The Education of Engineers.

EDITOR OF THE TECH,—In your issue of Dec. 6, you reprinted from the Railroad Gazette an article under the above heading, purporting to come from a "practical man," in which some advice is given to a young man who wishes to educate himself for the profession of civil engineer. As this advice is so entirely opposed to all advanced ideas in regard to technical education, and as it applies not only to the civil engineer, but to all who are of actual experience, and the architect as well,—and indeed to a person engaging in any industry, I will accept your invitation to say a few words upon "the other side of the question." To put the article from the Gazette into a few words, it amounts to just this: that while there are certain occupations, such as the making of surveys, the building of earthworks and masonry, the laying of rails, and the construction of bridges, the term "profession of civil engineering" is an absurdity, and we are gravely told that our technical schools are of little or no real value, and that the young man is advised, after having obtained a rudimentary knowledge of algebra, geometry, and trigonometry, to "plunge into practice at once." If he wishes to learn how to locate a railroad, according to the Gazette, he should join a party of men who are engaged in railroad location; if he wants to learn about grading and masonry, he should find a contractor who is employed upon such work; if he wants a knowledge of bridge building, he can learn how to design and build bridges very much better by entering the employ of some firm in that line of business than he can in a technical school. Not only are we treated to this bit of wisdom, but we are told that "there is not a branch of civil or mechanical engineering now practised in this country in which the men who have achieved either the greatest distinction or pecuniary success have had a liberal education, either classical or technical"; and that, "as a matter of fact, what can be learned in a common school is sufficient to make someone to be eminent or successful in any branch of engineering"; and finally, that "so far as the achievement of success, i.e., making money by honorable means" (we won't stop to criticise this definition), "is concerned, the higher technical education is of little or no help."

To a person who has witnessed the rise and progress of technical education in this or in any other country, such statements are their own severest criticism. The so-called "practical man," who expresses such opinions, puts himself in direct opposition to the illustrious men of all countries who have placed themselves at the summit of the engineering profession. The world has never seen a man more skilled in the best engineering practice, or more interested in the elevation and thorough training of engineers, than the late William Fairbairn of Manchester. "It is absurd," says Mr. Fairbairn, "to talk against theory, as if a knowledge of the exact sciences was a dangerous and useless attainment. Nothing can be more erroneous than this impression, as on close inspection there is no practice without theory, anything more than there is effect without a cause. In the useful arts theory can only be considered dangerous when it is not reducible to practice; and the real meaning of the term "theory," which creates so much alarm in the minds of practical men, is neither more nor less than a series of definite rules by which practice is governed, and through which we derive, from fixed and definite laws, those sound and definite results which of all others it is the primary object of practice to accomplish. In my opinion, every one should be taught the rudiments and the higher branches of their professions upon the same principles that barristers and physicians are taught. All persons intended for professional pursuits, in connection with the arts of construction, should have a theoretical as well as a practical education."

"It is notorious," says Mr. John Scott Russell,—and certainly no better authority ever lived,—"that the railways which have been made in the educated countries of Germany and Switzerland have been made far cheaper than those constructed by us in England. It is known that they have been made by pupils of the industrial schools and technical colleges of those countries; and I know many of these distinguished men who take pride in saying that they owe their positions entirely to their technical schools."

A young man," says a recent writer in the Engineering News, "who wishes to attain success in the occupation of a civil engineer ought to begin by obtaining a sound technical education. The indications are that a technical education as a qualification for technical pursuits will grow every year more and more important, until finally it will become in this country, as it is now in Germany, indispensable." The way to excellence in engineering, now," says a well-known English writer, "is not by promiscuous trial and by happy guess-work, but by carefully studying what has already been done. Formerly, the only education was that of actual experience. Now a large mass of experience has been digested, and general rules begin to appear. There is an immense advantage to be gained by attacking this mass of knowledge in a systematic manner, such as that in which it comes before the student in his course through a college. This is in truth the only manner in which anything like a complete mastery can be obtained. To