

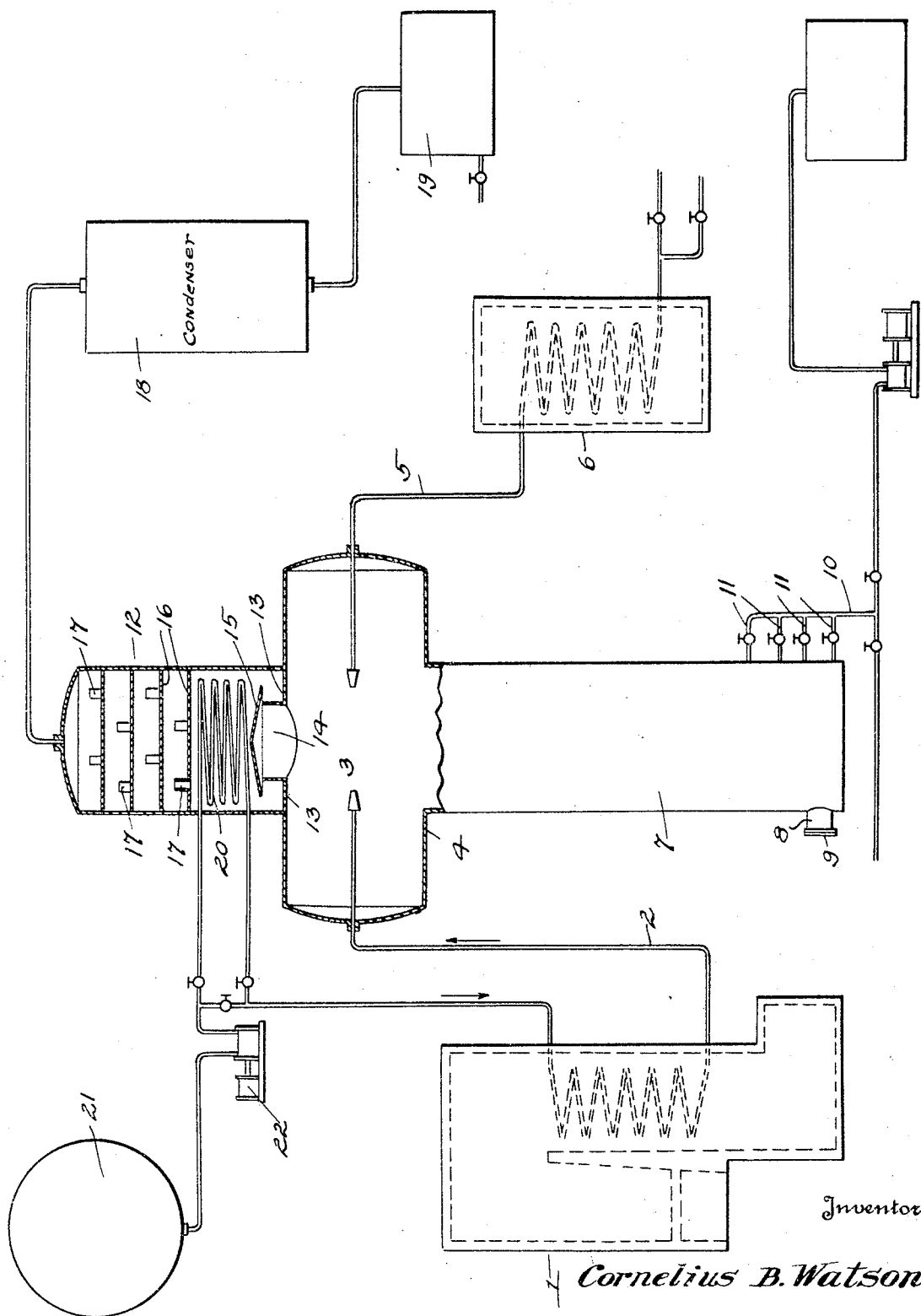
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METHOD OF TREATING PETROLEUM OIL

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## UNITED STATES PATENT OFFICE

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## METHOD OF TREATING PETROLEUM OIL

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This invention relates to improvements in the art of treating petroleum oil, and has for an object the provision of a novel and improved method for converting relatively heavy hydrocarbon compounds of high boiling point into lighter compounds of relatively low boiling point.

Another object of the invention resides in the provision of a process for cracking petroleum oils while the operation is carried on in the vapor phase and to produce a motor spirit characterized by its anti-detonating properties.

The further object of the invention rests in improved method of cracking petroleum oil, which consists in heating the oil initially to a vaporous state, and causing the same to attain a temperature wherein the oil verges on the state of cracking or molecular decomposition, and in actively intermingling the oil while in the condition set forth with steam or steam and air superheated to a temperature above that of the oil vapor, whereby the temperature of the oil, by the process of heat interchange thus provided, is raised sufficiently to effect the cracking thereof, provision being made for removing and fractionating the light bodies of oil released by the process and for separately collecting the free carbon or coke deposit, formed by the reactions, in a portion of the system remote from the cracking and fractionating apparatus.

For a further and more detailed understanding of the invention reference is to be had to the following description and the accompanying drawing—

In said drawing;

The figure is a diagrammatic view showing apparatus by which the present invention may be practiced.

In the embodiment of the invention herein selected for illustrating my improved process, the numeral 1 designates a primary heater which may be in the form of a tube still, to which the relatively cool oil is passed so that the temperature thereof may be elevated to substantially 750 degrees to 900 degrees F., although this temperature range may be varied in accordance with the character of

the oil that is handled or other control factors. Upon leaving the heater, through the outlet pipe 2, the oil is in a substantially vaporous state and relatively low pressures. The outlet pipe 2 enters a reaction zone 3, provided in a separating and fractionating tower 4. The pressures applied to the oil in the still 1 are sufficient preferably to maintain the desired velocity of oil flow through the heating coil of the still and to overcome pipe friction. These pressures may range from five to 50 pounds per square inch, although it is within the province of the invention to employ higher pressures in the still 1 if desired. In the fractionating tower the pressures are released due to the flashing of the oil into the larger reaction chamber 3, and the pressures in such fractionating chamber are rarely in excess of 20 pounds per square inch and usually much lower pressures are employed.

Also entering the reaction zone is a conduit 5, which extends from a superheater 6, through the coils of which are passed steam and air in commingled form and obtained from any suitable source of supply. The steam and air are preferably heated by the superheater to attain a temperature range of, for example, between 1000 degrees and 1500 degrees F., and this highly heated fluid is actively commingled with the oil vapors released into the reaction zone from the primary heater. It will be seen that due to the temperature differential existing between the oil vapors and the superheated fluid, heat exchange operations take place within the reaction zone, whereby the oil vapors have the temperatures thereof elevated sufficiently to cause the cracking or molecular decomposition of the oil vapors, thereby breaking down the heavier compounds thereof into lighter compounds more suitable for use as a motor fuel.

Beneath the reaction zone, the tower, 4, is formed to include a large receiver, 7, into which falls the heavier bodies of the hydrocarbon which are unsuitable for motor fuel purposes. These bodies may include large amounts of free carbon or coke, which settle within the bottom of the receiver and may

be withdrawn from time to time through the medium of a discharge opening 8, normally closed by means of a cover or lid 9. The heavier liquids, which also accumulate in the bottom of the receiver may be withdrawn by way of an outlet pipe 10, connected with the bottom of the receiver by means of a plurality of short horizontal pipe sections 11, the latter being valve regulated, so as to control the level of the liquid in the bottom of the receiver. It will be understood that the liquid withdrawn from the system by way of the outlet pipe may, if desired, be recirculated through the primary heater, or may be led off to any other suitable receptacle and employed for other purposes.

Above the reaction zone the separating tower is formed to provide a fractionator 12, which may be of any standard construction. In the present instance, however, the same includes a bottom 13, arranged immediately above the reaction zone 3, provided with an upstanding passage 14, through which the lighter fractions or products of conversion pass into the bottom of the fractionator, per se. The passage 14, may, if desired, be protected by a dome 15, which prevents condensation within the fractionator from falling downwardly into the reaction zone. The fractionator employs the usual trays 16, arranged horizontally and in vertically spaced order within the interior of the tower. These trays are provided with upstanding tubes 17, through which pass the ascending vapors and descending condensate. The lighter vapors which pass from the top of the fractionator may be conveyed to a condenser 18, in which the vapors are liquefied and may then be conducted to a separate tank or the like 19. The high boiling compounds, which are collected in the bottom of the fractionator, may be withdrawn and stored in a separate receptacle 19b, or may be conducted to further fractionators in order to secure the desired number of "cuts" or oil fractions. If desired, the interior of the fractionator may be provided with one or more cooling or refluxing coils 20, through which the cold oil, obtained from a source of supply 21, may be forced by means of a pump or its equivalent 22, and also by means of which the temperature of the oil vapor is immediately lowered following conversion to approximately 650 degrees F. or lower. From the coils 20 the oil may then be led to the inlet side of the primary heater 1. By this arrangement the temperature of the cold oil may be elevated before its insertion into the primary heater for the dual purpose of controlling the temperatures within the fractionating tower more conveniently and also for the purpose of extracting and using waste heat developed within the fractionator. It is, of course, within the province of the invention

to force the oil directly from the source of supply 21, to the primary heater.

What is claimed is:

A process for cracking hydrocarbon oil to produce motor fuel which consists in vaporizing a flowing stream of high boiling point oil, and heating the oil vapors to a temperature of between 750° F. and 900° F. at a relatively low pressure and for an insufficient time to substantially crack them, then injecting the heated vapors at a high velocity into a reaction zone against a stream of superheated steam having a temperature of between 1000° F. and 1500° F. so that the temperature of the oil vapors is raised to a temperature at which they will decompose, withdrawing non-vaporous products from the reaction zone, withdrawing the vapor products overhead from the reaction zone and suddenly cooling them to a non-converting temperature directly after they leave the reaction zone, and then fractionating the cooled lighter vapors to obtain the desired motor fuel fraction.

In testimony whereof I affix my signature.  
CORNELIUS B. WATSON.