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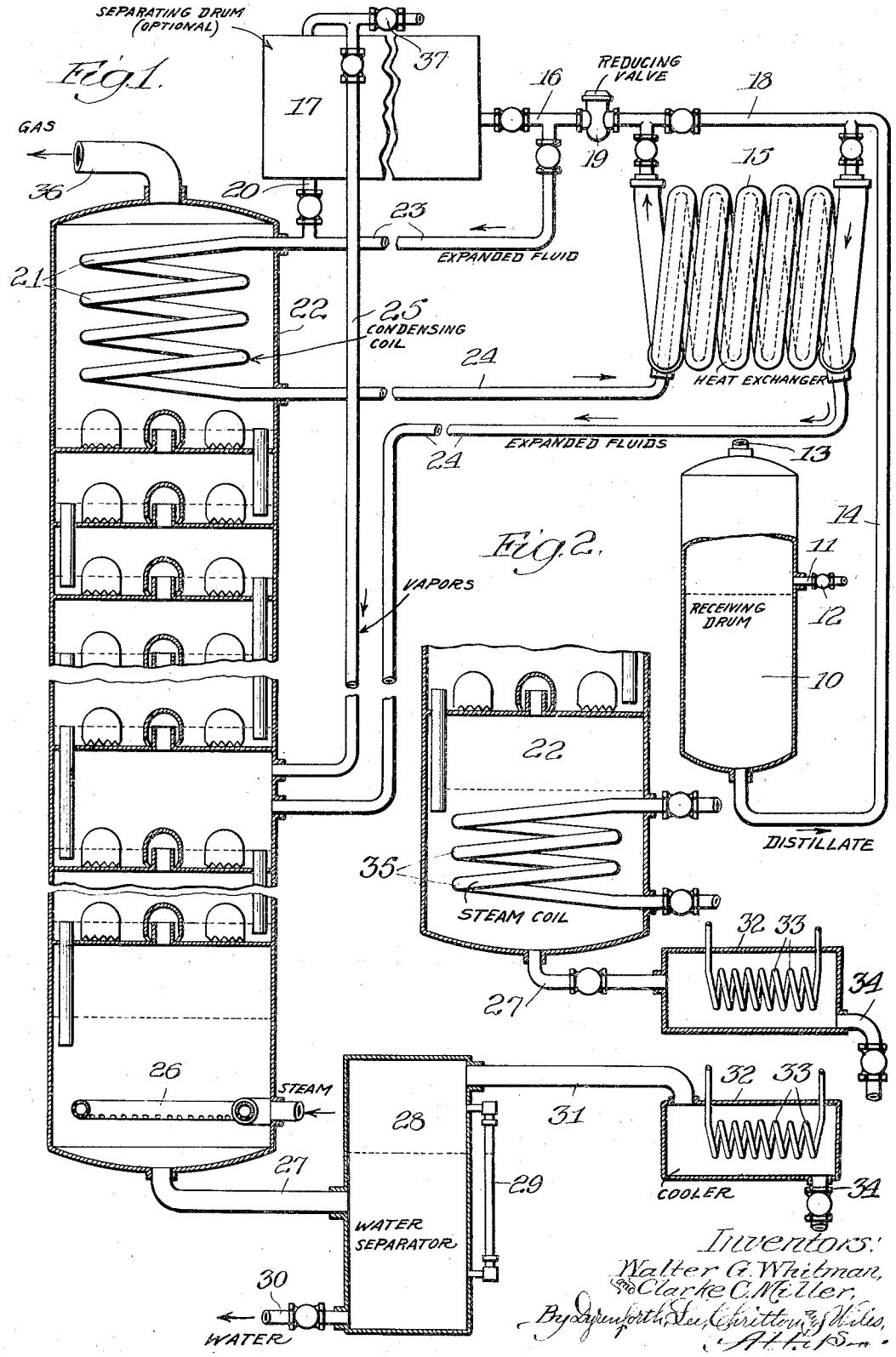


Fig. 1.

Fig. 2.

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REMOVAL OF GAS AND LOW-BOILING FRACTIONS FROM PETROLEUM PRODUCTS

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This invention relates to the removal of gases and low boiling fractions from petroleum products and particularly from gasoline and gasoline-containing distillates from pressure cracking operations.

The invention will be readily understood from the following description of a preferred method of operating in conjunction with the accompanying drawings in which:

Figure 1 is an elevation partly in section of an apparatus suitable for this purpose; and

Fig. 2 is a fragmentary view illustrating a modification of the apparatus.

Referring to the drawings, 10 is a receiving drum, adapted to be supplied with distillate by pipe 11 which is provided with a reducing valve 12. From the top of drum 10, a pipe 13 leads to suitable collecting or absorbing apparatus (not shown) and pipe 13 is provided with suitable means (not shown) for maintaining the pressure in drum 10 at a desired degree. From the bottom of drum 10 a pipe 14 leads to a heat exchanger 15, which may suitably be of the double tube type. The outlet from the heat exchanger 15 feeds into a pipe 16 which leads into a separating chamber or drum 17. A pipe 18 and suitable valves may be provided so as to enable the heat exchanger to be by-passed when desired. In the pipe 16 a suitable reducing valve 19 is provided. From the bottom of the separating drum 17, a pipe 20 leads into a coil 21 in the upper part of a fractionating column 22. A pipe 23 and suitable valves may be provided so as to enable the separating drum 17 to be by-passed when desired. The outlet pipe 24 from the coil 21 passes through the heat exchanger 15 and leads into an intermediate part of the column 22. From the top of the separating drum 17, a valved pipe 25 leads into an intermediate part of the column 22. A valved pipe 37 connects with the pipe 25 and leads to an absorbing apparatus or storage system (not shown). The column 22 is provided with suitable fractionating devices, which may suitably be bubble-cap plates provided with bubble-caps and overflow pipes. From the top of the column a vapor outlet 36 leads to an absorption plant (not shown). In the base of the column 22 suitable heating means may be provided. As shown in Fig. 1 the heating means may be a perforated pipe 26 which is adapted to inject steam into the distillate which collects in the base of the column. From the base of the column 22 a pipe 27 leads to a receiver 28 provided with a gauge glass 29, a valved water outlet pipe 30 and a distillate outlet pipe 31. The pipe 31 leads into a cooler which may suitably be a chamber 32 provided with a cooling coil 33 and an outlet 34.

As shown in Fig. 2 the heating means may be a closed steam coil 35 and in this modification the receiver 28 may be omitted, the outlet pipe 27 leading directly into the cooling chamber 32.

The operation will be fully understood from the following illustrative example. Pressure distillate condensed and further cooled with water, under about 300 lbs. gauge pressure, is admitted by pipe 11 through reducing valve 12 into the drum 10 which is maintained at a pressure of about 80 lbs. gauge. The gas and vapors separating in drum 10 are passed by pipe 13 to suitable absorption apparatus (not shown). The temperature of the oil drops about 10° F. owing to the expansion effected at valve 12, the temperature of the oil in drum 10 being, for example, about 60° F. Oil from drum 10 is passed by pipe 14 to heat exchanger 15, and passing through the outer pipe thereof, is cooled to about 50° F. The oil then passes through reducing valve 19 and its pressure is reduced to substantially atmospheric, its temperature being thereby reduced to about 35° F. The expanded oil is passed into the separating drum 17 wherein separation of the gases and vapors takes place, the gas being conducted by pipe 25 to an intermediate point of the column, or, if desired, is removed from the system by pipe 37. The liquid oil is passed through the coil 21, thereby maintaining a low temperature in the head of the column, thus providing reflux for the column and reducing to the extent desired the amount of gasoline constituents carried off by the gases which pass out of the column by pipe 36.

The oil issuing from the coil 21 has a temperature of about 39° F. and passing through the heat exchanger 15, serves to effect the precooling of the incoming oil as hereinbefore described. The oil emerging from the heat exchanger 15 by pipe 24 has been heated therein to about 50° F. and is fed by said pipe into an intermediate point of the column 22. Before being thus supplied to the column, the oil may be further heated, if desired, by any suitable means, for example, by the hot oil withdrawn from the still. The oil thus supplied, together with reflux from the upper part of the column descends through the column over the bubble-cap plates below its point of entry, gradually increasing in temperature and being intimately contacted with gas and vapors derived from the heated lower end of the column. A body of oil is collected and maintained in the lower portion of the column and is maintained at a temperature such as about 130° F. sufficiently high to ensure absence of any substantial quantities of gases and wild ends in the finished distillate. This temperature may be maintained by injecting open steam into the body of oil as illustrated in Fig. 1 or by passing steam through a closed coil therein as illustrated in Fig. 2.

The gases and vapors fed into the column by pipe 25 together with the gases and vapors liberated in the lower part of the column, ascend through the upper part of the column, being therein intimately contacted with the reflux condensed by coil 21, and subjected to gradually decreasing temperature. In this treatment gasoline constitutents are condensed from the ascending gases and contact with the coil 21 effects a further condensation of such constituents.

Pre-cooler 15 may be by-passed and supplementary cooling means may be used in the apparatus, if desired. Further, the separating drum 17 may be omitted or by-passed, if desired, and both gases and liquid may be passed through the cooling coil 21.

The method exemplified by the foregoing detailed example effects the removal of gases and wild vapors while retaining substantial quantities of valuable low-boiling gasoline constituents which would be carried off by said gases and vapors if the distillate were subjected to natural weathering or rerunning.

Although the present invention has been described in connection with the details of a specific embodiment thereof, it is not intended that such details shall be regarded as limitations upon the scope of the invention, except in so far as included in the accompanying claims.

We claim:

1. The method of removing gases and low-boiling fractions from hydrocarbon distillates which consists in reducing the pressure on such distillate thereby liberating gas therefrom, expanding the gas while in the presence of said distillate to reduce the temperature of the distillate, passing the chilled distillate through a closed conduit in the upper part of a fractionating column, then introducing the distillate with its contained gas into the column at an intermediate point of said column and applying heat at a lower part of said column.

2. The method of removing gases and low-boiling fractions from hydrocarbon distillates which consists in reducing the pressure on such distillate thereby liberating gas therefrom, expanding the gas and reducing the temperature of the oil, passing the chilled distillate through a closed passage in the upper part of a fractionating column, then passing the distillate in heat exchange relationship with incoming distillate, passing said first mentioned distillate into an intermediate part of said column, and applying heat at a lower part of said column.

3. The method of removing gases and low-boiling fractions from hydrocarbon distillates which consists in reducing the pressure on such distillate thereby liberating gas therefrom, and causing the gas to expand while in the presence of said distillate to reduce the temperature of the distillate, passing the chilled distillate through a closed conduit in the upper part of a fractionating column, supplying said distillate and gas to an intermediate point of said column, and applying heat at a lower part of said column.

4. The method of removing gases and low-boiling fractions from hydrocarbon distillate which consists in reducing the pressure on such distillate thereby liberating gas therefrom, expanding the gas and reducing the temperature of the distillate, separating said gas from said distillate, passing the chilled distillate through a closed conduit in the upper part of a fractionating column, supplying said distillate to an intermediate point of said column, supplying said separated gas separately to an intermediate point of said column, and supplying heat at a lower part of said column.

5. The method of removing gases and low-boiling fractions from hydrocarbon distillate which consists in reducing the pressure of such distillate thereby liberating gas therefrom, expanding the gas and reducing the temperature of the distillate, separating said gas from said distillate, passing the chilled distillate through a closed conduit in the upper part of a fractionating column, then passing the distillate in heat exchange relationship with incoming distillate, passing said first mentioned distillate into an intermediate point of said column, passing the separated gas into an intermediate point of said column, and applying heat at a lower part of said column.

6. The method of removing gases and low-

boiling fractions from hydrocarbon distillates under high pressure which consists in reducing the pressure thereon to a pressure substantially above atmospheric pressure, removing the gases and vapors thereby liberated, then reducing the pressure on said distillate to substantially atmospheric pressure, thereby liberating gas therefrom and causing the liberated gas to expand while in the presence of said distillate to reduce the temperature of the distillate, passing the chilled distillate through a closed conduit in the upper part of a fractionating column, then introducing the distillate with its contained gas into the column at an intermediate point of said column and applying heat at a lower part of said column.

7. The method of removing gases and low-boiling fractions from hydrocarbon distillates under high pressure which consists in reducing the pressure thereon to a pressure substantially above atmospheric pressure, removing the gases and vapors thereby liberated, then reducing the pressure on said distillate to substantially atmospheric pressure, thereby liberating gas therefrom while causing the liberated gas to expand in the presence of said distillate to reduce the temperature of the distillate, passing the chilled distillate through a closed conduit in the upper part of a fractionating column, then passing the distillate in heat exchange relationship with incoming distillate at superatmospheric pressure, then introducing the first mentioned distillate into the column at an intermediate point of said column and applying heat at a lower part of said column.

8. An apparatus for removing gases and low-boiling fractions from hydrocarbon distillates which comprises a conduit for supplying distillate under pressure, a reducing valve therein, a fractionating column, a closed conduit in the upper part of said column and adapted to be supplied with distillate from the first said conduit, a heat exchanger, a conduit leading from the closed conduit in the upper part of the column into an intermediate point of said column and located in heat exchange relationship with the first said conduit so as to cool the distillate under said pressure passing therethrough, and means for supplying heat to the lower part of said column.

9. An apparatus for removing gases and low-boiling fractions from hydrocarbon distillates which comprises a conduit for supplying distillate under pressure, a reducing valve therein, a separating drum into which said conduit feeds, a fractionating column, a closed conduit in the upper part of said column adapted to be supplied with distillate from said drum, means for conveying distillate from the conduit in the column into an intermediate point of said column, means for supplying gases from the separating drum into an intermediate point of said column, and means for supplying heat to the lower part of said column.

10. An apparatus for removing gases and low-boiling fractions from hydrocarbon distillates which comprises an expansion drum, a conduit leading thereinto, a reducing valve in said conduit, a second expansion drum, a conduit for leading liquid from the first drum into the second drum, a reducing valve in said conduit, a fractionating column, means for supplying heat to the lower part of said column, a closed conduit in the upper part of said column, means for supplying liquid oil from the second separating drum thereto, means for supplying gases and vapors separated in the second expansion drum to an intermediate point of said column, a heat exchanger and means for conveying liquid oil from the closed conduit in the column to an intermediate point of the column, the last said means and the conduit leading from the first expansion drum to the second being located in heat exchange relationship so as to cool the incoming oil before it passes through the second reducing valve.

11. A method of utilizing pressure distillate from cracking operations, which comprises cooling said distillate by reducing the pressure thereon to liberate gas therefrom and cause said liberated gas to expand in the presence of said distillate, passing the cooled distillate in a confined stream through the upper part of a fractionating column, then introducing said distillate with its contained gas into an intermediate point of said column, and supplying heat at a lower part of said column.

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