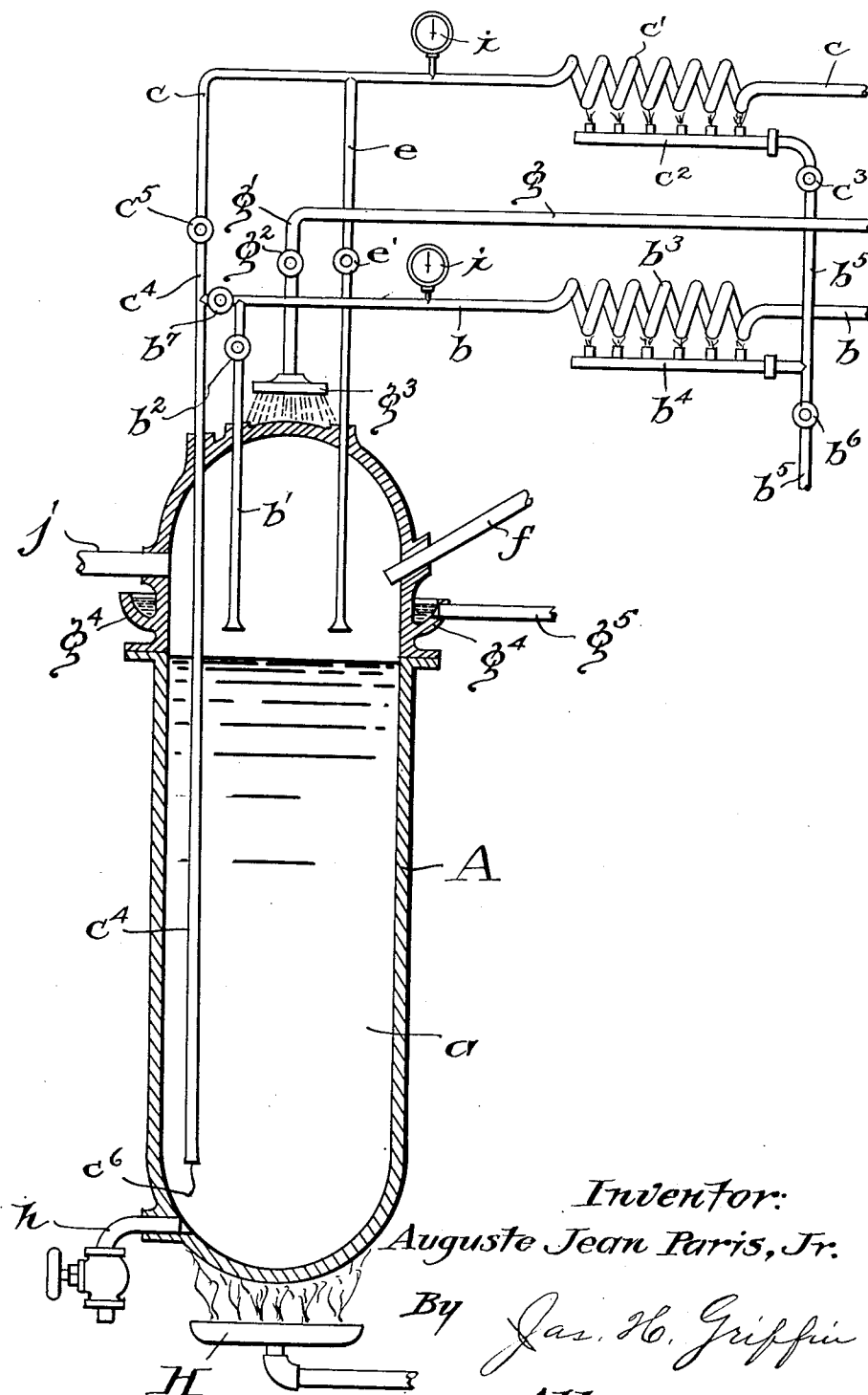


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 PROCESS OF DISTILLING AND CRACKING PETROLEUM AND ANALOGOUS OILS.
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1,367,828.

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UNITED STATES PATENT OFFICE.

AUGUSTE JEAN PARIS, JR., OF BRADFORD, PENNSYLVANIA.

PROCESS OF DISTILLING AND CRACKING PETROLEUM AND ANALOGOUS OILS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, AUGUSTE JEAN PARIS, Jr., a citizen of the United States, residing in Bradford, county of McKean, and State of Pennsylvania, have invented a certain new and useful Process of Distilling and Cracking Petroleum and Analogous Oils, of which the following is a specification.

This invention is a process of distilling and cracking petroleum, or any of its distillates, and the process is applicable also, in some of its phases, to the treatment of oils obtained in the distillation of coal shale and other mineral products. The process is an improvement, in certain particulars, on the process disclosed by me in a prior application, Serial No. 25,403, filed May 3, 1915.

In the process disclosed in the said application, the material under treatment, *e. g.*, petroleum or natural gas, or both in conjunction, are introduced separately into a chamber or still containing molten lead, said molten lead furnishing the heat by which the oil and gas are decomposed as desired.

The salient feature of the present invention, over the process of said prior application, consists in commingling or mixing the oil and gas prior to their introduction into the molten lead contained in the chamber or still. Either the oil or gas may be heated, if desired, and then commingled, or both the oil and gas may be heated, or they may be first mixed or commingled, and the mixture preheated prior to its introduction into the still.

By introducing the mixture of oil and gas into the still, and particularly for the purposes of cracking or polymerizing the oil or the constituents of the gas, I find that the operations are more complete and can be carried out more expeditiously, and that the process, in general, gives much better results, than the process of my prior application referred to.

Features and advantages of the invention, other than those adverted to, will be apparent from the hereinafter detailed description, as well as obvious to those skilled in the art.

In the accompanying drawing I have illustrated one form of apparatus which I have found practical and satisfactory in practicing the method forming the subject matter of the present invention, but I desire to have it understood, however, that the apparatus is merely typical or illustrative of one type of

apparatus which may be used, and that the method may be practised in various other types of apparatus without materially changing the spirit or substance of the invention, the salient features of which are not dependent on any particular form of apparatus.

The drawing shows in elevation, more or less diagrammatically, the form of apparatus to which reference has been made.

Referring to the drawing, A is a retort or still, adapted to contain molten metal, *a*, preferably lead, and it is manifest that the column of molten lead may be of any desired height, thereby providing means for controlling the pressure within the still, particularly at the bottom thereof.

A main *b* is provided for introducing oil or other liquid into the still through a branch pipe *b'*, controlled by a valve *b²*. The main *b* may be provided with a preheater *b³*, which, as shown, is in the form of a coil which may be heated by a gas burner *b⁴*, which receives its supply of gas from a gas pipe *b⁵* provided with a valve *b⁶*.

Another main *c* is provided for introducing gas into the still or retort, beneath the surface of the molten metal, said pipe being provided with a preheater *c'*, heated by a burner *c²* which receives its supply of gas through valve *c³* positioned at the upper part of gas pipe *b⁵*. A downtake *c⁴* from pipe *c* is provided with a valve *c⁵*, said downtake pipe having its outlet *c⁶* located below the surface of the molten metal.

Oil supply pipe *b* has a valve extension *b⁷*, connecting with the gas downtake pipe *c⁴* whereby oil may be commingled with the gas in said pipe, and the mixture introduced below the surface of the metal in said still, and, usually, near the bottom thereof.

Still or retort A may be heated in any desired manner, for the purpose of keeping the lead in a molten condition and at a desired temperature, but I have shown a gas heater H, for supplying the required heat. It will be understood that the temperature of the still may, if desired, be controlled thermostatically as described in my prior application.

Main *c* is provided with a downtake *e* having a valve *e'*, the outlet of said pipe being located above the molten metal *a*, whereby, if desired, gas may be introduced near the top of the still and above the molten metal. Entering near the top of the still and above

the molten metal is a pipe f , whereby air or oxygen may be introduced near the top of the still for the purpose of either burning, or blowing out, any free carbon which accumulates on the surface of the lead as a result of the cracking operation. Gas entering through pipe e may also be used, if desired, for blowing out lamp black from the still.

The temperature at the top of the still may be controlled by water or other refrigerating liquid entering through a main g having a branch g' provided with a valve g^2 , the end of said branch having a nozzle g^3 , by which water is sprayed on the top of the still, and flows into a trough g^4 , whence it is drawn off through overflow pipe g^5 .

Still A is provided, near its bottom, with a valved draw-off pipe h , whereby the molten metal may, if desired, be removed from the still, and it will be understood that the system is provided with such customary expedients as pressure gages i , thermometers, etc.

The various distillates, or products of decomposition, formed in the still A, and particularly the oil vapors resulting from the cracking operation, escape through exit pipe j positioned near the top of the still, and may be trapped out or separated in any manner well understood in the art, such, for example, as that disclosed in my prior application referred to above, Serial No. 25,403.

Having fully described the apparatus, and its general mode of operation, brief reference will be made to the specific method followed in the treatment of petroleum, either crude, refined or any of the distillates thereof, for cracking the same. The gas employed, preferably natural gas, flows through pipe c , and may be heated or not, as desired, in a preheater c' , thence through downtake pipe c^4 and outlet c^6 into the molten metal, and preferably near the bottom of the still. Oil enters through pipe b , and may be preheated or not, as desired, in heater b^2 , whence it passes, through valve branch b^1 , into the downtake gas pipe c^4 , wherein it is commingled with the gas, the resulting mixture entering the still through outlet c^6 . The mixture of oil and gas is cracked in its passage through the molten metal, with incidental separation of carbon. The resulting vapors flow off through pipe j , and the separated carbon may either be burned at the top of the still by introducing air or oxygen through pipe f , or this carbon or lamp black may be blown off from the still, through exit pipe j by means of gas introduced at the top of the still through branch pipe e . If the carbon is blown off, it may be recovered and utilized as lamp black.

It will be understood that the temperatures and pressures may be controlled to a nicety in the apparatus described, and by

employing a suction or vacuum on exit pipe j , a vacuum may be obtained at the top of the still, whereas there is a pressure at the bottom of the still, depending on the height of the column of molten metal. Moreover, by cooling the top of the still the temperature thereof may be kept very much lower than that at the bottom of the still.

It is not deemed necessary to specify the specific pressures or temperatures required to effect the results desired, since these vary with the particular oil or other material treated and are well known to those skilled in the art. However, as a specific illustration, I may mention the following: Assuming I am operating on the fuel oil distillates of Pennsylvania fuel oil, say of 38 degrees Baumé, and natural gas, either oil or gas or both, may or may not be preliminarily heated as described. Operating in retort A at a temperature of from 900 to 1200 degrees F., the mixture will be satisfactorily cracked at pressures varying from two atmospheres and upward, the higher the pressure employed, the lower the temperature required to effect the cracking.

Features of the invention, other than those described, will be apparent to those skilled in the art, and it will be obvious that the process is not restricted to all the details of operation described. I may, for example, in lieu of using natural gas, employ any of the constituents of natural gas in practicing the process, such as methane, ethane, butane, propane, or petane, or a mixture of any two or more of such constituents.

Having thus fully described the invention, what I claim as new, and desire to secure by Letters Patent, is:

1. The herein described method of treatment of hydrocarbon gas and petroleum oil which comprises forming a mixture of such gas and oil, introducing said mixture directly into a body of molten metal and effecting cracking of the constituents of the mixture by the heat and pressure of the molten metal.

2. The herein described method of treatment of hydrocarbon gas and petroleum oil which comprises forming a mixture of such gas and oil, introducing such mixture, in preheated condition, directly into a body of molten metal at a sufficient depth beneath the surface of the metal that the latter will exert a substantial pressure thereon, and effecting cracking of the constituents of the mixture by the heat and pressure of the molten metal.

3. The herein described method of treatment of natural gas and petroleum oil which comprises forming a mixture of such gas and oil, introducing said mixture directly into a body of molten metal and effecting cracking of the constituents of the mixture by the heat and pressure of the molten metal.

4. The herein described method of treatment of natural gas and petroleum oil which comprises forming a mixture of such gas and oil, introducing such mixture, in preheated condition, directly into a body of molten metal at a sufficient depth beneath the surface of the metal that the latter will exert a substantial pressure thereon, and effecting cracking of the constituents of the mixture by the heat and pressure of the molten metal.

5. The herein described method of treatment of hydrocarbon gas and hydrocarbon oil which comprises forming a mixture of such gas and oil, introducing said mixture directly into a body of molten metal and effecting cracking of certain of the constituents of the mixture by the heat and pressure of the molten metal.

6. The herein described method of treatment of hydrocarbon gas and hydrocarbon oil which comprises forming a mixture of such gas and oil, introducing such mixture, in preheated condition, directly into a body of molten metal at a sufficient depth beneath the surface of the metal that the latter will

exert a substantial pressure thereon, and effecting cracking of certain of the constituents of the mixture by the heat and pressure of the molten metal.

7. The herein described method of treatment of natural gas and petroleum oil which comprises forming a mixture of such gas and oil, introducing said mixture directly into a body of molten metal and effecting cracking of certain of the constituents of the mixture by the heat and pressure of the molten metal.

8. The herein described method of treatment of natural gas and petroleum oil which comprises forming a mixture of such gas and oil, introducing such mixture, in preheated condition, directly into a body of molten metal at a sufficient depth beneath the surface of the metal that the latter will exert a substantial pressure thereon, and effecting cracking of certain of the constituents of the mixture by the heat and pressure of the molten metal.

In testimony whereof I have signed my name to this specification.

AUGUSTE JEAN PARIS, JR.