May 3, 1949. G. L. GUDENRATH 2,468,750

METHOD OF SEPARATING HYDROCARBONS

Filed May 12, 1945 3 Sheets-Sheet 1

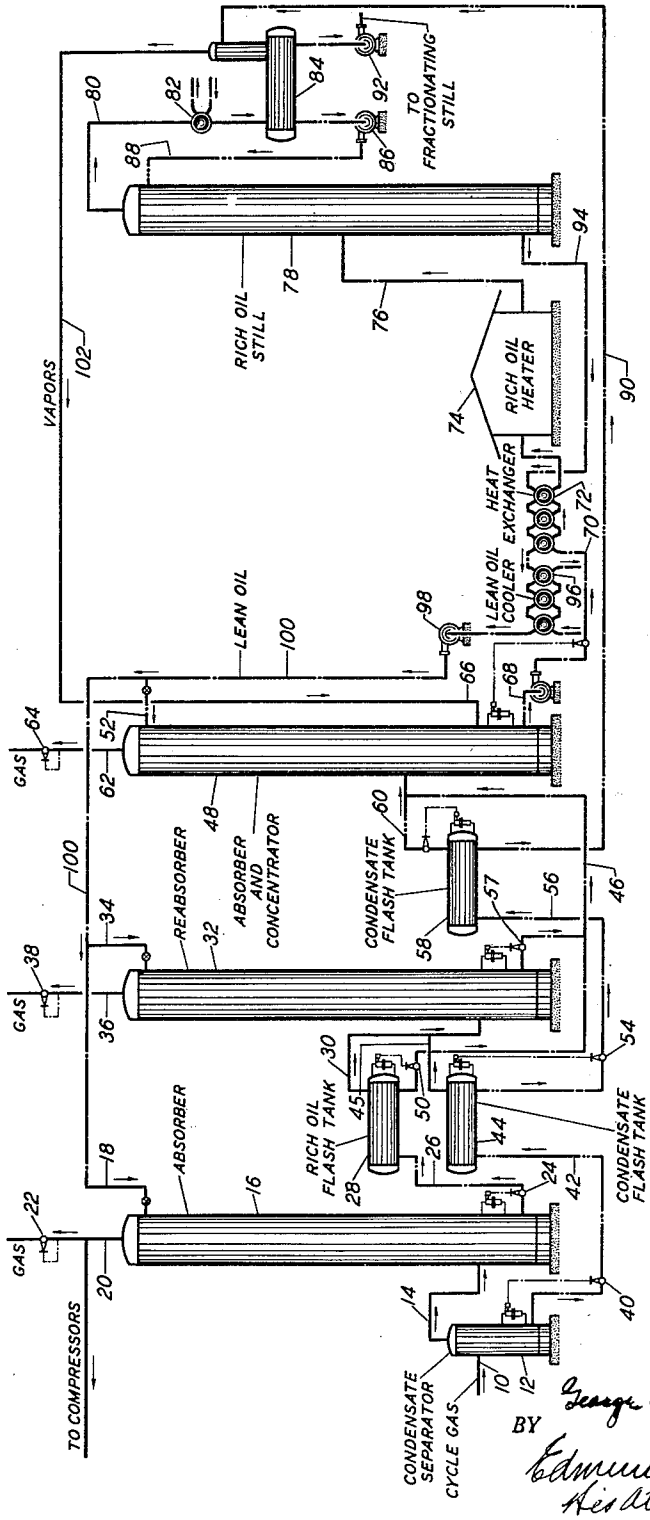


Fig. 1

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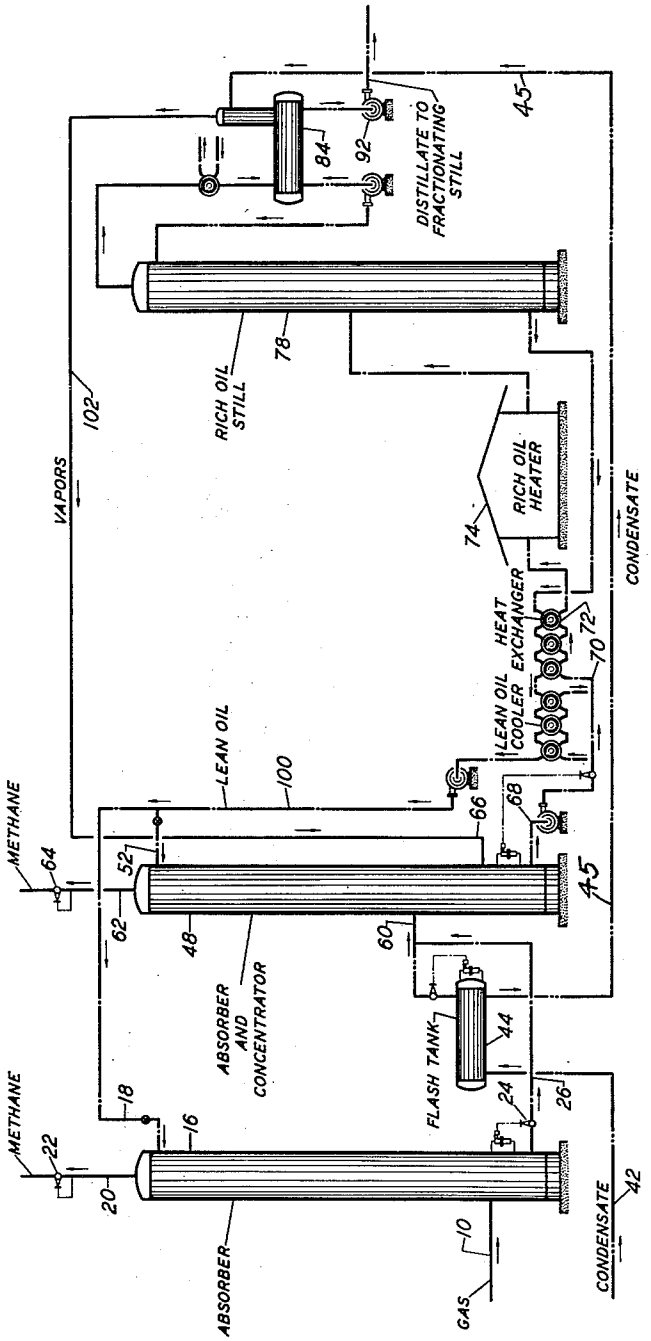


Fig. 2

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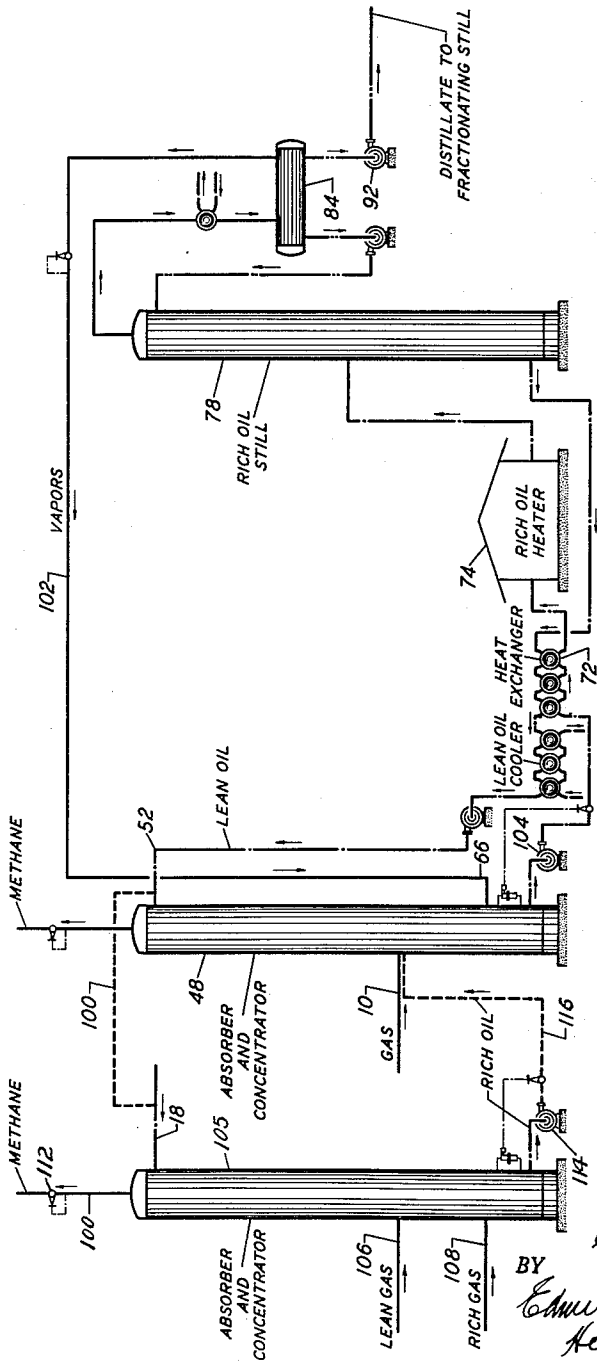


Fig. 3

Fig. 4

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METHOD OF SEPARATING HYDROCARBONS

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Application May 12, 1945, Serial No. 593,490

4 Claims. (Cl. 196—8)

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This invention relates to the recovery of hydrocarbons. More particularly the invention relates to improvement of the selectivity with which the heavier, more desirable hydrocarbons may be recovered from gas by condensation or absorption in a suitable menstruum.

In the recovery of hydrocarbon distillates, from gas wells by the recycling process it is the practice to remove the gas from the well at the full pressure at the bottom of the well, then condense a portion of the distillate as the pressure is reduced by retrograde condensation, next absorb the hydrocarbons containing C_2 and higher carbon atoms to the molecule, then raise the pressure of the remaining gas to the original well pressure and pump or cycle it back through the well into the rock formation.

At high pressures great difficulty is encountered in separating methane from the other constituents without leaving a relatively high percentage of ethane, propane and some butane in the gas after it has passed through the absorption system. Further the absorption oil often retains a relatively large amount of methane some of which is condensed with the heavier hydrocarbons and becomes a part of the hydrocarbon distillate to be fractioned. The partial pressure of methane makes the fractionation complicated and quite expensive. Ethane and propane are valuable products and it is desirable to recover them from a gas mixture containing a higher percentage of methane.

Most natural gas contains natural gasoline and is treated in absorption plants for the recovery of ethane, propane, butanes, pentanes and gasoline. Also the gases from petroleum distillation plants and oil cracking plants are treated in absorption and distillation units to separate the hydrocarbons containing C_2 and higher carbon atoms to the molecule for the manufacture of fuel and chemical products.

The primary object of the present invention is to provide a method of improving the selectivity of the recovery of heavier and more desirable hydrocarbons from gas with respect to the lighter less desirable hydrocarbons, such as methane or hydrocarbons having a high vapor pressure.

A further object of the present invention is to provide a method of effectively absorbing the hydrocarbons having more than one carbon atom to the molecule out of natural gas and effectively separating the methane from the absorption oil and the other absorbed hydrocarbons.

Another object of the invention is to provide a method of absorbing hydrocarbons from gas and separating methane from the heavier hydrocarbons and menstruum without heating the absorbing menstruum or hydrocarbon mixture.

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A further object of the invention is to provide a method of absorbing hydrocarbons from gas in an oil menstruum while separating methane from the rich menstruum and obtaining the maximum recovery of ethane, and heavier hydrocarbons.

With these and other objects in view the invention consists in the method of absorbing hydrocarbons from gas in an absorption menstruum and separating methane therefrom, which is hereinafter described and particularly defined in the appended claims.

The various features of the invention are illustrated in the accompanying drawings in which Figure 1 is a diagrammatic flow sheet of an apparatus particularly adapted for absorbing the hydrocarbons from high pressure gas obtained in a recycling system in which condensate is recovered from the gas before the hydrocarbons are absorbed and the pressure on the gas, condensate and absorbing menstruum is reduced in stages for separating methane.

Figure 2 is a diagrammatic flow sheet of an apparatus of the type illustrated in Figure 1 in which the gas to be treated is under a lower pressure than the pressure for which the apparatus of Figure 1 is adapted wherein the absorption can be effected in two different pressure stages.

Figure 3 is a diagrammatic flow sheet of an apparatus wherein the hydrocarbons may be absorbed in a menstruum under a pressure which is as low or lower than the pressure under which the menstruum may be distilled to separate the absorbed hydrocarbons and at the same time efficiently separating the methane from the menstruum and separated hydrocarbons; and

Figure 4 is a diagrammatic view of an apparatus in which a method of absorbing hydrocarbons simultaneously from a lean gas and a rich gas may be carried out while effectively separating methane from the absorbing menstruum and the separated hydrocarbons.

Throughout the specification and claims the hydrocarbons are referred to as C_1, C_2 and higher hydrocarbons which designate those hydrocarbons both saturated and unsaturated, containing one or two or more carbon atoms to the molecule.

Referring to Figure 1, high pressure cycle gas is introduced through a line 10 into a condensate separator 12 where condensate which has been condensed in the vapor line or in a condenser by retrograde condensation is separated from the cycle gas. The gas passes through a line 14 into the bottom of an absorption tower 16, which may be a bubble tower or a filled tower, downwardly through which flows a body of absorption oil that

is introduced into the top of the tower through a line 18. The volume and temperature of the absorption oil is such that when the gas which may be at the high pressure existing at the well, passes upwardly through the tower substantially all of the C_2 and higher hydrocarbons are absorbed in the oil, and methane gas is passed through a line 20 to compressors where the pressure is raised to recycle the gas back into the gas wells. Gas may be removed from the cycling system through a control valve 22.

In absorbing the C_2 and higher hydrocarbons the absorption oil becomes saturated with methane. It is important therefore that the methane be separated because methane is troublesome during the rich oil distillation and also during the fractionation to separate the individual hydrocarbons.

When the gas is being treated under high pressures from 1000 to 3000 lbs. per square inch, it is difficult to reduce the pressure of the gas in a single stage and still effectively separate the methane and recover the C_2 and higher hydrocarbons. Accordingly the rich oil from the bottom of absorption tower 16 passes through an expansion valve 24 and flows through a line 26 into a flash tank 28. The hydrocarbon vapors which are separated in the tank 28 are composed of C_1, C_2 and higher hydrocarbons and flow through a line 30 into the lower portion of a reabsorption tower 32 and pass upwardly through a body of absorption oil which is introduced into the top of the reabsorber through a line 34. In the reabsorber substantially all of the C_2 and higher hydrocarbons are absorbed in the oil and methane passes out through a line 36 and pressure reducing valve 38.

Simultaneously with this operation the condensate from the separator 12 flows through a pressure reducing valve 40 and line 42 into a flash tank 44 where lower boiling hydrocarbon vapors are released. These vapors flow through a line 45 and join with the vapors in line 30 to pass into the bottom of the reabsorption tower 32.

The rich oil from the flash tank 28, which is saturated at its pressure with methane, passes through a line 46 and is introduced into the bottom of an absorption section of an absorber and concentrator tower 48. The pressure on the rich oil is reduced through a valve 50 so that the oil expands to relase C_1, C_2 and some heavier hydrocarbon vapors. The C_2 and heavier hydrocarbon vapors are absorbed in an absorption oil which passes downwardly through the tower 48 after being introduced through a line 52.

Simultaneously with the introduction of rich oil from the tank 28 condensate from the tank 44 passes through a pressure reducing valve 54 and line 56 into an expansion tank 58 wherein the pressure is reduced to the pressure or slightly higher pressure than the pressure existing in the tower 48. The pressure existing in the tower 48 is comparatively low, that is for example from 50 to 200 lbs., and is such that the methane may be effectively removed from the absorption oil in the tower before the rich oil from the tower 48 is passed to a still for removing absorbed hydrocarbons from the rich oil. Rich oil leaves the bottom of reabsorber 32 through an expansion valve 57 and flows into the tower 48 through the line 46. The vapors separated in the tank 58 pass through a line 60 to join with the rich oil passing through the line 46 and flow into the bottom of the absorption section of tower 48. The vapors from the rich oil and condensate pass upwardly through the tower 48 where substantially all the C_2 and higher hydrocarbons are absorbed and substantially all the methane passes out from the top of the tower through a line 62 and valve 64.

Since the rich oil and vapors introduced through the lines 46 and 60 may contain some methane it is important to remove this methane from the rich oil before the rich oil leaves the tower 48. To accomplish this the rich oil leaving the absorption section of tower 48 passes downwardly through a stripping section located below the inlet of the line 60. Near the bottom of the concentrating section hydrocarbon vapors containing some C_1 and substantial quantities of C_2 and higher hydrocarbons are introduced through a line 66. These vapors pass upwardly through the absorption oil and displace methane in this absorption oil with C_2 and higher hydrocarbons and carry the methane upwardly through the tower 48. By the time the rich oil reaches the bottom of the stripper section at the bottom of the tower 48 substantially all of the methane has been removed. This rich oil is then drawn out through a pump 68 and circulated through a line 70 and heat interchanger 72 into a rich oil heater 74. The rich oil is heated to a sufficiently high temperature to vaporize the C_2 and higher hydrocarbons which are to be recovered and this rich oil is passed through a line 76 and flashed into the midportion of a rich oil rectifying still 78. The rich oil rectifying still is preferably a bubble cap still which will permit the C_2 and higher hydrocarbons to pass overhead and out through a line 80 while causing the absorption oil to pass downwardly through the still. The C_2 and higher hydrocarbons pass from the vapor line 80 to a condenser 82 and the condensate is collected in an accumulator 84. Part of the condensed hydrocarbons is circulated by pump 86 and line 88 up to the top of the still 78 to act as reflux. A slightly higher pressure is maintained in the still 78 and accumulator 84 than is maintained in the absorber 48 to assist in separating C_2 and higher boiling hydrocarbons from the absorption oil and to force C_2 and higher boiling hydrocarbon vapors through the line 102 and into the tower 48.

When the condensate is flashed in the chamber 58 substantial amounts of the lower boiling hydrocarbons are removed therefrom and the remaining condensate passes from the tank through a line 90 up to the top of the bubble cap contactor at the top of the accumulator 84 to join the body of C_2 and higher hydrocarbons in the accumulator. From the accumulator the hydrocarbon distillate may be removed through pump 92 and pass through a line to a fractionating still where the individual hydrocarbons may be fractionally separated.

When the desired C_2 and higher hydrocarbons are removed from the rich oil it becomes a lean oil which is withdrawn from the bottom of the still 78 through a line 94 and passed through the heat exchanger 72, then through a cooler 96 from which it is carried by means of a pump 98 and forced through a line 100 into the lines 18, 34 and 52 to supply lean absorption oil to the towers 16, 32 and 48, respectively.

In the operation of the rectifying still 78 some hydrocarbon vapors are formed and are separated from the distillate in the accumulator 84. These vapors which may contain a small amount of C_1 but are composed principally of C_2 and higher hydrocarbons, pass outwardly through the contactor countercurrent to the condensate

to a line 102 and constitute the vapors which are passed into the bottom of the stripping section of tower 48 for the purpose of separating substantially all of the methane from the hydrocarbons passing through the contactor and tower 48.

In Figure 2 is illustrated an apparatus which is used for absorbing and separating hydrocarbons from a gas which may be under a lower pressure than the pressure of the gas which might be treated in the apparatus illustrated in Figure 1. This pressure may, for example, be from 200 to 600 lbs. per square inch. In this apparatus gas is introduced through a line 10 into an absorber 16 and passes upwardly through absorption oil introduced through a line 18. Methane separated from the gas passes out through a line 20 and valve 22. Rich oil from the bottom of the absorber 16 passes out through valve 24 and line 26, and flows through an inlet line 60 into the bottom of the absorption section of a combined absorber and concentrating tower 48. Condensate from the gas is drawn in through a line 42 and is flashed into a flash tank 44. The flashing operation removes substantially all of the C_1 to C_4 hydrocarbons, which vapors pass through a line 60 and join with the rich oil flowing through the line 26 into the tower 48. The distillate remaining in the tank 44, consisting of substantially all heavier hydrocarbons, is passed through a line 45 to the top of the bubble cap contactor tower on the top of the accumulator 84. In the bubble cap section the condensate is further distilled by the light vapors passing up through the section from the accumulator to remove lighter hydrocarbons.

The vapors released from the rich oil from absorber 16 by pressure reduction, and vapor from tank 44 pass upwardly through the tower where the C_2 and higher hydrocarbons are absorbed and methane is released through a line 62 and valve 64. Lean absorber oil is introduced into the tower 48 through a line 52 and passes downwardly through the tower and a stripping section. Near the bottom of the stripping or concentration section hydrocarbon vapors are introduced through a line 66 which vapors are composed principally of C_2 and heavier hydrocarbons to displace the methane in the absorption oil and vapors passing through the tower 48. Rich oil which consists of a mixture of the enriched oil introduced through the line 52 and the rich oil from the absorber 16 pass out from the bottom of the tower 48 to a pump 68 and pass through a line 70 and heat interchanger 72 into a rich oil heater 74. The rich oil is distilled in a rectifying still 78 in the same manner as that described in connection with the distillation of rich oil in the apparatus of Figure 1. The distillate which accumulates in accumulator 84 may be passed through a pump 92 to a fractionating still to separate the individual hydrocarbons. Vapors composed principally of C_2 and heavier hydrocarbons pass from the top of the accumulator 84 through a contactor to a line 102 into the inlet 66 for the purpose of displacing methane from the condensate and the absorption oil in the tower 48.

It is emphasized that the return of the C_2 and higher hydrocarbons into the bottom of the combined absorber and concentrator acts to concentrate the propane and butane constituents which are recovered from the gas and at the same time displace the methane from the absorption oil. With most of the gasoline treating

systems a substantial portion of propane and butane is removed with the methane from the absorbers, but with the apparatus and method herein described, a higher percentage of propane and butane may be recovered. Tests which have been made in the field show that an average of ten to fifteen percent (and in some cases as high as fifty-eight percent) more ethane can be recovered than with the processes commonly in use. Further, an average of from three to five percent (and in some cases more than eleven percent) more propane may be recovered than with the processes commonly used.

In Figure 3 is illustrated an apparatus which is well adapted for treating a gas for example of 50 to 400 lbs. for the recovery of C_2 and higher hydrocarbons while separating the methane. In this case the gas introduced through line 10 flows into the bottom of an absorbing section of a combined absorber and concentrator tower 48. Lean oil is introduced into the top of the tower through a line 52 and rich oil is removed from the bottom of the tower through a pump 104 by which it is forced through a heat interchanger 72 and rich oil heater 74. The absorption oil flows down through the tower 48 below the gas inlet and passes through a stripping section counter-current to a stream of hydrocarbon vapors introduced through an inlet 66 which are supplied to the inlet through a line 102. The rich oil is distilled in a still 78. The C_2 and higher hydrocarbons are accumulated in accumulator 84. The vapors from the still and accumulator pass out through the line 102.

In Figure 4 is illustrated a type of combined absorber and concentrator which is well adapted for the purpose of treating two sources of gas, such as a lean natural gas and a rich natural gas, in order to recover the C_2 and higher hydrocarbons and separate methane therefrom. The lean gas which is composed principally of methane and a relatively small amount of C_2 and higher hydrocarbons is introduced into a combined absorber and concentrator 105 through a line 106 at the bottom of an absorber section of the tower 105. At the same time rich gas, which contains a smaller amount of methane and a relatively larger proportion of C_2 and higher hydrocarbons than is contained in the lean gas, is introduced through a line 108 near the bottom of the stripping section of the tower 105. This gas passes upwardly through the stripping section to displace the methane and to concentrate the percentage of C_2 and higher hydrocarbons in the rich oil passing downwardly through the tower 105. The methane is removed from the top of the tower through line 110 and valve 112 and rich oil is drawn out through a pump 114 by which it may be circulated through a line 116 to pass into an absorber and concentrator 48 to be treated in the tower 48 and still 78, in the same manner that has been described in connection with the treatment of rich oil in Figures 1, 2 and 3.

The common practice for treating different types of natural gas which contain different amounts of C_2 and higher hydrocarbons is to mix the gases and pass them into the bottom of an absorption tower. Comparative results in which an operation is carried out in which a lean and rich gas are mixed and passed through the bottom of the tower and the treatment of the same gas in the apparatus, such as illustrated in Figure 4, has shown the composition of the rich oil from the two types of operation:

Gases mixed

	Rich gas, Mol/24 Hr.	Lean gas, Mol/24 Hr.	Mixture of gases, Mol/24 Hr.	Rich oil, Mol/24 Hr.
C_1	1,126	23,301	24,427	759
C_2	467	2,676	2,143	524
C_3	494	1,633	2,127	1,077
IC_4	89	311	400	380
NC_4	72	316	388	385
IC_5	14	91	105	105
NC_5	10	74	84	84
C_6+	2	94	96	96
Lean Oil				7,866
Total	2,274	28,496	30,770	11,276

Gas separate as shown in Figure 4

	Rich gas, Mol/24 hr.	Lean gas, Mol/24 hr.	Rich oil, Mol/24 hr.
C_1	1,126	23,301	460
C_2	467	2,676	741
C_3	494	1,633	1,273
IC_4	89	311	384
NC_4	72	316	385
IC_5	14	91	105
NC_5	10	74	84
C_6	2	94	96
Lean Oil			7,421
Total	2,274	28,496	10,949

An important feature of the present invention resides in the separation of methane from other hydrocarbons in the gas and the concentrations of light constituents, such as propane and butane, in the hydrocarbons being absorbed from the gas. For each mol of methane removed from a fractionator feed approximately fifteen mols of propane or five mols of ethane can be added to the vapor without changing the vapor pressure of the fractionator feed. It will be seen, therefore, how important it is to remove even small quantities of methane and to replace it with ethane and higher hydrocarbons thus materially increasing the recovery of the C_2 and higher hydrocarbons.

It will be noted also that the methane is effectively separated from the other hydrocarbons of the gas and from the absorption oil without the use of heat or stripping steam. The stripping of methane, from an absorption oil at low temperatures is much more selective than when treating an absorption oil which has been heated.

Furthermore the use of the combined absorber and concentrator permits the stripping of the methane from the absorption oil and gas without as many pressure reducing stages or reabsorbers as is customarily used for this purpose in commercial practice.

Tests have shown, furthermore, that a lesser amount (up to ten percent less) of lean oil is required for absorbing the hydrocarbons from gas with the present invention than with the most efficient absorption system which has heretofore been used.

Although the combined absorber and concentrator **48** has been illustrated and described as a single tower, it is obvious that the combined unit could be made up as absorber unit and a separate stripping unit wherein the gas would flow upwardly and the oil would flow downwardly first through the absorber unit and then through the stripping unit.

In the claims reference is made to the removal of "C_1 hydrocarbons" from the top of the absorber and concentrator. It is to be understood that hydrogen and non-condensible gases, such as CO, CO_2 and nitrogen, will be removed with the methane if they are present. It is also to be understood that in commercial operation of absorption and distillation equipment it is not practicable to separate all methane from the heavier hydrocarbons without leaving a small amount of hydrocarbons, such as ethane and propane with the methane. With the present invention the amount of C_2 and C_3 hydrocarbons leaving the absorbers with the methane is comparatively a very small amount.

The "C_2 and heavier hydrocarbons" introduced into the base of the stripper, as referred to in the claims, are vapors recovered from the distillation of a hydrocarbon mixture, said mixture having previously had the methane separated therefrom. The still **78** and accumulator **84** generally contain small amounts of methane and are operated so as to pass C_2 and heavier hydrocarbons from the accumulator and up through the bubble cap section to remove C_1 and other fixed gas from the condensate and hydrocarbon distillate in the accumulator. These "C_2 and heavier hydrocarbons" may therefore contain a comparatively small amount of methane and fixed gas in it which will be separated in the absorber and concentrator **48**.

The preferred form of the invention having been thus described, what is claimed as new is:

1. The method of separating C_2 and higher hydrocarbons from high pressure gas comprising separating a condensate by retrograde condensation from the gas, passing the uncondensed gas into the bottom of an absorption tower and upwardly through an absorption oil passing down through the tower, removing substantially only C_1 hydrocarbon from the top of the tower, removing a rich oil from the bottom of the tower, reducing the pressure on the rich oil and passing it into the bottom of an absorption section of a second tower, passing absorption oil downwardly through the second tower to join the rich oil from the first absorption tower, passing the resulting mixture of absorption oils downwardly through a stripping section of the second tower, introducing near the bottom of the stripping section hydrocarbon vapors composed principally of C_2 and higher hydrocarbons and passing the vapors upwardly through the tower, removing substantially only C_1 hydrocarbon from the top of the second tower, flashing the condensate with pressure reduction down to the pressure existing in the second absorption tower, passing vapors released from the condensate by the flashing operation into the second tower with the rich oil from the first tower, removing the rich oil mixture from the stripping section and distilling it to recover C_2 and higher hydrocarbons overhead, partially condensing said overhead to produce a distillate and a lower boiling point vaporous fraction, passing said vaporous fraction into contact with the flashed unvaporized condensate to displace low boiling hydrocarbons therefrom and to obtain said vapors composed principally of C_2 and higher hydrocarbons which are introduced into the stripping section of the second tower.

2. The method of separating C_2 and higher hydrocarbons from high pressure gas comprising: separating a condensate by retrograde condensation from the gas, passing the uncondensed gas into the bottom of an absorption tower and upwardly through an absorption oil passing down through the tower, removing substantially only C_1 hydrocarbon from the top of the tower, removing a rich oil from the bottom of the tower,

flashing the rich oil under reduced pressure in an expansion chamber, separating vapors formed by the flashing and passing them through an absorption oil of an intermediate absorption stage under the pressure prevailing in the expansion chamber, removing C_1 hydrocarbon from the intermediate absorption stage, passing rich oil from the expansion chamber under reduced pressure into the bottom of an absorption section of a third tower, passing rich oil from the intermediate stage under the pressure prevailing in the third tower into the rich oil from the expansion chamber flowing into the third tower, passing absorption oil downwardly through the third tower to join the rich oil from the expansion chamber and intermediate stage, passing the resulting mixture of absorption oils downwardly through a stripping section of the third tower, introducing near the bottom of the stripping section hydrocarbon vapors composed principally of C_2 and higher hydrocarbons and passing the vapors upwardly through the tower, removing substantially only C_1 hydrocarbon from the top of the third tower, flashing the condensate with pressure reduction down to the pressure existing in the third tower, passing vapors released from the condensate by the flashing operation into the third tower with the flashed rich oil from the first tower, removing the rich oil mixture from the stripping section and distilling it to recover C_2 and higher hydrocarbons overhead, partially condensing said overhead to produce a distillate and a lower boiling vaporous fraction, passing said vaporous fraction into contact with the flashed condensate to displace low boiling hydrocarbons therefrom and obtain said vapors composed principally of C_2 and higher hydrocarbons which are introduced into the stripping section of the second tower.

3. The method of separating C_2 and higher hydrocarbons from high pressure gas comprising: separating a condensate by retrograde condensation from the gas, passing the uncondensed gas into the bottom of an absorption tower and upwardly through an absorption oil passing down through the tower, removing substantially only C_1 hydrocarbon from the top of the tower, removing a rich oil from the bottom of the tower, flashing the rich oil into reduced pressure in an expansion chamber, separating vapors formed by the flashing and passing them through an absorption oil in an intermediate absorption stage under the pressure prevailing in the expansion chamber, removing C_1 hydrocarbon from the intermediate absorption stage, passing rich oil from the expansion chamber under a reduced pressure into the bottom of an absorption section of a third tower, passing rich oil from the intermediate stage under the pressure prevailing in the third tower into the rich oil from the expansion chamber entering the second tower, flashing the condensate with pressure reduction to the pressure existing in the intermediate stage, separating vapors from the flashed condensate and passing them through the absorption oil of the intermediate stage, again reducing the pressure on the condensate to the pressure in the third tower to vaporize lighter constituents in the condensate, passing the vapors of lighter constituents into the bottom of the absorption section of the third tower, passing absorption oil downwardly through the third tower to join rich oil from the expansion chamber and intermediate stage, passing the resulting mixture of absorption oils downwardly through a stripping section of the third tower, introducing near the bottom of the stripping section hydrocarbon vapors composed principally of C_2 and higher hydrocarbons and passing the vapors upwardly through the tower, removing substantially only C_1 hydrocarbon from the top of the third tower, removing rich oil mixture from the stripping section, and distilling it to recover C_2 and higher hydrocarbons overhead, partially condensing said overhead to produce a distillate and a lower boiling vaporous fraction, passing said vaporous fraction into contact with the flashed condensate from the second flashing operation to displace low boiling hydrocarbons therefrom and obtain said vapors composed principally of C_2 and higher hydrocarbons which are introduced into the stripping section of the said third tower.

4. A process of recovering C_2 and higher hydrocarbons from high pressure gas containing methane comprising: separating a hydrocarbon condensate from the gas by retrograde condensation, passing the remaining gas through an absorber to absorb C_2 and higher hydrocarbons in an absorption oil, withdrawing methane from the absorber, reducing the pressure of the enriched absorption oil and passing it into an intermediate portion of a second absorber having absorption oil passing therethrough, withdrawing methane from the top of the second absorber, flashing the condensate with pressure reduction to the pressure prevailing in the second absorber to release low boiling hydrocarbon gas and vapors therefrom, introducing the released gas and vapors into said second absorber at an intermediate portion thereof, rectifying rich oil withdrawn from the bottom of the second absorber to recover C_2 and higher hydrocarbons overhead, partially condensing said overhead to produce distillate and a low boiling vaporous fraction, passing said vaporous fraction directly into contact with the flashed condensate to displace low boiling hydrocarbons therefrom, mixing the scrubbed condensate directly with said distillate and introducing said low boiling vaporous fraction into the bottom of said second absorber and passing it upwardly therethrough.

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