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METHOD FOR DISTILLING OILS

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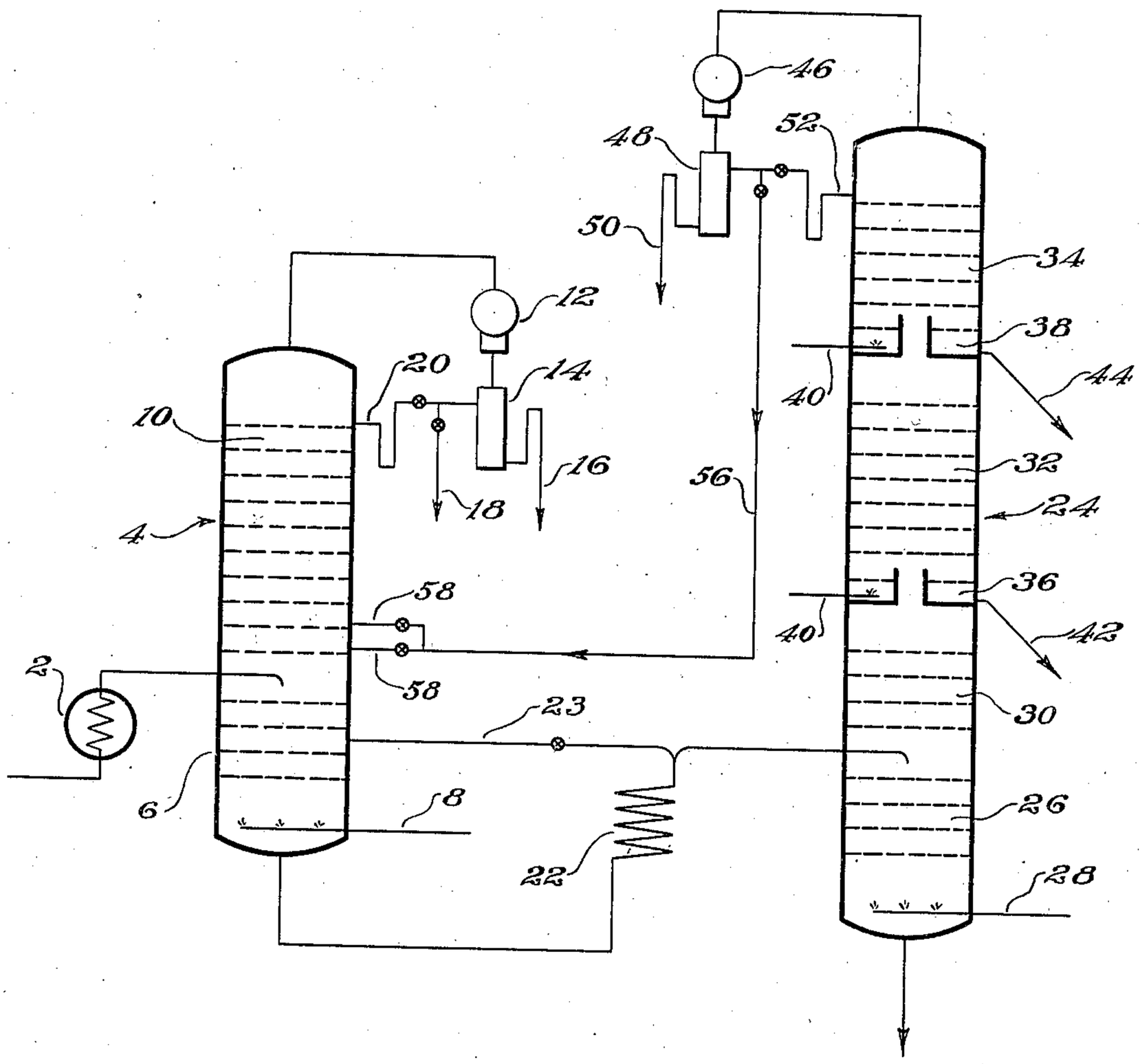

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METHOD FOR DISTILLING OILS

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The present invention relates to methods and apparatus for distilling oils.

It is well-known that the initial boiling point of any overhead distillate is not subject to control, since it is determined by such light ends as may be present in the charging stock. By ordinary methods, control of the initial boiling point can be effected only by making sure that the light ends are not present in the charging stock, but any such control is not commercially feasible, since the preliminary removal of the light ends from a large body of charge material would require an excessive quantity of heat and stripping steam.

The object of the present invention is to provide a method and apparatus whereby the initial boiling point of any overhead distillate may be economically controlled. With this object in view, the present invention comprises the method and apparatus hereinafter described and specifically defined in the claims.

The accompanying drawing is a diagram of the preferred form of apparatus for practising the present invention.

The present invention is herein illustrated and described as embodied in a system for obtaining naphtha of controlled initial boiling point, although it may be applied to heavier fractions.

The crude oil is heated in a heat exchanger **2** or by other suitable means and passed to the vaporizing zone of a column **4**. The portion of the oil remaining unvaporized passes through a bottom stripping zone **6** into which steam is introduced at **8**. Above the point of introduction of the crude, a series of fractionating decks **10** is provided, by which the end boiling point of the light gasoline product is controlled. The vapors are condensed in a condenser **12** and the condensate is decanted at **14** to permit removal of water at **16**, withdrawal of a light gasoline product at **18**, and return of gasoline as reflux by the pipe **20**.

The residue withdrawn from the bottom of the column **4** contains some of the components present in the light gasoline product withdrawn at **18**. If substantially complete removal of the small quantity of light components from the large body of residue were attempted, an uneconomically large quantity of steam or a very considerable heating would be required. This would require increased refluxing in the fractionating section of the column **4**. According to the present invention, no attempt is made to effect complete separation in the column **4**.

The residue from the first column is heated in a pipe still **22**, from which a portion may be returned to the column by a line **23**, for reboiling purposes, in place of or in conjunction with the steam introduced at **8**. Reboiling, instead of steam stripping, may be practised when the overhead gasoline contains material which is not condensable with the available cooling water. In such cases, the column is preferably operated under super-atmospheric pressure, and no steam is used. Whether the distillation is carried out with steam, or by reboiling, or both, no attempt at complete separation in the primary column is made.

The partially stripped or reboiled residue, heated in the pipe still **22**, is delivered to the vaporizing zone of a second column **24**, which has a bottom stripping zone **26** into which steam is introduced at **28**. Above the point of introduction of the heated oil, there are provided fractionating sections, indicated as three sections **30**, **32** and **34** and two side stripping sections **36** and **38**. It will be understood that the number of fractionating and side stripping sections may be different from the number shown, depending on the number of side products to be removed. Stripping steam is introduced into the sections **36** and **38** by pipes **40**.

By fractionation, kerosene, accumulated in the section **32**, passes through the side stripping section **36** and is drawn off at **42** while naphtha accumulates in the section **34**, passes through the side stripping section **38** and is drawn off at **44**. The initial boiling point of the naphtha at **44** is controlled by the stripping operation and the end point by the fractionation provided in the sections **32** and **30**.

The vapors passing out the top of the column are condensed in a condenser **46** and the condensate passed to a decanter **48** from which the water is removed at **50**. A part of the condensate is returned by a pipe **52** as reflux to the top of the fractionating section **34**, whereby the control of the end boiling point of the naphtha side product is effected. The remainder of the condensate is returned by a pipe **56** to the primary column **4**, preferably at a point at which the composition of the material in the column approximates that of the returned material. Valved branch lines **58** permit introduction of the returned material to selected decks. The material returned by **56** includes components within the boiling point range of the light gasoline product which is withdrawn at **18** and also components within the boiling point range of the naphtha withdrawn at **44**. When this material is fractionated in the section **10**, it is so divided that

the components belonging in the light gasoline are vaporized and become part of the gasoline at 18, while the heavier components flow down the column into the residue which is withdrawn from the bottom of the column.

It will be seen that the control in the fractionating sections of both columns, namely, 10 and 34, is not critical, since components which are not initially allocated to their unique products find their way back to the first column for further separation.

The process offers the advantage of saving considerable steam and heat over any process in which substantially complete separation in the first column is attempted. Ordinarily, only a small quantity of material needs to be handled in the return pipe.

The present invention is particularly useful in the separation of light gasoline and naphtha where a low end point straight run gasoline has a high anti-knock value without additional processing but where the higher boiling components represented by a naphtha fraction must be cracked to obtain satisfactory anti-knock characteristics. For maximum efficiency, it is practically essential that the naphtha to be reformed have a controlled initial point, indicating the absence of components of low boiling point. Moreover, control of the end point of the light gasoline is necessary to make sure that this fraction does not contain material of lower anti-knock value. The present invention accomplishes these results at little, if any, additional expense over the usual imperfectly controlled methods.

The present invention is not limited to gasoline but may be applied to any fractions, it being only necessary that the fraction which is to be controlled for initial point be withdrawn as a side product while the light ends are returned to a preceding step.

The invention having been thus described, what is claimed is:

1. The method of separating hydrocarbon mixtures by fractional distillation which consists in heating the mixture and feeding it to a primary fractionating column to obtain a low-boiling distillate as one fraction and a residue under conditions to incompletely remove from the residue materials within the boiling range of the low-boiling distillate, heating the residue and passing it to a second column, condensing overhead material of the second column, refluxing in the second column with a part of said overhead condensate to condense a side stream, vaporizing from the side stream substantially all of the material within the boiling range of the low-boiling distillate, removing said side stream as another fraction of controlled initial boiling point, and conducting to the primary column above the point of feed of the original mixture the remainder of the second column overhead condensate which includes substantially all of the low boiling distillate components carried in the primary column residue and some of the components within the boiling range of said other fraction.

2. The method of separating hydrocarbon mixtures by fractional distillation which consists in heating the mixture and feeding it to a primary fractionating column to obtain a gasoline distillate and a residue under conditions to incompletely remove from the residue materials within the boiling range of the gasoline distillate, heating the residue and passing it to a second column, condensing overhead material of the second column, refluxing in the second column with a part of said overhead condensate to condense a naphtha side stream, vaporizing from the side stream substantially all of the material within the boiling range of the gasoline distillate, and conducting to the primary column above the point of feed of the original mixture the remainder of the second column overhead condensate which includes substantially all of the gasoline components carried in the primary column residue and some of the components within the boiling range of the naphtha side stream.

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