

ERNEST SOLVAY.

Ernest Solvay was born at Rebecq, in the Province of Brabant, on April 16, 1838, as the son of Alexandre Solvay, quarry proprietor and Vice-President of the Chamber of Commerce of Nivelles; he died at Brussels on May 26, 1922. Although he had no opportunities for obtaining a university education, he became in 1859 assistant manager of the Gas Company of Saint Josse ten Noord, Brussels, under his uncle; whilst acting in this capacity he became interested in the manufacture of soda, probably because his father carried on the refinement of common salt on a small industrial scale. Previous to this time sodium carbonate had been manufactured exclusively by the process advocated by Leblanc in 1790, in which sodium carbonate was produced from common salt by aid of the following reactions:—

1. $2\text{NaCl} + \text{H}_2\text{SO}_4 = \text{Na}_2\text{SO}_4 + 2\text{HCl}$.
2. $\text{Na}_2\text{SO}_4 + \text{CaCO}_3 + 2\text{C} = \text{Na}_2\text{CO}_3 + \text{CaS} + 2\text{CO}_2$.

The Leblanc process derived its importance from the French revolutionary wars, which impeded importation, and later inquiries seem to indicate that it was invented by Dizé on the basis of previous work by Bryan Higgins, Méthérie and others; it is clear, however, that Leblanc first carried the process into successful practice, and the works which he established in partnership with the Duke of Orleans at St. Denis did well until this nobleman was decapitated in 1793 and the factory confiscated. The troubled state of France during this epoch was unfavourable to chemical enterprise, and Leblanc committed suicide in 1806. In due course, however, the Leblanc process became the standard method for manufacturing soda, and remained without a competitor until Solvay established the ammonia-soda process on an industrial scale at a small works near Charleroi in 1863. Solvay had supposed that his process, patented in 1861, was entirely novel; it transpired later that the physicist Fresnel had used it in 1811, and that D. H. G. Dyar and J. Hemming had obtained an English patent for it in 1838. Whilst these and other anticipations of novelty cannot be denied, it is clear that Solvay was the inventor in the sense that he was the first actually to succeed in establishing the process economically on an industrial scale.

The ammonia-soda process consists in carrying out the following reactions:—

1. $\text{NaCl} + \text{NH}_4\text{HCO}_3 = \text{NaHCO}_3 + \text{NH}_4\text{Cl}$.
2. $2\text{NaHCO}_3 = \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$.

A consideration of the technical aspects of the reactions involved in the Leblanc and the Solvay processes at once reveals a difference in type. It transpired ultimately that no vast economy in cost of manufacture accompanied the transition from the Leblanc to the Solvay process; the former, however, necessitates an intricate organisation for dealing economically with the auxiliary products, whilst the latter is to a large extent self-contained in that the ammonia and carbon dioxide concerned can be re-absorbed in the cycle of manufacturing operations. The tenacity of life exhibited by the Leblanc process in face of the attacks of its new competitor is largely attributable to the commercial and technical skill which were exercised, particularly in this country, in dealing with the by-products. In the end, the Solvay process yielded some 95 per cent. of the world's production of soda; at the present moment, it is in course of replacement by a newer process based upon the electrolytic decomposition of sodium chloride.

Whilst struggling to establish his process Solvay became acquainted in 1872 with Ludwig Mond, who

was about his own age, and who, in partnership with the late Sir John T. Brunner, purchased the Winnington Park Estate at Northwich from the late Lord Stanley, and installed the ammonia-soda process; the situation of the new works was chosen with a view to the utilisation of the Cheshire salt brines. The Solvay process became a success, and is now in large-scale operation all over the world; from its production of about 3500 tons in 1872, it achieved an output in 1903 of 1,600,000 tons out of the 1,700,000 tons which represented the whole world's production. Naturally much had to be done to perfect details connected with the process, and it is interesting to note the recurrence in the history of the Solvay process of many names, such as Brunner, Mond, Tennant, Gossage, Deacon, Muspratt and James Young, which are inseparably associated with the development of the heavy chemical industry in Great Britain.

Notwithstanding his unorganised scientific education and the absorbing character of his industrial activities, Ernest Solvay was a person of wide sympathies, intensely interested in the higher developments of scientific thought and philosophy and incessant in his efforts to promote the material and intellectual progress of the whole world. The great war came as a great shock to the views which he had formed from contact with men of all nationalities as to the manner in which the future development of civilised humanity was to proceed. The great wealth which accrued from his industrial enterprises enabled Solvay in his later days to furnish very material support to many causes which he held very dear. In August, 1914, when the necessities of modern warfare led the Germans to remove what was of great value from, or to destroy the contents of the unique library, and to pillage the collection of medals of the Royal Academy of Belgium preserved in the Palais des Académies at Brussels, Solvay provided the funds which were required to keep in being the premier organisation of an intellectual character in Belgium. He was keenly interested in what he termed the problems of life and of social questions; he published many pamphlets from 1892 onwards on these matters, notably on "Le rôle de l'électricité dans les phénomènes de la vie," "Le comptabilisme," "Le productivisme social," and "Notes sur des formules d'énergétique physio- et psycho-sociologique." In 1893, during the revision of the constitution of Belgium, he was elected to the Senate by the Liberal Party; in 1897 he was again elected, and his speeches in the Senate on labour, death duties and just modes of taxation attracted great attention by reason of their breadth of outlook and their intense human sympathies. His desire to promote scientific development led him to found and to finance a number of institutions in Brussels for the promotion of scientific effort; he established the Solvay Society of Brussels and the Solvay Institutes of Physiology, Sociology, Physics and Chemistry. The Solvay International Institute of Physics was inaugurated in 1912 with the aid of a capital of 1,000,000 francs, to be expended by 1949, for the purpose of assisting the development of physical science, partly by defraying the expenses of research workers, partly by the holding of periodical conferences at which some twenty-five eminent physicists should discuss the larger physical problems. Several such conferences have been held and the verbatim reports of the meetings are of the utmost interest. An analogous chemical foundation was established under similar conditions in 1921, with a capital gift of 1,000,000 francs, and its first meeting was held in the Solvay Institute at the Parc Leopold, Brussels, in April of this year, M. Solvay himself being present at the discussions.

Although Ernest Solvay was of a very retiring disposition and shunned publicity, he received many well-deserved honours. The present King of the Belgians appointed him a Minister of State and a Grand Commander of the Order of Leopold; he received the Lavoisier Medal of the French Institute and the grand medal of the University of Paris. He was a Chevalier of the Legion of Honour, a corresponding member of the French Academy of Sciences, and an honorary member of the American, Dutch and French Chemical Societies and of the Royal Institution of London. He was an honorary member of the administrative council and a doctor, *honoris causa*, of the University of Brussels. It may be noted that he was an ardent mountaineer; at the age of 65 he repeated his previous ascents of Mont Cervin, and when 68 years old crossed the Grépon in the Charmoz group of Mont Blanc.

W. J. PORE.

THE HOME DYESTUFFS INDUSTRY.

E. F. ARMSTRONG.

Questions relating to the home dyo industry are still being actively discussed in both chemical and political circles. The machinery set up under the Dyestuffs Act, in particular the Licensing Committee, which has now been at work for 15 months, has had time to get properly into motion, and the moment appears opportune to attempt a review of the present situation from a standpoint as free as possible from bias, but yet representative of the views of the chemical community. An open letter, dated May, 1922, addressed by Mr. James Morton to his friends the Free Trade Members of Parliament will serve as a peg on which to hang the discourse. Mr. Morton's credentials are well known; as a colour-user before the war he produced fabrics and carpets of great beauty and artistic merit, using dyestuffs of which fastness to light was the outstanding quality. During the war he set out to produce these colours himself with a courage and an enthusiasm which both deserved and commanded success. To-day, having made his venture, he finds the present doubtful and the future uncertain. Mr. Morton's personal efforts, ably backed by a loyal band of technical workers, have resulted in the preparation of a certain class of essential colours, in quantity equal to the total demands of the country, and in quality even surpassing the pre-war standard; no British dyemaker has had higher standards.

Mr. Morton attributes the present troubles to the disastrous consequences of the Sunkey judgment, and there can be few who will deny that no legal decision has been more productive of injury to British trade and of unemployment in the chemical, textile and allied industries. He is, however, more concerned with the future. The pledge given by the Government and by the nation to make our dyestuff industry independent of the foreigner is beyond denial, but the mistakes made within the industry, not the least of which are the obvious signs of internal dissension, and the very widespread opposition to the measure, must make the fulfilment of the pledge, in letter and spirit, very difficult to a Coalition Government.

The criticisms of the Dyestuffs Act arise from a variety of causes. The most loudly heard are probably those inspired by the merchant of German and other foreign dyewares. These, though quite understandable, should not be regarded seriously in any quarter. More weighty are the objections of those to whom any form of protection or prohibition is politically anathema. Objections on the score of

price can be dismissed at once as shortsighted: nothing is more certain than that if a German monopoly were to be re-established here prices would rapidly rise again. It must be remembered that whereas before 1914 there was some competition between opposing groups of German dye-makers, to-day there is none; the "I. G." embraces the whole of the German firms. Once the home industry has been set on its feet low prices will be entirely a question of bulk production; the dye industry will be far too much in the limelight to be able to relax its efforts to produce economically. Far more serious in the long run are criticisms based on quality, both as regards standard and variability. The colour-maker must set quality and reliability above all else.

In the past German manufacturers set great store on their methods of instructing the consumer how to use each particular colour. This practice is to-day widely adopted in America in a variety of industries under the name "service systems." The manufacturer seeks to acquire all possible knowledge about the application of his products, and to place this at the disposal of *bona fide* customers. These in turn are often willing to let others inspect their plants, and hence a tendency arises to pool all available information, and the user who is most willing to learn has most to gain from the pool. This procedure certainly results in the greatest gain to the community, and is surely much preferable to the system by which each user works in secrecy and repeats the mistakes of his neighbour.

From the point of view of the chemist, which indeed most requires ventilating in this *Journal*, the chief criticism is that concerning technical control. Whilst nobody denies the progress made by the colour-makers in general, and that of individual firms in particular, colours were made and used before 1914, and it is generally felt that much more might be done, and that much of the development has been on unsound lines. Unfortunately, much capital has been spent unproductively, so that unless drastic writing-down is resorted to, the products will have to bear the burden of heavy overhead charges.

The most prominent factor in the German success has been the leadership of technical and technically-trained men. Much has been written and said to discredit the commercial methods of the German firms, but it is false policy to lose sight of the outstanding fact that technically their achievements were of the very highest order, and that the technical men had the chief, if not the sole, voice in their broad policy.

It is difficult to bring home to the lay mind what every chemist feels, namely, that the colour industry differs from all others in being essentially a scientific industry, and that its control must be largely in the hands of men who combine commercial ability with an intimate knowledge of the problems of the chemical industry and the faculty of leadership; this does not necessarily involve a profound knowledge of the chemistry of the dyes themselves.

Broadly, the problem is to make relatively small quantities of a large number of dyes in a state of reasonable purity from intermediates derived from the products of coal-tar distillation, and to sell these to the consumer at a fair price, at the same time showing him how to use the dyes to the best advantage. The actual consumption of many dyes about which outcry is made is too small to warrant their manufacture in Britain *for Britain only*; in other words, an export as well as a home trade has to be established. In the world's markets the products have to be sold on their merits.

The raw products of the colour industry are derived from the tar-distiller and the two trades should be so correlated that the colour industry