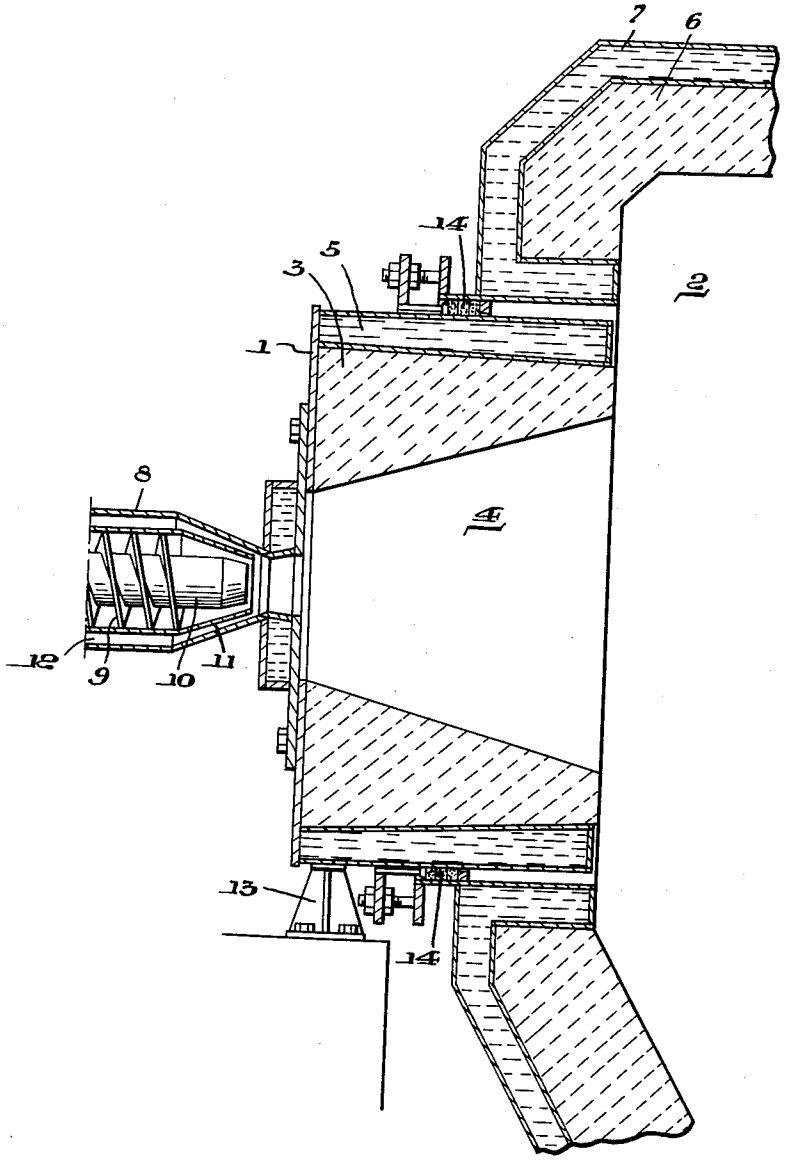
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APPARATUS FOR GASIFICATION OF FINELY-DIVIDED FUELS

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APPARATUS FOR GASIFICATION OF FINELY-DIVIDED FUELS

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The present invention relates to an apparatus for gasification of finely-divided fuels in suspension in oxygen and, if desired, endothermically reacting gasification media, and is an improvement continuing-in-part common subject matter of Friedrich Totzek application No. 476,453, filed December 20, 1954, now U.S. Patent 2,898,204, for Process for Production of Combustible Gases, allowed November 21, 1958, which is owned by a common assignee and successively continues common subject matter of the assignee's Totzek application Serial No. 297,965, filed July 9, 1952, now U.S. Patent 2,920,945, and through said application the common subject matter of the assignee's Patents Nos. 2,702,744; 2,702,743; 2,670,820, and the parent Totzek application Serial No. 43,950, filed August 12, 1948, and now abandoned.

Both solid fuels in powdered form as well as liquid fuels in vaporous form or in atomized form are considered as fuels. Steam or carbon dioxide or a mixture of both of these materials can be used as endothermically reacting media. Both pure oxygen as well as oxygen-enriched air are considered as oxygen in the scope of the present invention.

In such gasification apparatus it is known that a mixture of fuel and gasification media is injected through a burner-like nozzle into a burner chamber which has a reaction space which is conically widened in the direction of flow of the mixture. This reaction space (if desired several of them) discharges in a gas collecting chamber structure providing a gas collecting space from which the produced gas is discharged at the top and the separated gasification residue is discharged at the bottom.

Up to now the reaction space chamber and the gas collecting space chamber were constructed as one separate structural unit, namely the actual reaction space chamber was rigidly connected with the gas collecting space chamber and took part in the latter's motion as stipulated by the expansion due to heat. This single structure arrangement was selected since it was considered that the gas tightness of the entire apparatus would be achieved by a metal jacket enclosing all parts.

The rigid connection of the reaction space structure with gas collecting space structure made it necessary to connect the supply lines of the reaction media to the burner nozzle with flexible passage means. Apart from the fact that certain operating difficulties result therefrom, the known apparatus had the inconvenience that extensive dismantling operations were frequently necessary for changing or repairing the reaction space chamber structure which was subject to the greatest stresses.

These difficulties are overcome by the present invention. The apparatus conforming to the present invention consists in connecting the reaction space structure on one side rigidly with the supply lines for the reaction media and connecting the reaction space structure on the other side with the gas collecting space structure in a gastight but otherwise unrigid manner by an expansion joint structure, so that the gas collecting space and its structure can follow the motion stipulated by its expansion due to heat in contrast with the reaction space and its structure which is immovably arranged during the operation.

A section of a gasification apparatus is illustrated in the drawing by which the invention is explained in more detail. The illustrated apparatus is designed for gasification of finely-divided fuel but there is no change in the basic structure when hydrocarbon oil, for example, is to be gasified instead of solid fuel. Only the construction of the burner located outside of the reaction space must be adapted to the particular fuel.

The entire gasification apparatus consists of the so-called burner head or reaction chamber structure 1 and the gas collecting space chamber structure 2. The burner head itself is formed by fireproof masonry 3 in which is located an opening 4 which is conically widened toward the gas collecting space 2 of the gas collecting chamber structure 6. This opening 4 is the actual reaction space in which the reaction between the fuel and gasification media takes place. A water cooling jacket 5 is provided to regulate the temperature of the fireproof masonry 3.

The gas collecting space 2 is also surrounded by fireproof masonry chamber structure 6 which is covered by a water jacket 7. The actual burner 8 also forms part of the burner head 1. In the present case this consists of a worm 9 which conveys the finely-divided solid fuel in the direction toward reaction space 4. Oxygen is supplied under a slightly increased pressure through the hollow shaft 10 of worm 9. A gastight packing consisting of the powdered fuel to be gasified is formed between the hollow shaft 10 and the outer wall 11 of the worm by the special conical structure of the mouthpiece of the burner, so that oxygen or other gases can not flow backward through the worm. By exit of the oxygen from the hollow shaft 10, the oxygen draws the fuel from the annular packing and forms a homogeneous mixture with it. This mixture is immediately ignited on entering the reaction space 4 in which a high temperature prevails. The endothermically reacting gasification media is supplied through annular line 12 and is introduced in the reaction space 4 in such a direction that it surrounds the central zone of exothermic reaction between fuel and oxygen with an envelope moving in the same direction, which especially protects the fireproof masonry 3 from an excessive heat stress and also enters in reaction with the glowing ungasified fuel. The reaction space 4 is supported on a bracket 13 and is moreover rigidly connected with the supply lines 8 of the reaction media. The gas collecting chamber structure for space 2 is supported, on a place not illustrated in the drawing, so that it can follow the motions which are caused by the expansion due to heat. In order to achieve a gastightness between reaction space 4, on the one hand, and the gas-collecting space 2 on the other hand, there is provided male and female expansion joint members with a stuffing box seal 14 which permits a relative motion of the reaction space structure 4 and the gas collecting space 2 structure in relation to one another and also stops the escape of gas. The stuffing box seal is arranged in a vicinity in which no high temperatures prevail, so that a gastight operation of this seal 14 is assured.

When several burner heads 1 of the described type are connected to gas-collecting space 2, these burner heads are advantageously rigidly connected with one another, and the type of connection is determined by the special form of the gas collecting space.

If an exchange of burner head 1 is necessary, the supply line 8 of the reaction media is disconnected at any optional place and then the entire burner head can be withdrawn from the structure of gas collecting space 2.

We claim:

1. Apparatus for gasification of finely-divided fuels in suspension in oxygen, comprising: a burner nozzle rigidly connected with a burner chamber structure for injection of a mixture of fuel and gasification media into a reaction space in the burner chamber structure, said burner

chamber having inner tapered walls to provide a reaction space conically widened in the direction of flow of the mixture; and a separate gas collecting chamber structure providing a gas collecting space in communication with said widened part of the burner chamber to receive the gases discharged therefrom, for discharge of the produced gas at the top and of the gasification residue separated therein at the bottom of the gas collecting space; characterized by, supply lines for introduction of the reaction media to the burner nozzle and rigidly connected to the burner nozzle, and a gas-tight expansion joint structure between the burner chamber structure and the gas collecting chamber structure, whereby the gas collecting chamber structure can follow the motions stipulated by its expansion due to heat in contrast with the rigid burner chamber structure which is immovably arranged during operation thereof.

2. Apparatus as claimed in claim 1, and in which the expansion joint is constituted of male and a female expansion joint members with a stuffing box seal between the reaction chamber structure and the gas collecting chamber structure for sealing the gasification apparatus.

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