ON THE FORMATION OF AMMONIUM THIOSULPHATE IN GAS GENERATORS.

By Dr. H. Endemann.

Mr. A. Faber du Faur, a metallurgist of this city, erected a short time ago a gas generator in which air forced through anthracite coal was converted into a mixture of carbon monoxide and nitrogen, which was to be used for certain metallurgical operations.

As a blast for the generators a Korting steam blower was used, so that a certain amount of steam entered with the air. This steam was quite wet, to such an extent that the under part of the generator was in a short time blown cold, while the heat was developed only in the upper parts. The gases so produced passed from the generator through a 30-inch main of $\frac{3}{16}$ inch boiler plate, and thence through branches to places where the gas was to be utilized. In the main pipe as well as in the branches, much liquid condensed, which was drawn off from time to time, and where the liquid had a chance to pass through joints long stalactites of light pink color were formed.

I have examined these stalactites, and found that they consisted principally of ammonium thiosulphate. The sulphur for this combination came evidently from the anthracite coal, while the nitrogen of the ammonium was derived from the air and the hydrogen from the water.

I look upon the formation of this compound as being as follows:

The upright generators contain layers of anthracite coal in different stages of decomposition and combustion. The lower, hottest layer of the coal produces at first carbon dioxide, which in the upper layers is reduced to carbon monoxide. The pyrites of the anthracite coal is in the upper layers simply decomposed by heat into FeS and S. This sulphur passes off with the gases. The FeS in its downward march encounters then free oxygen, and oxide of iron and sulphur dioxide are formed, which latter passes on likewise with the gases. Some of the water

is decomposed by the carbon of the anthracite coal forming hydrogen, a part of which may be found in the gases, while another portion in the presence of atmospheric nitrogen is converted into ammonia. Along with the gases, carbon monoxide, hydrogen, and nitrogen, we have therefore a number of condensable substances to pass into the main, namely water, sulphur, sulphur dioxide and ammonia.

When condensation takes place these substances unite as follows:

$$SO_2 + S + H_2O + 2NH_3 = SO_2 \begin{matrix} \diagup S—NH_4 \\ \diagdown O—NH_4 \end{matrix}$$

The product, with an excess of water, forms a solution.

There is nothing especially new in the reaction. That alkaline sulphites in solution dissolve sulphur, forming thiosulphates, is known. The formation of ammonia from nitrogen and hydrogen at great heat is likewise conceded, and it may be even considered more likely of formation, since the hydrogen is here in the nascent state, while experiments regarding this reaction were made with mixtures of gases. But even the fact that during the combustion of non-nitrogenous compounds in air, ammonia is formed, is established.

It is likewise an established fact that iron pyrites loses first one atom of sulphur when heated in the absence of oxygen, and the second atom only during true combustion.

The gas producer has since been altered by the introduction of a fan blast in the place of a steam blast and the condensation and formation of this by-product has ceased. A white dry powder, which is now found in the flues, proved to be nothing but ashes, which had been carried along by the rapid movement of the gases.