

ledge of the principles of science leads men to look, when an industry is to be developed. The physicist and the engineer had done their part, and now the chemist and the botanist took up the work, and showed that by using certain fertilisers the percentage of sugar in the beet-root could be largely increased. These improvements in the European sugar industry have forced the West Indians to make similar improvements, and those who have failed to do so have gone to the wall. It is not surprising then to hear, from time to time, of the establishment of botanical gardens in various of these islands; and we can also easily understand the anxiety shown by large employers of labour in the same part of the world to facilitate the founding of schools for the education of the labourers' children. They know that, as a rule, education means advance in intelligence, and that this brings with it increased efficiency in *any* kind of work. The industries of a country advance with the technical education of its inhabitants. Imperfect training means imperfect, wasteful methods of doing things. Good training in any branch of industry includes the acquisition of the principles which underlie the art. In order that progress may be made, it is not sufficient to know only the methods at present employed; it is also necessary to know where improvements are needed, where they are possible, and the best way to attempt them. We do not need to go far afield to find instances of disastrous failures in manufacturing enterprises, due to reliance on empirical knowledge.

It is a fact of every-day experience that the method of carrying on any manufacture or other industry must be varied to suit a great many varying circumstances. Mere experience of what has been done will not enable

a man to grapple with these pioneer problems. He must get down to principles. If a man has that commanding native genius which enables him to grasp principles and applications at a glance, he may succeed in surmounting every obstacle to an enterprise; but these men are rare, and the community's prosperity depends on the average man. If the average man depends on knowledge gained from a necessarily limited experience, he is not as likely to be successful as one who has added to experimental knowledge an acquaintance with the laws and those generalizations called laws, which underlie and connect all phenomena. For example, a copper mine is discovered. The ore is very rich, and contains silver as well as copper. An attempt is made to work the ore by a process which has given excellent results with other ores. Expensive plant is set up, but the results are found to be unsatisfactory. This is a *new* ore. There are substances in it which make the old process inapplicable. The average empirical man is floored. He can do nothing without the advice of a scientific metallurgist. The thing is *new*, and requires a reference to the general principles of chemistry and metallurgy. At the Montreal meeting of the British Association for the Advancement of Science, a very noticeable feature in some of the departments was the prominence of great manufacturers as readers of papers and sharers in the discussions of scientific questions. These men dealt with both practical and theoretical questions in a way which convinced the hearer that they were thoroughly at home in both domains. When one listened to such men, and knew who they were, one could better understand the position which England holds as first in metallurgical and in many chemical industries. In the latter, however,