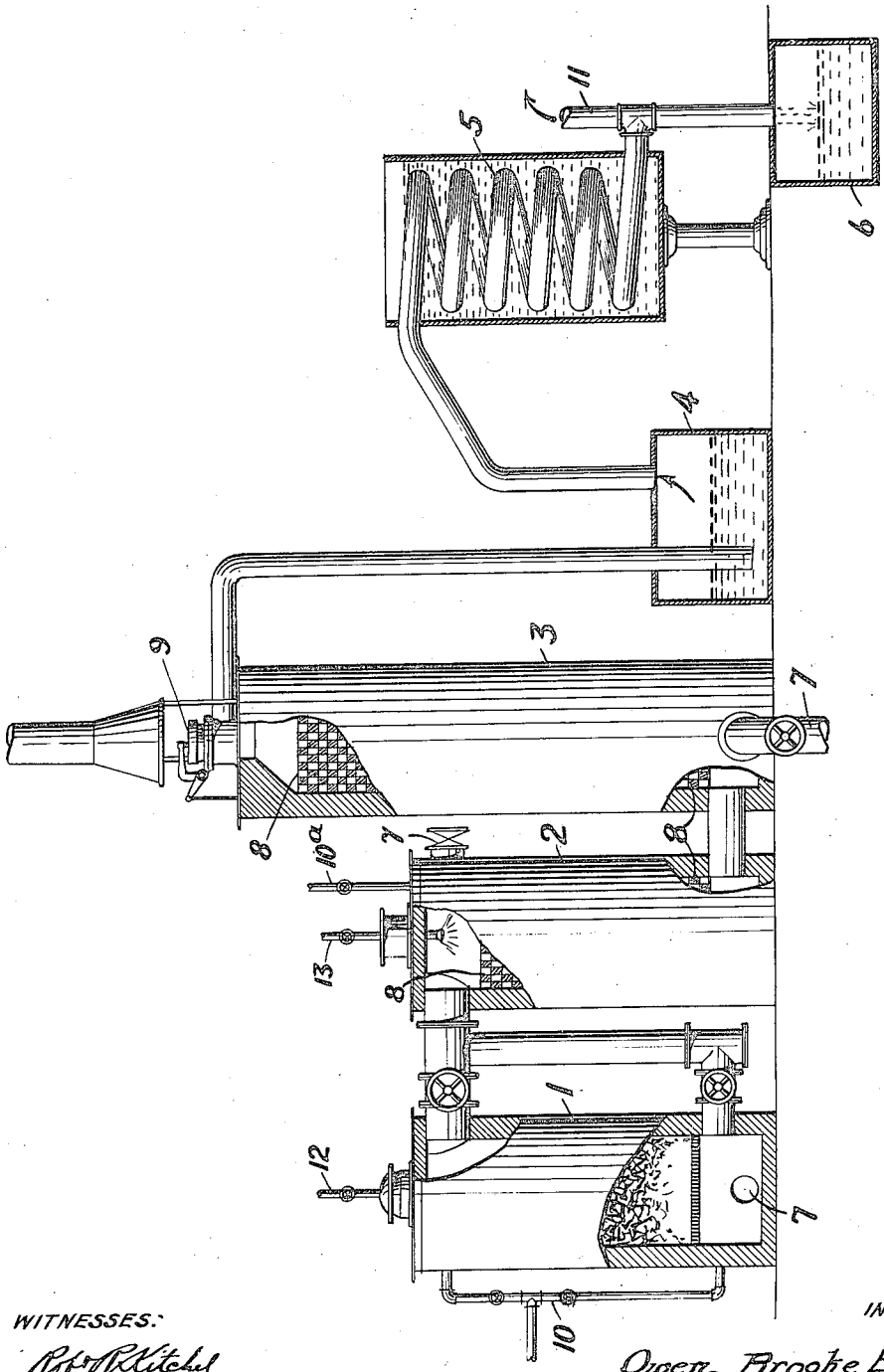
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MANUFACTURE OF TOLUOL.

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1,230,087. Patented June 12, 1917.




WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## MANUFACTURE OF TOLUOL.

1,230,087. Specification of Letters Patent. Patented June 12, 1917.

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*To all whom it may concern:*

Be it known that I, OWEN BROOKE EVANS, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Toluol, of which the following is a specification.

The principal object of the present invention is to provide a comparatively inexpensive and efficient method for manufacturing crude toluol from naphtha, so that more crude toluol can be recovered than is present in the naphtha prior to its treatment. Another object of the invention is to provide a process for obtaining toluol which can be practised by means of apparatus which exist in many gas works.

Solvent naphtha or crude naphtha or tar naphtha or heavy naphtha, as it is commercially called, is referred to herein as naphtha and it may be described as a complex mixture of compounds largely of the aromatic series, such for example as benzol, toluol and xylol and it is one of the fractions obtained by the ordinary distillation of so-called light oil which in its turn is one of the fractions of distillation of gas tar, gas drip and like hydro-carbons. Toluol as referred to herein is commercial or crude toluol which contains some benzol and the like. The toluol content of naphtha is about three per cent. and by my invention the toluol recovered is increased to about thirteen per cent., which indicates a chemical breaking down or molecular rearrangement in the process.

According to my invention, naphtha is subjected to a high temperature in the presence of steam or water gas, or a mixture of both, whereby it is converted into a hydrocarbon gas and into a vapor consisting of toluol and other members of the aromatic series. This vapor is later condensed out of the gas as a drip, from which the toluol can be recovered by distillation in any of the well known methods.

By way of illustration, it may be said that when fixed in the presence of water gas at a temperature of about 1500° F. there will be produced from the naphtha about 20 cubic feet of gas per gallon, having a candle power of, approximately 70. The drip recovered will amount to about seventy per cent. of the original naphtha used, and will contain about ten times the percentage of low boiling compounds such as benzol and toluol as that present in the untreated naphtha.

In some cases it may be found advisable to fix the naphtha at a high temperature without admixture with steam or blue gas, subsequently purging the apparatus of the contained hydrocarbon vapors by means of steam or water gas. In general, however, this method results in the production of more lamp-black than when the naphtha is fixed in the presence of water gas or steam, and, therefore, this method of procedure is but rarely applicable.

The accompanying drawing illustrates partly in side elevation and partly in section a form of apparatus useful for the practice of the invention.

In the drawing there is illustrated a water gas set or apparatus for making water gas. 1, is the generator, 2 the carbureter, 3 the fixing chamber or superheater, 4 a wash box, 5 a cooling coil and 6 a drip receptacle. 7 are air connections for blasting the generator to make producer gas and for burning the producer gas to preheat the checker-brick 8. This operation is called the blast and during it the products of combustion pass off at 9. 10 are steam connections for introducing steam through the fire so as to make water gas, which traverses the apparatus and can be led away mixed with fixed hydrocarbon gases at 11. This operation is called the run. $10^a$ is a connection for admitting steam to the carbureter. The described steps, that is the blow and the run, are repeated alternately. 12 and 13 are inlets to the interior of the apparatus.

In the practice of my invention in connection with the described apparatus the latter is operated in the usual way. However, during the runs naphtha is introduced as by the connection 12 or 13, or otherwise stated, the water gas is carbureted with naphtha. The associated naphtha and blue water gas traverse the checker-brick, the wash box 4 and the cooler 5, and the carbureted water gas is led off by way of the pipe 11 for such use as may be desired. The drip or condensed vapor collected, for example, in the wash box 4 and in the receptacle 6 contains a high percentage of crude toluol; that con-

densing in receptacle 6 having a higher percentage of toluol than that collected in wash box 4, and the condensate collected in wash box 4 and receptacle 6 may be later distilled or refined by any of the well known methods. During this process of carbureting and fixing, as it is called in water gas practice, some of the naphtha is chemically broken down or molecularly rearranged and converted into toluol, for the quantity of the latter recovered exceeds the quantity present in the naphtha. When the interior checker-brick 8 has been heated by the combustion of producer gas with air, as during the blow, naphtha may be introduced and subjected to its high temperature or fixed without the presence of steam or a mixture of steam and water gas, and in this case the apparatus is purged with steam or a mixture of steam and water gas. In general the operation and results in this case are as has been above described, except that more lampblack is produced.

What I claim is:

1. The process of manufacturing toluol which consists in preheating a checker-brick chamber by internal combustion to a temperature sufficiently high to materially increase the percentage of toluol, subjecting naphtha of gas drip origin substantially as herein described to the heat of said chamber thereby forming a gas carrying toluol vapor, leading the gas and toluol vapor from the chamber, and recovering the toluol, substantially as described.

2. The process of manufacturing toluol which consists in preheating a checker-brick chamber by internal combustion to a temperature sufficiently high to materially increase the percentage of toluol, and subjecting naphtha of gas drip origin substantially as herein described in the presence of water gas to the heat of said chamber thereby forming a hydrocarbon gas carrying toluol vapor, and leading the gas and toluol vapor from the chamber, and recovering the toluol, substantially as described.

3. The process of manufacturing toluol which consists in heating a chamber to a temperature sufficiently high to materially increase the percentage of toluol, subjecting naphtha of gas drip origin substantially as herein described to the heat of said chamber thereby forming a gas carrying toluol vapor, and recovering the toluol, substantially as described.

4. The process of manufacturing toluol which consists in heating a chamber to a temperature sufficiently high to materially increase the percentage of toluol, subjecting naphtha of gas drip origin substantially as herein described in the presence of water gas to the heat of said chamber thereby forming a hydro-carbon gas carrying toluol vapor, leading the gas and toluol vapor from the chamber, and recovering the toluol, substantially as described.

5. The process of manufacturing toluol which consists in heating naphtha of gas drip origin substantially as herein described to a temperature sufficiently high to materially increase the percentage of toluol therein, and recovering the toluol.

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Witnesses:
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