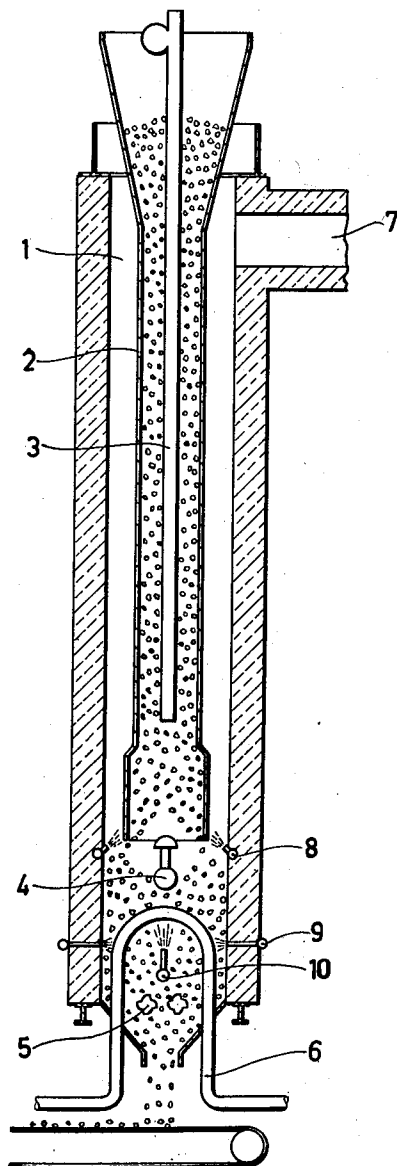


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METHOD IN PYROLYZING AND BURNING AND A SHAFT
FURNACE FOR THE EXECUTION THEREOF
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1

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METHOD IN PYROLYZING AND BURNING AND A SHAFT FURNACE FOR THE EXECUTION THEREOF

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6 Claims. (Cl. 202—6)

The present invention relates to pyrolysis and combustion of fuels, e.g. shale or coal. It is known in the art to carry out such pyrolysis in a retort, which has been placed in a combustion shaft, in which the residues from the pyrolysis are burned and the heat of the gases from this combustion are transferred to the pyrolysis retort. Possibly the furnace can be combined with arrangements for heating circulating water or steam.

In order to accomplish the pyrolysis the retort must be supplied with a certain quantity of heat, which here is done mainly by means of radiation, including gas radiation, and convection. The quantity of heat which in this way is transferred to the retort per unit of time depends, not only on the velocity of the material passing, but also on the size and heat value of the pyrolysis residues from the retort and on the quantity of combustion air introduced. Different fuels may at the pyrolysis give very different quantities of volatile components and most varying contents of combustible matters in the pyrolysis residues. Thus, by way of example, the pyrolysis of shale may give residues (shale coke) with heating values between 200 and 1500 kcal./kg.

In a shaft furnace of the type mentioned, if the time for passing the furnace and the particle size of the fuel are fixed, a certain, critical heating value of the pyrolysis residues is required in order to obtain a satisfactory pyrolysis. If the heating value in question should be too low, the production of heat in the combustion shaft will be too low and an insufficient quantity of heat is transferred to the retort. The result is then an incomplete pyrolysis. This difficulty, according to the present invention, is eliminated by means of introducing extra fuel into the zone of combustion, for instance by means of blowing a combustible gas into this zone. When burning pyrolysis residues of very low heating value a sufficient high temperature for a satisfactory combustion can not be reached without adding extra fuel. If in such cases the combustion of coke is combined with an extra gas combustion or the like, the temperature of the coke bed will be raised so that the combustion velocity is increased and a sufficient heat transfer to the retort is obtained.

Even when shale coke of a high heating value is produced, a combustion with extra fuel as per the present invention is most valuable. As a matter of fact, it has been proved possible by this means to increase the production per retort and combustion shaft considerably.

The point of fusion of the ash constituents of many fuels is so low that risk for baking or caking of the coke grains is present. In such cases it is often suitable to cool the fuel bed, for instance by means of a pipe system with circulating water or steam. In such a case it will, however, be difficult to obtain a complete combustion of the coke, particularly when the coke is rich in ash constituents, as is usually the case with shale coke.

Therefore, the invention is characterized in the combination of a supply of extra fuel with cooling, which has given additional regulation possibilities and thus given

2

an increased possibility of operating the pyrolysis and the combustion in every desired direction.

The additional fuel, characteristic for the invention, can be of different kinds. The simplest way, however, is to add it as a combustible gas. This combustible gas may be of any arbitrary kind and may be of some quite external origin or wholly or partly come from the pyrolysis. Thus the residue gases from the pyrolysis may be used for this purpose, after the fluid components have been condensed and possibly also other certain valuable constituents have been removed. Hereby the method as per the present invention can be made self-supporting of heat, which, naturally, is of extraordinary value.

The supply of the extra fuel can be done in many different ways, for instance together with the combustion air. For the arrangements for the extra fuel supply consideration must be taken not only to the construction of the furnace, for instance the location of possible cooling pipes but also to the heating value of the coke. If this value should be higher than the above mentioned critical value, it is not necessary to charge the extra fuel to the fuel bed proper, but the extra fuel may then suitably be added just above the upper surface of the fuel bed. For obtaining the ready controllability aimed at the extra fuel should be added direct into the fuel bed, even if the pyrolysis residues should have a high heating value. In the case of pyrolysis residues very poor in heating value it is always suitable to introduce at least a material portion of the extra fuel into the fuel bed to facilitate the combustion there. In such case it is suitable to introduce the extra fuel as evenly as possible into the burning coke, so that local overheating and corresponding caking of the coke grains is avoided.

In the attached drawing, an apparatus for the execution of the invention is shown. This, however, is only to be considered as an example and the invention is not limited thereto.

In a combustion shaft 1 a cylindrical retort 2 is placed. About in the centre of this retort a pipe 3 is placed for drawing off the gas, the open end of this pipe ending a bit above the lowest part of the retort. This lowest part of the retort is open and provided with a nozzle 4 for blowing in steam. The upper part of the retort is also open and here the fuel is introduced, which, after having been pyrolysed in the retort, enters the lower part of the combustion shaft in the form of coke. Here the combustion takes place, after which the ashes are removed by means of special arrangement 5 in the bottom of the combustion shaft. In the lower part of the combustion shaft a cooling pipe 6 for circulating water or steam is placed. The flue gases from the combustion pass outside around the retort and are then drawn off through a flue gas exit 7 in the upper part of the combustion shaft. Just above the surface of the fuel bed a burner set 8 is placed, through which gaseous extra fuel may be introduced. This burner set is intended to be used when the pyrolysis residues have a high heating value. Thereby, the fuel bed is not charged by the extra fuel supply, while, on the other hand, the pyrolysis gets an additional supply of heat. Should the pyrolysis residues have a low heating value, the extra fuel supply must be added to the fuel bed itself. The addition of the extra fuel in such case can be made through the pipes 9 through the lower part of the wall of the fuel shaft and/or by means of a distribution pipe 10 located in the inner part of the fuel bed.

What is claimed is:

1. In a method of pyrolyzing and subsequently burning materials containing organic matter such as shale coke involving the steps of (a) burning a pyrolysis residue fuel bed in a combustion chamber with the aid of combustion air introduced thereto and (b) heating a charge

3

of said material containing organic matter in an associated pyrolysis chamber by means of heat derived from said combustion of such pyrolysis residue, the improvement which consists in regulating the temperature of the combustion by the combined steps of introducing an added fluid fuel into the pyrolysis residue fuel bed while at the same time passing a cooling medium in indirect heat-exchanging relation through said bed.

2. The improved method defined in claim 1, in which the added fuel is a combustible gas comprising a gaseous component of the pyrolysis product.

3. The improved method defined in claim 1, in which the added fuel is a combustible gas admixed with the combustion air.

4. The improved method defined in claim 1, in which at least a part of the added fuel is introduced into the combustion chamber immediately above the surface of the fuel bed.

5. The improved method defined in claim 1, in which a part of the added fuel is introduced into the combustion chamber immediately above the surface of the fuel bed and a part of the added fuel is introduced into the interior of the fuel bed.

6. A pyrolysis furnace comprising a generally upright combustion shaft, an elongated generally upright retort within the shaft the lower end of said retort terminating above the lower end of the shaft, a combustion chamber

4

in the lower part of the shaft, said retort having an outlet adjacent its lower end for passage of pyrolysis residues from said retort into said combustion chamber forming a solid fuel portion of said combustion chamber, a passageway for combustion air into the lower part of said combustion chamber, a controllable fluid fuel supply means extending into said solid fuel portion of the combustion chamber, and a cooling medium conduit arranged within said combustion chamber and beneath said retort opening.

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