METHOD AND APPARATUS FOR TREATING PETROLEUM HYDROCARBONS

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 CENTRIFUGE

 KOMAGENIZER

 MOTOR

 AGITATOR

 FILTER

 CENTRIFUGAL PUMP

 INVENTOR.

 W. M. CROSS

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METHOD AND APPARATUS FOR TREATING PETROLEUM HYDROCARBONS.

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This invention relates to improvements in a process and apparatus for treating petroleum hydrocarbons, and refers more particularly to a process in which the hydrocarbons are subjected to an acid treatment and a subsequent treatment with clay alone or in combination with a metallic salt in order to remove from the hydrocarbons such objectionable impurities as gums, resins, and sulphur compounds, some of which are difficult to eliminate without rather complete treatment and with an attendant loss of considerable quantities of the oil and treating materials.

The advantages in the present process lie particularly in the effectiveness of the treatment, the continuity of operation, the resulting product passing all of the well-known tests such as the doctor tests, the copper corrosion test, and test for percentages of gum or resinous material remaining in the oil after treatment.

The process also reduces considerably the time of treatment and the amount of treating materials utilized and affords a process by means of which the ingredients recovered after treatment may be reused for subsequent treatment of hydrocarbons.

The single figure is a diagrammatic elevation view of the apparatus with parts in section.

The hydrocarbon to be treated is introduced through the line 1 controlled by a valve 2, while an acid material, preferably sulphuric acid, is combined therewith, being introduced through a line 3 regulated by a valve 4. The mixture is charged, by means of a pump 5 suitably constructed so as not to be attacked by the acid, through a line 6 at the end of which is positioned a homogenizing valve shown diagrammatically at 7. The function of this valve is to separate and divide the particles of the combined liquids into a spray or mist inducing a combination of the particles which is much more intimate than can be obtained by agitation or mechanical mixing devices. This homogenized mixture passes through a tube 8 in which is positioned a plurality of vanes arranged in reverse directions in order to produce still further turbulence and more intimate contact of the liquid. The mixture is then passed through the pipe 10 and is discharged through a divided pipe 11 into a centrifuge 12. The centrifuge is mounted upon bearing members 13 carried by supports 14 and rotated at high speed by means of a motor 16 driving the pulleys 16 and 17 by means of a belt 18. A gland connection 19 is positioned between the stationary tube 8 and the rotating shaft 20 of the centrifuge.

The effect of the centrifuge is to separate the lighter oil from the heavier acid, the latter being thrown to the outer portion of the revolving centrifuge, while the lighter material will remain near the center thereof. Stationary outlet lines 21 extend practically to the circumference of the inner face of the centrifuge and serve to withdraw the heavier acid from the interior of the revolving separating element. Near the center of the centrifuge is a discharge line 22 for removing the lighter oil. The oil withdrawn through the line 22 is discharged into a receptacle 23 and passes down through the line 24 to the agitator 25. The acid taken off through the lines 21 is withdrawn through the line 26 from which it may be returned to the line 3 for reuse with the incoming oil.

The acid treated oil collecting in the agitator has introduced thereto a highly adsorbent hydrated silica clay of aluminum silicate such as bentonite or innumerable other clays of a highly adsorbent nature. This clay may or may not be combined with a metal or metallic salt such as copper, lead, zinc, iron, or other metal having an affinity for the sulphur compounds of the oil, such as described in Patent No. 1,513,733 of November 18, 1924, to Roy Cross. Where the oil has a high sulphur content, the treatment is much more effective where the metallic mineral is used with the clay. This clay or adsorbent aluminum silicious matter is introduced to the agitator by means of a hopper 27 and a conveyor screw 28 driven by means of a motor 29. The amount of clay or silica used will vary according to the character of the oil and the amount of acid necessary for proper treatment. It will be noted that there is no water wash between the acid treatment and the treatment with the adsorbent clay or bentonite.

In order to produce the desired turbulence and intimate mixture of the clay and oil, a circulatory system consisting of pipes 30, 31 and a centrifugal pump 32, are supplied in order to circulate the mixture to and from the agitator. From time to time quantities of the mixture are drawn off through the pipe 33 regulated by a valve 34 and di-
rected to a filter press diagrammatically shown at 35. In the filter press the clay is separated from the treated liquid oil, the oil passing off through the line 36 controlled by a valve 37, while the clay is removed from the filter cloths or screens and reignited when it is ready for reuse in the agitator. By means of this system, a relatively short and complete contact—say, of one-half minute duration—of the acid and oil may be produced, the rapidity of contact eliminating, to a great extent, polymerization of the gasoline which considerably diminishes the undesirable effect of the acid treatment. For like reasons, the water wash has been dispensed with and also for the fact that the addition of water tends to produce a hydrating redesolving of certain of the resinous compounds of the oil. The centrifuge may be put in a horizontal position.

By utilizing a quick acid treatment and a subsequent effective adsorbing clay treatment, a distillate oil or untreated gasoline, kerosene or the like, may be purified to a degree that it will pass the commercial tests for marketable motor fuel. This treatment, also, does not affect the boiling point range as do redistillation treatments heretofore deemed necessary in the refining of commercial motor fuel commonly known as gasoline.

During the period of acid contact, it is highly desirable that the temperature of both oil and acid be kept as low as is practically possible and at all times below 100° F. To advantageously maintain this temperature, parts of the apparatus may be suitably water-cooled, such as the centrifuge and related parts, or the oil may be chilled prior to its introduction to the system.

I claim as my invention:

1. A continuous process for treating petroleum hydrocarbons, consisting in combining the oil with an acid to form an intimate mixture, limiting the period of contact to a predetermined length of time of approximately one half minute to prevent polymerization of the oil, separating the oil from the acid sludge by mechanical separation.

2. A continuous process for treating petroleum hydrocarbons, consisting in combining the oil with an acid to form an intimate mixture, limiting the period of contact to a predetermined length of time of approximately one half minute to prevent polymerization of the oil, separating the oil from the acid sludge by centrifuging.

3. An apparatus for purifying oil comprising a homogenizer, a conduit connected to the homogenizer and provided with baffle means in the conduit, means connected to the conduit adapted to separate the oil from the acid body.

WALTER M. CROSS.