

THE VALUE OF TECHNICAL EDUCATION TO ARTISANS IN THE BUILDING TRADES.*

If there be room for difference of opinion in regard to the value of technical education in other industries, there can scarcely be any in regard to this. Undoubtedly of late years, and in the colonies especially, the standard of quality in building work is much lower than that of thirty years ago in the Old Country—the difference being very noticeable to those who come fresh to it from Europe. The reasons for this are several. No doubt the rough and ready style of work in pioneer days, however necessary and valuable in its day, set, quite naturally, a low standard which it has been difficult to raise above. The influence of adventurers and speculators (a race not unknown in Australia) has had also a prejudicial effect on the quality of work, and further, the relative expensiveness of labor in comparison with the cost of material has made cheapness of production the end aimed at, rather than quality of product. It will be admitted, I think, that the building trade is second to none in importance. Not only are the numbers of workmen very large, and all trades of an honorable and manly type, but, unlike the cotton-spinner of Manchester, or the cutler of Sheffield, the building artisan finds his trade wherever human beings congregate. He is limited by no locality, or time, or climate. If technical education, as applied to these trades, had no further effect than the raising of their intelligence and status, it would be a powerful factor in the well-being of the community. But apart from the number of artisans directly interested, the welfare of the community is largely bound up with that of the building trade. Next to the supply of food and water, I suppose the provision of healthy, comfortable, well-built houses takes a first place. We all need shelter, and the importance of the kind of dwellings we occupy is evident to all. As for the moral effect on a community it is not easy to estimate the strength of the sentiment which fills the breast of the true born Briton, whose house is his castle (in spite of it being sometimes "in pawn") and to whom the roof and the hearth are still the things (next to the marriage tie) of security, content and permanence.

An experience of over twenty years of active practice as an architect, and the conduct of large classes in technical subjects, bringing me into close touch with some hundreds of young artisans engaged in the various trades, have strongly impressed me with the sense of the value of technical education to the trades in question. I believe it to be the universal experience of architects that an all-round intelligent workman is the exception. A man who can read a plan with readiness, grasp general instruction, and enter fully into the meaning and spirit of a design is rarely to be found. Such a simple elementary work of construction as a king-post truss is seldom understood, and in problems of setting out work, and so on, the most obsolete of rule-of-thumb methods which a knowledge of elementary geometry could suggest. What frequent complaints are made of the ignoring of any necessity for an abutment to resist the thrust of a flat arch, the broken curves of plaster work, the defective construction which manifests itself in huge settlements and cracks, the inability to avoid or detect or remedy most painful blunders in design, decoration and workmanship. How often may one see in local Exhibitions and the like some piece of work designed and executed by an intelligent artisan—a work reflecting credit on a man's industry—and that is all. Yet he will stand by it with a glow of satisfaction on his honest face, amid an admiring group of his friends and neighbors. It may be a dovecot having a flimsy front in $\frac{1}{2}$ in. pine, in imitation of the facade of Milan Cathedral, or an aviary of similar construction with Roman pilasters, Early English arches, and a Greek pediment, with Egyptian ornament and pinnacles of 15th Century French Gothic. Turning then to the specific advantages which technical education should render to artisans, undoubtedly the art of drawing takes a first place. There is no branch of industry in which the ability to use the pencil with freedom is not of great value, and the helpless manner in which the ordinary workman attempts to express his ideas by drawing is notorious. Drawing is a splendid education of both eye and hand; the young student is taught to draw out and improve the natural powers of his hand before it has become stiff and flexible and habituated by custom to certain set motions. It trains both the eye and the hand to be more efficient instruments of the mind, and is an excellent discipline for the mind itself. I would rather have every young artisan instructed in the use of scales, the art of reading a plan with readiness, the practice of projection, and obtain such a general insight into the art of building construction that all branches of the trades may be seen in their true relation with each other. He should also have some teaching in the art of physical science—some real knowledge, however limited in extent, of the ordinary laws of nature—useful not only for the grasp of facts but as a training in the scientific spirit and way of looking at things.

Passing, now, to the various trades, let me briefly enumerate some of the salient points in which a knowledge of the principles of Art and Science will be of direct value to the workman. Take first the mason, a man who, in my opinion, is second to none in intelligence and ability. The geological history of the stones which he has to work will guide him in selecting, working and setting of them. Geometry is required to set out his working

lines and moulds and patterns, and a knowledge of the laws of mechanics and of general design will also be of service. The bricklayer will find a knowledge of applied mechanics and statics of great advantage; also such a knowledge of chemistry as will guide him in the use of limes and cements, the proportions of mortar, concretes, &c. Geometry will of course be of service in setting out his work, though this is generally done by the carpenter—a usage which has tended, I fear, to render the bricklayer less interested in such matters than is for his advantage as an intelligent artisan. The carpenter requires such a knowledge of the proportions of timber that he may select and wisely use them. Geometry, projection, the nature of strains and stresses, and the nature, application, and characteristics of building materials, are as serviceable to him as to any workman on the building. The plumber should have an acquaintance with chemistry and metallurgy, the properties of solids, liquids and gases, and metals and alloys, construction of joints, principles of traps and other sanitary details and general principles of sanitation. The plasterer needs a similar knowledge of chemistry of limes and cements as is found useful to the bricklayer. He needs further a training in practical geometry, in modelling and the principles of Classic and Gothic ornament, in addition to the power of sketching, which all artisans require. The smith and founder should be well grounded in metallurgy, statics and applied mechanics, mechanical drawing and elementary geometry.

The slater, in the work of ordinary plain slating, works mechanically, and only needs a knowledge of geometry in the event of carrying out elaborate patterns. The painter and glazier requires a scientific acquaintance with the materials he uses, some knowledge of geometry and the laws of the color, as well as a training in decorative design and principles of Art.

I can understand the question arising, why has the technical education of the past twenty-five years effected so little improvement in the personnel and work of the artisan? There are, I believe, several reasons for the slow progress which has been made. In the first instance, primary education in the Old Country twenty-five years ago was very different from that which is now equipping the young for the battle of life. Technical instructors were also men who very largely needed themselves to be trained—a band of efficient teachers could scarcely be expected to spring from the earth with full equipment. A heavy mass of inertness had also to be set moving, and the beginnings were necessarily slow, difficult and tentative in their nature. I think further, that it must be admitted that the instructors were generally of the wrong class—as a rule, they were free-hand drawing masters, excellent men in their way, but with only just sufficient knowledge of technical branches of study to pass examinations for which they were required to coach their students, and with practically no acquaintance with trades and callings for which the students were being trained. The methods of teaching were, in consequence, often defective and the aims also were by no means above reproach. The tendency at any rate was to draw students away from their handicrafts to become draughtsmen. The temptation for young artisans to do this is unfortunately very strong, and when in the actual training of a man his handicraft was ignored it materially resulted in spoiling many a good mechanic and added to that large and shiftless body, the army of ill-equipped draughtsmen, architects and engineers. Admitting all this, however, I maintain that much has been done by technical education to maintain the status of the workman and, if not to improve, to arrest the decline in the standard of work. Dealing now with a matter within my own knowledge, I can point to young men who, having received a training in the principles of Art and Science affecting their trades, are of distinctly greater value to their employers, have risen to the position of foremen and overseers, and have a better prospect of permanent employment when work is scarce. It must be conceded that technical education is not a failure, when it imparts such a stimulus to young men that they desire to enter callings where manual skill, combined with dexterity and trained intelligence and eye, are essential conditions of success. It does excellent work if it helps beginners in life to take part in some work requiring special skill, instead of drifting into that vague profession of clerkship, which is too often taken to because a youth has no training or talent that would fit him for the more honorable calling of a producer.

Chrome green is made from a precipitate of chrome yellow mixed with a precipitate of Prussian blue.

CLAY EMBANKMENTS.—The support of embankments, where clay forms a considerable part of the material, is a kind of mystery to the unskilled owner and builder of such embankments. In Marine Country, opposite the city, for example, there are clay strata all over the slopes, and slides thus caused can be seen on every hand, so the conclusion is that clay will not stand as an embankment unless held by bulkheads of masonry or wood. The fact is, however, that clay stands very well at an angle of 45 degrees, or 1 to 1, if saturated. It is all a question of water. No other material is so much affected by saturation. It is at the same time the best and worst material for an embankment. A range of 16 to 45 degrees between drained and undrained embankments is phenomenal. Clay embankments require drains to be placed at frequent intervals, and should have laths of wood, straw or other substance laid in, to form leading channels or perforations connecting to the drains. —*Industry.*

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