June 20, 1961 J. VAN POOL ET AL 2,988,894

FRACTIONATION OPERATION

Filed July 17, 1959 2 Sheets-Sheet 1

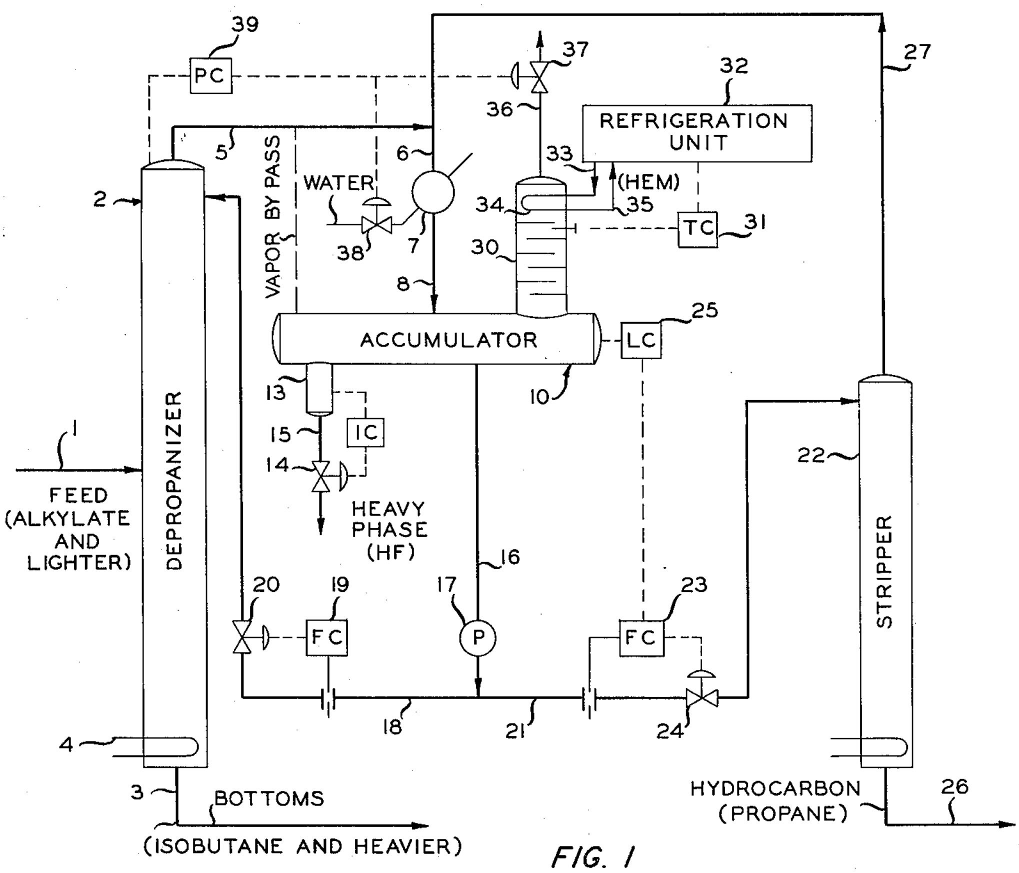

FIG. 1

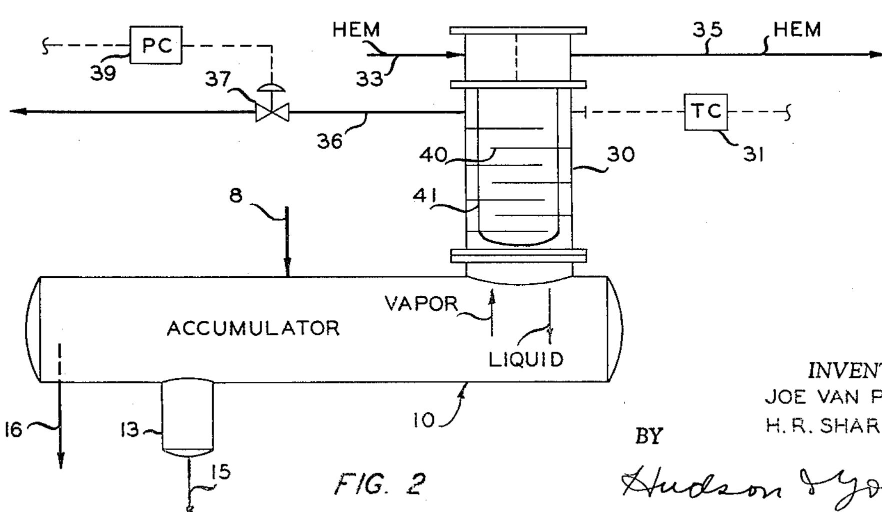

FIG. 2

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FRACTIONATION OPERATION

Filed July 17, 1959 2 Sheets-Sheet 2

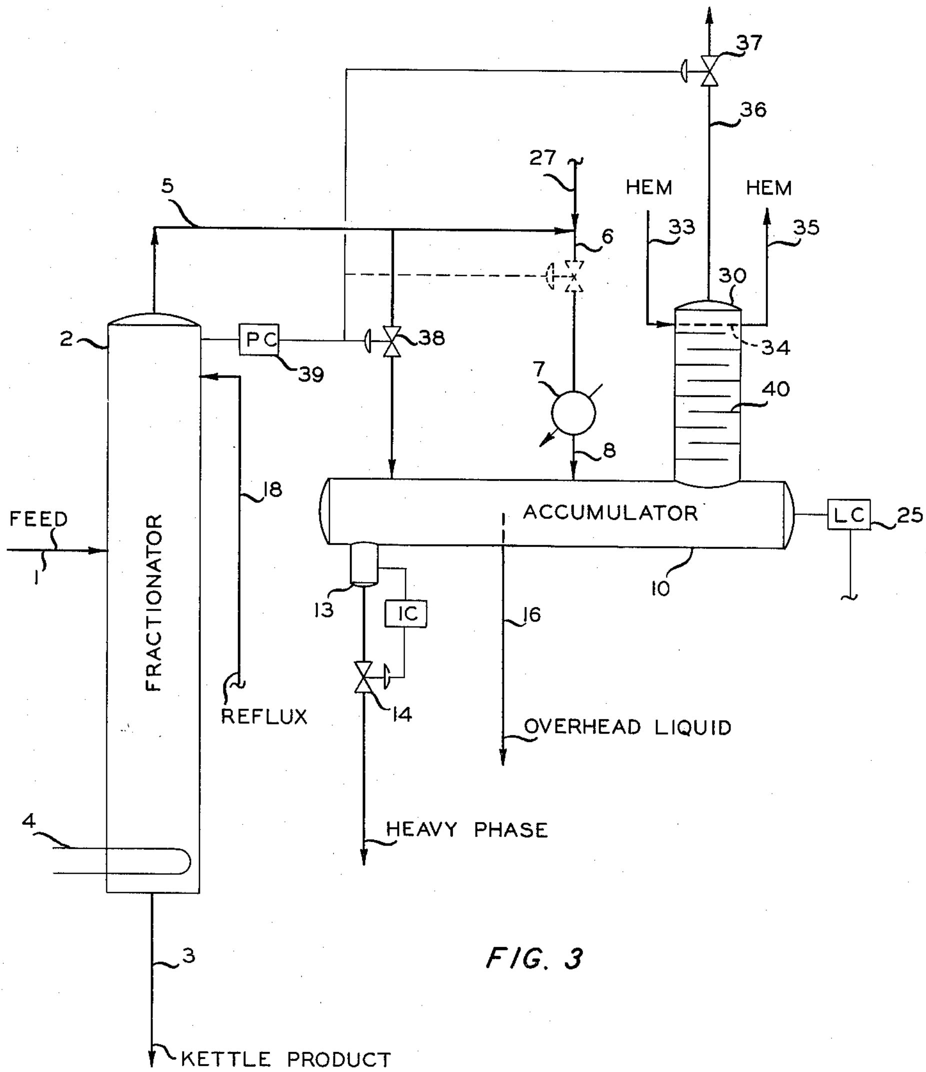

FIG. 3

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FRACTIONATION OPERATION

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This invention relates to an improved fractionation operation. In one of its aspects the invention relates to the removal of non-condensibles from a fractionation operation by way of a condenser from which non-condensibles are periodically removed whenever pressure in the system can no longer be effectively controlled to a desired value by controlling the cooling capacity of a cooler provided upon the overhead from the fractionator in the system. In another of its aspects, the invention relates to the removal of non-condensibles from a fractionation operation by way of a condenser from which non-condensibles are periodically removed whenever pressure in the system can no longer be effectively controlled to desired value by providing in addition to a provided cooler having a desired cooling capacity, and through which the overhead is passed, a by-pass line, and controlling the amount by-passed overhead, responsive to the pressure in the system, so as to by-pass decreasing quantities of overhead, thus passing increased quantities of overhead through the cooler as the pressure in the system increases, the combined overheads ultimately being passed to an accumulator zone from which non-condensibles are removed. In another of its aspects the invention relates to method and apparatus wherein the flow of water to a cooler provided to cool overhead from a fractionator and the withdrawal of non-condensibles from a condenser to which vapors from an accumulator to which cooled overhead is passed are controlled responsive to the pressure in the system as it can be sensed in the fractionator, the water to the cooler being gradually increased to prevent undesired pressure in the system, specifically in the fractionator, until such time as further increase of water to the cooler cannot be effectively accomplished and then non-condensibles are removed from the condenser by opening a relief valve thereon responsive to said pressure.

The presence of non-condensibles in distillation systems is well known. This invention, though generally applicable to such systems, will now be described as it is specifically applied to a fractionation system in which an alkylation effluent is fractionated to recover normally liquid hydrocarbons, a propane fraction, and non-condensibles.

In the venting of non-condensibles from a system, to avoid undesired accumulation of non-condensibles therein and undesired pressure rises due to said non-condensibles, there is unavoidably vented together with the non-condensibles a portion of usually desirable product or distillate. Thus, in the fractionation of an alkylation effluent, it is known that non-condensibles such as nitrogen, methane, and ethane accumulate in the system and must be vented therefrom. In venting non-condensibles from the system, there is unavoidably entrained therewith an important amount or proportion of propane which is a desired hydrocarbon. Thus, when the non-condensibles go to flare or to use as fuel gas component, propane and HF which are desired are lost.

We have now conceived method and apparatus wherewith increased propane recovery can be effected, that is to say, a desired distillate which normally is entrained unavoidably with vented non-condensibles from a fractionation system can now be recovered in greater quantities by retaining non-condensibles in the system up to a certain maximum desirable accumulation thereof and then venting the non-condensibles from the system, preferably

by way of a condenser, which is adapted to knock back or to condense otherwise entrained desired distillate, but not venting from the system non-condensibles until such time as a cooler or condenser on the overhead from the fractionator tower can no longer serve effectively to keep the pressure in the fractionator tower or in the system at a desired value by increasing the flow of coolant to said cooler responsive to pressure in the fractionator tower or system.

Also we have conceived as a variant of controlling flow of coolant to the cooler the use of a by-pass around the cooler and control of the flow of overhead from the fractionating tower through the by-pass responsive to pressure so that as the pressure tends to increase, more of the overhead will flow through the cooler.

In a further variation, in lieu of having the valve on the by-pass line, there is no valve but there is a valve, as described herein, on the line going to the cooler. Thus, as the pressure increases, the valve would open and more condensation of the overhead product would be obtained. Opposite-acting valves disposed respectively in each of the by-pass line and the line leading to the cooler are also contemplated.

An object of this invention is to provide an improved fractionation system. Another object of the invention is to more effectively recover normally, unavoidably entrained, desired distillate when venting non-condensibles from a fractionation system. A further object of the invention is to recover increased quantities of propane and HF when fractionating an alkylation effluent containing the same. A still further object of the invention is to provide an improved method and apparatus for the recovery of a desirable distillate component in a combination fractionation and stripping operation.

Other aspects, objects and the several advantages of this invention are apparent from a study of this disclosure, the drawing, and the appended claims.

According to this invention, there is provided a method, and apparatus, for the control of a fractionation system in which there occurs an accumulation of non-condensibles which must be removed from the system and removal of which entails the loss of desirable condensible vapors which comprises providing a cooling zone for overhead from a fractionation zone and controlling the cooling of overhead from said fractionation zone responsive to the pressure in said zone, and increasing the amount of cooling of overhead effected responsive to tendency of the pressure to increase and when the pressure tends to increase beyond capacity of the cooling zone to cope therewith, venting non-condensibles from a point in the system beyond said cooling zone.

According to this invention there is also provided a method for the control of a fractionation system in which there occurs an accumulation of non-condensibles which must be removed from the system and removal of which entails a loss of desirable condensible vapors which comprises providing a cooling zone for overhead from a fractionation zone, providing an accumulator zone to accumulate liquid formed in said cooling zone, passing condensate from said accumulator zone to said fractionation zone as reflux therefor, providing a condensing zone in communication with said accumulator zone, providing a non-condensible withdrawal upon said condensing zone, providing a pressure sensing zone wtihin said fractionation zone, providing a coolant flow control on the coolant flowing through said cooling zone, transmitting a signal from said pressure sensing zone to said coolant flow control thus to control said coolant flow responsive to pressure in said fractionation zone, and relieving the pressure in said condensing zone by venting non-condensibles through said non-condensibles withdrawal whenever the coolant flow control is insufficient substantially to control the pressure in said fractionation zone to a desired pressure.

Still further according to the invention, condensed overhead is passed to a stripping zone wherein desired distillate is obtained as a bottoms and noncondensibles stripped from said desired distillate as well as a portion of desired distillate unavoidably entrained with said noncondensibles is passed as an overhead from said stripping zone to said controlled cooling zone.

In the drawings, FIGURE 1 diagrammatically shows an embodiment of the invention in which an alkylate effluent is fractionated. FIGURE 2 shows an embodiment of a combination accumulator-condenser especially adapted for use in the invention. FIGURE 3 shows by-passing of fractionator overhead cooler.

Referring now to FIGURE 1 of the drawings, an alkylate effluent is fed by way of pipe **1** to fractionator **2** from which isobutane and heavier are recovered as bottoms by way of pipe **3**. A reboiler **4** is provided in the foot of the fractionator. Overhead is passed by way of pipe **5**, pipe **6**, cooler-condenser **7**, and pipe **8** into accumulator **10**. From accumulator **10** there is recovered an alkylation catalyst phase, in this instance, hydrofluoric acid, which is returned to the reactors from keg **13** by way of liquid level control valve **14** in pipe **15**. Hydrocarbon phase is removed from accumulator **10** by way of pipe **16** and fed by way of pump **17** and pipe **18** to fractionator **2** as reflux therefor. A flow recorder controller **19** adapted to control reflux flow through valve **20** is provided. Production quantity of hydrocarbon phase from accumulator **10** is passed by way of pipe **21** to stripper **22**. Pipe **21** is provided with a flow recorder controller **23** which operates upon valve **24**. Flow recorder controller **23** is adapted to be reset by liquid recorder controller **25** on accumulator **10**. Accumulator hydrocarbon phase from accumulator **10** is stripped in stripper **22** to provide propane which is removed by way of pipe **26**. Overhead from stripper **22** passes by way of pipe **27** to pipe **6** and thence by way of cooler-condenser **7** and pipe **8** to accumulator **10**.

Returning now to accumulator **10** there is provided on accumulator **10** a condenser **30** provided with a temperature recorder controller **31** which is effective to control a refrigeration unit **32** from which heat exchange medium passes by way of pipe **33** into a heat exchange coil **34** in the top of condenser **30**. The used heat exchange medium is returned to refrigeration unit **32** by way of pipe **35**. Non-condensibles can be vented from accumulator **10** by way of condenser **30** through pipe **36** and valve **37** on pipe **36**.

There is provided on cooler-condenser **7** a coolant water flow control valve **38**. Valves **37** and **38** are responsively connected to split-range pressure recorder controller **39** which senses the pressure in fractionator **2**. This split-range pressure recorder controller **39** is conventional, and operates valves **37** and **38** as follows. Valve **38** ranges from closed to fully opened between pressure signals from the split-range pressure recorder controller **39** from 3 to 10 pounds. Valve **37** ranges from closed to fully opened between pressure signals from unit **39** from 10 to 17 pounds. That is, valve **38** controlling coolant flow will be fully opened in response to a signal from unit **39** before vent valve **37** starts to open. In this manner, full advantage of cooling is effected before venting occurs. If the full cooling effect cannot control the pressure in tower **2** to the preset value, then the vent valve operates to control this pressure by venting the noncondensibles.

It will be obvious to one skilled in the art in possession of this disclosure that pressure recorder controller **39** need not necessarily be placed as shown in the drawing. It can be placed on the accumulator or even on the condenser or elsewhere as one skilled in the art will understand. However, it is now preferred to place the pressure controller directly at the top portion of fractionator **2** because it is this pressure which it is desired most effectively to control since there is desired to be obtained a maximum amount of isobutane and heavier as bottoms from fractionator **2**, yet to obtain as much depropanization in fractionator **2** as is possible.

By maintaining the largest possible desirable pressure of non-condensibles in the system and venting only periodically, according to the invention, substantial quantities of propane and HF are recovered over those heretofore recoverable.

Other embodiments of our invention include: (*a*) the location of valve **38** in a condenser by-pass pipe between the tower overhead and the accumulator. Of course, as pressure in the tower increases, the valve in the by-pass pipe, actuated by the split-range pressure recorder controller **39**, will pinch down to force more fluid through the condenser-cooler **7**. In this embodiment, there is no control on the coolant used in **7**, but the valve **37** in the vent pipe **36** functions in the same manner as described with respect to the embodiment shown in the drawings; (*b*) using the by-pass as in (*a*) but with no valve therein, but using valve **38** in the condenser pipe **6**, wherein, in another embodiment, as pressure in the tower increases, valve **38** in pipe **6** further opens in response to unit **39** to effect more condensation of the overhead product. Valve **37** is located in vent pipe **36**, and functions the same as in the first embodiment; no control is effected on the coolant used in condenser-cooler **7** in this embodiment; (*c*) in still another embodiment, opposite acting valves may be used in the condenser by-pass pipe and in the condenser pipe as disclosed in U.S. Patent 2,890,156. Again, as pressure in the tower increases, the by-pass valve is pinched down and the condenser pipe valve is further opened to effect more flow through the condenser-cooler **7** in response to split range pressure recorder controller **39**. Again, there is no control on the coolant used in unit **7**, but valve **37** in vent pipe **36** functions as before described.

The following table shows operating data for one day's operation using the intermittent venting according to the invention.

Table I

	DC_3 Feed	DC_3 Bottoms	DC_3 Overhead Make [1]	Stripper Feed	Stripper Bottoms	Stripper Overhead	Accumulator Vent [3]	Accumulator HF Yield
Nitrogen, #/Day	(353)	----------	(353)	(353)	----------	(353)	(353)	----------
Methane, b./d.	10	----------	10	10	----------	10	10	----------
Ethane, b./d.	3	----------	3	3	----------	3	3	----------
Propane, b./d.	1,533	77	1,456	2,073	1,420	617	36	----------
Isobutane, b./d.	15,869	15,847	22	21	21	1	1	----------
Normal Butane, b./d.	3,295	3,295	----------	----------	----------	----------	----------	----------
Isopentane, b./d.	330	330	----------	----------	----------	----------	----------	----------
Light Alkylate, b./d.	2,954	2,954	----------	----------	----------	----------	----------	----------
Heavy Alkylate, b./d.	156	156	----------	----------	----------	----------	----------	----------
Hydrogen Fluoride	138	----------	138	16	----------	16	1	137
B./d. Total	24,288	22,659	1,629	2,123	1,441	647	[2] 51	137

[1] Does not include reflux.
[2] #/Day N_2 not in total.
[3] Intermittent total for one day's operation.

The following table shows operating conditions for the various units of the operation just described.

Table II

Depropanizer unit:	
Top pressure, p.s.i.g	285
Bottom pressure, p.s.i.g	290
Top temperature, °F	136
Bottom temperature, ° F	233
Overhead accumulator unit:	
Pressure, p.s.i.g	280
Temperature, ° F	100
Effluent from exchanger, ° F	40
Stripper unit:	
Pressure, p.s.i.g	285
Top temperature, ° F	136
Bottom temperature, ° F	141

When operating without the knock-back unit, the vent gases have the following compositions.

Table III

Nitrogen, #/hr	(353)
Methane, b./d	10
Ethane, b./d	3.2
Propane, b./d	68.2
Isobutane, b./d	1.5
HF, b./d	4.6

It will be seen from column 8 of Table I that the propane barrels per day lost in the accumulator vent gases, when using the intermittent venting of the invention is 36. This is to be contrasted with the propane barrels per day lost given in Table III when operating without the knock-back unit with the intermittent venting of the invention. This loss is 68.2. Thus, without the invention there are lost 32.2 barrels per day of propane (LPG). Also, by similar considerations, it is seen that 3.6 barrels per day of hydrogen fluoride and 0.5 barrels per day of isobutane are also lost when operating without the benefits of the invention. In the unit to which reference has been made there has resulted a savings on hydrogen fluoride alone of $335.00 per day. The savings on propane per day has amounted to $90.00.

Referring now to FIGURE 2, there is shown a specific form of the combination of accumulator **10** and condenser **30**. In FIGURE 2, the condenser **30** is equipped with baffles **40** and hairpin bundle tubes **41**. This form of condenser has been found to be very desirable in the operation of the invention. The hairpin bundle takes the place of cooling coil **34** shown in FIGURE 1. Numbers affixed to various parts of FIGURE 2 to the extent they are identical with those of FIGURE 1 are intended to show identical equipment.

It will be understood by one skilled in the art in possession of this disclosure that certain pieces of apparatus and details have been omitted for sake of simplicity. Such apparatus and details will be supplied routinely by one skilled in the art in possession of this disclosure seeking to place the same into actual operation.

Reasonable variation and modification are possible within the scope of the foregoing disclosure, the drawings, and the appended claims to the invention the essence of which is that in a fractionation system the overhead is cooled and condensed responsive to the pressure in the system, preferably in the fractionator, until such time as the cooling capacity can no longer be sufficiently increased to maintain a desirable pressure in the system or fractionator whereupon non-condensibles are vented from the system, more specifically by way of a condenser adapted to function upon vapors emanating from an accumulator to which overhead condensate is passed.

We claim:

1. A method for removing from a fractionation system a gas or vapor which accumulates therein causing undesired rise in pressure and the constant venting of which results in a loss of a desired gas or vapor which com-

prises charging to a fractionation zone a feed to be fractionated therein, fractionating said feed to produce a bottoms product, which is withdrawn therefrom, and an overhead containing said desired gas or vapor, passing said overhead to a cooling zone, therein cooling said overhead, passing the thus cooled overhead to an accumulation zone, in said last zone separating a liquid phase and a gas or vapor phase containing said desired gas or vapor, removing the liquid phase from said last zone, passing at least a portion of the removed liquid phase to said fractionation zone as reflux therefor, passing gas or vapor phase in said accumulation zone to a condensing zone wherein desired gas or vapor is condensed and recovered, periodically relieving the system of accumulated uncondensed gas or vapor causing said undesired pressure rise, by removing uncondensed gas or vapor from said condensing zone, controlling the pressure in said fractionation zone by adjusting the temperature to which overhead is cooled in said cooling zone responsive to the pressure in said fractionation zone by providing additional cooling to said cooling zone as the pressure rises in said fractionation zone up to substantially the cooling capacity of said cooling zone and relieving the system periodically as stated only when said cooling zone is cooling at substantially its full desired capacity, so as to restore control of the pressure by adjusting the temperature to which the overhead is cooled in said cooling zone.

2. A method for fractionating an alkylation effluent containing propane and gases lighter than propane which comprises fractionating in a fractionation zone said effluent to remove therefrom a bottoms product containing essentially hydrocarbons higher boiling than propane and an overhead stream containing propane, some HF, and gases lighter than propane, passing said overhead to a cooling zone, therein cooling said overhead, passing the cooled overhead to an accumulation zone, in said last zone separating a liquid phase and a gas or vapor phase containing propane and said lighter gases, removing liquid phase from said last zone, passing at least a portion of the removed liquid phase to said fractionation zone, passing vapor phase in said accumulation zone into a condensing zone wherein desired propane is condensed and removed, periodically relieving the system of accumulated uncondensed gas or vapor lighter than propane causing said undesired pressure rise, by removing uncondensed gas lighter than propane from said condensing zone, controlling the pressure in said fractionation zone by adjusting the temperature to which the overhead is cooled in said cooling zone responsive to the pressure in said fractionation zone by providing additional cooling to said cooling zone as the pressure rises in said fractionation zone up to substantially the desired cooling capacity of said cooling zone and relieving the system periodically as stated of essentially gases lighter than propane only when said cooling zone is cooling at substantially its desired full capacity, so as to restore control of the pressure by adjusting the temperature to which the overhead is cooled in said cooling zone.

3. A method for the control of a fractionation system in which there occurs an accumulation of non-condensibles which must be removed from the system and removal of which entails a loss of desirable condensible vapors which comprises providing a cooling zone for overhead from a fractionation zone, providing an accumulator zone to accumulate liquid formed in said cooling zone, passing condensate from said accumulator zone to said fractionation zone as reflux therefor, providing a condensing zone in communication with said accumulator zone, providing a non-condensibles withdrawal upon said condensing zone, providing a pressure sensing zone within said fractionation zone, providing a coolant flow control on the coolant flowing to said cooling zone, transmitting a signal from said pressure sensing zone to said coolant flow control thus to control said

coolant flow responsive to pressure in said fractionation zone, and relieving the pressure in said condensing zone by withdrawing non-condensibles through said non-condensibles withdrawal whenever the coolant flow control is insufficient substantially to control the pressure in said fractionation zone to a desired pressure.

4. A method according to claim 3 wherein the non-condensibles withdrawal is operated responsive to the pressure in said fractionation zone to be opened to withdraw non-condensibles whenever the pressure in said fractionation zone tends to exceed said desired pressure.

5. A method for the recovery from a fractionation system an overhead distillate tending to be removed from the system together with non-condensibles which are removed from the system to avoid undesirable pressure rising in the system, said method considerably reducing the unavoidable removal of distillate when non-condensibles are being removed, which comprises fractionating in a fractionating zone a feed containing said distillate to obtain an overhead containing said distillate and non-condensibles, passing said overhead to a controlled cooling zone wherein at least a portion of said overhead is condensed leaving, however, some distillate and non-condensibles in the vapor phase, passing condensed overhead to said fractionating zone as reflux therefor, passing vapor phase from said cooling zone into a condensing zone, in said last zone condensing a substantial portion of said distillate in vapor phase, passing condensed overhead to a stripping zone, in said last zone stripping non-condensibles from said condensed overhead and unavoidably taking therewith in the vapor phase a portion of desired distillate, passing vapors from said stripping zone to said cooling zone, controlling the pressure in said fractionating zone by controlling the flow of coolant to said controlled cooling zone responsive to the pressure in said fractionating zone, and whenever the pressure in said last zone can no longer be effectively maintained at a desired value by increasing the coolant to said cooling zone, removing non-condensibles from said condensing zone.

6. A method according to claim 5 wherein the removal of non-condensibles from said condensing zone is effected by providing a withdrawal for non-condensibles controlled responsive to the pressure in said fractionating zone.

7. A fractionation apparatus comprising a fractionator, a cooler, an accumulator, a condenser in communication with said accumulator, means to remove condensate from said accumulator, means to pass condensate to said fractionator as reflux, means to remove non-condensibles from said condenser, means upon said cooler to regulate its cooling capacity, means upon said fractionator to sense pressure therein, and means to control said means to regulate upon said cooler responsive to the pressure in said fractionator, means being provided to pass overhead successively from the fractionator to the cooler and then to the accumulator.

8. Apparatus according to claim 7 wherein the means to remove non-condensibles from the condenser is provided with means to control it responsive to the pressure in said fractionator to cause it to function when the cooling capacity of said cooler has become insufficient to substantially maintain the pressure in the fractionator at a desired level.

9. A method for removing from a fractionation system a gas or vapor which accumulates therein causing undesired rise in pressure and the constant venting of which results in a loss of a desired gas or vapor which comprises charging to a fractionation zone a feed to be fractionated therein, fractionating said feed to produce a bottoms product, which is withdrawn therefrom, and an overhead containing said desired gas or vapor, passing said overhead to a cooling zone, therein cooling at least a portion of said overhead, passing overhead which has been thus cooled to an accumulation zone, in said last zone separating a liquid phase and a gas or vapor phase containing said desired gas or vapor, removing the liquid phase from said last zone, passing at least a portion of the removed liquid phase to said fractionation zone as reflux therefor, passing gas or vapor phase in said accumulation zone to a condensing zone wherein desired gas or vapor is condensed and recovered, periodically relieving the system of accumulated uncondensed gas or vapor causing said undesired pressure rise, by removing uncondensed gas or vapor from said condensing zone, and controlling the pressure in said fractionation zone by adjusting the extent to which overhead is cooled in said cooling zone responsive to the pressure in said fractionation zone.

10. A method for removing from a fractionation system a gas or vapor which accumulates therein causing undesired rise in pressure and the constant venting of which results in a loss of a desired gas or vapor which comprises charging to a fractionation zone a feed to be fractionated therein, fractionating said feed to produce a bottoms product, which is withdrawn therefrom, and an overhead containing said desired gas or vapor, passing said overhead to a cooling zone, therein cooling at least a portion of said overhead, passing overhead which has been thus cooled to an accumulation zone, in said last zone separating a liquid phase and a gas or vapor phase containing said desired gas or vapor, removing the liquid phase from said last zone, passing at least a portion of the removed liquid phase to said fractionation zone as reflux therefor, passing gas or vapor phase in said accumulation zone to a condensing zone wherein desired gas or vapor is condensed and recovered, periodically relieving the system of accumulated uncondensed gas or vapor causing said undesired pressure rise, by removing uncondensed gas or vapor from said condensing zone, controlling the pressure in said fractionation zone by adjusting the extent to which overhead is cooled in said cooling zone responsive to the pressure in said fractionation zone by providing additional cooling of said overhead as the pressure rises in said fractionation zone up to substantially the cooling capacity of said cooling zone and relieving the system periodically as stated only when said cooling zone is cooling at substantially its full desired capacity, so as to restore control of the pressure by adjusting the temperature to which the overhead is cooled in said cooling zone.

11. A method for fractionating an alkylation effluent containing propane and gases lighter than propane which comprises fractionating in a fractionation zone said effluent to remove therefrom a bottoms product containing essentially hydrocarbons higher boiling than propane and an overhead stream containing propane, some HF, and gases lighter than propane, passing at least a portion of said overhead to a cooling zone, therein cooling said overhead, passing the thus cooled overhead to an accumulation zone, in said last zone separating a liquid phase and a gas or vapor phase containing propane and said lighter gases, removing liquid phase from said last zone, passing at least a portion of the removed liquid phase to said fractionation zone, passing vapor phase in said accumulation zone into a condensing zone wherein desired propane is condensed and removed, periodically relieving the system of accumulated uncondensed gas or vapor lighter than propane causing said undesired pressure rise, by removing uncondensed gas lighter than propane from said condensing zone, controlling the pressure in said fractionation zone by adjusting the extent to which the overhead is cooled in said cooling zone responsive to the pressure in said fractionation zone by providing additional cooling of said overhead as the pressure rises in said fractionation zone up to substantially the desired cooling capacity of said cooling zone and relieving the system periodically as stated of essentially gases lighter than propane only when said cooling zone is cooling at substantially its desired full capacity, so as

to restore control of the pressure by adjusting the temperature to which the overhead is cooled in said cooling zone.

12. A method for the control of a fractionation system in which there occurs an accumulation of non-condensibles which must be removed from the system and removal of which entails a loss of desirable condensible vapors which comprises providing a cooling zone for overhead from a fractionation zone, providing an accumulator zone to accumulate liquid formed in said cooling zone, passing condensate from said accumulator zone to said fractionation zone as reflux therefor, providing a condensing zone in communication with said accumulator zone, providing a non-condensibles withdrawal upon said condensing zone, providing a pressure sensing zone within said fractionation zone, passing a coolant through said cooling zone, providing a controlled by-pass for overhead around said cooling zone, transmitting a signal from said pressure sensing zone to the control on said by-pass thus to control said pressure in said fractionation zone, and relieving the pressure in said condensing zone by withdrawing non-condensibles through said non-condensibles withdrawal whenever the cooling control is insufficient substantially to control the pressure in said fractionation zone to a desired pressure.

13. A method according to claim 12 wherein the non-condensibles withdrawal is operated responsive to the pressure in said fractionation zone to be opened to withdraw non-condensibles whenever the pressure in said fractionation zone tends to exceed said desired pressure.

14. A method for removing from a fractionation system a gas or vapor which accumulates therein causing undesired rise in pressure and the constant venting of which results in a loss of a desired gas or vapor which comprises charging to a fractionation zone a feed to be fractionated therein, fractionating said feed to produce a bottoms product, which is withdrawn therefrom, and an overhead containing said desired gas or vapor, passing said overhead to a cooling zone, therein cooling at least a portion of said overhead, by-passing a portion of said overhead around said cooling zone, passing overhead which has been thus cooled to an accumulation zone together with said portion which has been by-passed, in said last zone separating a liquid phase and a gas or vapor phase containing said desired gas or vapor, removing the liquid phase from said last zone, passing at least a portion of the removed liquid phase to said fractionation zone as reflux therefor, passing gas or vapor phase in said accumulation zone to a condensing zone wherein desired gas or vapor is condensed and recovered, periodically relieving the system of accumulated uncondensed gas or vapor causing said undesired pressure rise, by removing uncondensed gas or vapor from said condensing zone, controlling the pressure in said fractionation zone by adjusting the temperature to which overhead is cooled in said cooling zone responsive to the pressure in said fractionation zone by providing additional cooling to said cooling zone as the pressure rises in said fractionation zone up to substantially the cooling capacity of said cooling zone and relieving the system periodically as stated only when said cooling zone is cooling at substantially its full desired capacity, so as to restore control of the pressure by adjusting the temperature to which the overhead is cooled in said cooling zone.

15. A method for controlling the pressure in a fractionation system comprising charging to a fractionation zone a feed to be fractionated therein, fractionating said feed to produce a bottoms product, which is withdrawn from said fractionation zone, and an overhead, passing said overhead to a cooling zone, cooling therein said overhead, passing the thus cooled overhead to an accumulation zone, separating in said accumulation zone a liquid phase and a gas or vapor phase, removing the liquid phase from said accumulation zone, passing at least a portion of the removed liquid phase to said fractionation zone as reflux therefor, determining the pressure in said fractionation zone, and controlling the extent to which said overhead is cooled in said cooling zone responsive to said pressure by providing additional cooling of said overhead as the pressure increases in said fractionating zone.

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