and removable cleaning plates 20. A residuum draw-off 21 controlled by valve 22, furnishes a means for removing the heavy residual oil, together with the precipitated carbon collecting in the vapor chamber. The vapors released from the oil body are directed through the risers 23 to the line 24 by means of which they are introduced to the bottom of the dephlegmator. As explained, the vapors rise through the successive pools through the risers 7 bubbling up through the raw oil in each pool and what vapors are not con-

densed in these successive pools are drawn off through the gooseneck 25, which is controlled by valve 26. These vapors, after being subjected to the cooling effect of the water condenser 27, collect as a distillate in the receiving tank 28. This receiving tank is equipped with pressure gauge 29, liquid level gauge 30, liquid draw-off 31, controlled by a valve 32, and a gas relief pipe 33, controlled by valve 34. The water condenser 27 is fitted with a water inlet pipe 35 and an outlet pipe 36.

If it is desired to decrease the temperature of the liquid oil contained in either of the pools 4, 5 or 6, the same may be drawn off through the lines 37 and forced by the pumps 38 through the cooling water condensers 39, from which they are directed back to to their respective pools by means of the return lines 40. It is essential that the valves 41 and 42 are open during this local circulation and that the valves 43 and 44 are closed. If, on the other hand, for any reason it is more desirable to raise the temperature in any one of these pools, the liquid oil is similarly drawn off through the pipes 37 and directed down through the lines 37*a*, and circulated by means of the pumps 45 through the heating coils 46 mounted above suitable heating means 47, after which the heated oil proceeds back to their respective pools through the return lines 48 and through a short connecting section of the return lines 40. It is essential during this circulation that the valves 43 and 44 are in an open position and the valves 41 and 42 are closed.

In this manner, when it is desired to obtain a distillate containing only the more volatile hydrocarbons such as the naptha and benzine content, the temperatures of the pools must be lowered so that the high boiling point hydrocarbons will be condensed therein, the lighter or more volatile oil vapors bubbling through the successive pools and finally condensed as low boiling point distillate in the receiver 28. Thus, by controlling the temperature of the dephlegmating agent, the quantity and character of the distillate finally connected in the receiver may be positively controlled. It may be an advantage to have the dephlegmating agent in one pool relatively cool and in another pool hot. In this case, the liquid from the first pool may be circulated through the cooling condenser while the liquid in the second pool may be directed through the heater by a manipulation of the valves in the respective lines.

Having thus described my invention, what I desire to secure by Letters Patent is:

1. In the art of fractional distillation of petroleum, the process which comprises passing vapors upwardly through a plurality of fractionating zones at different levels, passing reflux liquid downwardly in a continuous stream through said zones countercurrent to and in contact with said vapors, withdrawing liquid from one of said zones and cooling it, and returning liquid so cooled to a zone at least as high as the zone from which it was withdrawn.

2. In the art of fractional distillation of petroleum, the process which comprises passing vapors through a plurality of fractionating zones, passing reflux liquid in a continuous stream through said zones countercurrent to and in contact with said vapors, withdrawing liquid from one of said zones and cooling it, and returning liquid so cooled to the zone from which it was withdrawn.

3. In the art of fractional distillation of petroleum, the process which comprises passing vapors of the oil through a plurality of fractionating zones, passing reflux oil in a continuous stream through said zones countercurrent to and in contact with the vapors, circulating liquid oil from and back to one of said zones, and cooling the liquid oil while in circulation external to said zone.

4. In the art of fractional distillation of petroleum, the process which comprises passing vapors of the oil upwardly through a plurality of fractionating zones at different levels, passing reflux oil downwardly in a continuous stream through said zones countercurrent to and in contact with the vapors, circulating liquid oil from one of said zones back to a zone at least as high as the zone from which it is withdrawn, and cooling the liquid oil while in circulation external to said zones.

5. A fractionating system for petroleum comprising a fractionating column, means therein for defining a plurality of fractionating chambers at different levels, means within said column for conducting reflux liquid in a continuous stream downwardly therethrough, means for passing vapors of the liquid to be fractionated upwardly through the column countercurrent to and in contact with the reflux liquid, cooling means external to said column, and connections for withdrawing liquid from one of said chambers to said cooling means and for returning it to a chamber at least as high as the chamber from which it is withdrawn.

In testimony whereof I affix my signature.

CARBON P. DUBBS.