

trades depending upon skill in art, so other trades will be improved and developed by the cultivation of those mental faculties specially employed in their apprehension. Thus the engineer would be better able to obtain the maximum results from his machinery, if he be very familiar with the fundamental laws of mechanics. The dyer will turn out brighter dyes, and better workmanship, if he be acquainted with the principal laws and combinations of chemistry. The gardener, if he study the varied forms of plant-life, and be taught the science of botany. No trade or profession, be it ever so humble, but would be improved, and its functions more skillfully performed, if the workmen engaged in it possessed a knowledge of the scientific principles and theories upon which it depends. Nay, an ignorance of these truths has often been the cause of loss to the employer, and of dire calamity to the workmen. It was soon discovered by the coal-owners near Lille and Charleroi that the workmen who attended the neighbouring technical schools were of estimable value in comparison with the untutored workmen. Their boilers were better heated, and with less coal; accidents were reduced to a minimum; and repairs and stoppage of machinery were less frequent. The firemen, therefore, from the schools of Lille and Charleroi were much sought after. Enhanced wages were paid them; and the most responsible posts given them. How many thousands of our mining population have been hurried into premature graves through ignorance of the simplest scientific principles which a few lessons would teach. In consequence of this, our Government has established a law compelling all mining companies to employ some highly competent and well-informed manager to superintend the mine. He must earn, by examination, a certificate of competency; and must show that he is not only acquainted with the various methods of ventilation, and precautions for checking firedamp, &c., but must have a knowledge of magnetism, electricity, pressures of gases, and fluids. If but the rudiments of these sciences were understood by our mining populations, less fear might be entertained of the occurrence of those sad catastrophes that are constantly casting gloom and desolation over our mining districts. A knowledge of the causes of the calamities would impel men to take greater care not to violate them.

The necessity and urgency of this technical knowledge must be patent to all thinking men. Hitherto, however, legislation has dealt but slightly with it. Commissions have been appointed to investigate and report upon it. Scholarships have been offered for its promotion, notably by Mr. Withworth. An elaborate syllabus has been drawn up by the Society of Arts to encourage its systematic teachings and examinations. Yet no real effort has been made by Government to organise and establish schools where it might have a fair chance of flourishing. There seems, however, at the present time, to be a general uprising throughout the country to the immediate and vital importance of this work. Leeds, Bradford, Bristol, London, and other centres of industry are awaking with strength and earnestness to its necessity. The Artisan's Institute, London, conducted by that indefatigable and earnest friend of the working classes, Rev. Henry Lolly, has proved the necessity and practicability of technical classes. Bristol and Leeds have shown how powerful for good they are upon the staple manufactures of those towns. And Bradford only a few days ago auspiciously inaugurated schools for this teaching, and, with the assistance of their Chamber of Commerce, subscribed readily a £2,000 guarantee fund for their promotion and maintenance. The employed, as well

as employers, of these towns feel deeply that not a moment should be lost if they are to retain the prosperity of their staple industries. They are keenly feeling the powerful competition of continental countries in the production of the goods in which they have long prided themselves as having a supremacy. Germany, France, Switzerland, and even Belgium and Austria are fast treading upon our heels in those manufactures that we have specially plumed ourselves as being peculiarly our own. Nay, some of them are not only abreast of us but are fast outstripping us in the commercial race.

France is beating us in the manufacture of fancy goods and silks. The province of Alsace, owing to its splendid technical schools, is driving Manchester out of the market in its manufacture of prints and calicoes, which are unrivalled for their beauty, brilliancy of colour, and tastefulness of design. The woollen trade of Leeds and Halifax is rapidly departing to the enterprising towns of Saxony; and our iron trade is slowly but surely going to Belgium, France, and Germany. And if we are not quick to amend, we shall find ourselves not only shut out of Continental markets, but even that great emporium of our trade, America, will close its doors against us. Napoleon Bonaparte vented his spleen upon us by stigmatising us as a "nation of shopkeepers." We could afford to quietly smile at this sneer, whilst we manufactured and sold our ridiculous goods. Continental nations soon saw, however, that to be a nation of shopkeepers, of manufacturers, of producers, was to be the guarantee for wealth, power, independence, and comfort. They are, therefore, laudably striving to rival us in the world's markets. They know our exceptional advantages—our island fertile in mineral resources, our people endowed with minds to plan and invent, our attained position, as the first manufacturing country of the world. Our competitors saw that, considering ourselves secure in our position, we had become negligent and apathetic. We had taken to ourselves the motto, "Rest and be thankful." They saw that our weak place was the unskilfulness and inefficiency of our workmen. They, therefore, concluded that to beat us in the race their workmen must have more skilled intelligence than ours. So elaborate and systematic instruction in science and technology of various trades were given. Colossal establishments for the purpose were erected by the benevolence of philanthropists and the wise foresight of Governments. Chemnitz Technical School, with its seven hundred students; Stuttgart, with its thousand joiners, masons, and engineers; Vienna, with its twelve hundred workmen students; Malhausen, Lubec, Lyons, Lille, and other large centres of industry are turning out educated and skilled workmen both in the manipulatory and theoretical departments of their various trades. The buildings for the tuition of these men are being erected almost regardless of expense. The new "Gewerbe Schule" at Chemnitz will cost £80,000, and will be maintained by an annual grant of £7,000 from Government. At Elberfeld the school building cost £20,000; and the Barmen School £15,000. Other schools are in projection, to cost even more than these. These facts mainly account for the sudden advancement Germany and other countries have made in the commerce of the world.

Of course, there are factors in the argument to account for this rapid progress of the continent, and apparent decline of England, in commerce and trade. The elaborate system of trades' unions, of employers' unions, of strikes and lock-outs in this country, have tended to increase the price of our productions, and so