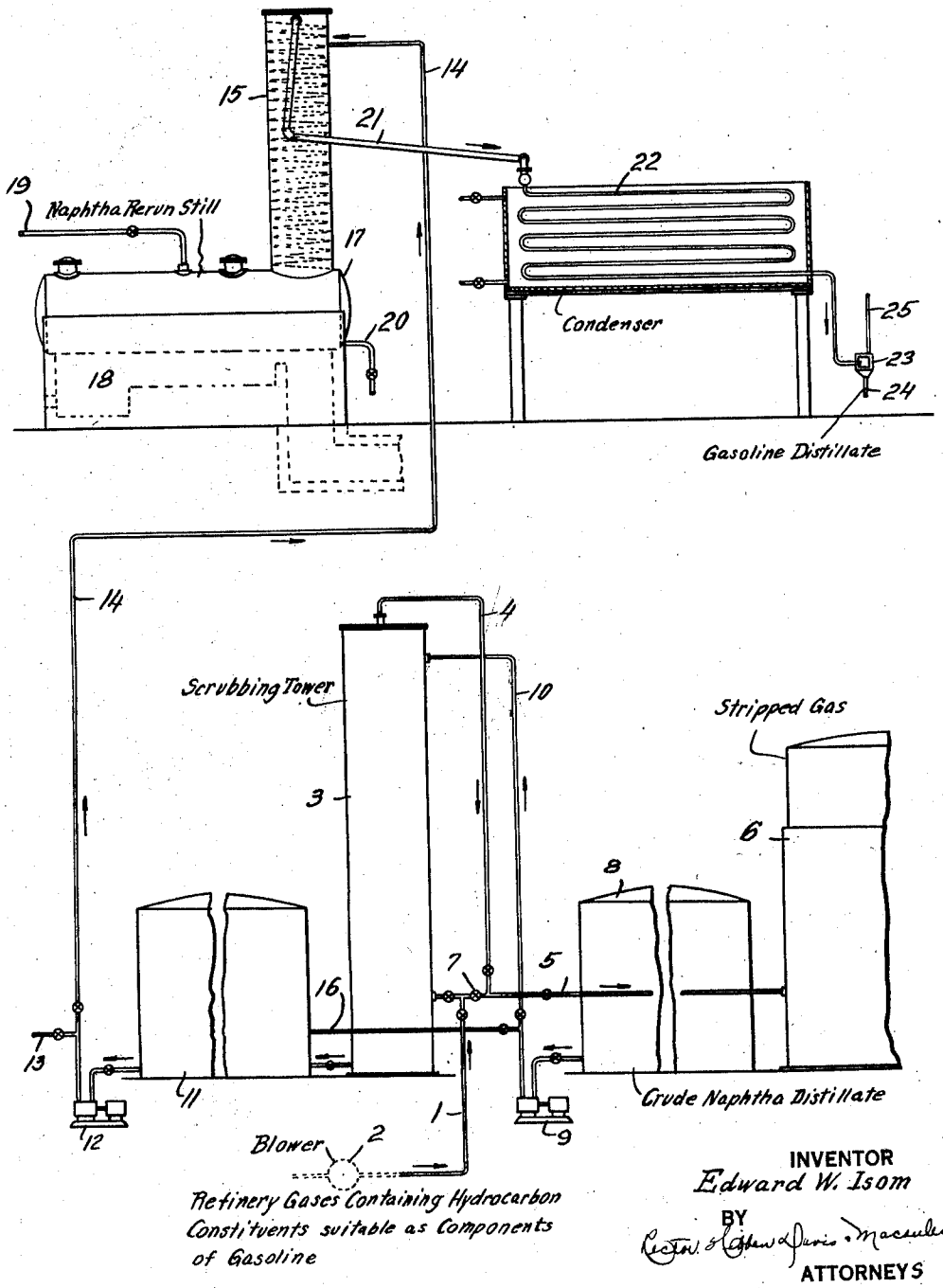
July 29, 1930. E. W. ISOM 1,771,409

DISTILLATION OF OIL

Filed April 20, 1927



INVENTOR

Edward W. Isom

BY

Lester & Allen & Davis & Macauley

ATTORNEYS

Patented July 29, 1930 1,771,409

UNITED STATES PATENT OFFICE

EDWARD W. ISOM, OF SCARSDALE, NEW YORK, ASSIGNOR TO SINCLAIR REFINING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE

DISTILLATION OF OIL

Application filed April 20, 1927. Serial No. 185,116.

This invention relates to improvements in the treatment of oil refinery gases and in the handling of crude gasoline-containing naphtha distillates. Usual oil refinery operation involves the production of various hydrocarbon gas mixtures, usually including a proportion of vapors of light hydrocarbons condensable at ordinary temperatures and pressures sufficient to make it desirable if not economically necessary to treat these gas mixtures for the recovery of such condensable constituents. These light condensable constituents correspond, in large measure, to the lighter and more volatile portions of gasoline, and they are valuable and desirable as components of gasoline. Likewise, usual oil refinery operation involves the production of various crude gasoline-containing naphtha distillates which are rerun, that is redistilled, to produce finished gasoline products. Many such crude naphtha distillates are deficient with respect to the lighter portions of gasoline so that the gasoline distillates separated from them on rerunning are likewise deficient with respect to such lighter components. In customary practice, these gasoline distillates are brought to the desired standard by blending the light oils containing a large proportion of such lighter components, such as casinghead gasoline or the so-called natural gasoline recovered from natural gas. This invention provides an improved method for recovering light condensable hydrocarbons from refinery gases and for enriching gasoline distillates with lighter components.

According to the present invention, refinery gases containing hydrocarbon constituents suitable as components of gasoline are scrubbed with crude gasoline-containing naphtha distillates to be rerun and the gasoline components, absorbed and originally present, are recovered together as a gasoline distillate in the rerunning operation.

Such crude naphtha distillates contain constituents suitable as components of gasoline and, in addition, heavier constituents separated by the rerunning or redistillation. The process of this invention takes advantage of the high solvent power for gasoline components, particularly light gasoline components, of these heavier constituents of the crude naphtha distillate. At the same time, in the process of this invention, the rerunning operation is made to serve a dual capacity. The absorbed gasoline components as well as those originally present are recovered in a single operation, making possible important heat economies. The process of the present invention is of special value and application in connection with crude naphtha distillates deficient in lighter gasoline components. In the process of this invention, such crude naphtha distillates may be enriched with lighter components, making possible the direct recovery of a finished gasoline distillate or reducing the amount of light material necessary to be blended with the gasoline distillate from the rerunning operation. Many crude distillates, for example, contain a proportion of light gasoline components too low with respect to the total of constituents present suitable as components of gasoline, and the process of this invention is particularly advantageous for enriching such crude distillates with light constituents.

It is common practice, in cracking heavier hydrocarbon oils such as gas oil by distillation under pressure to produce gasoline, to take off from the operation and condense as a pressure distillate the gasoline components produced and in addition heavier components intermediate gasoline and the charging stock supplied to the cracking operation which are relatively refractory to the cracking conditions maintained therein. Such crude gasoline-containing distillates are then subjected to redistillation to separate the gasoline from heavier constituents not suitable as components of gasoline. The pressure distillate is frequently subjected to chemical treatment before or during the rerunning operation. Such crude gasoline-containing distillates are useful in carrying out this invention. Likewise, the cracked vapors from pressure still operation are sometimes subjected to fractionation, as by fractional condensation in a bubble tower or other fractionating tower, to effect an initial separation of the vapors into a lighter gasoline-character distillate and a heavier fraction containing some constituents

suitable as components of gasoline together with the heavier constituents taken off from the pressure still operation. Such heavier fractions are rerun to separate the gasoline components. These crude heavy gasoline-containing distillates, containing but a small proportion if any of lighter gasoline components, are particularly useful in carrying out the present invention. While the invention is of special value and application in connection with such crude gasoline-containing cracked distillates and crude heavier gasoline-containing fractions from such cracked distillates, it is also useful in connection with straight run crude naphtha distillate fractions containing gasoline components together with heavier components, particularly where the crude naphtha distillate is deficient in lighter gasoline components.

The particular types of scrubbing operation and rerunning operation used in carrying out the invention are not important. The rerunning operation, for example, may be carried out in an ordinary shell still, heated by direct fire or by steam or by a combination of the two. It is, however, advantageous to carry out the rerunning operation in a still provided with a tower through which the vapors from the still pass and into which crude naphtha distillate containing absorbed constituents is introduced into direct contact with the vapors. The scrubbing operation may be carried out in the usual type of scrubbing tower with countercurrent flow of the gas mixture and the crude naphtha distillate. To increase the solubility in the crude naphtha distillate of absorbable constituents present in the gas mixture, the scrubbing operation may be carried out under superatmospheric pressures.

The invention will be further described in connection with the accompanying drawings which illustrate, diagrammatically and conventionally, one form of apparatus adapted for carrying out the process of the invention. The drawings represent a rerun still with a tower and condenser, a scrubbing tower, tankage and a gas holder arranged for carrying out the process of the invention.

Refinery gases containing hydrocarbon constituents suitable as components of gasoline are supplied through connection 1, for example by means of a blower 2. These gases pass upwardly through the scrubbing tower 3 from the upper end of which the stripped gases escape through connection 4 passing to the gas holder 6 through connection 5. Valves, including a by-pass 7, are arranged in the gas connections as shown to permit control of the flow of gases. Crude naphtha distillate from tank 8 is supplied to the upper end of the scrubbing tower through connection 10 by means of pump 9. This crude naphtha distillate, for example, may be a crude cracked pressure distillate, "bottoms" containing gasoline components resulting from fractionation of a cracked pressure distillate, or a straight run crude gasoline-containing distillate. The crude naphtha distillate flows downwardly through the scrubbing tower in contact with the rising gas mixture and absorbs condensable hydrocarbon constituents from the gas mixture. From the bottom of the scrubbing tower, the crude naphtha distillate with absorbed hydrocarbon constituents passes to tank 11. From tank 11, the crude naphtha distillate with absorbed hydrocarbon constituents is supplied to the upper end of the tower 15 on a rerun still through connection 14 by means of pump 12. It will be understood that the rerun still illustrated may be but one of a battery of several stills. A single scrubbing tower will usually handle more crude naphtha distillate than can be charged to a single still. Crude naphtha distillate containing absorbed hydrocarbon constituents thus may be supplied to a number of rerun stills from tank 11, for example, through connection 13. Crude naphtha distillate in excess of that required for the scrubbing operation may also be supplied to the still 17, for example, through connection 13. Crude naphtha distillate in excess of that required for the scrubbing operation may also be supplied to the tank 11, for example through connecton 16. The rerun still 17 is of ordinary shell construction and is mounted in a furnace setting 18. Connection 19 is provided for initially charging the still. Connection 20 is provided for the discharge of "bottoms" from the still to permit of continuous operation. The vapors separated in the rerun still escape from the upper end of the tower 15 through connection 21 and pass to the condenser 22. This condenser discharges into look-box 23 from which the gasoline distillate is discharged through connection 24 and gases and vapors remaining uncondensed through connection 25. The rerunning operation may be controlled by regulating the rate at which crude naphtha distillate is supplied to the tower 15 through connection 14. The absorbed light hydrocarbon constituents are vaporized in the rerun still and in the rerun still tower and escape to the condenser 22 through connection 21 together with the gasoline components originally present in the crude naphtha distillate. In the condenser, the absorbed gasoline components and the gasoline components originally present in the crude naphtha distillate are condensed to form the distillate product discharged through connection 24.

In some cases, particularly with crude naphtha distillates containing large proportions of very light constituents, the stripping of the hydrocarbon gas mixture in the scrubbing operation of the present invention may not be as complete as desired, in which event

the remaining gas mixture may be subjected to further treatment for the recovery of additional quantities of light condensable hydrocarbons. In any case, however, to the extent that light condensable hydrocarbon constituents are removed from the gas mixture in the operation of this invention, the advantages of the invention in eliminating any necessity for separate operations to recover such constituents and in enriching the gasoline fraction of the crude naphtha distillate to the extent that such constituents are absorbed are secured.

I claim:

1. A combined operation for stripping hydrocarbon gas mixtures of constituents suitable as components of gasoline and of obtaining from crude cracked gasoline containing naphtha distillates gasoline distillates enriched with respect to lighter constituents comprising scrubbing gas mixtures containing absorbable constituents suitable as components of gasoline with crude cracked gasoline containing naphtha distillates to be rerun and thereafter rerunning the crude cracked naphtha distillates to separate gasoline distillates containing absorbed gasoline components and gasoline components originally present in the crude cracked naphtha distillate.

2. A method of enriching crude cracked gasoline-containing distillates with lighter constituents suitable as components of gasoline, comprising scrubbing hydrocarbon gas mixtures containing absorbable constituents suitable as components of gasoline with the crude cracked distillates and thereafter redistilling the crude cracked distillate to separate a gasoline distillate containing gasoline components absorbed in the scrubbing operation.

In testimony whereof, I have subscribed my name.

EDWARD W. ISOM.