

the masters of workshops, sub-managers, foremen, and even workmen."

Our article, thus far, consists mainly of extracts from or opinions of eminent British jurors, or manufacturers, at the Paris Exhibition; and as these opinions will carry with them infinitely more weight than any we can ourselves advance on this to us important subject, we have no hesitation in thus placing them before our readers. The letters in full, from which the extracts are made, will be found in the *London Engineer* of July 12th to August the 9th, and will well repay a careful perusal.

On the value of a thorough scientific training to the manufacturer, Mr. Young thus writes:—

"England for a long time excelled all other countries in the finish of her machines; but we now find that foreign machine makers are rapidly approaching us in finish, and having skilled and intelligent labour cheaper than ourselves, are progressing in all the elements of manufactures.

"Permit me to use my own case as an illustration. Originally I was a working man, but have succeeded in increasing the range of manufacturing industry. The foundation of my success consisted in my having been fortunately attached to the laboratory of the Andersonian University in Glasgow, where I learned chemistry under Graham, and natural philosophy and other subjects under the respective professors. This knowledge gave me the power of improving the chemical manufactures into which I afterwards passed as a servant, and ultimately led to my being the founder of a new branch of industry, and owner of the largest chemical manufacturing works of the Kingdom. It would be most ungrateful of me if I did not recognise the importance of scientific and technical education in improving and advancing manufactures. Many men without such education have made inventions and improvements, but they have struggled against enormous difficulties, which only a powerful genius could overcome, and they have been sensible of the obstacles to their progress. Stephenson, who so greatly improved locomotives, had to be his own instructor, but he sent his son Robert to Edinburgh University, and the son did works at least as great as his father and with far less difficulty to himself."

In another portion of this number we publish a paper by Mr. Kitson, of Leeds, on "The Paris Exhibition in its relation to industrial instruction."

Although Mr. Kitson there maintains that England is yet "able to hold her own" in manufactures, a fact of which we have not a doubt, he yet admits the pressing necessity that devolves upon the government of Britain, to provide a higher class technical education for its people, if she is to continue to hold the advanced position she has heretofore done, and, to a certain extent, yet holds amongst the industrial nations.

The *London Engineer* remarks, that "the Paris Exhibition has at least shown that our manufac-

turing supremacy is in great danger, and that the cause lies in the uneducated condition of our workmen as a body. * * * Fifteen years ago we were suddenly awakened to the utter want of artistic knowledge which disfigured and often rendered grotesque the forms of our unquestioned mechanical supremacy. South Kensington (Art and Science Instruction) was the result, and despite the feeling that exists against the management there, it is admitted that much has been done, amongst the middle classes at least, to bring in a better state of things. On every side we see proofs of the spread of sounder art principles, and a more educated appreciation of the beautiful, largely due, no doubt, to borrowing and imitation, but yet with a small element of self-production underlying or accompanying. * * * But when shall the children, whose lives are to be devoted to the mechanical or manufacturing arts, go to learn the principles that underlie their daily calling, principles without which they can only work like mechanics, and contribute nothing to the advancement of the arts to which they are devoted? Where shall the masses go for any sound elementary instruction in mechanics, natural philosophy, or chemistry? How shall they learn anything scientifically about fluids, air, light, electricity, or heat? * * * It is of trained, thinking workmen we are mainly in want. Men who have studied and mastered the principles which underlie their callings, and who go about their work not from rule of thumb but from rule of brain. We have obstinately thought it sufficient to train the hands merely of our workmen, and we suddenly awake to the fact that our neighbors have trained their heads too, and to such an extent that not only can they find amongst the choice intellects of their men scientific and thoroughly skilled managers, but workmen who can intelligently carry out scientific notions without slavish dependence on the thought or directions of their chief. * * * On the basis of a generous and liberal system of truly national education (such as we have in Canada with some improvements—Ed.) We need, too, a broad system of secondary instruction, in whose circle all the choice spirits from below shall join those whose superior advantages naturally place them on a higher intellectual plain; and here art and science schools will find their true vocation, and intellects prepared to the point that shall make their instructions at once acceptable and reproductive."

Engineering, a leading scientific journal, edited by Zerah Colburn, referring to the advantages possessed by continental over British workmen, says: "Let us at least maintain the prestige of the leading nations, for that the race is becoming keener and keener no observing man can see and fail to admit. We know how our relative positions have changed in the last ten years, and there are reasons for fearing that within the next ten years the change may be much more decisive against us. Let us begin with organized technical education, in which we are already one generation behind."

If the position of this question in England is as shown by the various and numerous extracts here