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EDUCATIONAL ASPECTS OF FREE
EDUCATION.

AN innocent outsider would naturally suppose that the discussion on a proposal for free education would turn chiefly on educational and social considerations. So long as the question was of merely academic interest, this was, to a large extent, the case. It is true that strong Churchmen viewed with distaste a change which might increase the growing difficulty, found by voluntary school managers, of making both ends meet, or might possibly even sweep them off the board altogether, and that the enthusiasm of many partisans on the other side for the remission of fees was heightened by the hope that such a measure would give a new impetus to the formation of School Boards. But, on the whole, the disputants made at least an attempt in public to discuss the matter in its bearings on the child, the teacher, and, the parent. The overburdened parent, the pauperizing effect of partial remission, the child kept from school because of his parents' poverty, the teachers converted into tax-collectors—these were the stage properties of the one party; while the stock-in-trade of the other side included the sacred necessity of guarding "parental responsibility," and the assertion that no one values what he does not pay for, and that to tax the hard-earned savings of the respectable middle-class to free the education of the children of the worthless and unthrifty was a Socialistic proposal of the crudest kind.

We now find that most of this talk was pure cant. It ceased to be heard from the moment when free education became a practical party question. To outward appearance the contest over the Bill has become a kind of Jerusalem race—everyone wishing to leave to someone else the unpleasant task of formulating the criticisms with which he secretly sympathizes, but to which fear of his constituents prevents him from giving utterance.

If we could induce the parties to break through this conspiracy of agreement, we should find that, with a few exceptions, the point on which the advocates feel most keenly is the possibility of using the Act as a lever either to destroy or to perpetuate for ever the voluntary school system. In spite of the apparent calm, the battle between the supporters of School Boards and voluntary schools is raging fiercely below the surface; and most of the amendments put down for the Committee stage are certain to represent attempts, more or less open or disguised, to wrest the provisions of the Act to suit the purposes of one or the other party.

It must be confessed that this is to a great extent natural. The Act of 1870 was a compromise: the present Bill virtually reopens the question, and it is felt that, whatever be the logic or want of logic in the argument that Imperial grants should involve local control, the time when large additional grants are being made to voluntary schools is the time, *if ever*, to drive home the question of popular management. We do not, then, quarrel with those who feel that the opportunity must not be lost of raising this question; indeed, we should respect them more if they raised it more openly. But we do

protest against the almost total omission of all educational considerations in the arguments used on both sides.

It is time that the third party to the dispute—the real friends of education—made themselves heard. Their one object is to see that the educational benefits of the measure should be maximized, and the incidental evils minimized. They ask what is to be demanded in the shape of increased efficiency in return for a new grant of £2,000,000 to school managers. Is a great part of it to be allowed to be absorbed by the reduction of private subscriptions and rates, or is it to be used to improve the children's education, and make it a better preparation for their future industry?

In the rural districts, the grant in lieu of fees will almost universally be in excess of the income now received from fees. There will therefore be a surplus in the hands of the managers, or manager—for very often these schools are in the hands of one man. Where will this surplus go? In our opinion some method ought, if possible, to be found of "ear-marking" it for education rather than for subscribers' pockets. If this were done, nearly the whole of the rural schools of England might be raised in character. It would be possible, for example, to introduce, with the aid of the new surplus, some simple teaching in agricultural subjects, such as is recognized in the Code, but is at present a dead letter; for the increased grant would be quite enough to pay a competent travelling teacher to give such instruction in a group of schools. If there were universal county or district school authorities, it might be well to hand over the surplus grant into their hands, to be used solely for the improvement of the various schools on whose account it was paid. As, unfortunately, our organization is piecemeal, we are forced to deal direct with each school, and we can therefore only appeal to public-spirited managers to take care that the children for whose education they are responsible reap the full advantage of every penny which they receive over and above the present fees charged. It is to be feared, however, that in many cases the managers are at the mercy of their subscribers, and many of them would probably now welcome the proposal made by the Bishop of London, but foolishly rejected by his clerical friends on the late Royal Commission—that a certain minimum of private subscriptions should be required by law in the case of every voluntary school. If such a provision were in force, school managers in the country would be saved many anxious forebodings at the present time.

The second point in the Bill on which educational reformers should fix their attention is the limitation of the benefits to children between five and fourteen. The lower limit need not trouble us, and may be left to be worried by the "poor man's" numerous friends. But the upper limit should be resolutely opposed. It is quite true that at the present time it is of comparatively little importance—only affecting some few thousands of children. But if one of the great objects of educational policy is to lengthen the period of school life, the handful of children at elementary schools above fourteen should certainly not be fined for staying there; if anything, they should receive scholarships to enable them to do so. In our opinion, moreover, ex-seventh standard children (who are not for the most part touched by the present Bill) should be also admitted free, or at least sufficient

scholarships should be provided to enable any poor child who has passed the standards to continue his education either in the school or elsewhere. We do not say that such scholarships should be universally provided out of the present grant, but they would be a most proper object to which to apply part of the surplus which will be handed to many schools over and above the fee equivalent. These considerations suggest another possible way of dealing with the surplus grants. The great object of those who are interested in the development of higher elementary, technical, and secondary education should be to strengthen instead of weakening the connection between primary and higher schools. It is to be feared that any provision for freeing elementary schools up to a certain point or a certain age, will tend to sever rather than to unite the two grades of schools, unless the flow between them is at the same time stimulated by the establishment of free scholarships or in other ways. A free (or partly free) elementary school is not the ultimate ideal. We want a free road kept open to the University. Is it too late to throw out the suggestion that school managers receiving a fee-grant in excess of the amount previously received in fees should be required to use the surplus for an object akin to that contemplated by the main provisions of the Bill—viz. the extension of free education for selected scholars beyond the narrow limits of the primary schools, in other words the provision of continuation scholarships? Up to a short time ago it would have been replied that in many cases there were no higher institutions accessible, but the application of the Local Taxation grant to technical and secondary education is fast changing all that, and a proposal which a few years since would have been unfeasible is now well within the range of practical politics.

DIFFERENTIAL AND INTEGRAL CALCULUS.

Differential and Integral Calculus, with Applications.

By Alfred George Greenhill, M.A., F.R.S. Second Edition. (London: Macmillan and Co., 1891.)

PROF. GREENHILL is known to the academic world as an accomplished mathematician who has powerfully helped to advance certain branches of applied mathematics; he is also known to the readers of NATURE as a friend (militant) of the practical man. We say at once, in all sincerity, that we sympathize with Prof. Greenhill in both his capacities. The volume on the infinitesimal calculus now before us, although professedly a second edition, is in reality a new work, addressed to the special needs of the practical man by his mathematical friend Prof. Greenhill.

Of many of the author's didactic innovations we highly approve. The treatment of the differential and integral calculus together from the very beginning is a piece of sound method, the introduction of which has been delayed merely by the bad but not infrequent practice of separating the two as examination subjects. The introduction of the hyperbolic functions to systematize the integrations which can be performed by means of the elementary transcendents, has been, as we can testify from experience, a great help in elementary teaching. The admirable "chapter in the integral calculus" which was published separately

in an extended form some years ago, and is now condensed and simplified in a separate chapter at the end of the work under review, is the most important addition to the teaching material of the integral calculus that has been made for a long time; that chapter alone is worth the price of Prof. Greenhill's book. The plan of drawing the illustrations of the subject from departments of pure and applied mathematics with which the learner may afterwards have to do is also excellent. Finally, there blows through our author's pages that inimitable freshness which emanates from the man who is familiar with much that is newest and best in his day, who does not merely make extracts from books, but who speaks of things in which he has taken a part. This freshness can only be compared to that agreeable odour which inland people tell us comes from mariners and others who cross the sea from strange lands. Like these same mariners, our author produces from his pockets strange and puzzling curiosities, such as reciprocants, tide predictors, Schwarzian derivatives, Mehler's functions, to delight and to dazzle the learner. It is true he tells but little of these things; still, it is pleasant to look at them; and they make us happy under our present toil by leading us to think that we too may one day visit the country where these pretty things are at home amidst their proper surroundings.

Where there is so much to praise we are truly sorry to insinuate the bitter drop of blame; but, much as we love and follow Plato, something must be conceded to truth. In the first place, we think that in this second edition the introduction of heterogeneous illustration has been overdone. The fundamental rules of the infinitesimal calculus are really very few in number, and the practical man's friend would do well to impress that upon him at the outset, instead of scattering these principles through a large volume, and overlaying them with thick masses of disconnected application, to such an extent that poor Mr. Practical-Man is in danger of losing his tools among the shavings, or, to use a metaphor which Prof. Greenhill's pupils might prefer, of not seeing his guns for smoke. Prof. Greenhill must recollect that the man that sits down to read his book is not all possible practical men rolled into one, but *one* poor practical man—say, an engineer—who wants some knowledge of the infinitesimal calculus, and who will find many of the illustrations more indigestible than the principles of the calculus itself. Would it not be better for the practical man, as well as for any other man, to have the few leading principles of the calculus set before him with an adequate but moderate amount of illustration of a uniform geometrical kind, and not to be dazed by a flood of oracular statements about soap-bubble films, tide-predictors, &c., in the course of his initiation? Such digressions are most useful now and then in a lecture; they serve to give picturesqueness to the discourse, and help to fix the attention of the hearer: but we think that too many of them destroy the usefulness of a text-book, the object of which is quite different from the purpose of a lecture.

The matter we have just been criticizing may, perhaps, be held to be one of taste; and we cheerfully admit that much should be allowed to a writer of strong individuality. After all, we love to have the author in his book. There is another matter, of more importance, on which we