

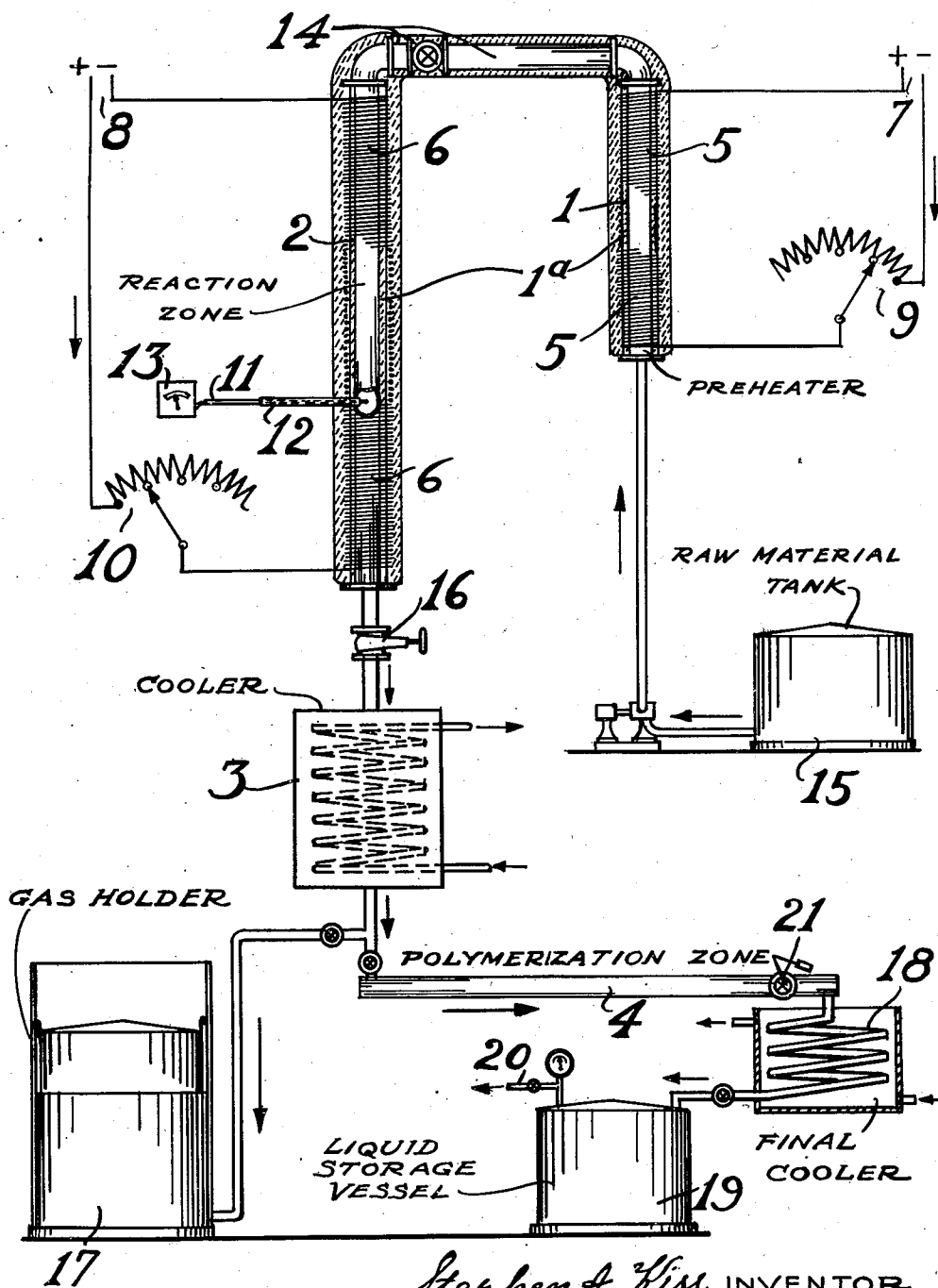
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PROCESS OF GASIFYING OILS AND COALS

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PROCESS OF GASIFYING OILS AND COALS

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10 Claims. (Cl. 196—10)

This invention relates to a process of completely gasifying oils or coals, or a mixture of oils and coals, and will be understood from the following description when read in conjunction with the drawing, the sole figure of which is a diagrammatic representation partly in section of an apparatus appropriate for carrying out the invention.

The raw materials used in the present invention are oils, especially mineral oils consisting of a mixture of various hydrocarbons such as petroleum oil, shale oil, products of liquefaction or extraction of coal, low temperature carbonization tars, coal tars obtained by high temperature carbonization, lignites, coals and also products such as heavy cracking coil tars, pitches, asphalts, paraffin wax, petrolatum, etc., which have a consistency intermediate between a liquid oil and a highly polymerized hard solid product, such as coal. I have discovered that such liquid or solid products, consisting to a large extent of a mixture of hydrocarbons or a highly polymerized texture of cyclic hydrocarbons, such as those present in coals, are substantially completely transformed into gaseous products when treated under conditions to be specified further below. It is, of course, understood that although hydrocarbons form the major constituents of the raw materials used in my process, nitrogen, sulfur and oxygen derivatives may also be present in the oils and are always present in the complex structure which constitutes coals.

In order to substantially completely transform such products into gases, I submit them to the action of high temperature ranging from about 800° to 900° C., preferably under a pressure higher than atmospheric. Oils have been previously submitted to cracking under a great variety of conditions and also coals have been carbonized at various temperatures. Such prior processes, however, always led to either a large proportion of oil such as in the cracking of oils, or to a very large percentage of coke such as, for example, in the carbonization of coal. I have discovered that such products are transformed substantially into gases by quickly heating them to a gasifying temperature which ranges from about 800° to about 900° C., and maintaining them at this temperature for a short period of time until they are completely broken up into gases due to the action of heat. One method of carrying out my process consists in discharging the raw material into a reaction zone and continuously withdrawing the gasified products from said zone. Both the best gasifying temperature and the pres-

sure depend on the raw material to be gasified and are determined experimentally. As examples of pressures to be used, I may mention 12 and 18 atmospheres, but it will be understood that the optimum pressure may vary within much broader limits and is to be determined experimentally for each stock. Temperatures in the neighborhood of 850° C. may be mentioned as examples of reaction temperature. The raw material is preferably pre-heated before it is discharged into the reaction zone to a temperature which may vary according to the conditions of the operation which, however, should not be high enough to cause an appreciable decomposition of the product in the preheater. We may cite 430° C. as an example of final preheating temperature.

When gasifying coals according to the present invention, it is preferable to thoroughly admix them with an oil such as coal tar or petroleum oil or a mixture of these two oils and preheat the mixture of coal and oil before discharging the same into the reaction zone.

The gaseous reaction product will be highly unsaturated and when derived from coal or from products of predominantly aromatic or cyclic nature will contain a large percentage of acetylene.

Referring now to the figure, the numerals 1, 2, 3 and 4 designate a preheater, a reaction zone, a cooler and a polymerization zone respectively. The wiring 5 and 6 which is connected to the sources of electricity 7 and 8 serves for heating tubes 1 and 2 to the desired temperatures. The resistances 9 and 10 are provided for regulating the amount of heat applied. An insulation of asbestos is placed between the metal tubes 1, 2 and the resistance wires 5 and 6. A pyrometer 11 is inserted through tube 12 into the reaction tube 2 and serves to measure the temperature in the reaction zone by means of the potentiometer. The tubes 1 and 2 are heavily insulated and so is the connecting tube 14. The raw material is pumped from container 15 through tubes 1, 14, and 2, then passed through release valve 16 into the cooler 3. The gases are then collected in the gas holder 17 or, after partial cooling in 3 are passed through polymerization zone 4 and final cooler 18 into the container for liquids 19, which is provided with a gas vent line 20. A pressure release valve 21 may be provided between the polymerization zone 4 and the final cooler 18.

The raw material is completely gasified under the conditions maintained in the reaction zone 55

and is then cooled, preferably after release of the pressure, either to approximately atmospheric temperature in order to obtain a gaseous product, or is partially cooled and submitted to polymerization to obtain liquid products. The nitrogen of the coal or oil appears in the form of ammonia in the gases which also contain CO, CO₂, and H₂O, due to the oxygen content of the raw material, together with CS₂ and H₂S proceeding from the sulfur originally contained in the raw material. The great bulk of the gas obtained consists, however, of highly unsaturated hydrocarbon gases.

The cooled gaseous reaction product may be either used as manufactured gas after the necessary purification from the sulfur compounds and from the ammonia, or may form the raw material for the preparation of various products such as ethyl alcohol, aldehyde, acetic acid, acetone, etc.

In many cases it is advantageous to polymerize the gasified product, after partial cooling, into liquid products since the polymerization gives better yields when high temperature gases are cooled down to the polymerization temperature than in the case in which cold gases are heated up to the polymerization temperature. Such heating up usually results in a partial decomposition of the gases to be polymerized. The polymerization of hydrocarbon gases may be carried out either in the presence or in the absence of catalysts as well known in the art. The polymerization product is rich in aromatic hydrocarbons.

The following example will illustrate my invention: 50% by weight of a de-ashed bituminous coal containing 30% volatile matter, 30% by weight of reduced Mid-Continent crude and 20% by weight of coal tar obtained in high temperature carbonization are mixed and homogenized in a colloidal mill. The homogenized raw material is passed through the apparatus. The temperature on leaving the preheater is 430° C. while the temperature as measured by the pyrometer 11 is 830° C. A pressure of 20 atmospheres is maintained in the reaction zone at the end of which the pressure is released to substantially atmospheric and the gases collected in gas holder 17, after their passage through cooler 3. The reaction zone consists of a 2" nickel-chromium-steel alloy tube one yard long. Maintaining a feed rate of one gallon per hour, the homogenized raw material is completely gasified with only traces of coke deposition in the reaction zone 2.

In the following claims the expression "oil, tar or coal" is meant to include, besides oils which contain a mixture of various hydrocarbons and coals, products intermediate in consistency be-

tween the liquid oil and the solid coal such as, for example, pitch, asphalt, paraffin wax, petrolatum, heavy tar, etc.

Various modifications of my process will be apparent to those skilled in the art. The present invention is not to be limited by the example given for illustration, but only by the following claims in which it is my intention to claim all novelty inherent in the invention.

What I claim is:

1. The process of obtaining valuable products from a raw material of oil, tar or coal, said raw material containing cyclic hydrocarbons, which comprises quickly heating the raw material to a temperature above about 800° C. under a pressure of several atmospheres, maintaining said raw material at said temperature and pressure until it is substantially completely transformed into products which are gaseous at normal temperature and pressure, and cooling the gaseous products.

2. The process according to claim 1 in which the raw material contains aromatic products.

3. The process according to claim 1 in which the raw material is a mixture of oil and coal.

4. The process according to claim 1 in which the gaseous reaction products are cooled to a polymerization temperature higher than atmospheric and then passed through a polymerization zone in order to obtain liquid products.

5. The process of obtaining valuable products from a raw material of oil, tar or coal, said raw material containing cyclic hydrocarbons which comprises continuously passing the raw material into a reaction zone, maintaining a temperature above about 800° C. and a pressure of several atmospheres in the reaction zone, continuously removing the reaction products as soon as substantially complete gasification is obtained in the reaction zone and rapidly cooling said removed reaction products.

6. The process according to claim 5 in which the raw material contains aromatic products.

7. The process according to claim 5 in which the pressure in the reaction zone is of the order of magnitude from about 12 to 18 atmospheres.

8. The process according to claim 5 in which the reaction products are cooled to a polymerization temperature higher than atmospheric and then passed through a polymerization zone in order to obtain liquid products.

9. The process according to claim 1 in which the raw material is heated to a temperature between about 800° C. and 900° C.

10. The process according to claim 5 in which the raw material is heated to a final reaction temperature of between 800° C. and 900° C. in the reaction zone.

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