

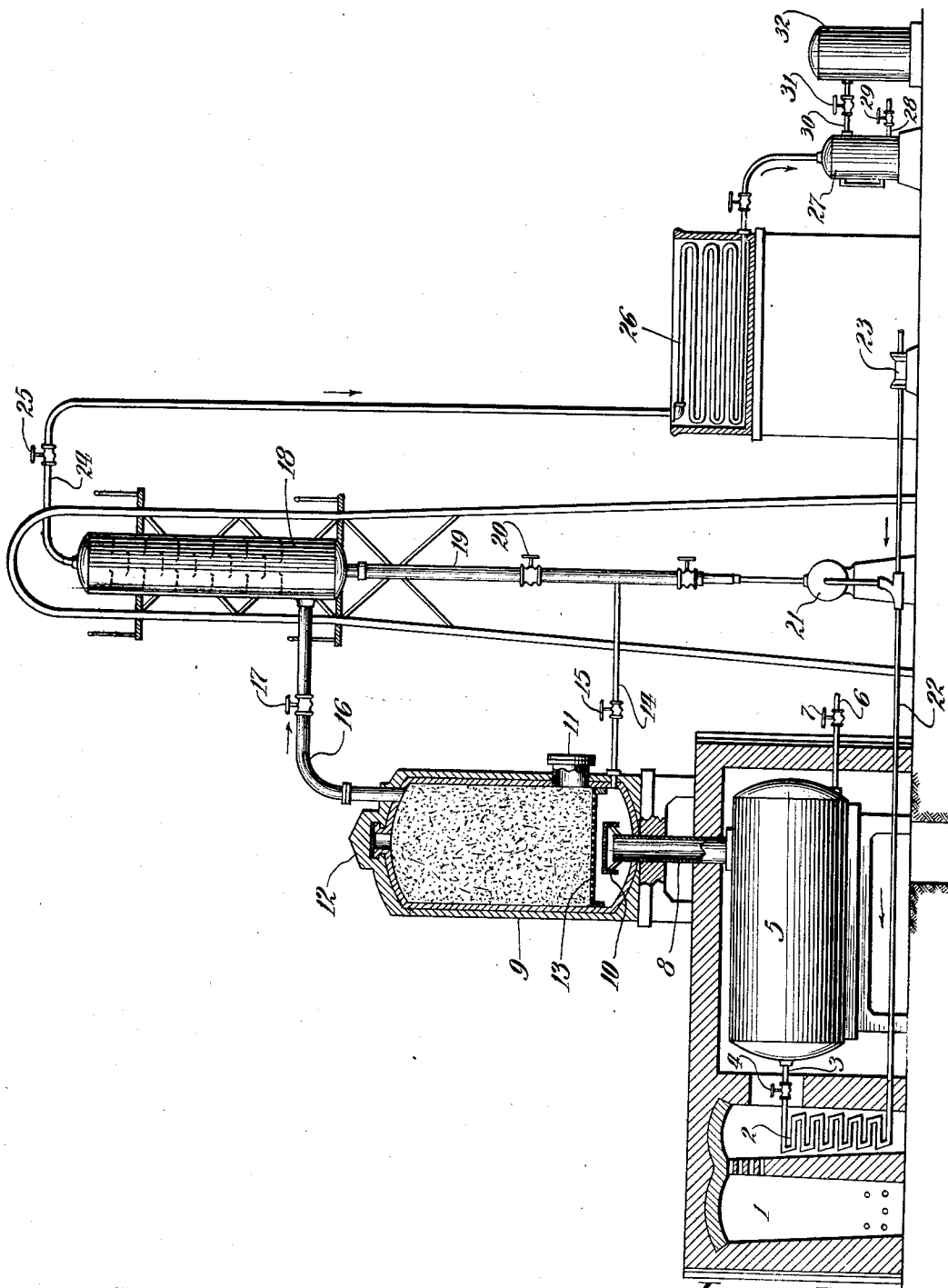
Nov. 14, 1933.

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1,934,847

CRACKING PROCESS

Original Filed Dec. 18, 1925



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UNITED STATES PATENT OFFICE

1,934,847

CRACKING PROCESS

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Application December 18, 1925, Serial No. 76,173
Renewed July 31, 1930

2 Claims. (Cl. 196—56)

This invention relates to improvements in cracking processes and refers more particularly in its novel features to the step of dephlegmation.

5 According to the present invention I cause the cracked vapors to pass through a dephlegmator containing a body of more or less comminuted bitumen, as, for example, broken coal, broken shale, or the like. Other bitumens may perhaps be used, as, for example, natural or 10 artificial asphalts of high melting point; i. e., preferably higher than the temperature of the vapors entering the dephlegmator.

In order to more clearly understand the invention I have shown the accompanying drawing, in which the single figure represents a somewhat diagrammatic view partly in side elevation and partly in vertical section of an apparatus adapted for carrying out my invention.

20 Referring to the drawing, 1 designates a furnace in which is mounted a heating coil 2, provided with transfer line 3, having throttle valve 4, and leading to an enlarged expansion chamber 5. This chamber 5 may either be more or 25 less heated by the stack gases or otherwise externally heated or may be merely insulated. The chamber 5 is provided with liquid draw-off 6, controlled by throttle valve 7 and with vapor outlet pipe 8 extending into the lower end of a 30 dephlegmator 9. The pipe 8 is provided with a spaced cap 10, so arranged as to permit the vapors to pass freely to the dephlegmator, but preventing any condensed material from falling back into the chamber 5.

35 The dephlegmator 9 is provided at one end with a relatively large manhole 11, and at its top with another manhole 12. Just above the cap 10 is a foraminous plate 13, adapted to support the coal or other bitumen, as clearly shown in the 40 drawing.

The reflux condensate from the oil vapors as well as any dissolved hydrocarbonaceous material from the coal are drawn out through the line 14 having throttle valve 15. The material 45 which still remains in vapor form in dephlegmator 9 passes out through pipe 16 controlled by throttle valve 17 to the lower portion of a second dephlegmator 18. The material which is condensed in the dephlegmator 18 is drawn off 50 through line 19 having throttle valve 20, to where it meets the pipe 14, and the two streams are then delivered by pump 21 to the raw oil feed line 22, which feed line is connected at one end to the pump 23 and at its other end to the inlet 55 side of the heating coil 2.

The vapors not condensed in the reflux condenser 18 pass out through vapor line 24, having throttle valve 25, to water condenser 26, and thence to receiver 27. This receiver 27 is provided with a liquid draw-off pipe 28 controlled 60 by throttle valve 29, and with a gas outlet pipe 30 controlled by valve 31, the pipe 30 in turn being connected, if desired to a gas holder 32.

The process may be carried out as follows: Petroleum oil, as, for example, gas oil or fuel oil, 65 is pumped from any suitable source of supply into the heating coil 2, where it may be heated at a transfer temperature of, say, 950 degrees F. The heated oil passes into the chamber 5, which, as heretofore stated, is either insulated or more 70 or less externally heated, (there may be a plurality of these chambers 5, if desired, which chambers may be operated alternately or together, but it is not thought necessary to encumber the drawing with a showing of a plu- 75 rality of chambers,) and the vapors pass out through the pipe 8 into the dephlegmator 9. The temperature of this dephlegmator may be controlled in any one of a number of ways well known in the art, which it is not necessary here 80 to describe. As the vapors pass up through the bed of coal or other bituminous material, the heavier ends are condensed, the amount of such condensation depending upon the temperature at which the dephlegmator is maintained rela- 85 tive to the boiling point of the vapors themselves. The coal acts in effect to produce a scrubbing action and cleans those vapors which are not condensed and which pass out into the second reflux condenser. (If desired, this second re- 90 flux condenser can be by-passed in an obvious manner.) The coal serves, as stated, to scrub the vapors, and also to act to baffle them to facilitate reflux condensation. On the other hand the action of the hot vapors which may enter 95 the dephlegmator at a temperature of 850 degrees F. is such as to both dissolve out and distil certain of the hydrocarbonaceous constituents of the coal or other bitumen. Those that remain in liquid form are drawn out with the 100 petroleum reflux condensate, while those that vaporize at the temperature and pressure used will pass out with the gasoline vapors into the second reflux condenser where more reflux condensation may take place, and more or less of 105 them finally reach the water condenser and thence the receiver together with the incondensable gases produced. The reflux condensate and the liquid dissolved or distilled out of the coal may be re-run through the system by means of 110

the reflux pump and lines heretofore described. As heretofore stated, however, the lightest portions of the distillates obtained from the coal will pass into the receiver.

5 As the process proceeds, the chamber or chambers 5 will, of course, accumulate coke and in time have to be cleaned out. By this time the coal in the dephlegmator will have been freed of a large part, if not the greater part, of its
10 evaporable constituents, and is in prime condition for fuel.

The system may be operated under a uniform pressure from the heating coils to the receiver of, say, 500 pounds more or less. Or the system
15 may be so operated as to have differentials; i. e., lower pressures, for example, on the dephlegmator than on the coil 2 or chamber 5. It is understood that the pressure may be widely varied, and with varying pressures you will use
20 different oil temperatures. The apparatus would be so run as to avoid as far as possible coking up the heating coil 2.

I claim as my invention:

1. A process for treating hydrocarbon liquids
25 and solids to produce low boiling point liquid products, which comprises maintaining a mass of hydrocarbon solids in an enlarged zone, maintaining a body of the hydrocarbon liquids under cracking conditions of temperature and pressure
30 in an independent enlarged zone, passing vapors evolved from the liquid hydrocarbons in said independent enlarged zone through said mass of hydrocarbon solids, to distill portions thereof and to dissolve other portions, subjecting the vapors
35 resulting from such distillation of the hydrocarbon solids, while commingled with vapors evolved

from the hydrocarbon liquids, which vapors have passed through said mass of hydrocarbon solids, to reflux condensation, to separate the heavier fractions therefrom, withdrawing the dissolved portions of the solid hydrocarbons and
80 uniting them with said heavier fraction, again subjecting such heavier fractions prior to any substantial cooling to a cracking temperature, and uniting such heavier fractions while at a
85 cracking temperature with the hydrocarbon liquids maintained in said independent enlarged zone.

2. A process for producing low boiling point oil from hydrocarbon liquid and hydrocarbon solids which comprises continuously supplying the
90 liquid to a heating zone and passing the same therethrough in a restricted stream while heating the stream to cracking temperature under pressure, discharging the heated stream into a vapor separating zone and separating the same
95 therein into vapors and residuum, removing the vapors and introducing the same while at a temperature of at least 850° F. into a mass of the hydrocarbon solids, condensing a portion of the vapors in said mass while distilling the mass by
100 the heat of the vapors, subjecting the remaining uncondensed vapors commingled with the vapors evolved from the solids to dephlegmation thereby forming reflux condensate, combining such reflux condensate and the condensate formed in
105 said mass with the hydrocarbon liquid being supplied to the heating zone for subjection to cracking temperature therein, and finally condensing the dephlegmated vapors as a product of the
110 process.

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