

## THE FIXATION OF ATMOSPHERIC NITROGEN.

Test run by Frank J. Buck  
on Lime owned by  
Col. Ed Fletcher ( El Cajon Ranch)  
San Diego County, California.

Twenty years ago Sir William Crookes in his speech to the British Association made the startling statement that the world was rapidly approaching starvation thro the concentration of an increasing population into cities and consequent multiplication of food demands upon each acre of tilled land. He pointed out that the grain-eating habit of mankind was rapidly robbing the soil of its nitrogen; that there was not enough available to keep the race going. He foresaw starvation and famine. It served its purpose by focussing the attention of economists and scientists sharply upon the immediate importance of what had heretofore been regarded as of merely academic interest - the problem of "fixing" atmospheric nitrogen.

The British scientist called particular attention to the inexhaustible store of this element which comprises four-fifths of the atmospheric air, and suggested this as the most promising field for research.

While the rest of world was thinking of nitrogen in terms of agriculture, Germany was already thinking in terms of gunpowder and explosives. The German plants are capable of turning out about sixty thousand (60,000) tons of atmospheric nitrogen products annually; she had developed the production of by-product nitric acid from coal to a large output and was possessed of a cheap method of converting ammonia into nitric acid, the form in which nitrogen is required for the manufacture of explosives. With these resources fully developed and a supply of nitrates accumulated Germany went to War.

600,000 tons of Chile nitrates may be taken as the normal peace-time requirement of American agriculture. In 1917 we imported 1,365,000 tons and still the war department has not enough nitrogen for military purposes. Plants for nitrogen fixation are being built at Sheffield, Alabama using steam power. This is for the production of synthetic ammonia-will produce about 60,000 pounds a day.

### THE HABER PROCESS

of atmospheric nitrogen fixation by passing hydrogen gas under pressure thro a chamber electrically heated, resulting in the nitrogen of the air combining with the hydrogen to form

-2-

"NH<sub>3</sub>" ammonia. Its operation depends on sufficient supply of hydrogen gas.

### CYANIMID PROCESS

used in the United States is based on the fact that calcium (lime) carbide - may be induced with comparative ease at a high temperature to absorb nitrogen which has been liberated from the air. This is pumped to electric heated ovens and absorbed by the carbide, making a compound known commercially as cyanimid, a valuable fertilizer. It takes one continuous electric horse power to produce two tons of cyanimid annually.

### THE BIRKELAND -EYDE PROCESS.

The sample No. 1 - "marked direct method" was treated by this process, which gives nitrate of lime as a finished produce, also known as the electric arc process of decomposing air by passing it thro an enormous flaming arc at a temperature up to 6000°F. This is the process used in Norway, and has been in successful operation for years, wide publicity and statements saying the process could not be used in other countries successfully now is known to have been German propaganda, having for its purpose the discouragement of nitrogen fixation in other countries.

Sample No 2 "marked synthetic" made by process known as catalyst. Pass a mixture of ammonia (NH<sub>3</sub>) and air thro a heated chamber at the end of which is a platinum screen, or sponge serving as a catalyst and presto the oxygen of the air replaces the hydrogen of the ammonia and we have nitric acid "HNO<sub>3</sub>"

This was one of the German camouflaged patents which I became familiar with while studying at Freiberg.

### RESULT OF TEST.

Your rock being a carbonate of lime has given a produce somewhat different to any I have had experience with heretofore. The product does not crystalize out but remains damp. The nitrogen contents can only be determined by analysis, which I am not equipped to make, would advise same to be made by Wrana-King of Los Angeles.

Should the nitrogen content prove satisfactory the commercial success of your proposition then depends upon cost of electric current, which can be easily determined. Nitrogen gas from electric arc machine was passed thro the lime seventy two hours. In case the nitrogen content should be satisfactory I would advise you to install a small plant, say, to produce from 300 to 500 pounds per day, thus determine suitable process, cost of manufacture, etc.

Sincerely

Frank J. Buck,  
Metallurgical Engineer,  
1227-17th St.  
SAN DIEGO, CAL.

*Thru  
Lime  
deposits*

Have samples analyzed for

CALCIUM NITRATE

NITROGEN % N

• % NH<sub>3</sub>

• % N<sub>2</sub>O<sub>5</sub>

FREE NITROGEN (N) %

By Wrana King Company (Analytical Chemists)

Laboratory

822 East Third St.,

Los Angeles, California.

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San Diego Co. Cal

Twenty years ago Sir William Crookes in his speech to the British Association made the startling statement that the world was rapidly approaching starvation thro' the concentration of an increasing population into cities and consequent multiplication of food demands upon each acre of tilled land. He pointed out that the grain-eating habit of mankind was rapidly robbing the soil of its nitrogen. That there was not enough available to keep the race going. He foresaw starvation and famine. It served its purpose by focusing the attention of economists and scientists sharply upon the immediate importance of what had heretofore been regarded as of merely academic interest. The problem of "fixing" atmospheric nitrogen. The British scientist called

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still the war department has not enough nitrogen for military purposes. - Plants for nitrogen fixation are being built at Sheffield Alabama using steam power. This is for the production of synthetic ammonia, which will produce about 60,000 pounds a day.

The Haber <sup>Nitrogen</sup> Process of atmospheric fixation by passing Hydrogen gas under pressure thro' a chamber electrically heated, resulting in the Nitrogen of the air combining with the Hydrogen to form "NH<sub>3</sub>" ammonia. Its operation depends on sufficient supply of hydrogen gas.

Cyanamid Process used in the United States is based on the fact that Calcium (lime) Carbide may be induced with comparative ease at a high temperature to absorb nitrogen which has been liberated from the air. This is pumped to electric heated ovens and absorbed by the Carbide, making a compound known commercially as cyanamid a valuable fertilizer.

It takes one continuous electric horse power to produce two tons of cyanamide annually.

The Birkeland-Eyde process.

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Result of test.

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Frank J. Buck  
Metallurgical Engineer,  
1227-17th St

Have samples  
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calcium Nitrate

San Diego Calif

- Nitrogen % N
- = % NH<sub>3</sub>
- = % N<sub>2</sub>O<sub>5</sub>
- Free Nitrogen (N) %

By Wrana King Co (analytical chemists)  
Laboratory  
822 EAST THIRD ST  
Los Angeles Calif

**Ed Fletcher Papers**

**1870-1955**

**MSS.81**

**Box: 36 Folder: 2**

**Business Records - Reports - Buck, Frank  
J. "The Fixation of Atmospheric Nitrogen"**



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