250° F. this process would seem to offer the simplest and most inexpensive means of removing from illuminating gas the larger portion of the bisulfide of carbon which it still contains after the treatment ordinarily given to it in gas works, whenever the amount of this impurity present is sufficiently large to make it important that it should be reduced.

84 WILLIAM STREET, NEW YORK

CHEMISTRY AN IMPORTANT FACTOR IN THE FERTILIZER INDUSTRY¹

By J. E. BRECKENRIDGE

Not so many years ago the fertilizer manufacturer looked upon the chemist as a non-producing something, which was a necessary evil. Friction continually existed between superintendent and chemist, the superintendent being sure that materials were batched on correct weights and that the chemist was wrong if the analyses did not come up to the guarantee. In one factory where a man inspected the cars of tankage as they were received and classed them by looks, as 8, 9 or 10 per cent goods, the superintendent said that this man could guess nearer than the chemist could test. Such conditions were not unusual in factory management. Rock, acid, potash salts and ammoniates were all combined wet, and it was not unusual to have to allow 10 per cent excess for potash, because it would not show as water-soluble in the final product. No account was taken of the actual chemical action when phosphate rock containing iron, alumina, silica and fluorine was mixed with sulfuric acid and potash salts added.

Conditions at the present time are entirely changed. Successful manufacturers insist that superintendent and chemist work together, and that all chemical action influencing the analysis of mixed fertilizers be carefully watched so that there shall be the greatest efficiency of the materials used. The superintendent should be held responsible for the pounds received of phosphoric acid, potash in terms of K_2O , and nitrogen, and unless conditions affecting the loss of available phosphoric acid, water-soluble potash and nitrogen are understood, the greatest efficiency will not be realized.

The manufacture of acid phosphate is one of the oldest processes now in use in the industry. Not long ago, we were satisfied with 16 per cent available phosphoric acid from 66 per cent calcium phosphate Florida rock. Now we are not satisfied unless we get 17 to 17.5 per cent available from the same grade of rock. Then it was unheard of to obtain 16 per cent available phosphoric acid from 62 to 63 per cent calcium phosphate Charleston rock; now this is possible. Such results are entirely due to taking advantage of every possible condition which affects chemical reaction, such as fineness of rock, strength of acid, time of mixing and manipulation of acid phosphate from dens to storage.

The possibilities of phosphoric acid compounds from phosphate rock and sulfuric acid have hardly been considered, due largely to the presence of arsenic. This condition no longer exists, as it is possible to reduce the arsenic content in phos-

phoric acid made from phosphate rock and sulfuric acid to a percentage that will pass the pure food standard. Hence, chemistry aids the fertilizer industry by producing the phosphoric acid not only for the soil, but for general phosphoric acid compounds. Again, electrochemistry offers, to the fertilizer industry, possibilities of securing very high temperatures and thus rendering available the phosphoric acid in refractory minerals. Fluorine compounds are now being made from the flue gases from acid phosphate manufacture, which has been made possible only by taking advantage of chemical reaction.

Chemistry has made rapid strides for the benefit of the industry from the nitrogen standpoint. We no longer have to rely on animal, mineral and vegetable ammoniates, since nitrogen recovered from the air helps to increase the supply and thus regulate prices. Chemistry has increased the nitrogen supply available for soil by giving us the conditions necessary for rendering inert nitrogen available, thus allowing us to use many waste materials.

Nature has accomplished most for the industry in regard to potash, for the natural deposits seem to outclass anything that has been done in giving us supply of this element. Possibilities of feldspar and alunite potash are still in the distance, as well as the recovery of beet sugar molasses potash by passing the molasses over zeolites, when the potash is said to be held so that it can be recovered from the zeolite.

Chemistry again gives promise of potash from kelp, where the actual cost of the potash may be reduced by the income from by-products. Cement furnaces also are being investigated, where it may be possible to volatilize and recover the potash contained in the raw materials.

Chemistry has an important place in the fertilizer industry in relation to the conditions which affect drilling of fertilizers. If the materials at hand were always the same as to chemical composition, little trouble would be experienced in mixing them. But there are so many varying materials, and so many varying compositions, that unless foresight is used as to the chemical reactions possible where materials are mixed, serious trouble will result.

Chemistry again aids the fertilizer industry in chemical engineering problems that are common to power plants.

Chemistry is the basis of all commercial values in the fertilizer industry. Where we consider that profits may be easily turned to losses by incorrect chemical work, it must be realized that the fertilizer manufacturers must have able and competent chemists to do their work.

There is much work ahead in the fertilizer industry. Unless every effort is used to develop reliable methods for chemical analysis, and research work is carried on to increase the supply of fertilizer materials, and unless chemical conditions affecting fertilizer manufacture are carefully studied to the end that greatest efficiency be gained, the chemist will not have done his part in the development of this industry.

CARTERET, NEW JERSEY

OBITUARIES

HERMAN FRASCH

With deep regret we record the death of Mr. Herman Frasch, the distinguished chemical engineer, which occurred in Paris, on May 1, 1914.

Mr. Frasch was born in Gaildorf, in Wurtemberg, in 1852, and received his early education as an apothecary in Germany. In 1868, he came to America and was, for a time, in charge of the laboratory of Professor Maisch of the Philadelphia College of Pharmacy. Being particularly interested in Industrial Chem-

¹ Chairman's address, Fertilizer Chemistry Division, 49th Meeting A. C. S., Cincinnati, April 6-10, 1914.

istry, he established a laboratory in Philadelphia, in 1874, in which he began a series of investigations which led to some of the most brilliant achievements in the field of chemical engineering.

His first invention was a process for refining paraffin wax in 1876. This process was a great success and was followed by his invention of a process for the refining of the sulfur oils of the Canadian, Ohio, and Illinois fields. Previous to this invention, these inferior oils had a very low market value and were limited to use as fuel oils. In 1885, he organized the Empire Oil Company and established a small refinery at London, On-