

Oct. 30, 1934.

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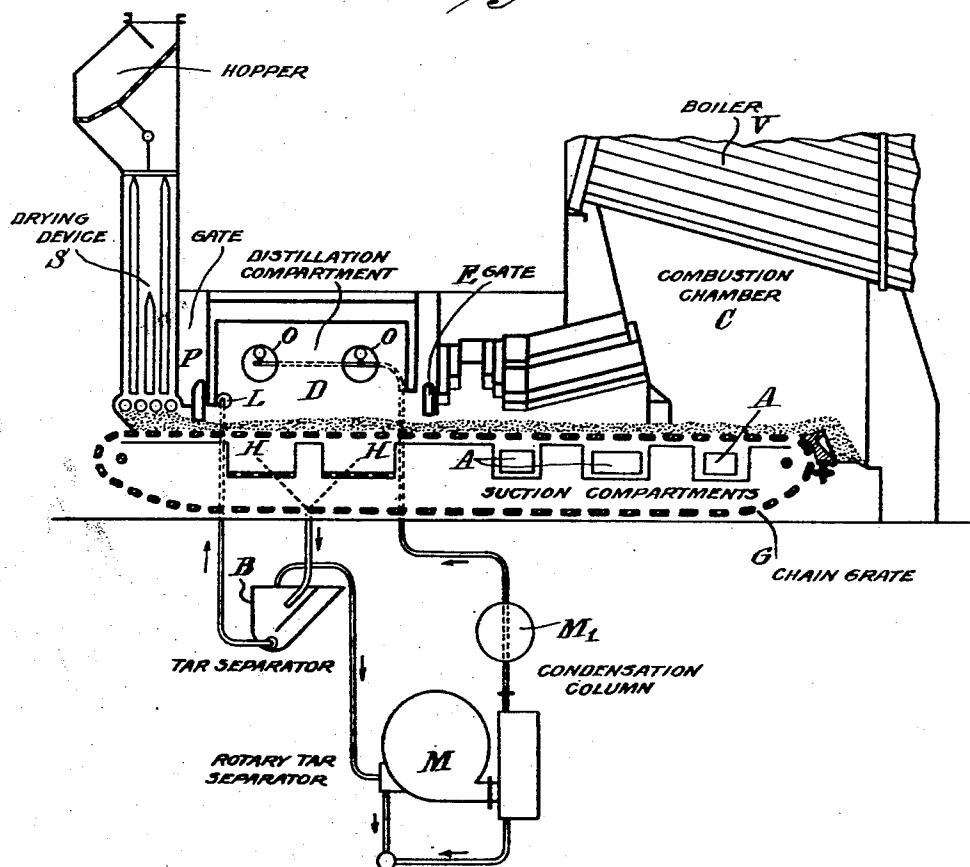
1,978,945

APPARATUS FOR THE DISTILLATION OF COAL

Original Filed Dec. 11, 1928

2 Sheets-Sheet 1

Fig. 1.



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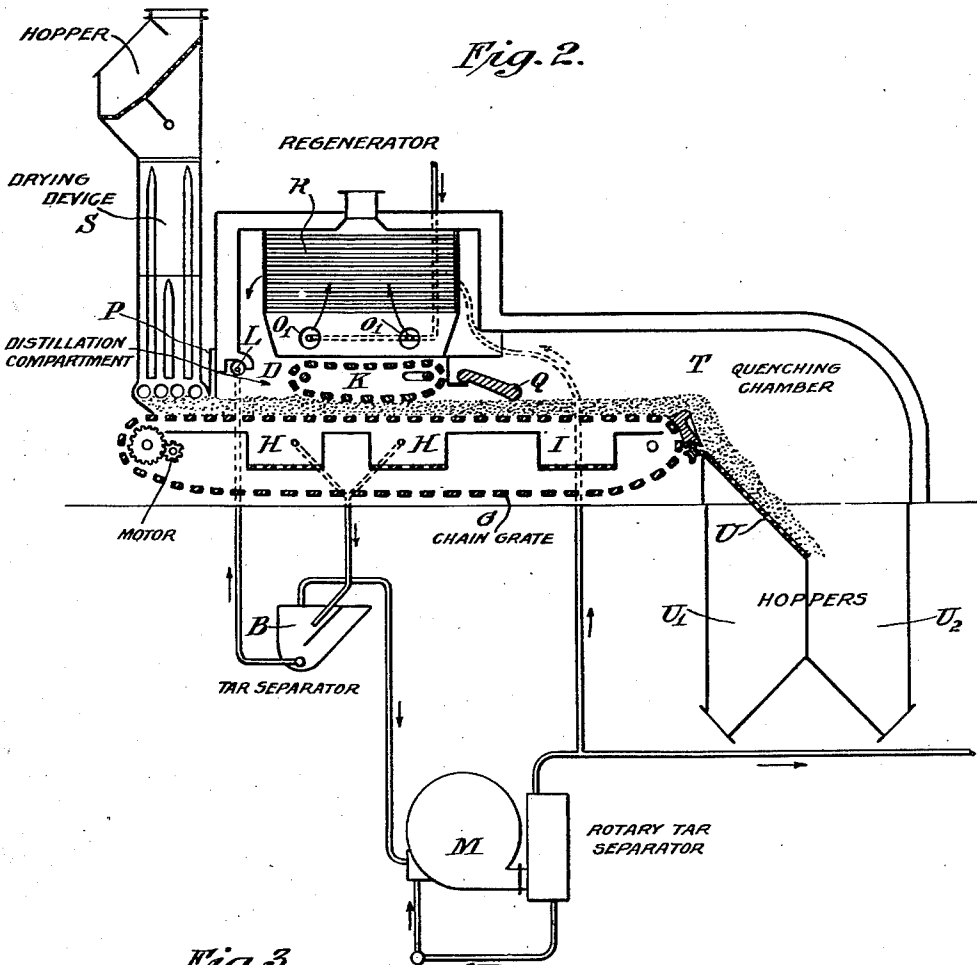
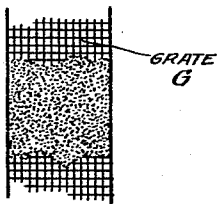


Fig. 3.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE DISTILLATION OF COAL

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Original application December 11, 1928, Serial No. 325,188. Divided and this application May 28, 1931, Serial No. 540,608. In France November 8, 1928

1 Claim. (Cl. 202—117)

This is a division of my copending application Serial No. 325,188, filed December 11, 1928, issued as Patent No. 1,909,956.

The invention relates to apparatus for the distillation of fuels such as coal.

Persons skilled in the art are aware of the interest that attaches to extracting tars from fuels previous to combustion thereof and of the many processes or methods that have been put into operation with a view of obtaining the aforesaid result.

Said methods or processes may be classified in two main groups:

According to the processes of the first group, the coal to be treated is not in contact with the heating fluid and heat is transmitted through a partition.

According to the processes of the second group, the coal to be treated is heated internally by the heating fluid.

This invention relates to the second mentioned method, and, according thereto, the fuel to be treated, previously dried and heated up to about the softening point, is laid on a travelling grate pervious to fluids, as, for instance, on a power chain grate.

It is a well-known fact that the best temperature for obtaining tars from distillation at a low temperature is included between 300° and 500° C.; in front of and above the metal travelling grate, there is a distillation chamber wherein the fuel is heated up to the above mentioned optimum temperature. Such heating may be ensured by combustion in the compartment of any available fuel, whether gaseous, liquid or solid.

One of the characteristic features of my invention consists in the possibility of heating the fuel to be distilled by means of the gas obtained from the distilling either by burning the same, since it is combustible, or through heating it up to an adequate temperature, say 700° C. Of course radiation from the walls of said distillation chamber cooperates in heating the raw fuel that is laid on the metal grate or conveyor.

On the other hand, the links of the chain are at a sufficiently high temperature, when they come again forwards after a complete revolution to cooperate in the heating of the fuel. Furthermore, said heating has the effect of freeing from dust the coal coming from the drying device, thereby preventing coal dust from passing through the grate.

Another essential feature of my invention is that the gaseous products of the distillation are drawn under the fuel layer by suction chests

wherein a lower pressure is maintained than in the distillation chamber.

Therefore, the fuel layer is heated from above, from below, and within its mass, said layer resting on a conveyor pervious to gases, the gaseous products being drawn underneath into suction chests or compartments.

The vapor products are partly condensable and include distillation gases having a high calorific power. These are the gases that can be used, as already stated, for heating the fuel in the distillation chamber.

The heavy tars laden with dust withdrawn from the first condensation devices, are returned to the fuel in the distillation chamber; they cooperate in reducing the amount of dust which passes through the grate, they are distilled anew in the fuel layer on contact with the nascent hydrocarbons and the distilled gases are sucked into the lower suction compartments or chests as above explained.

Beyond the distillation compartments, there is arranged another compartment, which may be the combustion chamber of a boiler, or a quenching and cooling metal box for the semi-coke; but under this compartment extends the conveyor (that is to say the chain grate) so that the fuel passes automatically from the first to the second compartment without interference from outside.

As will be readily realized, such a device permits:

(a) Either simply extracting the primary tars and tar oils and hydrocarbons such as benzol and toluol and burning the semi-coke and gases.

As a matter of fact, owing solely to the movements of the conveyor moving along, the semi-coke passes from one compartment to the other at a temperature of approximately 500° C. and it is necessary only to draw air through compartments located under the conveyor in order readily to cause combustion.

The gases, are sent into the second compartment or combustion chamber wherein they cooperate, jointly with the semi-coke, in heating, for instance, a steam generator. Part of the gases may, indeed, be utilized, as already stated, to ensure the heating of the distillation compartment through direct combustion.

(b) Or else, extracting, as in the previous case, the primary tars, burning the semi-coke in the combustion chamber, and, instead of sending back into the latter the collected gases, housing them in a gasometer for industrial or domestic use.

In this case, heating of the fuel in the distilla-

tion chamber may be ensured by a part of the gases previously heated up to an adequate temperature in a regenerator, so that the gas produced may not be mixed with other gases which are liable to alter the richness thereof.

The regenerator or gas heater may be heated by any routine means (producer gas, etc.) and, especially, by hot gases from the boiler or even by a part of the rich gas produced. The location of the regenerator should be so selected as to minimize radiation losses, for instance, directly above the distillation chamber.

(c) Or again, extracting the primary tars, as above indicated, storing the rich gas in a gasometer, and quenching the semi-coke so as to prevent combustion thereof, and utilizing this solid fuel for some ulterior, industrial or domestic use.

The compactness of said semi-coke may be increased in the course of its travel through the distillation chamber by means of a loose chain, resting thereon and suitably weighted, and the slack side of which will ensure compression of the softened fuel down to hardening at the end of distillation, without interfering with the continuous travel of the fuel.

The pressure of said second chain may be adjusted as desired by increasing or decreasing the slack.

(d) Or, lastly, extracting the primary tars and rich gases, as above indicated, also the water gas and the air gas by sending the semi-coke on to another chain grate or into a furnace whereon or wherein combustion of the semi-coke is effected by the oxygen of water or by the oxygen of air in accordance with the routine water-gas or air-gas manufacturing methods.

In order to make my invention more clearly understood I have illustrated two embodiments thereof in the drawings appended hereto and wherein:

Figs. 1 and 2 schematically illustrate apparatus in elevation with parts in section for performing the process, and Fig. 3 is a top plan view showing the layer of coal on the endless grate.

In Fig. 1 there are shown from left to right, the hopper, the drying device S, the distillation compartment D, the combustion chamber C and the boiler V. Underneath, the chain grate G.

As will be apparent, the chain grate is the grate with which the boiler would be normally equipped, but it extends forward under the distillation compartment D and the drying device S.

The drying device, indicated as an example, may be constituted by vertical channels through which the raw coal moves down by gravity and is heated by combustion gases from the boiler.

Dried and heated, the coal falls down on to the grate whereon the thickness of the layer is regulated by the gate P. The fuel travels freely through chamber D, heated up to 600°-650° C. and is distilled. The semi-coke passes into the combustion chamber C wherein it is burnt by air blown into suction compartments or chests A. Gate E permits adjusting the amount of heat that the combustion chamber transmits by radiation to the distillation chamber. Said amount of heat, may, indeed, be sufficient alone to keep the combustion chamber at optimum temperature.

The hydrocarbons obtained by the distilla-

tion are detarred and are drawn into the suction compartments H, and are rid of their liquid hydrocarbons by the usual means. B is a tar separator wherein the gases bubble in hot tar. The heavy tars, which settle down, are laden with dust; they are sent back, through L, into the distillation chamber D wherein they are freed of dust and redistilled. M is a rotary tar separator, M' a petrol removing column.

The gases, detarred and rid of their liquid hydrocarbons, are sent to the burners O where complete or partial combustion thereof is caused depending on the extra heat to be provided for the distillation chamber. Excess gases pass under baffle E and are burnt in combustion chamber C.

In the device illustrated by Fig. 2, it is contemplated to extract semi-coke in agglomerated form. On issuing from the condensation apparatus (not shown but like M₁ in Fig. 1), the cooled distillation gas is led to suction chamber I, passes through the conveyor and the semi-coke layer which gives up thereto its actual heat and is cooled. The gas thus partly heated goes to regenerator R and goes through the same cycle as in the foregoing case.

The semi-coke passes into the quenching chamber T.

An adjustably tensioned chain K, of the same width as the fuel layer, presses down on the latter while this is soft, that is to say in the course of distillation. Said chain is free and is taken along by the motion of the fuel so that no relative movement is caused between the layer and the two chains K and G. On leaving grate G, the semi-coke accumulates in hopper U₂ after having passed over a sieve U whereby the pea coke is separated and drops into hopper U₁.

What I claim is:

Apparatus for the low temperature distillation of coal comprising an endless chain grate pervious to gases, means for moving said grate, means for depositing coal in a layer on a first part of the upper horizontal run of said grate, means for regulating the thickness of the layer, a low temperature distillation chamber arranged above and around a second part of the upper run of the chain grate, heating means for distilling at low temperature the layer of coal in said distillation chamber, a suction compartment arranged against the under side of said second part of the upper run of said grate, means for exhausting the distillation gases from said distillation chamber through the layer of coal and said suction compartment, a tar separator into which said suction compartment discharges, means for circulating tar and coal dust from the bottom of said separator to the distillation chamber and discharging the tar and coal dust on the coal layer in the distillation chamber, means for circulating at least one part of non-condensed gases from said tar separator to the distillation chamber, a loose endless grate of the same width as the layer of coal arranged in the distillation chamber with its bottom run loosely hung upon the layer and pressing on the same, whereby the distilled coal is agglomerated in said distillation chamber, and a second chamber adjacent the discharge end of the upper run of the endless chain grate for receiving the distilled and agglomerated coke residue.

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