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PRODUCTION OF FUEL GASES FROM GRANULAR TO PULVERULENT FUELS

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FIG. 1

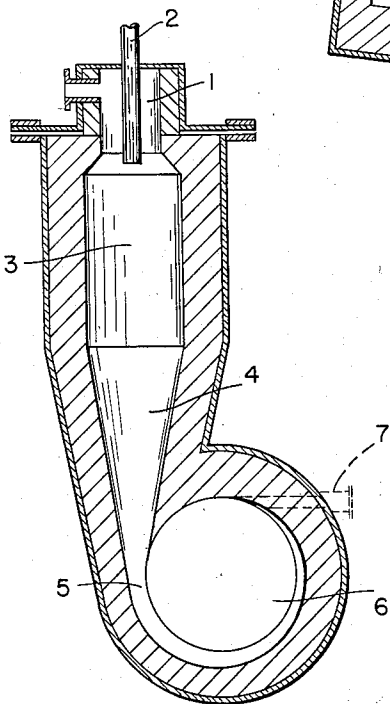
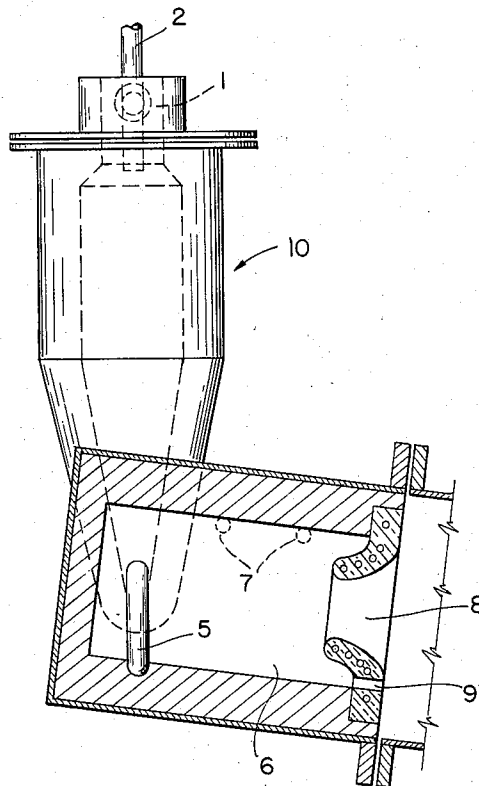


FIG. 2

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Claims priority, application Germany February 12, 1949

2 Claims. (Cl. 48—203)

This invention relates to the production of fuel gases from granular to pulverulent fuels.

It has already been proposed to burn granular to pulverulent fuels in a rotation-symmetrical chamber, a so-called centrifugal combustion chamber, which is operated by introducing the fuels tangentially together with a carrier gas, for which purpose a part of the combustion air itself may be used, and keeping the fuels in rotation by further introducing combustion air tangentially until the solid fuels are practically completely burnt. From a centrally disposed outlet opening gases only with little or no dust content leave the combustion chamber. If the combustion is carried out at so high a temperature that the ashes are in the molten state, the liquid slag may be drawn off at a suitable place at the periphery of the combustion chamber.

When using the said centrifugal combustion chamber for the gasification of granular to pulverulent fuels, the difficulty is encountered that the ratio of gaseous gasifying agent to solid fuel is considerably less than in the complete combustion. In the gasification with air, for a given amount of fuel dust only half of the air necessary for complete combustion is consumed, and in the gasification with air and oxygen and endothermic gasifying agents, such as steam and carbon dioxide, the ratio of gaseous gasifying agents to solid fuel is even considerably less. In order to give the solid fuel sufficient rotary impulse, notwithstanding the smaller amount of gas, the fuel would have to be introduced into the centrifugal combustion chamber with the carrier gas at a very high rate of flow. Dust flames, as a fact, have but a relatively low extinction speed so that when the fuel and the carrier gas would be introduced at too high a speed, the flame is extinguished. High inlet speeds further result in the solid fuel particles being conveyed very rapidly to the periphery of the chamber where the fuel can be contacted only with a relatively small amount of gasification agent. The result of this is that the degree of gasification of the solid fuel is reduced to an unbearable extent.

We have now found that the said difficulties can be obviated by partially gasifying the solid fuel with a part of the gasifying agent, prior to its entry into the gasification chamber proper (the so-called centrifugal gasification chamber), in a preliminary chamber directly connected with the said gasification chamber proper. When the air is used as a gasifying agent, the quantity used thereof should amount, preferably, to more than 20%, while with endothermic gasifying agents it should amount, preferably, to more than 50% of the total fuel to be introduced. The dimensional proportions of the preliminary chamber are advantageously chosen with a view to ensuring a safe seat of the flame at the opening of the burner into the preliminary chamber. By varying the ratio of the amounts of gasifying agent to the amounts of fuel and by varying the length of the preliminary chamber it is possible to achieve the preliminary gasification therein up to the desired degree. At least towards the end of the preliminary chamber, its cross-section may

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have a funnel-shaped constriction so that the mixture of ungasified fuel, produced combustion gas and any gasifying agent enters tangentially into the centrifugal gasification chamber at the desired speed.

The invention will be further described with reference to the accompanying drawings in which Figures 1 and 2 are a sectional side and a sectional end view, respectively of one embodiment of the invention. Like reference numerals are used for like parts in all the figures.

Solid fuels, intimately mixed with a carrier gas, for which purpose part of the gasifying agent may be used, enters through a pipe 1 into a preliminary chamber 3, 4. A gasifying agent, preferably one rich in oxygen, enters through a pipe 2, arranged centrally within the pipe 1. The mixture is ignited at the mouth of the pipe 2. The preliminary chamber consists of a cylindrical part 3 and a funnel-shaped part 4. The mixture of fuel and gas leaving the preliminary chamber enters tangentially at 5 into a centrifugal gasification chamber 6. Through nozzles 7 arranged at the periphery of chamber 6 more gasifying agent is tangentially introduced. The combustion gases which are practically free from solids leave the centrifugal gasification chamber 6 through a central opening 8, while the liquid slag thrown against the periphery runs to the lowest point of the chamber 6 by this being disposed in a slightly inclined position, and is removed through opening 9.

The following example will further illustrate the invention, but the invention is not restricted thereto. The example is given with reference to the accompanying drawings.

Example

5 metric tons per hour of dried brown coal dust thoroughly mixed with 940 cubic meters of steam (measured at N. T. P.) enter through the pipe 2 into the preliminary chamber 3, 4. 1125 cubic meters of oxygen and 2890 cubic meters of air (measured at N. T. P.) enter through the pipe 1 centrally disposed around pipe 2. The gasifying agents are preheated to 500° C. The mixture is ignited at the mouth of 2. The mixture of combustion gas, ungasified brown coal dust and unspent gasifying agent enters tangentially at 5 at a temperature of 1700° C. into the gasification chamber 6. A mixture preheated to 500° C. of 290 cubic meters of steam, 375 cubic meters of oxygen and 960 cubic meters of air (measured at N. T. P.) is tangentially introduced per hour through the nozzles 7 at the periphery of the chamber. 12,500 cubic meters per hour (measured at N. T. P.) of gas having the composition:

56% of CO and H₂
20% of CO₂ and H₂O and
24% of N₂

leave through the central opening 8. The temperature of this gas is 1700° C. 600 kilograms of liquid slag are withdrawn per hour through the opening 9 situated at the lowermost point of the chamber.

What we claim is:

1. A process for the production of fuel gases from granular to pulverulent fuels which consists in introducing the total amount of the aforesaid fuel to be gasified and a considerable part of the gaseous gasifying agent used in the reaction into an antechamber arranged directly at the inlet opening of a centrifugal gasification chamber proper, the axis of said antechamber being disposed at a substantial inclination with respect to the axis of said centrifugal gasification chamber proper, effecting gasification of a substantial portion of the pulverulent fuel in said antechamber by reaction with said gaseous gasifying agent, leading the mixture of non-gasified solid fuel, fuel gas and any gasifying agent leaving the antechamber into the centrifugal gasification

chamber tangentially, keeping it in rotation therein by tangentially introducing into said centrifugal gasification chamber further amounts of gasifying agent for a length of time sufficient to effect substantially complete gasification at the non-gasified solid fuel and for regulating the temperature in such a manner that there is formed a liquid slag, which slag, separates at the periphery of the gasification chamber so that it can be withdrawn in the liquid phase.

2. Process in accordance with claim 1 including increasing continuously the linear velocity of the mixture of non-gasified solid fuel, fuel gas and any gasifying agent flowing through the part of the antechamber adjacent the gasification chamber proper.

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