Certain Combustion Products of Natural Gas. By P. N. Evans.

The specimen of material shown was deposited in the course of about three months in a galvanized iron pipe over a natural gas burner in LaFayette, the total quantity being about 500 grams. When first formed the material was waxy in character and accumulated at the lower end of the pipe, which was about four feet in height, but on standing for some months in a closed bottle it became hard and brittle.

Its strong, disagreeable, fishy odor made it seem worth examining, since it was quite unexpected considering the circumstances of formation, resembling trimethylamine, which gives the peculiar odor to herring brine.

As might be expected, the usual tests showed the presence of zinc and iron in the ferrous condition. The material is for the most part soluble in water, the slight insoluble residue having the appearance of oxide of iron.

Barium chloride showed the presence of considerable quantities of sulphate, and on warming with concentrated sulphuric acid the odor of sulphur dioxide was very evident, the evolved gas readily darkening paper moistened with mercurous nitrate, but not darkening lead acetate, showing the presence of sulphites, but not sulphides; the aqueous extract also instantly decolorized a solution of iodine and of iodine and starch. That the sulphur dioxide was not derived by reduction from the sulphuric acid used was shown by the same reactions when hydrochloric acid was substituted.

None of these constituents—iron, zinc, sulphuric and sulphurous acids—were unexpected; neither did they account for the odor. The presence of nitrogen, however, was a surprise, considering that its only source was the free nitrogen of the air and that of the natural gas, which is supposed to contain only very small quantities of the element and in the free state. On warming the substance with a solution of potassium or sodium hydroxide the odor of ammonia was very evident, accompanied by the original fishy smell not noticed when warmed with acid.

To remove all doubt of the formation of ammonia and to learn whether it was accompanied by any considerable quantity of any amine, about 15 grams of the material were distilled with sodium hydroxide and the steam passed into dilute hydrochloric acid. The boiling was continued about 30 minutes, and then the distillate was evaporated to dryness. The residue in the distilling flask retained its fishy odor unimpaired, while the distillate had a very disagreeable odor resembling decaying cabbage. The

residue obtained from the distillate was considerable in quantity and gave about 1.5 grams of a yellow platinum compound, which showed on ignition a percentage of 43.52 and 43.55 of platinum in two determinations. The platinum in ammonium chloroplatinate amounts to 43.92 per cent.

These experiments showed, then, about .5 per cent. of nitrogen as ammonia in the deposit—the main point of this communication.

Attempts to show the presence of primary amines by the isocyanide reaction failed, and nothing but the odor seemed to indicate the presence of amines of any kind. A deposit formed in an iron (not galvanized) pipe under similar conditions had little or no odor.

Direct Nitration of the Paraffins. R. A. Worstall.

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Evolution of Free Nitrogen in Bacterial Fermentations. A Preliminary Paper on the Composition of the Gas Evolved in Bacterial Fermentations. By Sevfrance Burrage and A. Hugh Bryan.

During the study of certain species of bacteria in the bacteriological laboratory at Purdue last year, Miss Clara Cunningham found one that produced an enormous amount of gas in fermentation tubes. In fact, the evolution of gas was so rapid and profuse as to attract immediate attention as something extraordinary. The bacillus responsible for this had been separated from sugar beet. It was thought to be of sufficient interest to have the gas analyzed, which was done. The gas was found to be made up of CO_2, H, O and a residual gas which was presumed to be nitrogen. But the occurrence of free nitrogen in this way and in this comparatively large proportion is rare and unusual, and it raised the question whether this could really be nitrogen. No positive test had been made. Every other possible gas had been shown to be present or absent, and nitrogen and argon were all the possibilities remaining. This seemed to be sufficient proof for the chemist, but the bacteriologist wanted a positive proof for nitrogen, which was made, and the nitrogen was found.

In looking up the literature on the subject very little was learned. Nitrogen had been found in a few cases, but no positive tests given. And in some of these cases, on account of the small amount of the nitrogen