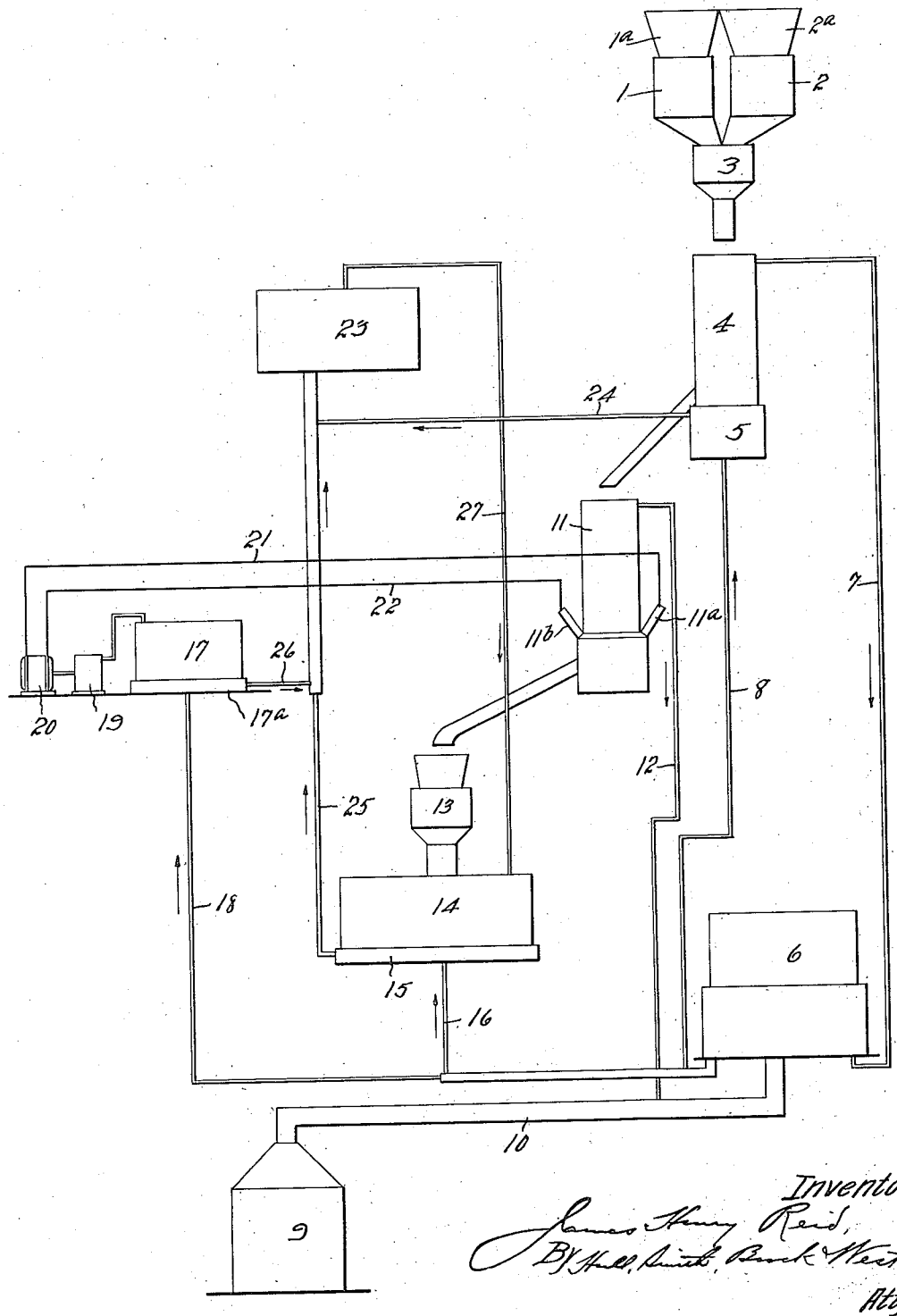
Sept. 2, 1924. 1,506,999

I. H. REID

PROCESS OF PREPARING MATERIAL FOR AND PRODUCING THEREFROM NITRIFIED MATERIAL

Filed Dec. 16, 1920



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Patented Sept. 2, 1924. 1,506,999

UNITED STATES PATENT OFFICE.

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PROCESS OF PREPARING MATERIAL FOR AND PRODUCING THEREFROM NITRIFIED MATERIAL.

Application filed December 16, 1920. Serial No. 431,100.

To all whom it may concern:

Be it known that I, JAMES HENRY REID, a citizen of the United States, residing at Readsboro, in the county of Bennington and State of Vermont, have invented a certain new and useful Improvement in Processes of Preparing Material for and Producing Therefrom Nitrified Material, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to a process for preparing material for, and for producing therefrom, nitrified material, and has for its general object to accomplish these objects in a particularly efficient and economical manner.

In the practice of my invention, I retort a mixture suitable for the production of carbid material and for the evolution of gas, reduce the carbid material to carbid with the evolution of more gas, and nitrify the carbid. The retorting operation and the heating of the carbid in an atmosphere of nitrogen will preferably be accomplished by the combustion of some of the gases evolved by the retorting operation and by the carbid reaction, while the nitrogen necessary for the nitrifying of the carbid will preferably be obtained in part at least from the products of combustion of such gases. Where a local electric generator is employed for the generation of the electrical energy required for the production of the carbid, the power necessary to operate the generator may also be obtained by the combustion of some of the gases produced as above set forth, and the nitrogen (or a part thereof) produced by such combustion may also be used in the nitrification of the carbid.

In the drawing, there is shown a diagrammatic view of a plant or system for realizing my invention.

For the production of the carbid material, I preferably employ approximately equal parts by weight of distillable cokable carbonaceous material (such as bituminous coal) and a calcium oxy-compound (such as calcium carbonate, in the form of limestone). The coal and the limestone are ground—the former to a fineness of about forty mesh—grinders for this purpose being indicated by 1 and 2 and provided each with a hopper, 1^a and 2^a, for the coal and limestone, respectively. From the grinder, the coal and limestone are delivered to a mixer 3, and the intimate mixture of coal and limestone is then delivered to a retort or a bench of retorts, indicated at 4 and each having a combustion chamber 5.

In the retort or retorts, the mixture is heated at a temperature of from about 1600° F. to 2800° F. until the coal is converted into coke and the gaseous distillation products have all been liberated. These products comprise not only all the gases obtained by the ordinary distillation of bituminous coal, but additional gases due to the cracking of the tarry constituents of the coal in and through their contact with incandescent particles of limestone and coal or coke, as pointed out in my application No. 358,456, filed February 13, 1920. The gas thus evolved will be purified in the usual manner and may be conducted to a gas holder 6 by a suitable conduit 7. The retort may be heated by the combustion of part of the gases thus produced, the gases being led to the combustion chamber 5 by a pipe 8, gases for the initial operation of the retort being furnished by means of a gas producer 9 which may also deliver its gas into the holder 6 by a conduit 10.

The material obtained by the retorting operation consists of an intimate mixture of coke and limestone, the limestone not having been converted into lime by reason of the fact that the retorting operation has been conducted in a reducing atmosphere, at least as long as hydrocarbon vapors or gases are evolved. The mixture thus produced is in an ideal condition for the production of calcium carbid in an electric furnace 11, which may be of the type shown in my aforesaid application, the limestone-coke being delivered into said furnace in any convenient manner and preferably while in a heated condition. In the furnace 11 the limestone coke will be converted into calcium carbid with the evolution of gas consisting principally of carbon monoxide. The gas thus evolved may also be conducted to the holder 6, through a conduit 12.

The calcium carbid will be passed through a grinder indicated at 13, and thence delivered into the nitrification oven or retort 14, the combustion chamber of which is indicated generally at 15. The gas for heating

the said material for nitrification will also preferably be taken from the holder 6, being conducted to the nitrification oven or retort by a pipe 16.

Where a local electric generator is employed, the boiler 17 of the same may be heated by means of gas conducted from the holder 6 through a pipe 18 and burned in the combustion chamber 17ª. Steam from the boiler 17 will operate the turbine or other engine 19 which drives the generator 20, the conductors 21 and 22 of which lead to the opposite electrodes 11ª and 11ᵇ of the electric furnace 11.

For the purpose of nitrifying the carbid supplied to the oven or retort 14, products of combustion from the retort 4, the nitrification oven 14 and the boiler 17 (or from any one or more of the same) will preferably be employed, the said gases being conducted to a purifier 23 by means of which carbon dioxide and other impurities may be removed from the nitrogen. The conduits for the products of combustion are indicated at 24, 25 and 26, and the conduit for conducting nitrogen from the purifier at 27.

In the operation of the foregoing plant or system, the raw material is prepared, ground, retorted, converted into calcium carbid and finally into nitrified material. Ordinarily the gases evolved from the retort 4 and from the furnace 11 will be ample to retort the fuel, nitrify the product, and operate the electric generator. Should there be any deficiency of such gas at any time, this deficiency may be readily made good by means of the producer 9. Finally, the products of combustion which would otherwise go to waste are utilized for the purpose of nitrifying the carbid. It will be apparent that, in and through the operation of my invention, I have accomplished a great efficiency and a great conservation of energy in the process of producing nitrified material from the raw materials up to and including the final product.

Having thus described my invention, what I claim is:

1. The process of producing nitrified material which comprises retorting a mixture capable of evolving gas and producing carbid material, reducing the said material to carbid in an electrical furnace, heating such carbid in a container, utilizing at least some of the gases produced in the retorting and carbid-producing operation as fuel for heating the retort and the container and for the production of electrical energy for the carbid reaction, and nitrifying the carbid in such container by nitrogen obtained from the products of combustion of at least a part of such fuel.

2. The process of producing nitrified material which comprises retorting a mixture capable of evolving gas and producing carbid material, reducing the said material to carbid in an electrical furnace, heating such carbid in a container, utilizing at least some of the gases produced in the retorting and carbid-producing operation as fuel for heating the retort and the container, and nitrifying the carbid in such container by nitrogen obtained from the products of combustion of at least a part of such fuel.

3. The process of making nitrified material which comprises retorting a mixture capable of evolving gas and producing carbid material to produce such material and such gas, reducing such mixture to produce carbid, using at least some of the gases evolved in the retorting and reducing operations as a fuel for the retorting operation, collecting nitrogen from the combustion of such gaseous fuel, and nitrifying the carbid with such nitrogen and by heat developed by the combustion of a part of such fuel.

4. The process of making nitrified material which comprises heating in a retort closed to the atmosphere a mixture capable of evolving a combustible gas and producing carbid material, reducing such material to carbid, heating such carbid in a container in the presence of nitrogen, and utilizing at least some of the gases produced in both the retorting and the carbid-producing operations for the purpose of heating such retort and container.

5. The process of making nitrified material which comprises retorting a mixture to form a solid product and a combustible gas, furnacing the solid product to form a product capable of being nitrified and a combustible gas, and using at least a portion of the gases from such heating operations as fuel to heat the retort.

6. The process of making nitrified material which comprises retorting a mixture to form a combustible gas and an intermediate product, furnacing said product to form a combustible gas and a subsequent product, and using the gases from both the retorting and the furnacing operations as fuel for the development of heat for performing said operations.

In testimony whereof, I hereunto affix my signature.

JAMES HENRY REID.