Aug. 29, 1933. G. EGLOFF 1,924,848

PROCESS AND APPARATUS FOR CRACKING OIL

Original Filed Dec. 15, 1920 2 Sheets-Sheet 1

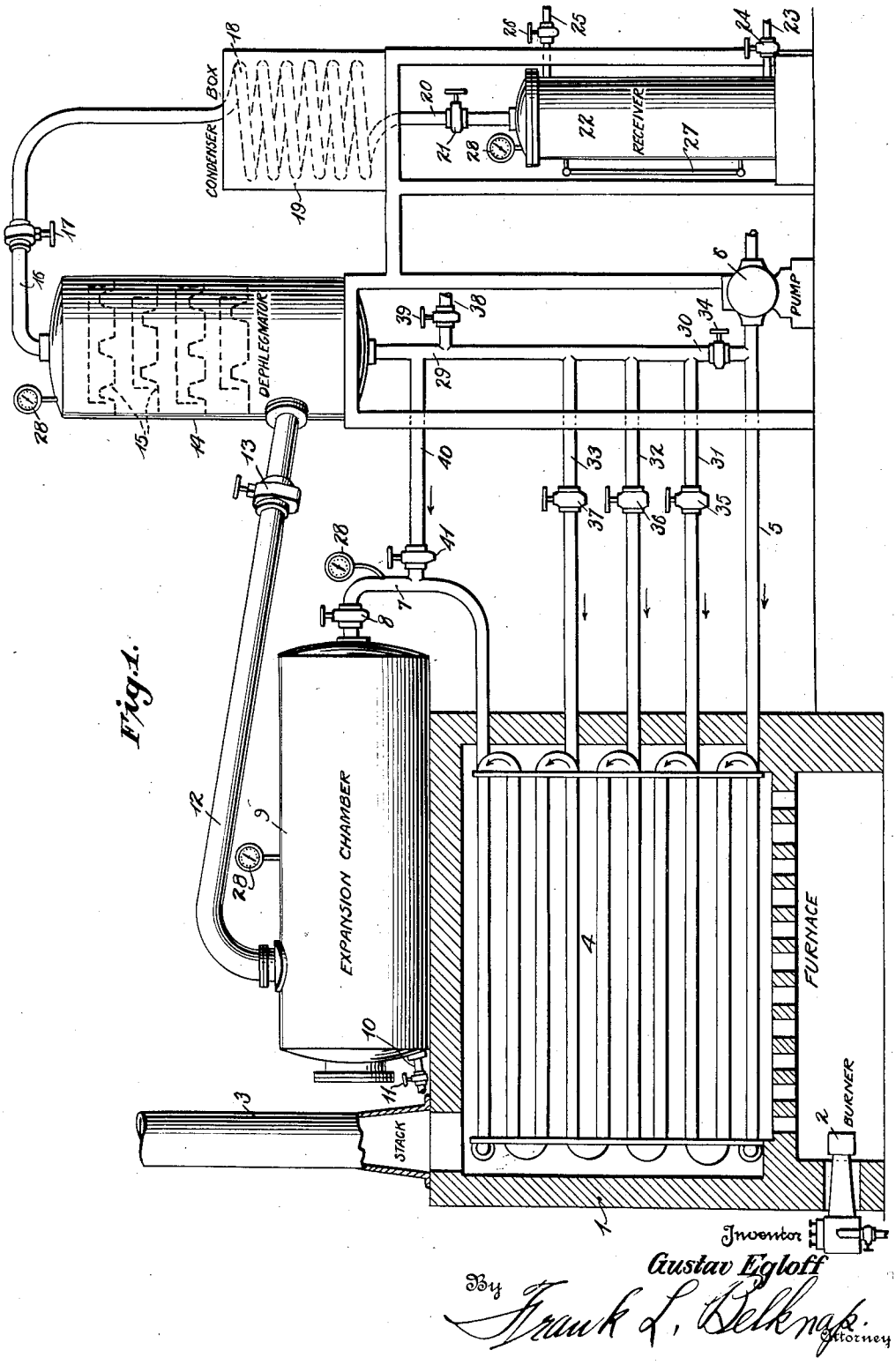


Fig. 1.

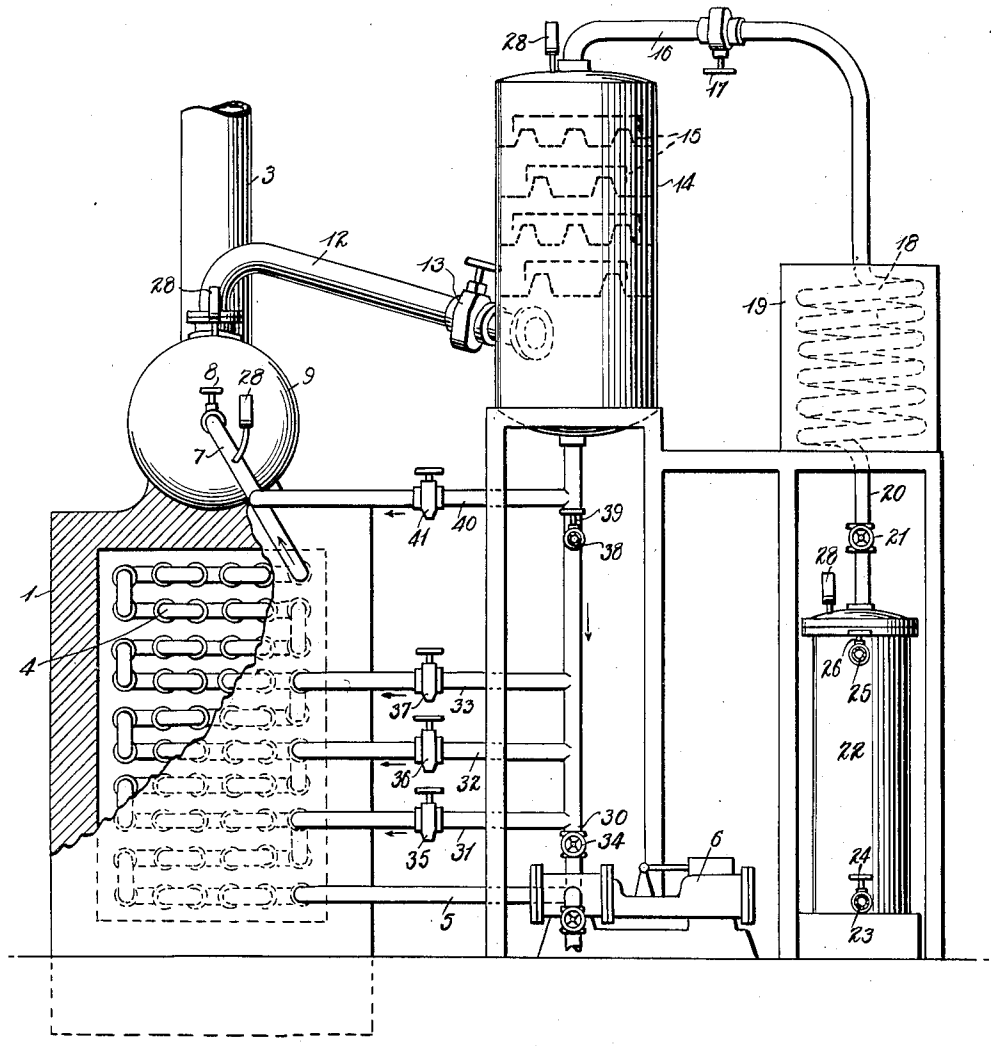
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Fig. 2.



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PROCESS AND APPARATUS FOR CRACKING OIL

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Continuation of application Serial No. 430,869, December 15, 1920. This application July 10, 1926, Serial No. 121,715. Renewed October 2, 1930

4 Claims. (Cl. 196—48)

This invention relates to improvements in process and apparatus for cracking oil, and refers more particularly to the manner of treating reflux condensate.

This application constitutes a continuation of an application filed by me December 15, 1920, Serial No. 430,869.

The process is generally carried out as follows:

The raw oil to be treated is fed through a relatively long heating coil, as for example a pipe coil four inches in diameter composed of 66 twenty-foot lengths of pipe, or 1320 linear feet in all. The pipes may be so nested in the furnace as to consist of eleven rows of six lengths of pipe 20 feet each, or 120 feet to each row. The reflux condensate may be returned either to the charging line and compelled to travel the whole 1320 feet, or may be introduced at say 960 feet from the inlet side of the heating coil, or 720 feet or 480 feet from the inlet side of said heating coil. However, as the process proceeds, it may be desirable to vary the length of travel in which the reflux condensate is subjected in the heating coil, or as part of the same process it may be necessary and desirable to treat different kinds of oils, the pressure distillates of which are all to be mixed in the same receivers, or it may be desirable to make a blend by first cracking fuel oil, then gas oil and then kerosene separately in the same apparatus and delivering the products of cracking to the common receiver. In such case, it may be desirable or necessary to vary the length of travel of the reflux condensate produced from the cracking of kerosene relative to the length of travel of the reflux condensate produced from the gas oil or fuel oil.

In the drawings, Fig. 1 is a view partly in side elevation and partly in vertical section of my improved apparatus. Fig. 2 is a view partly in end elevation and partly in vertical section thereof.

Referring to the drawings, 1 designates the furnace, provided with burner 2 and stack 3. In the combustion space of this furnace is mounted the heating coil 4, as for example of the diameter and construction heretofore described. The inlet side of this coil is connected by feed line 5 to the charging pump 6 connected to source or sources of raw oil supply. The discharge side of the coil is connected by transfer line 7, having throttle valve 8, to a relatively large, elongated shell-like horizontally disposed expansion chamber 9. This expansion chamber 9 is provided with residue drawoff pipe 10, having throttle valve 11, and with vapor outlet pipe 12, having throttle valve 13, and leading to side of dephlegmator 14. This dephlegmator is provided with baffles 15 as shown, and at its upper end it has vapor outlet pipe 16, having throttle valve 17, which pipe 16 leads to condenser coil 18, seated in condenser box 19. The lower end of the coil is connected by pipe 20, having throttle valve 21, to the upper end of receiver 22. This receiver 22 is provided with liquid drawoff pipe 23, controlled by throttle valve 24, gas outlet pipe 25, controlled by throttle valve 26 and liquid level gauge 27. Suitable pressure gauges 28 are provided in various parts of the system as shown.

Describing now the manner of handling the reflux condensate, it is drawn off from the bottom of the dephlegmator by pipe 29. This pipe 29 is provided with a plurality of branches 30, 31, 32 and 33, having corresponding throttle valves 34, 35 and 36 and 37 respectively. These branches connect respectively to the feed line 5 and to various parts of the coil as for example at the points distant from the charging line heretofore referred to. The line 29 is also provided with a branch 38 having throttle valve 39, whereby the reflux condensate may be diverted elsewhere. It is also provided with still another branch 40, having throttle valve 41, which pipe 40 leads to the transfer line 7. It will be seen that the arrangement is such as to permit of controlling at will the length of travel of the reflux condensate through the heating tubes or the reflux condensate may be returned to and mixed with the hot oil just before the latter enters the expansion chamber. Or, if desired, the reflux condensate may be diverted elsewhere and independently treated. Also, this last is not intended as part of the manner of normally operating the process, but only in exceptional cases or in cases of emergency.

The process may be carried out as follows:

Fuel oil may be fed continuously through the heating coil and subjected to a temperature of say 725 degrees F. at a pressure of 150 pounds. The reflux condensate, depending upon the extent to which it needs to be recracked, is introduced to various parts of the heating coil or caused to travel the whole length of the latter. The process may be also carried out in this apparatus as follows: Heavy Mexican crude may be first fed through the heating coil and subjected to a predetermined pressure and temperature sufficient to crack it and the reflux condensate returned to various parts of the heating coil as desired. Next, Kansas fuel oil

of say 26 Baumé gravity may be fed through the system and likewise subjected to a predetermined pressure and temperature, as for example, a higher temperature of pressure than the crude. The reflux condensate is returned to whatever part of the system is best fitted to produce the desired result. Next, Kentucky gas oil of say 34 degrees Baumé is passed through the system under regulated conditions of pressure and temperature different from that of the preceding. Next, kerosene from Illinois fields may be similarly treated under still different conditions of temperature and pressure. It is well understood by those skilled in the art that the temperature and pressure will vary with various oils, and that also the reflux condensate from various oils may need to be subjected to more or less recracking than is the case of reflux condensate of other oils. This can be readily accomplished in the novel apparatus here shown. The pressure distillate which is obtained in the receiver will be a blend of the desired character and the result is that when the pressure distillate is rectified in the usual way, that a blended gasolene will be obtained and in such a way as to permit of regulating the percentages of given end points constituents, or, in other words, getting a percentage distillation curve of predetermined character.

Having thus described my invention, what I claim is:

1. A process for cracking hydrocarbon oil consisting in passing the oil to be treated through a coil disposed within a furnace wherein it is raised to a cracking temperature, in delivering the heated oil to an enlarged reaction zone wherein conversion occurs and substantial vaporization of the oil takes place, in subjecting the vapors to reflux condensation to separate therefrom the insufficiently cracked fractions, in returning the reflux condensate to said coil for retreatment and during the operation of the process changing the character of the oil charged to said coil and simultaneously with the changing of the character of the oil charged to said coil changing the point in the length of said coil to which the reflux condensate is returned, and in maintaining a superatmospheric pressure on the oil undergoing treatment in the process.

2. An oil cracking apparatus comprising a heating coil disposed within a furnace, a vapor separating chamber, a transfer line connecting the outlet end of said coil with said chamber, a dephlegmator in vapor communication with said chamber, means for introducing reflux condensate formed in said dephlegmator to said transfer line without passage thru said coil, additional means for introducing reflux condensate to said coil, and a final condenser communicating with said dephlegmator.

3. An oil cracking apparatus comprising a heating coil disposed within a furnace, a vapor separating chamber, a transfer line connecting the outlet end of said coil with said chamber, a dephlegmator in vapor communication with said chamber, means for introducing reflux condensate formed in said dephlegmator to said transfer line without passage thru said coil, additional means for introducing reflux condensate to said coil at a point intermediate the ends thereof, and a final condenser communicating with said dephlegmator.

4. An oil cracking apparatus comprising a heating coil disposed within a furnace, a vapor separating chamber, a transfer line connecting the outlet end of said coil with said chamber, a dephlegmator in vapor communication with said chamber, means for introducing reflux condensate formed in said dephlegmator to said transfer line without passage thru said coil, additional means for introducing reflux condensate to said coil at a point intermediate the ends thereof, means for varying such intermediate point of introduction of reflux condensate to said coil, and a final condenser communicating with said dephlegmator.

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