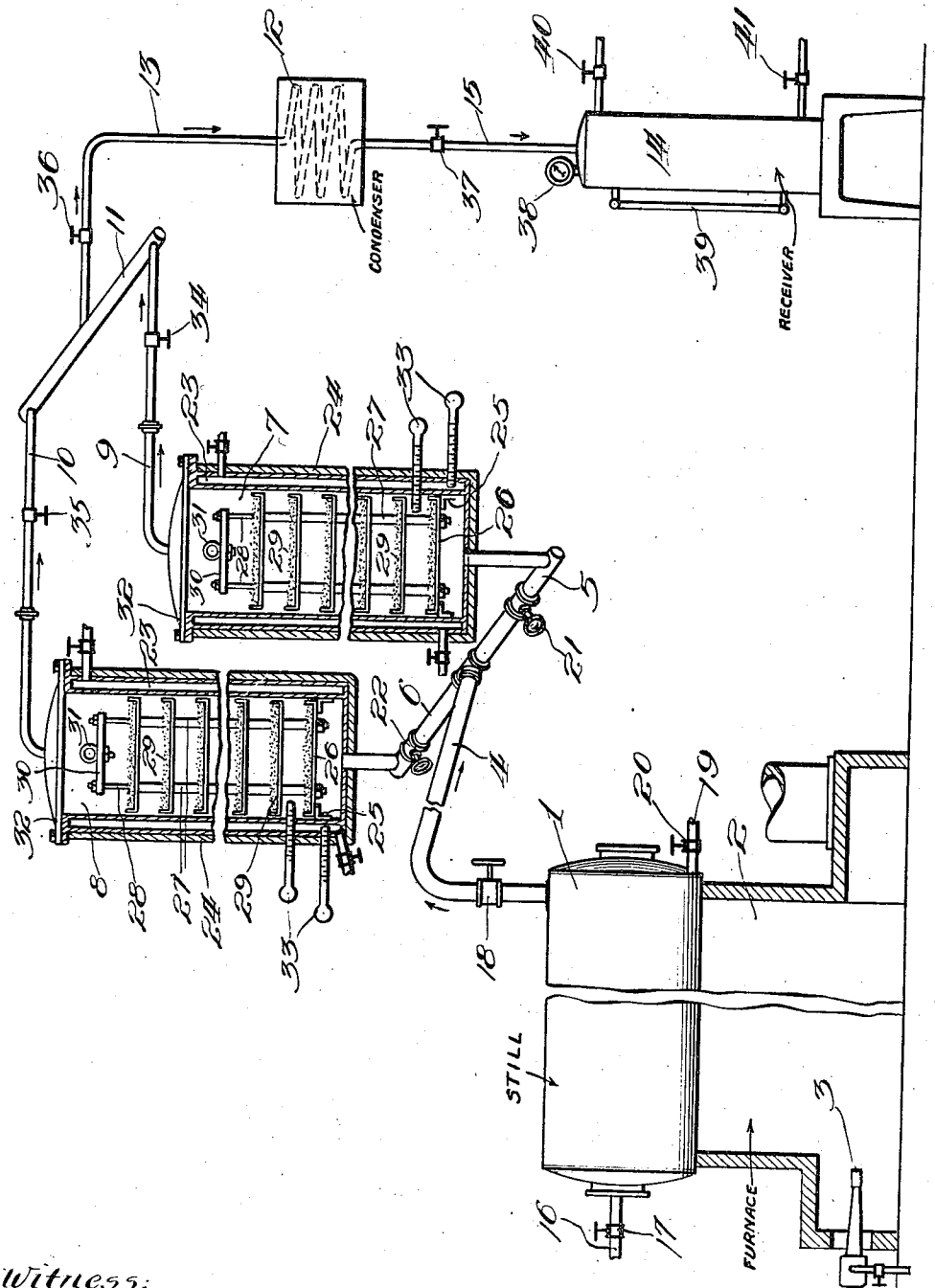
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PROCESS OF TREATING HYDROCARBONS

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PROCESS OF TREATING HYDROCARBONS.

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This invention relates to a process for treating hydrocarbons, and refers more particularly to the conversion, decolorization and neutralization of the hydrocarbon products to product hydrocarbons of a lower boiling point having the characteristics of gasoline.

Among the salient objects of the invention are to provide a process in which the hydrocarbons are treated while in the vapor phase, to the action of anhydrous silicates whereby the hydrocarbon products are relieved of objectionable elements, and when condensed, produce a water white marketable distillate; to provide a process in which the substance used in connection with the conversion of the oil has not only a cleansing and purifying action, but also has the characteristics of a neutralizer and catalyst promoting the conversion while improving and increasing the distillate obtained; to provide a process which may be operated continuously and is preferably operated under a substantial pressure of the generated vapors; to provide an apparatus which permits the isolation of selected stages so that the stages separated from the system may be cleaned and cut back into the system without interruption of the processing of the hydrocarbon products.

The single figure is a diagrammatic side elevational view of the apparatus with parts shown in perspective to show more clearly the arrangement of the separate treating columns.

At 1 is shown a still mounted in a furnace 2 which is heated by means of gas burners 3. The still is connected by a vapor line 4 and secondary lines 5 and 6 to treating columns 7 and 8. These columns in turn are connected by pipes 9 and 10 respectively to a common header 11 which communicates with a water condenser 12 through a line 13. The receiver 14 is connected by a pipe 15 to the discharge end of the condenser.

Referring to the method of treating the oil, the charging stock is introduced to the still through the pipe 16 controlled by a valve 17 and after conversion in the still, the volatile portions pass off through the vapor line 4 controlled by the valve 18. The unvaporized liquids may be drawn off either intermittently or continuously through the liquid drawoff line 19 controlled by the valve 20.

The vapors rising through the vapor line 4 may be directed to either of the treating columns 7 or 8 by controlling the valves 21 and 22 interposed in the lines 5 and 6.

The treating columns are identical in form and a description of one will suffice. The column consists of an outer jacketed casing 23 which is heavily insulated as shown at 24 to prevent loss of heat by radiation. At the bottom of the treating column are lugs 25 which support the lower pans 26. At regular intervals throughout the column and held in spaced apart relation by spacer tubes 27 mounted upon the vertical rods 28 are perforated pans 29. The rods are connected at the top by means of bars 30 which are fitted with rings 31 by means of which the pans may be withdrawn through the top of the casing when the removal heads 32 are unbolted from the casing and removed.

In addition to the pans 29 being perforated, the lower pans 26 are also perforated to permit the vapors rising through the connection in the vapor line 4 to percolate through the column and through a granular treating agent which is distributed over the surface of the perforated pans.

In the jacket of the casing may be circulated hot oil or steam to maintain the proper temperatures during treatment. Thermometers 33 are interposed both in the jacketed portion and also in the interior of the casing in order to ascertain at all times the temperatures therein. The treated vapors pass off from the top of the column through the lines 9 and 10 controlled by valves 34 and 35 respectively, are subjected to a condensing action, and are finally collected as liquid distillate in the receiver 14.

Valves 36 and 37 are interposed in the lines 13 and 15, if it is desired to regulate the pressures in the separate stages.

The receiver is equipped with a pressure gauge 38, liquid level gauge 39, pressure relief valve 40 and a liquid drawoff valve 41.

The invention lies principally in the treatment of hydrocarbon products while in the vapor phase to the action of an anhydrous silicate having certain desirable qualities, namely to extract undesirable properties from the vapors due to its absorbent capabilities, and in addition certain chemical effects which tend to purify the resulting product. Also the substance or material through which the vapors are percolated has a catalytic tendency which not only im-

proves the character of the distillate, but increases materially the quantity of desirable low boiling point products obtained.

Such a material or substance is a mineral known as bentonite which is mined in Utah, South Dakota, Wyoming, Colorado, New Mexico and other western States.

The mineral is found as hydrous silicate of alumina and is used after being ignited to remove substantially all of its moisture content.

In treating the vapors, it is desirable to have the material in a relatively finely divided condition, and it is also desirable that the temperature of the treater or treating column is maintained above the dry point of the distillate being treated, as the material readily deliquesces, producing a gummy mass, the amount of mineral necessary for producing the desired effect being reduced as low as 10 pounds for every 1000 pounds of oil treated, and even these relations may be varied in accordance with the charging stock which is to be treated, and the distillate it is desired to obtain.

In addition to the use of the anhydrous silicate it has been advantageous under certain conditions to incorporate with the silicate a metallic salt such as copper, iron or other metal that will combine with sulphur. It is an advantage to have the metallic salt in a finely divided state and mixed with the bentonite or silicate prior to its ignition. Such copper salts as malachite, azurite or cuprite have practically as good a desulphurizing action as chemically pure copper oxide. Good results have also been had with siderite or basic carbonate of iron as a deodorizer and decolorizer. Natural silicates and carbonates of zinc also have been found to give good results. Manganese compounds deodorize and desulphurize, but have a slight tendency to give a green distillate. It is desirable to use these metallic substances in conjunction with the bentonite or like silicious substances.

The method that has been most successful in giving gasoline that is water white in color with a perfectly sweet odor and which passes the Doctor test and the copper corrosion test, is to make a gel by mixing water with the bentonite and combine with the gel a metallic compound such as copper oxide in a finely divided state and in proportions corresponding to the amount of sulphur in the oil to be treated. The mixture is then dried, and ground into granular form, and subsequently ignited at a temperature preferably not less than 500° F.

The vapors on passing through this material will be relieved of their sulphur content and other objectionable elements and will be collected in the receiver as a sweet odored water white distillate.

The apparatus is such that either column 7 or 8 may be isolated from the system by closing the valves interposed in the lead lines connected to the vapor pipe 4 or the header 11. Unions are shown in the lines 9 and 10 connected into the top of the treating column for removing the vapor pipes and the heads 32 of the columns.

It has been found that a more perfect contact is obtained by the use of bentonite mixed with diatomaceous earth.

When one treating column has been cut out of the system, and the perforated pans removed through the top of the column by withdrawing the rack formed by the two vertical rods and cross bars 30, the material may be rejuvenated by burning out the adsorbed carbonaceous material. The rejuvenated material may be ground and replaced in the pans, and the column again cut into the system while the opposite column is cut out for cleaning.

In the dehydration or decolorization of lubricating oils, it is desirable to have the material in the form of coarse granules, while in the treatment of the vapors for decolorizing and neutralizing as herein explained, a relatively fine powder gives a more complete treatment.

As far as the operating conditions such as pressure and temperature conditions maintained upon the system are concerned, this may be regulated in accordance with the oil treated and the character of distillate desired. Certain oils are best converted under relatively high pressures and temperatures, while others give best results under lower temperatures and pressures.

Bentonite as mined in the different western States may vary to some extent in the minerals which it contains, and for this reason the invention has not been limited solely to the use of bentonite, but rather to the use of an anhydrous silicate. The particular mineral content of the different forms of bentonite may affect to some extent the treatment of the oil, but an analysis prior to use and a proper mixture of the silicate with the metallic salt will obviate this objection.

If bentonite is used alone, proper conditions may be readily ascertained by experimentation.

I claim as my invention:

1. A process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of bentonite and a salt of a metal having an affinity for the sulphur compounds of the oil while maintaining the mixture above the dry point of the oil, and condensing and collecting the treated vapor as liquid distillate.

2. A process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of benton-

ite, diatomaceous earth and a metallic salt having an affinity for the sulphur compounds of the oil while maintaining the mixture above the dry point of the oil, and condensing and collecting the treated vapors as liquid distillate.

3. A process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of bentonite, diatomaceous earth and a metallic salt having an affinity for the sulphur compounds of the oil while maintaining the vixture above the dry point of the oil, and condensing and collecting the treated vapors as liquid distillate.

4. A process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of bentonite, diatomaceous earth and a metallic salt having an affinity for the sulphur compounds of the oil while maintaining the mixture above the dry point of the oil, and condensing and collecting the treated vapors as liquid distillate.

5. A process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of bentonite and copper salt, and condensing and collecting the treated vapors as liquid distillate.

6. A process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of bentonite, diatomaceous earth and a copper salt, while maintaining the mixture above the dry point of the oil, and condensing and collecting the treated vapors as liquid distillate.

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