APPARATUS FOR DISTILLING LIQUID HYDROCARBONS.
No. 546,697.
Patented Sept. 24, 1895.
UNITED STATES PATENT OFFICE.

PAUL DVORKOVITZ, OF LONDON, ENGLAND.

APPARATUS FOR DISTILLING LIQUID HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 546,697, dated September 24, 1895.
Application filed November 24, 1891. Serial No. 419,945. (No model.) Patented in England August 1, 1891, No. 13,089.

To all whom it may concern:

Be it known that I, PAUL DVORKOVITZ, a subject of the Queen of Great Britain, residing at London, in the county of Middlesex, England, have invented a new or Improved Apparatus for Distilling Liquid Hydrocarbons, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, and for which I have obtained Letters Patent in Great Britain, No. 13,089, dated August 1, 1891.

This invention relates to apparatus for distilling liquid hydrocarbons, the main point of novelty lying in the employment of a double set of oil-superheaters, a double set of retorts, and a double set of condensers, together with a steam-superheater and a device or devices for intimately mixing the steam and the oil and oil-vapors in the retorts, which latter are heated to aid in preventing condensation of the said vapors from taking place.

Having described this invention in general terms so as to define its scope, it will now be described in detail, and for that purpose reference will be made to the figures in the accompanying drawings, which illustrate one form of apparatus, the said form being one which has been found to give good results in practicing the new or improved method with oils of a specific gravity of, say, 900° to 960°, as compared with distilled water taken as 1000°.

In the said drawings, Figure 1 is a plan of the apparatus; Fig. 2, a side view of the oil-superheater and retort, and Fig. 3 a cross-section of the said retort.

A is the reservoir of material, say crude petroleum oil. In this reservoir is a coil of pipe X, through which passes the hot tar from the oil-retort, so that the contents of A are heated to a certain extent before leaving the reservoir, thus effecting a saving of energy.

\(a\) is a pipe for conducting the crude oil from A to the pump \(a'\), whence the oil passes by the pipe \(a''\) to the oil-superheater B. This superheater may be of any convenient known type, and it heats the oil to a high temperature, say about 600° or 700° Fahrenheit. From the oil-superheater B the oil passes by the pipe \(b\) to the perforated pipe \(b\) in the oil-retort C, (the temperature in which is, say, 700° Fahrenheit,) where, on issuing from the perforations, it meets the superheated steam, as herein described.

D is a boiler or steam-generator, serving to produce steam and supply the same through the pipe \(d\) to the steam-superheater E. From E the superheated steam issues by the pipe \(e\), bifurcating into the two pipes \(e\) and \(e\), of which \(e\) leads to the oil-retort C, in which it divides into three perforated pipes \(e\), \(e\), \(e\).

From the perforations in these pipes the steam

ized part of the oil (light tar) with it to a second condenser, as was the vaporized part in the oil-retort. The precipitated matter in the tar-retort is collected or removed in any convenient manner. The perforated oil and steam pipes referred to constitute a convenient device for intimately mixing the steam and the oil and oil-vapors in the retorts, which latter are heated to aid in preventing condensation of the said vapors from taking place.
issues to meet the oil or oil-vapors issuing from the perforations in the pipe b’, the steam being at a higher temperature than the oil or oil-vapor and splitting it into the two parts hereinbefore referred to. Of these two parts the precipitated matter, herein termed the “light tar,” passes to the bottom of the retort C, and the oil-vapors are carried by the steam quickly and without condensation to the first condenser F through conductors of large sectional area, in this case through the short domes c c’ and pipes d d’. In F the vapors are condensed and treated or collected in any of the usual known ways. The light tar which collects at the bottom of the oil-retort C is conducted by the pipe c’ through the coil X (where it is partially cooled by transference of a part of its heat to the crude oil in A) to the tar-reservoir G. From G the light tar is conducted through the pipe g and pump j to the tar-superheater I. From I the superheated tar, now raised to a temperature of, say, 700° or 800° Fahrenheit, passes by pipe h to a perforated pipe h’ in the tar-retort J, (the temperature in which is, say, 800° Fahrenheit,) the said pipe h’ corresponding with the pipe b’ in the oil-retort C. On issuing from the perforations of the said pipe it encounters steam passing from E by e e’ and perforated pipes e e’ e’ and corresponding with the perforated steam-pipes e e’ e’ in the oil-retort C. In the said tar-retort the steam acts upon the light tar in the same way as it did upon the oil in the oil-retort, splitting it into two parts. The oil-vapors are carried by the steam from the tar-retort through the short domes j and j’ and pipes j and j’ to the second condenser K, where they are condensed and collected and treated in any of the usual known ways. The precipitated matter, herein called the “heavy tar,” is run off from j to the heavy-tar receptacle L by the pipe j’. Cocks are inserted in the pipes c’ and j’ at or close to the points at which they issue from their respective retorts.

In the cases where oils of a lower specific gravity than those just mentioned are dealt with at a lower temperature is employed throughout, and generally it is necessary to employ temperatures of a higher or a lower degree, according as the oils are heavier or lighter. Thus if crude petroleum of, say, 800° to 900° specific gravity is dealt with in the oil in the oil-superheater is heated to, say, 400° Fahrenheit, the steam in the steam-superheater of, say, 500° Fahrenheit, and the light tar in the tar-superheater of, say, 450° Fahrenheit.

such a case a temperature of, say, 550° is maintained in the oil-retort and of, say, 550° in the tar-retort.

It will be noticed from Fig. 1 that the steam-superheater is placed between the oil and the light-tar superheaters. The object of this is, in heating the three superheaters by one furnace to obtain the steam of a higher temperature than the oil and light tar, the steam-superheater being over the hottest part of the furnace and the tar-superheater at a part hotter than the part at which the oil-superheater is.

When it is desired to obtain fractional distillations, so as to grade the products, any of the usual known devices for obtaining such grading are used in the place of the short domes, as shown in the figures.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is:

1. Apparatus for the double distillation of liquid hydrocarbon consisting of a furnace, three superheaters located side by side within said furnace, a steam generator connected with the intermediate superheater, a crude-hydrocarbon reservoir and a tar reservoir connected respectively with the other superheaters, two retorts, provided with means for heating them, a spray pipe leading from the intermediate superheater into both retorts, a spray pipe leading from each of the other superheaters to its corresponding retort, and a separate condenser for each retort; substantially as described.

2. Apparatus for the double distillation of liquid hydrocarbon consisting of a furnace, three superheaters located side by side within said furnace, a steam generator connected with the intermediate superheater, a crude-hydrocarbon reservoir and a tar reservoir connected respectively with the other superheaters, two retorts, a spray pipe leading from the intermediate superheater into both retorts, a spray pipe leading from each of the other superheaters to its corresponding retort, a separate condenser for each retort, a heating coil located within the crude-hydrocarbon reservoir, and a pipe connecting said heating coil with the residue-discharge opening of one of the retorts; substantially as described.

PAUL DWORKOVITZ.

Witnesses:

J. G. LORRAIN,
HENRY SHOCKLEY.