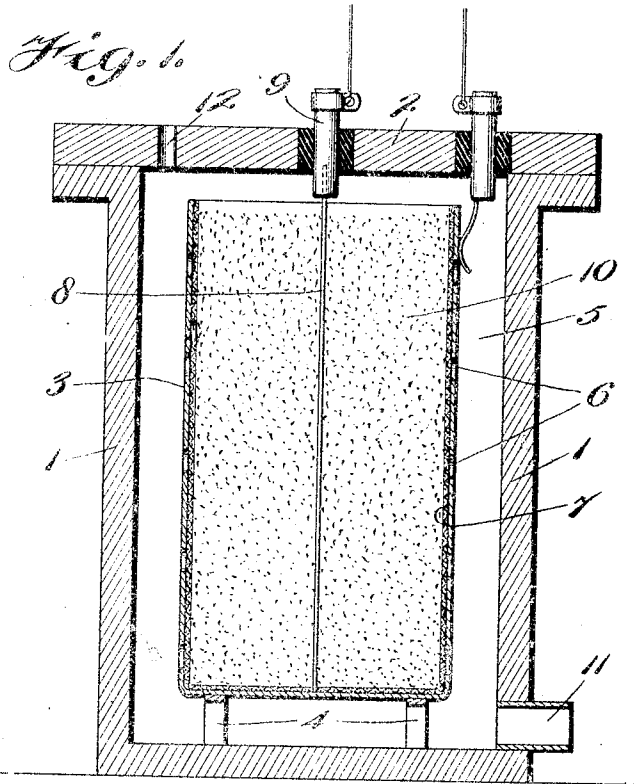
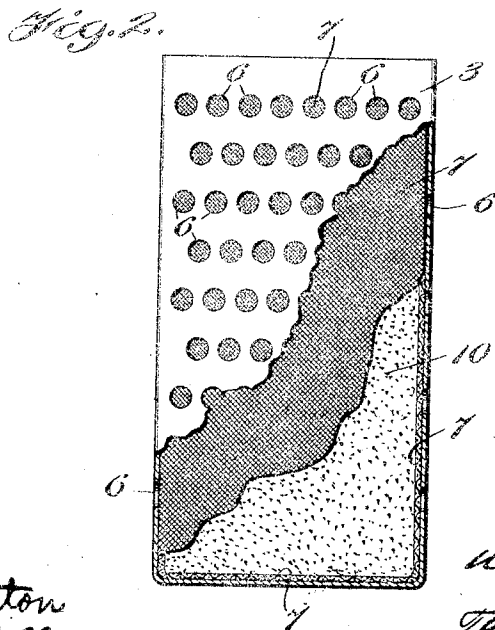


W. S. LANDIS.
METHOD AND MEANS FOR FIXING NITROGEN.
APPLICATION FILED APR. 3, 1914

1,103,060.

Patented July 14, 1914.



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UNITED STATES PATENT OFFICE.

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METHOD AND MEANS FOR FIXING NITROGEN.

1,103,060.

Specification of Letters Patent.

Patented July 14, 1914.

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To all whom it may concern:

Be it known that I, WALTER S. LANDIS, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Methods and Means for Fixing Nitrogen; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process of and apparatus for fixing atmospheric nitrogen and has for its object to render more efficient the method and apparatus now in use, as well as to shorten the time required to make commercial calcium cyanamid.

With these and other objects in view the invention consists in the novel steps constituting my process and in the novel apparatus for carrying out the same, all as will be more fully herein disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views Figure 1 is diagrammatic sectional view of an apparatus suitable for carrying out my process and Fig. 2 is a sectional view of the inner can or container illustrating its foraminous nature.

1 represents any suitable furnace, but preferably lined with refractory material and also provided with a lid 2. Inside the vessel 1 I provide the foraminous vessel 3 for holding the carbid 10 and support the said vessel 3 in any suitable manner as by blocks 4, leaving an annular space 5 between the vessels 1 and 3. The said foraminous vessel 3 is provided with holes 6 of rather large size through its walls for the purpose of freely admitting nitrogen therethrough. These holes may be in some instances as large as three-quarters of an inch to one inch in diameter, and of course their shape and relative arrangement is immaterial. Inside the said foraminous vessel 3 I hang a bag 7 preferably made of a textile fabric thus effectively closing the perforations 6 against the sifting of the finely ground carbid, and yet do not materially increase the resistance of the flow of nitrogen through the perforations 6 and the interstices of the fabric or bag 7. It is further evident of

course that the bag 7 need not be actually formed into a bag, for the mere placing of a fabric over the perforations 6 is sufficient.

8 represents a resistor directly embedded in the carbid mass 10 and preferably provided with an enlarged head 9. A convenient expedient is found in an electrical connection between the lower end of the resistor and the bottom of the conducting container 3, so that the said container may form a portion of the circuit passing through the said resistor 8. In some cases I prefer to use a plurality of resistors directly embedded in the carbid mass and when I do this I may provide still other circuits.

11 represents any suitable means for admitting nitrogen to the space 5 and perforations 6, while 12 represents any suitable vent for the escaping gases.

In practice the charge is ignited by bringing the resistor 8 to a temperature sufficient to cause a reaction between the carbid and nitrogen; and I have discovered that without the employment of the perforations 6 substantially all of the nitrogen which reaches the mass comes in through the open top of the vessel 3, but by providing the porous fabric 7 and the perforations 6 I am enabled to admit the nitrogen through the sides as well as through the bottom of the vessel 3 when it is desired to do so and therefore I am enabled to greatly lessen the time required for the complete nitrification of the mass, while at no time do I offer any hindrance to the normal flow of nitrogen through the interstices of the charge.

It is evident that the nitrogen has to travel the greatest distance through the reacting mass at the beginning of the reaction which reaction starts only around the resistor and therefore at that time I desire to eliminate as much as possible the resistance to this flow of nitrogen. Accordingly by the substitution of a textile fabric for the previously used paper in vessels such as 3 I overcome to a large extent the resistance which has been heretofore offered to the flow of this nitrogen and because I have discovered that the paper does not become permeable to nitrogen until it is burned away which is many hours after the reaction has started. By the employment of my loosely woven textile fabric on the other hand the mass is just as porous or the resistance to the passage of

nitrogen is just as small at the beginning of the reaction as it is when the said fabric is burned away. In some instances instead of using a combustible fabric such as 7 I may use one of a non-inflammable nature so that it could be repeatedly used for different runs.

It is obvious that those skilled in the art may vary the details of my process as well as the arrangement of parts of my apparatus without departing from the spirit of my invention and therefore I do not wish to be limited to the above disclosure except as may be required by the claims.

What I claim is:

15 1. The process of fixing atmospheric nitrogen which consists in providing a carbide charge; feeding nitrogen to said charge; providing a plurality of free passages for said nitrogen to said charge at its sides and equally distant from its center, and suitably igniting said charge, substantially as described.

25 2. The process of fixing atmospheric nitrogen which consists in providing a charge of calcium carbide; feeding nitrogen to said charge; providing a plurality of passages for said nitrogen to said charge equally distant from a line passing through its center; and electrically heating a portion of said charge to the point of ignition, substantially as described.

30 3. In an apparatus for fixing atmospheric nitrogen the combination of an outer vessel; an inner perforated vessel, adapted to con-

tain a charge of calcium carbide; means for feeding nitrogen to the perforations in said inner vessel; foraminous means associated with said inner vessel to prevent said carbide from passing through said perforations; and means to ignite said charge.

40 4. In an apparatus for fixing atmospheric nitrogen the combination of an outer vessel; an inner perforated vessel, adapted to contain a charge of calcium carbide; means for feeding nitrogen to the perforations in said inner vessel; foraminous means comprising a fabric associated with said inner vessel to prevent said carbide from passing through said perforations; and means comprising a resistor to ignite said charge, substantially as described.

50 5. In an apparatus for fixing atmospheric nitrogen the combination of an outer vessel provided with means for admitting nitrogen thereto; an inner vessel having perforations through its walls; a porous fabric inside said inner vessel closing said perforations and adapted to prevent a charge of carbide from passing through said perforations; and a resistor adapted to be embedded in said charge and provided with an enlarged upper portion, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

WALTER S. LANDIS.

Witnesses:

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