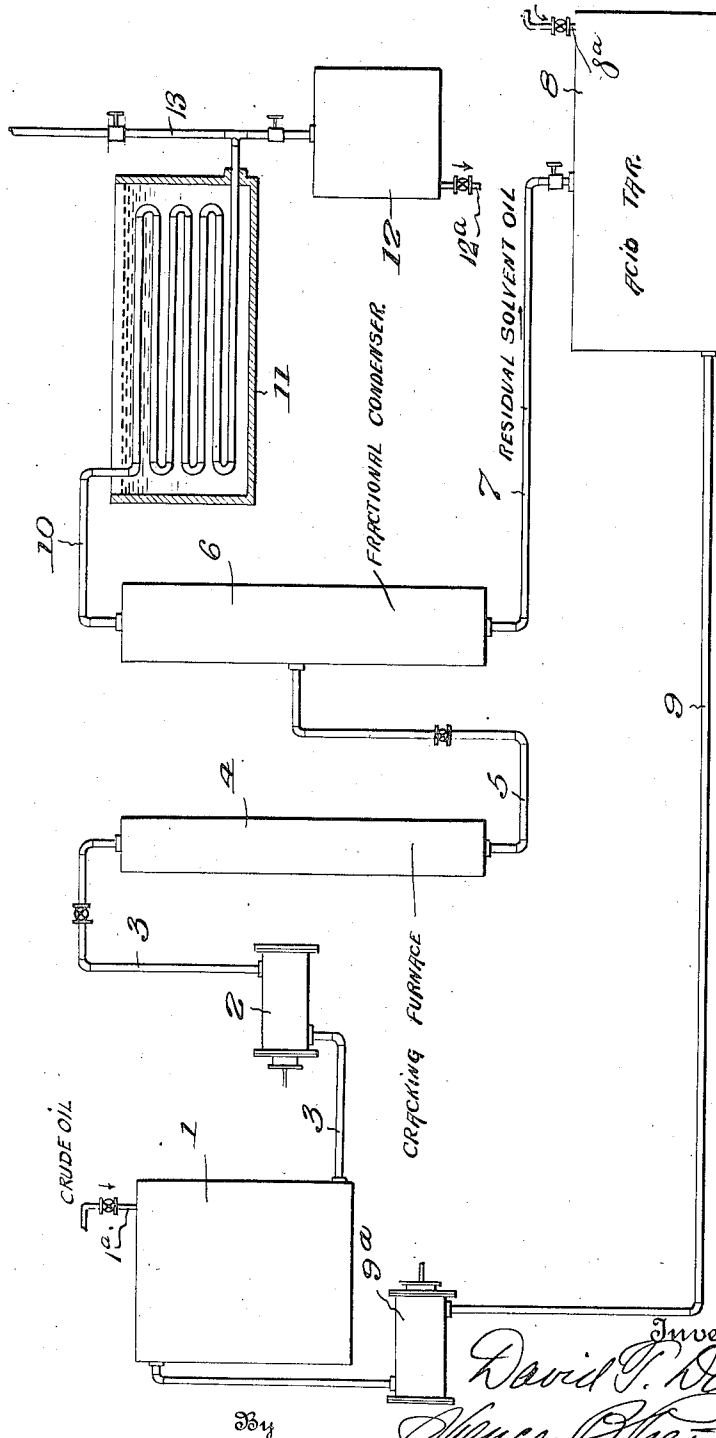


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TREATING HYDROCARBON OILS.
APPLICATION FILED APR. 30, 1918.

1,373,391.

Patented Mar. 29, 1921.



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UNITED STATES PATENT OFFICE.

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TREATING HYDROCARBON OILS.

1,373,391.

Specification of Letters Patent.

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Application filed April 30, 1918. Serial No. 231,688.

To all whom it may concern:

Be it known that I, DAVID T. DAY, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Treating Hydrocarbon Oils, of which the following is a specification.

This invention relates to a process of converting into gasoline such hydrocarbon residues as acid tar, sludge acid, or acid sludge, and material such as may be formed incident to the treatment of hydrocarbon oils with sulfuric acid. The invention also includes the treatment of pitches, tar, or asphaltic oils such as occur in nature.

It has long been recognized that the cracking of the above mentioned materials into gasoline is impractical in the forms of apparatus usually employed for cracking, on account of the large amount of carbon formed during the thermal decomposition of such oil residues.

This invention now discloses the fact that when such residues are dissolved in any appreciable percentage in other oils more fluid in their character, and preferably in oils which do not crack as easily as these tar oils, it is practical to pass the solution of these oil residues in such oils through a cracking apparatus at a lower temperature than that required for the cracking of a solvent oil. Also that these residues, when so cracked yield gasoline of good quality, and frequently the much more valuable aromatic hydrocarbons such as benzol and toluol in admixture with other cracked products. The presence of sulfuric acid residues in these oils in no way interferes with the cracking process, but as already demonstrated by me, Patent No. 1,221,698, the presence of the sulfur is favorable to the cracking of these oils, the action possibly being catalytic in its character.

In carrying out this process, the hot heavy residual oil remaining after any cracking process, and from which the light gasoline has been extracted by distillation or fractional condensation, is run through a pipe, which carries the oil to tanks containing the acid sludge. Such residual oil is described in the claims as petroleum residues. The oil then dissolves the acid sludge in such proportion as may prove most advantageous, usually from 10 to 50 per cent. The hot oil now carrying the acid sludge in solution or suspension, is returned to the feed tank of

the cracking apparatus and then passed through a cracking chamber, preferably at a temperature where cracking will be chiefly accomplished in the acid sludge dissolved in the suitable menstrum. It is found that the acid tar or sludge is largely—eventually completely—cracked into lighter products, and the dissolving oil can be then pumped back to take up another supply of acid tar, again serving as a solvent in which the acid tar is returned to the cracking apparatus, the former result being repeated. The temperatures found most advantageous for cracking such acid tar vary according to conditions of pressure and quality of the tar, possibly from 600° F. to 1000° F., a temperature of 600° F. to 700° F. being preferred.

The process may be conducted in any suitable form of apparatus. One form of apparatus is shown diagrammatically in the drawing forming a part of this application. In the drawing, 1 is a tank containing oil in which an amount of acid tar or similar material has been dissolved. 2 is a pump adapted to force the material from the tank 1 through the pipe 3 to a cracking furnace 4 which may be of the usual vapor tube type. Material from the cracking furnace 4 is led through a pipe 5 to a fractional condensation chamber 6, from the bottom of which the hot oil which has not been cracked escapes into a pipe 7, which carries this hot oil to a tank 8, containing the acid tar to be dissolved. 9 is a pipe extending from this tank of acid tar and adapted to carry the solvent oil, now charged with the heavy tar residue, to the tank 1. 10 is the exit pipe extending from the top of the fractional condensation tower from which latter the gasoline formed, and the permanent gases formed, are conducted through a suitable condensing coil 11 and into a tank 12 for holding the condensed gasoline. Untreated acid tar or sludge may be introduced into the tank 8 through an inlet pipe 8^a. Fresh relatively fluid oil such as crude oil, to be used as the solvent oil may be introduced into the tank 1 through an inlet pipe 1^a. The final gasoline product may be drawn from the tank 12 through a pipe 12^a. Valves may be provided in the pipes 3, 5, 7, 8^a, 12^a and 13 as well as in other parts of the apparatus to provide for regulation of temperatures and pressures as desired and to render convenient the operation of the

apparatus to perform the process described and claimed. Permanent gases are led from the tank 12 by means of a pipe 13 to any type of gas reservoir, not shown.

- 5 From the foregoing it will be clear that the present invention has provided a process for utilizing materials which heretofore could not be used. By the use of the present invention it will now be possible to obtain
10 valuable products from asphaltic oils, acid tars and sludges which have been formed in the treatment of oils with acids.

I claim:

1. The process of obtaining hydrocarbon
15 oils having low boiling points from hydrocarbon oils having high boiling points which comprises making a solution of a mixture of the original high boiling material to be treated with petroleum residues having
20 higher cracking points, subjecting the mixture to a heat treatment of at least 600° F. to bring about the desired cracking of the original material but at a temperature lower than required to crack substantial amounts
25 of the solvent material, subjecting the material so treated to a separating treatment to remove the low boiling point material produced from the original material, and returning the residues for mixing with additional high boiling materials.

2. The process of obtaining hydrocarbon
30 oils having low boiling points from petroleum residues containing acid tar which comprises making a solution of the original
35 residues containing acid tar with petroleum residues having higher cracking points, subjecting the mixture to a heat sufficient to bring about cracking of at least a portion of the original material but below the cracking
40 point of the higher cracking point material, subjecting the material so treated to a separating treatment to remove the low boiling material produced from the original material, and returning the residues for mixing
45 with original petroleum residues containing acid tar.

3. The process of obtaining hydrocarbon
50 oils having low boiling points from petroleum residues containing acid tar which comprises making a solution of a mixture of

the original residues containing acid tar with petroleum residues having higher cracking points, subjecting the mixture to a heat treatment of at least 600° F. to bring about the desired cracking of the original material, and subjecting the material so treated to a separating treatment to remove the low boiling material produced from the original material.

4. The process of obtaining hydrocarbon
60 oils having low boiling points from petroleum residues containing acid tar which comprises dissolving such petroleum residues in a solvent, treating a solution of such material with a temperature of at least 600°
65 F. but below the cracking point of the solvent to bring about the desired cracking of at least a portion of the residues containing acid tar, and separating the materials so treated.

5. The process of obtaining hydrocarbon
70 oils having low boiling points from petroleum residues containing acid tar which comprises dissolving such petroleum residues in a solvent having a higher cracking point than
75 that of the acid tar, heat treating a solution of such materials to a temperature below the cracking point of the solvent hydrocarbon to bring about the desired cracking of the original residue containing the acid tar,
80 and separating the materials so treated.

6. The process of obtaining hydrocarbon
85 oils having low boiling points from petroleum residues containing acid tar which comprises dissolving such petroleum residues in a solvent having a higher cracking point than that of the acid tar, heat treating a solution of such materials to a temperature of at least 600° F. below the cracking
90 point of the solvent hydrocarbon to bring about the desired cracking of the original residue containing the acid tar, separating the materials so treated to remove the low boiling point hydrocarbon so produced, and
95 using the residues as solvents for the additional fresh petroleum acid tar containing material.

In testimony whereof I have hereunto set my hand.

DAVID T. DAY.