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FUEL GAS

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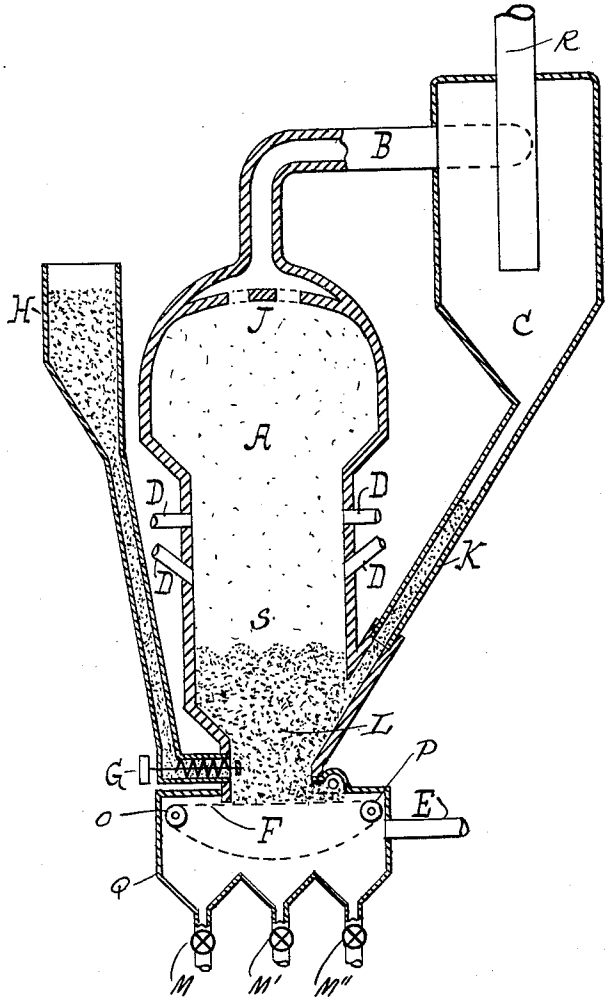

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UNITED STATES PATENT OFFICE

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FUEL GAS

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This invention relates to improvements in and apparatus for the manufacture of fuel gas.

The present invention is an improvement in or modification of the invention described and claimed in the U. S. Patents Nos. 1,687,118 and 1,776,876, which relate to a process for producing combustible gases in a layer of fine-grained fuel, the gasifying medium being blown into the producer from below in such a manner that the fine-grained ignited material continuously eddies up and down and presents the appearance of a boiling liquid. According to the modification described and claimed in the U. S. Patent No. 1,840,649, the gasifying medium is also blown in from above, and, in addition air, preferably in a highly heated condition, may be introduced into the hot-blast gas, laden with fuel, after issuing from the layer of fuel, the amount of such air being sufficient to effect the further gasification, except for a small residue, of the fuel carried away by the hot-blast gas.

I have now found that a gas of very high heating capacity can be obtained from granular fuels, usually of about nut size, which may also contain dust, by employing a gas producer of the kind specified, and adapted for the secondary gasification of coal dust evolved from the first gasification chamber, the said producer being provided with an enlarged secondary gasification chamber where a further supply of a gasifying agent may be added. Special advantage has been found to ensue from the employment of a gas producer consisting of a vertical shaft, provided with means for introducing the blast of the gasifying agent, for example, air, water vapor, oxygen or a gas rich in oxygen, from below and above the fuel bed, at such a rate that fine-grained fuel is kept in motion in such a manner that it presents the appearance of a boiling liquid and, at the same time, is incompletely gasified, the said shaft being also provided with a superimposed enlarged secondary gasification chamber into which the gas obtained together with the dust particles contained therein passes, which chamber is preferably provided with an incandescent dome serving as a heat accumulator, which is particularly advantageous in the production of water gas. I hereinafter refer to the said gasification chamber as a "large space". The object of the secondary gasifying chamber, which has a high temperature, namely of about 1000° to 1100° C. when an incandescent dome of refractory material is employed, is to subject the mixture of fuel and gasifying agent to prolonged exposure to high temperatures, for the complete or extensive gasification of the fuel. In this manner a gas, 35.5 cubic feet of which under normal conditions has a heating value of 124 B. t. u. can, for example, be produced from brown coal dust with about 10 per cent of moisture. The gasification medium introduced in the second stage may also be preheated, and when desired, complete gasification, however, is obtained in the secondary gasification chamber when the fuel to be gasified is admitted solely at the point of admission of the first blast. In the event of the temperature in the secondary gasification chamber becoming unduly high, steam or carbon dioxide is blown in through the second blast inlet and in this way a gas richer in hydrogen is obtained. The gasifying medium required for the secondary gasification may be admitted at various points.

I will now describe an embodiment of a gas producer according to this invention more fully with reference to the accompanying drawing, but the invention is not restricted to this particular arrangement.

In the accompanying drawing, which shows the gas producer in vertical section, A is the enlarged secondary gasification chamber from which the hot generated gases pass through a pipe B to a dust separator C from which the dust may be returned to the gasification chamber by means of a conduit K. The final gases are removed by pipe R. The supply pipes for the secondary gasification medium, for example air, are indicated at D. The bottom blast, preferably air, is blown in at E into the air chamber with sufficient force to keep the fuel moving up

and down in the manner of a boiling liquid. Friable, very dusty brown-coal, with about 15 per cent of moisture, is fed by means of a worm G from the bunker H into the first gasification chamber S. The glowing and moving charge L of coal rests in part on a travelling grate F which is moved by rollers O and P. In the first gasification chamber S incomplete gasification takes place. The continuous movement of the granular brown-coal causes the latter to crumble down still more, with the formation of dust, which latter is partly carried away by the gases and is completely or extensively gasified, in the chamber A, by the gasification medium introduced at D. Slags and ashes are collected in vessel Q and may be removed by valves M, M′ and M″. If, for example, a producer having a sectional area of 25 square meters in the first gasification chamber S and about 50 square meters in the secondary gasification chamber A, the height being about 15 meters from the grate to the crown of the incandescent dome, be operated with about 20,000 cubic meters of a bottom blast, introduced at E, and about 50,000 cubic meters of a top blast, introduced at D, per hour, a gas will be obtained which contains 8 per cent of CO_2, 21 per cent of CO, 12 per cent of H_2, 1.5 per cent of CH_4 and 57.5 per cent of N_2. The fine ash carried off with the gases from the producer contains only 20 to 30 per cent of coal particles, whereas, without the employment of a top air blast and the enlarged secondary gasification chamber, it sometimes contains as much as 70 per cent of coal particles.

A different arrangement of the gasification and secondary gasification chambers may be employed from that shown in the drawing without departing from the scope of the invention. If, for example, the two chambers be disposed horizontally, side by side, the advantage of a reduction in height is obtained. The two gasification chambers may also be connected by means of a wider pipe.

What I claim is:

1. In the production of fuel gas in a generator having a primary and a large secondary gasification zone from coal having a size ranging from that of particles of dust up to that of nuts, by gasification by means of a gasifying agent blown through the said coal while ignited at such a rate that the particles thereof continuously eddy up and down in such a manner that the ignited coal presents the appearance of a boiling liquid, the step of directly passing the crude fuel gas thus obtained together with the dust particles contained therein through the large secondary gasification zone maintained at a temperature of about 1000 to 1100° C., admitting only a further supply of a gasifying agent to the said secondary gasification zone and reacting said gasifying agent with said dust particles while maintaining the dust particles and gasifying medium in contact for a longer period of time than contact is maintained between the fuel and gasifying medium in the primary zone.

2. In the production of fuel gas in a generator having a primary and a large secondary gasification zone from brown coal having a size ranging from that of particles of dust up to that of nuts, the steps which comprise blowing air through the said brown coal while ignited at such a rate that the particles thereof continuously eddy up and down in the primary gasification zone in such a manner that the ignited brown coal presents the appearance of a boiling liquid, passing the crude fuel gas thus obtained together with the dust particles contained therein through the large secondary gasification zone maintained at a temperature of about 1000 to 1100° C., admitting only a further supply of air to the said secondary gasification zone and reacting said air with said dust particles while maintaining the dust particles and air in contact for a longer period of time than contact is maintained between the fuel and air in the primary zone.

3. In the production of fuel gas in a generator having a primary and a large secondary gasification zone from coal having a size ranging from that of particles of dust up to that of nuts, by gasification by means of a gasifying agent blown through the said coal while ignited at such a rate that the particles thereof continuously eddy up and down in such a manner that the ignited coal presents the appearance of a boiling liquid, the step of directly passing the crude fuel gas thus obtained together with the dust particles contained therein through the large secondary gasification zone maintained at a temperature of about 1000 to 1100° C., admitting a further supply of a gasifying agent to the said secondary gasification zone and reacting said gasifying agent with said dust particles while maintaining the dust particles and gasifying medium in contact for a longer period of time than contact is maintained between the fuel and gasifying medium in the primary zone.

4. In the production of fuel gas in a generator having a primary and a large secondary gasification zone from brown coal having a size ranging from that of particles of dust up to that of nuts, the steps which comprise blowing air through the said brown coal while ignited at such a rate that the particles thereof continuously eddy up and down in the primary gasification zone in such a manner that the ignited brown coal presents the appearance of a boiling liquid, passing the crude fuel gas thus ob-

tained together with the dust particles contained therein through the large secondary gasification zone maintained at a temperature of about 1000 to 1100° C., admitting a further supply of air to the said secondary gasification zone and reacting said air with said dust particles while maintaining the dust particles and air in contact for a longer period of time than contact is maintained between the fuel and air in the primary zone.

In testimony where of I have hereunto set my hand.

FRITZ WINKLER.