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Science and the Army Officer.

THE degree to which applied science dominated the great War astonished even those who had previously predicted that, in the twentieth century, bravery and brilliant leadership would, without the aid of the laboratory, be powerless against continental armies. As a consequence of the development of new methods of warfare, and the increasing elaboration of older ones, the British officer, especially the senior officer occupying a technical post, often found himself handicapped by lack of scientific knowledge. The War is too recent for its lessons to have been forgotten entirely, and it is less surprising that the question of the education and training of the artillery and engineer officer should have come up for discussion than that it should have received the very perfunctory consideration which has been accorded to it in the recent report[1] of a committee appointed by the late Government.

To the casual reader this report may very likely commend itself by the moderation and apparent pertinence of its conclusions and the clarity of its presentation. Closer study reveals that, in spite of the efforts of its authors, the report suffers from deficiencies and misconceptions which must spring from either a deliberate neglect of certain aspects of the question, or from the fact that there was no one on the committee possessing a really intimate knowledge of the present-day needs of the technical officer and the means in existence for satisfying them. The Committee had an ideal chairman in Lord Haldane, to whose wisdom the modern army owes so much, and to whose presence the report must owe much of its merit: the members were Lieut.-Col. W. R. Campion; Lieut.-General Sir J. P. du Cane, the Master-General of the Ordnance; Major-General C. F. Romer, Director of Staff Duties; and a civilian member, Mr. W. Spens, a well-known Cambridge tutor whose main interest would seem to be controversial theology, if a prominent work of reference is trustworthy. It is to be noted that there is no man of science of conspicuous eminence on the Committee, and that Cambridge is the only educational institution represented. The Committee had before it nineteen witnesses whose names and status are not given.

The problem of the education of officers falls naturally into two parts, concerned respectively with the training of the regimental officer and with that of the technical or specialist officer, whose importance has so much increased in the last ten years. It is in the consideration of the former that the Committee appears to best advantage. One of its first concerns was to devise means to make the military profession more attractive,

[1] Report of the Committee on the Education and Training of Officers Printed and published by His Majesty's Stationery Office. 1924. Price 9*d.* net.

for there has been recently a marked shortage of suitable applicants for commissions. It is wisely recommended that County Council and other scholarships should be tenable at the Royal Military Academy and the Royal Military College, establishments which are designed for the training of artillery and engineering cadets, and of infantry cadets, respectively. With the object of securing a higher standard of general education it is proposed to raise the lower limit of the age of entry to these institutions, which was until recently seventeen and a half, to eighteen years, which involves the shortening of the period of training for a commission from two years to eighteen months. This implies that general education is better given at the average public school than at the army schools, and there is little doubt that this is so.

There are some admirable sentiments expressed in this part of the report, but even here there are indications that opinions have been sometimes founded on a superficial inquiry rather than a patient investigation. For example, reference is made to the military discipline at the Royal Military Academy, which is considered too strict. No mention is made of the excellent relations between cadets and officers at the Academy, which is the astonishment and admiration of certain foreign institutions, nor is there any suggestion that officers who had recently passed through the Academy were questioned on this point. We ourselves have spoken on this subject to more officers than the whole number of witnesses heard by the Committee, without being able to elicit any suggestion that they found the discipline irksome. Rather, it is the most valuable part of the training at the Academy, and officers who enter a regiment through other channels miss in it something of real value, which can scarcely be said of the scientific teaching at that institution.

However, the question which more closely interests readers of NATURE is that of the higher education of the artillery and engineer officers. It is important that the best of these officers (who compare well with those that win honours degrees at universities) should be given opportunities of making full use of their powers, and encouraged to take up the more technical studies of the profession. For the sake of precision we may devote the main part of our consideration to the artillery, which offers so good an example of the multiplicity of technical qualifications involved to-day. Not only are a certain number of officers required in each department of artillery studies (we may cite, to take examples at random, range-finding, sound-ranging, gun-construction, external and internal ballistics, and fuse design), but also — a fact too commonly overlooked—it is much to be desired that there should be a body of officers with a good general scientific training, destined, especially in time of war, to take an intermediate position between the civilian experts and the ordinary staff officer. Few will deny that during the War much unnecessary trouble and delay arose because the officers appointed to work in conjunction with the men of science of the country had, in most cases, no knowledge at all of scientific method, and so, in spite of the best will in the world, were generally at a loss to know what to encourage and what to restrain, what was feasible and what impossible, who was eminent and who little better than a charlatan. While it is inadvisable, because impossible, to provide military experts in every branch of science which may be involved in modern war, there is certainly a place in every division for a few officers who can talk to experts in their own language without an interpreter. Finally, the few exceptionally gifted and scientifically inclined men who are to be found to-day (and no doubt will be found in the future) in the army, should have every opportunity and encouragement to acquire training in research which may fit them to take up the many important problems in ballistics and kindred subjects which are awaiting solution.

There is no indication in the Committee's report that the members have considered in any detail the nature of the technical training required for artillery officers—in fact, there is no indication that any one with either detailed knowledge of the subject or practical experience in teaching such officers ever came before the Committee. The most astonishing fact, however, is that the one army college of university rank, the one place in the British Empire where, for example, advanced instruction in theoretical ballistics is given, is not mentioned at all in the report, except in a single sentence, possibly copied from some army regulation, in an appendix. The Artillery College at Woolwich, known until a few years ago as the Ordnance College, was not entirely negligible even before the War, since it had on its staff at different times mathematicians of the calibre of the Rev. Francis Bashforth, Major P. A. MacMahon, and Sir George Greenhill. Since the War it has been entirely reorganised, and there have been appointed civilian professors of high academic standing in mathematics and ballistics, physics, engineering and chemistry, as well as expert military instructors in range-finding, gun-construction, design, and kindred subjects. The mathematical staff of the college are among the very small number qualified to speak on general ballistic problems; the physics and chemistry courses have been specially designed to bear upon service instruments and service requirements, and are supplemented by practical instruction much of which is upon lines not practicable in the average university; the engineering

branch has at its disposal a variety of apparatus, such as tank engines, especially installed for detailed study; the range-finding branch has mounted the most elaborate types of modern range-finder, including many taken from the Germans; the so-called arsenal branches, which deal with gun-construction, ammunition, and so on, give efficient instruction by keeping in the closest possible touch with the vast resources of Woolwich Arsenal. Much time and thought have been spent on making the instruction attractive and accessible to the officers, from lieutenant-colonels downwards, who pass through the college—and the type of instruction suitable for the undergraduate is not always best adapted for officers of some seniority.

Yet, *mirabile dictu*, a Committee dealing with the higher training of artillery officers as one of its chief concerns has apparently never heard of the Artillery College, which implies that among the nineteen witnesses whom it saw good to call, not one was connected with the institution which has far more experience in such training than any other. After realising this astounding situation, and the constitution of the Committee, it is scarcely surprising to read: "With a view to raising the technical qualifications of a number of artillery officers for special duties in connexion with research, experiment, *design and inspection of artillery material, ballistics, survey, sound-ranging and the science of gunnery generally* we consider that a small percentage of Royal Artillery officers should be sent to Cambridge to undertake a course analogous to that of the Royal Engineer officer" (the italics are ours). There seems to have been no one to point out to the Committee that this programme, which covers only a part of the necessary instruction, would involve the transportation to Cambridge of very many tons of range-finders and other instruments, guns, carriages, ammunition, and so on, the transfer of many experts whose particular knowledge is not represented at Cambridge, and, in short, practically the rebuilding at Cambridge of the whole organisation already in existence at Woolwich. The University authorities at Cambridge probably do not realise what was involved in their "very generous and advantageous offer."

It is extraordinary—or should be—that the War Office, having been at considerable expense to reorganise and re-equip the Artillery College since the War, and having succeeded in assembling an efficient and highly qualified staff, should, apparently, fail to recognise that it had within its own organisation civilian experts whose particular experience and scientific distinction render them eminently qualified to advise on all matters pertaining to the technical training of the artillery officer. Further, that it has an institution which might be made the nucleus of something greater, an army university for all branches of the service. That Lord Haldane and Mr. Spens should not have had their attention directed to the existence of the Artillery College by any of the nineteen witnesses indicates that these witnesses were ill-acquainted with the general problem under consideration; that the army members of the Committee never referred to an institution of which they have some right to be proud argues either exceptional modesty or exceptional forgetfulness. In any event, all that part of the report which deals with post-graduate courses is rendered nugatory by the failure to realise the organisation already in existence.

The Committee has also singularly failed to point out in clear terms what is the real weakness of the Royal Military Academy, namely, that the scientific instruction which is given there has long been a subject of mirth rather than of interest to the cadets under instruction, a fact which would have been elicited by questioning, say, a few present-day captains. In spite of an excellent tradition which includes the names of Hutton, Faraday, Bloxam, and in more recent days MacMahon, the cadet has not hitherto been encouraged to take this part of his instruction very seriously. The Committee recommends new laboratories, and, typically, suggests that the plans be submitted to the Board of Education rather than to the experts whom the War Office possesses but values not.

The recommendations that there should be greater encouragement offered to university candidates for commissions are excellent. The general spirit which lies behind the report is praiseworthy. There is, however, no purpose to be served by overlooking the fact that the Committee, assembled under such distinguished chairmanship, was defective in its constitution, hasty in its methods, and superficial in its inquiries, so that, particularly on the question of the higher education of technical officers, it has probably retarded rather than hastened the satisfactory solution of a difficult problem.

Clocks, Watches, and Chronometers.

(1) *Time and Timekeepers: including the History, Construction, Care, and Accuracy of Clocks and Watches.* By Prof. Willis I. Milham. Pp. xix+609. (London: Macmillan and Co., Ltd., 1923.) 30*s*. net.

(2) *The Marine Chronometer: its History and Development.* By Lt.-Comdr. Rupert T. Gould. Pp. xvi+287+40 plates. (London: J. D. Potter, 1923.) 25*s*. net.

(1) PROF. MILHAM tells us that for twenty years his lectures on descriptive astronomy have included the topic of time and timekeepers, and that