

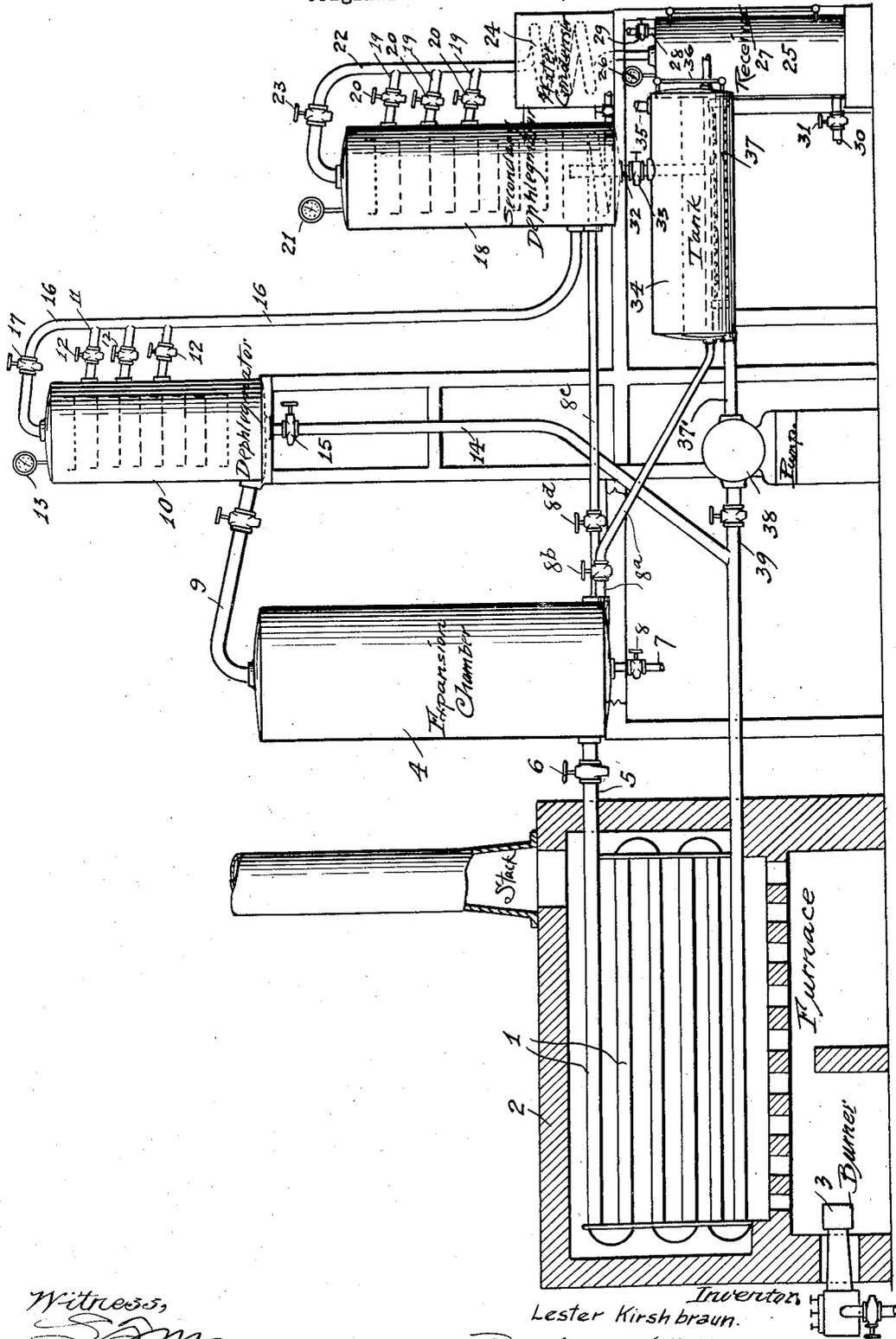
Feb. 2, 1932.

L. KIRSCHBRAUN

1,843,684

PROCESS FOR TREATING OIL

Original Filed Dec. 23, 1920



Witness,  
*S. J. Mann*

Inventor  
Lester Kirshbraun.  
By *Frank L. Belknap* Atty.

## UNITED STATES PATENT OFFICE

LESTER KIRSCHBRAUN, OF LEONIA, NEW JERSEY, ASSIGNOR TO UNIVERSAL OIL PRODUCTS CO., OF CHICAGO, ILLINOIS, A CORPORATION OF SOUTH DAKOTA

## PROCESS FOR TREATING OIL

Application filed December 23, 1920, Serial No. 432,832. Renewed January 13, 1928.

This invention relates to improvements in process and apparatus for treating oil and refers more particularly to improvements in the dephlegmation of the generated vapors subsequent to their passing from the cracking zone.

Among its salient objects is to provide a process in which the generated vapors, subsequent to being cracked, are first dephlegmated in a primary dephlegmator whereby a portion of the vapors are fractionally condensed, the remaining uncondensed portion passing to a secondary dephlegmator where an additional amount of the higher boiling point fractions are separated out; to provide a process in which a more uniform distillate is produced due to the fact that the oil charge does not have to be heated to as high a temperature in order to force the vapors through a dephlegmator of a size sufficient to separate out adequate quantities of the higher boiling point fractions; to provide a process in which, by the insertion of two smaller dephlegmators, the initial temperature in the cracking zone may be reduced and a greater part of the "wildcat" or extremely low boiling point hydrocarbons eliminated; to provide a process whereby the character of the final distillate may be regulated by drawing off vapors from different heights on the dephlegmator according to the atmospheric conditions and subsequently subjecting said vapors to a secondary condensing action and drawing the vapors from the second dephlegmator at regulated heights thereon and finally condensing the uncondensed vapors from the second dephlegmator and collecting the same in liquid form in the receiver; to provide an apparatus for the effecting of this process, and, in general, to provide a process and apparatus of the character referred to.

The single figure is a side elevation, partly in section, of the apparatus.

Referring to the drawing—heating coils 1 are mounted in a furnace 2 which is preferably heated by means of gas burners 3. At 4 is an expansion or vaporizing chamber connected to cracking coils by means of the pipe 5 controlled by a valve 6. This vapor chamber is equipped with a draw-off pipe 7 regulated by a valve 8. Ordinarily, the hot residuum from the vaporizing chamber is directed through the line 8a controlled by the valve 8b which line passes through the tank 34 where it acts to assist in preheating the incoming raw oil, or, if desired, it may be diverted through 8c regulated by valve 8d to a coil positioned in the bottom of the secondary dephlegmator 18. A vapor line 9 leads from the top of the vapor chamber to a dephlegmator 10 which is equipped with draw-off pipes 11 regulated by valves 12 positioned at different heights on the dephlegmator for the purpose of drawing off the uncondensed vapors. The dephlegmator is equipped with a pressure gauge 13 and a reflux line 14 controlled by a valve 15. A goose-neck 16 regulated by a valve 17 directs the vapors from the top of the primary dephlegmator to the lower portion of the secondary dephlegmator 18. The vapor lines 11 tapped into the primary dephlegmator at different heights communicate with the vapor line 16. The secondary dephlegmator is similarly equipped with vapor draw-offs 19 positioned at various heights thereon identical to the lines 11 in the primary dephlegmator. These draw-off lines 19 are controlled by valves 20. Pressure gauge 21 furnishes a means for ascertaining at all times the pressure in the secondary dephlegmator. A vapor line 22 controlled by a valve 23 is tapped into the top of the secondary dephlegmator and directs the uncondensed vapors from the secondary dephlegmator to the water condenser 24 from which the distillate flows to a receiver 25. The latter is equipped with pressure gauge 26, liquid level gauge 27, pressure relief pipe 28 controlled by a valve 29 and a liquid draw-off 30 regulated by a valve 31. The reflux from the secondary dephlegmator is drawn off through the line 32 in which is interposed a valve 33 and is mixed with the raw oil which is maintained at a regulated level in the tank 34. The raw oil is introduced to said tank through an inlet pipe 35 and is controlled at a regulated level by means of the gauge 36. After mixing with the reflux which is introduced to the body of the oil through a perforated horizontal pipe 37, the raw oil is

directed through a line 37' and a pump 38 from whence it is charged to the cracking tubes through the line 39. The reflux line from the primary reflux condenser is connected into the charging pipe 39 and regulated quantities of the reflux from the primary condenser may be introduced into the oil charge as desired. The operation of the process is substantially as related in the description of the drawing, the oil being heated in the heating coils 1 and converted to vapors in the vapor chamber 4 from which the vapors pass over to the primary and secondary dephlegmators, as explained.

Atmospheric conditions will regulate to a certain extent which vapor line will be used to draw off the vapors from the primary dephlegmator for introduction to the secondary dephlegmator. In a like manner the selection of the draw-off line from the secondary dephlegmator will be controlled by the character of the distillate desired and the atmospheric conditions which affect the dephlegmation in the secondary dephlegmator. In the vapor lines connecting the primary and secondary dephlegmators are valves, the idea being to cause the first dephlegmation to take place under pressure and the dephlegmation in the secondary condenser or dephlegmator to take place under substantially atmospheric conditions, or slightly above.

In a system having but a single dephlegmator, it is difficult to obtain a pressure distillate of hydrocarbons containing a maximum percentage boiling within the range of gasolene. Generally, a system using a single dephlegmator, which operates under pressure, will produce a pressure distillate approximating 50° B. gravity and containing from fifty to sixty percent of hydrocarbons boiling within the range of commercial gasolene. Attempts to improve the quality of this distillate by extending the dephlegmator has necessitated greater heat in the cracking tubes in order to permit of more extended rectification, also to compensate for additional radiation, and to develop the additional energy required by the production and storage of the greater amount of vapors dephlegmated under compression. It is apparent that the numerous redistillations which take place during dephlegmation require the storage of more heat in the vapors when carried out under compression than when this operation is conducted under atmospheric pressure. All such additional heat must, of course, be applied in the cracking zone and the result of excessive heating is to produce overcracking and the formation of undesirably large quantities of very low boiling point or "wildcat" hydrocarbons, uncondensable gas and carbon.

By operating the disclosed invention, it is possible to produce an improved quality of pressure distillate without the application of

this excessive heat and by the utilization of such heat as is stored up in the vapors as they leave the dephlegmator under pressure of a single stage dephlegmating unit. This is accomplished by releasing the pressure after the initial dephlegmation and thus utilizing the heat stored up in the hydrocarbons and the energy available with the release of the pressure to produce additional dephlegmation and eliminate the hydrocarbons having a boiling point outside of the gasolene range.

If from the first stage of dephlegmation there is a 50° B. gravity distillate available for condensation and this distillate is subjected to further dephlegmation by the disclosed process, it will be apparent that an improved distillate will result in the final condensation and instead of procuring only fifty to sixty percent hydrocarbons in the boiling point range of gasolene, a pressure distillate of about 50° B. gravity and containing from 75 to 85% gasolene may be obtained.

Exact control may be secured in the second dephlegmating unit by imposing a relatively low pressure above atmospheric on this portion of the system, should it be desirable at any time to retard the passage of the lower boiling point hydrocarbons into the receiver. This, together with the selection of the proper vapor take-offs, makes it possible to secure this exact control of dephlegmation and the selection of the fractions of the desired boiling points.

While the final condensation is generally at or slightly above atmospheric pressure, it should be stated that the smallest part of the distillate produced in the system is condensed in the final stage, the bulk of condensation taking place in the primary dephlegmator and representing approximately eight times the distillate produced during the final condensation.

The disclosure is not restricted to the use of two stages as it may be advisable to incorporate three or more dephlegmating steps in the system.

I claim as my invention:—

1. A process for treating oils, consisting in cracking the oil under a substantial pressure, dephlegmating the vapors in successive stages of reduced pressure, regulating the character of the final distillate by drawing off vapors from each stage of dephlegmation at points in the height of said stages which may be varied as variations occur in the rate of dephlegmation due to atmospheric conditions, condensing the vapors withdrawn from the final stage of dephlegmation, and maintaining a regulated differential pressure during operation.

2. A process for treating oils, consisting in cracking the oil under a self-generated vapor pressure, dephlegmating the vapors in successive stages under successively re-

duced pressure, regulating the character of distillate produced by controlling the points in the height of each stage of dephlegmation at which vapors are withdrawn, and condensing the vapors withdrawn from the final stage of dephlegmation.

3. A process of treating oil, consisting in cracking the oil while maintaining it under a self-generated vapor pressure, dephlegmating the vapor produced in an initial dephlegmator under a pressure substantially the same as that maintained during the cracking of the oil, directing the uncondensed vapors to a second dephlegmating stage and there subjecting them to dephlegmation under pressure less than that in the initial dephlegmating stage, condensing the vapors from the second dephlegmating stage, and controlling the distillate produced by regulating the points in the height of the dephlegmators from which the vapors are withdrawn, said points being varied as variations occur in the rate of dephlegmation due to atmospheric conditions.

LESTER KIRSCHBRAUN.