

laboratories are fitted with every modern convenience, and are equal in elaboration to anything which might be expected in a university. The idea of providing labour-saving appliances may be carried too far in the laboratories to be occupied by junior students. When everything is "laid on" and it is only necessary to turn a tap, opportunities for the exercise of ingenuity and dexterity, as well as the acquisition of useful practical knowledge, are lost. The young student should be encouraged to make many things for himself, starting with glass and rubber tubing, wire, sealing wax, etc.

The provision of school laboratories has gone on very rapidly during the last twenty years, and it is probably in girls' schools chiefly that it is least satisfactory. The Committee very wisely points out that in planning new schools it is much more important to secure ample space than to provide elaborate and costly fittings. There is a large number of private schools, chiefly for preparatory and cramming purposes, which have no provision for practical work, and how to deal with these people is not very clear while the parents are so ignorant and display so much indifference. A proper inspection system would probably have the effect of squeezing some of them to death, which would on the whole be an advantage to the country.

One other point may be mentioned relating, not directly to the pupils, but to the teachers. While it is certainly necessary to hold out to the teaching profession more liberal inducements to take up this kind of work, a higher standard of efficiency will reasonably be demanded of teachers. The Committee recommends that short courses of training should be established for teachers, which apparently they think should be taken concurrently with other studies, and not at the end of their course. This recommendation ought undoubtedly to be adopted by all who propose to become teachers in schools where the students are all beginners. A young man or woman may be full of knowledge without the least idea of the best way to reach young minds, and a few months devoted to the study of method will be found advantageous to everyone. The prospective teacher may have attended the systematic course of a professor at the university, but he ought not to proceed to imitate this in his dealings with boys and girls. At the same time, he ought to be cautioned against faddists and educational quack doctors, but should be led to examine his own stock of knowledge and experience, and ask himself how best he can make it attractive and useful to others. After one or two experiments each one will find out for himself how best to accomplish this, and to awaken in others an interest in the subject taught. Some freedom in this process ought to be allowed by headmasters and inspectors. Very valuable work in the way of suggestions to teachers of various subjects, both physical and biological, has been accomplished by the Association of Public-

School Science Masters and the corresponding Association of Science Mistresses, and attendance at the annual meetings of these bodies, which would probably be open to non-members, would be certain to be full of interest and instruction to young teachers.

W. A. T.

SCIENCE AND ADMINISTRATION.

THE growth in the magnitude and in the complexity of modern industrial and commercial undertakings has in recent years caused attention to be directed to the methods of management in connection therewith, and a vast amount of knowledge on the subject has been accumulated, co-ordinated, and arranged. In consequence, a great volume of literature, constituting the science of administration, has been brought into existence. To this an interesting addition has very recently been made by the publication in the number for the first quarter of 1918 of the *Bulletin de la Société d'Encouragement pour l'Industrie Nationale* of a paper read by M. Fayol on November 24, 1917, in Paris on "L'importance de la Fonction Administrative dans le Gouvernement des Affaires." We learn therein that the Société des Ingénieurs civils de France has recently made a strong recommendation that courses of instruction on "administration" shall be introduced forthwith into all the higher schools of civil engineering in France. M. Fayol, on the occasion mentioned, expressed a hope that instruction in this subject might be made part of the curriculum of every school in France, even a part of those of primary schools; he is convinced that widespread instruction in "administration" must result in immense benefit to the French nation.

A knowledge of scientific methods of administration and the application of the principles thereof in the domain of private undertakings, as well as in that of State enterprises, are matters which possess the same importance in these islands as they do in any other part of the world. There is reason to believe that this is fully appreciated in our business circles, and to this is it due that, at centres where courses of instruction are given in subjects connected with "administration," those responsible for the conduct of important undertakings encourage their employes to attend such courses, and even give them facilities for the purpose. But, unfortunately, a similar attitude does not prevail in our Government circles. Not so many years ago the head of one of the branches of a Government Department put forward proposals in connection with the institution of special courses of instruction in administrative subjects for the officers of his branch. The Minister in charge of the Department received the suggestion sympathetically; the officials of the London School of Economics were accommodating and took great pains in preparing a scheme for the purpose; however, the permanent officials of the Department were passively hostile. The subject remained

under discussion for a very considerable time, but eventually was allowed to drop. Naturally, no official reason was given why the proposal met with such a fate; possibly the permanent officials were opposed thereto for the reason that, in their opinion, the institution of the proposed courses would have made the branch in question "too strong"—that is to say, *too efficient*.

It would almost appear as if the attempt to attain such a result in the public services was regarded as a most reprehensible act. Yet it must be evident that, before scientific methods can be put into practice, such methods must be learnt and understood; also that individuals in the public services are no more capable of acquiring such knowledge by mere intuition than are those employed in civil life. Further, it is generally recognised that the days have long gone by when boldness in enterprise can make up for the lack of systematised knowledge and method, whether in the industries and in commerce, or in the domain of State activity, in diplomacy and in war.

The science of administration is concerned alone with those lessons which teach how the highest state of efficiency can be secured in the enterprises with which men busy themselves; the principles involved therein lie, as M. Fayol reminds us, within a narrow compass. "Administration" is neither an exclusive privilege nor a personal quality of those controlling or managing an undertaking or enterprise; it is really a function which, like all essential functions, comes into play between the head and the members of a body corporate. It must be distinguished from management, which is a rôle concerned with the care and skilful conduct of the whole of an enterprise, a rôle that must provide for the efficient performance of the following essential functions—namely, the administrative, technical, commercial, financial, that of custodianship and that of book-keeping.

Although "administration" is only one among the above six functions, nevertheless it demands that foresight, efficient organisation, co-ordination, and control shall prevail throughout the enterprise or undertaking, and it comes into play not only in the enterprise or undertaking as a whole, but also in every part and in every operation thereof.

Most powerful aids to efficient administration exist in "Taylorism" and in a sound organisation within the enterprise or undertaking; the former concerns the "science of efficiency" in relation to the individual; the latter concerns the same "science" in relation to the body corporate.

"Taylorism," or *chronométrage*,¹ consists in the determination of factorial values in time units for each item of the work of individuals when performed in the most efficient manner human beings are capable of. Such values can be ascertained in relation to every branch and item of human activity, and, when properly applied, afford

an unsurpassable check, of a preventive and anticipatory order, against waste of human effort.

Organisation consists in the proper subdivision of the work of an enterprise and in the most effective employment of the *personnel* necessary to carry it on. The principles involved are few in number, but no single uniform organisation can be devised which will suit the varying requirements of every undertaking: each must be provided with an organisation specially designed in relation to the nature of the operations that have to be conducted therein.

In the case of private undertakings the instinct of self-preservation is an impelling force, and, in consequence, they are, as a rule, provided with a sound and efficient organisation. On the other hand, in the case of the public services artificial conditions, as a rule, prevail, and the question of the survival of the fittest is not a troubling factor; in consequence, State undertakings are often provided with an illogical or unsound organisation.

Strange indeed are the ways of political reformers who concern themselves with State organisation and administration. In recent years, by a curious irony, struggles were started about the same time of a nature that whereas one State, which possessed an admirable organisation, might have been seen attempting to abandon the same for one less efficient, another State, which had become tired of inefficient methods, might, on the other hand, have been seen endeavouring simultaneously to introduce industrial conditions into its public services; these struggles were witnessed, in 1912, in Sweden and Italy, and arose in consequence of the reports of Royal Commissions.²

Sweden, at that time, possessed an old-established organisation in its public services—one that was brought into existence, in 1634, by that great administrator, Oxenstierna, who had fixed with precision the powers of the great Departments of the Swedish Government and had vested the management of State undertakings in Administrative Boards, whereon both technical and administrative officials serve. Even the Commission that recommended changes in the well-tryed State organisation of Sweden—changes which are, in the opinion of the well-informed, likely to introduce a bureaucratic encumbrance and political mismanagement in Swedish State undertakings of a technical character—has spoken favourably in its report of these Boards: it has stated that the independent position occupied by the Administrative Boards has in the past proved a considerable safeguard and had acted as a powerful element in contributing to the smooth working of the State machinery, whilst providing a powerful incentive towards progressive ideas.

Italy, on the other hand, at the period in question possessed an organisation in its public services scarce half a century old, an organisation which

¹ The invention of Mr. F. Winslow Taylor, of the Bethlehem Steel Co., U.S.A.

² (1) "Departementalkommitterades Betänkande." (Stockholm: H. L. Beckman's Boktryckeri, 1912.) (2) "Commissione Reale per lo Studio Technico, Amministrativo e Finanziario del Servizio Telefonico in Italia." (Rome: Tipografia dell'Unione Editrice, 1911.) (3) "Commissione Reale per il Riordinamento dei Servizi Postali e Telegrafici." (Rome: Tipografia ditta Ludovico Cecchini, 1912.)

suffered from the exigencies of political jurisdiction and, to some extent, from the mischief of bureaucratic control. At Rome, too, policy and technical Boards were in existence in connection with the public services, but these Boards occupied only a consultative position. Italy, in the struggle mentioned, was desirous of emancipating its public services of a technical nature from political influences and the incubus of bureaucracy, and substituting therefor an industrial organisation and commercial methods of administration.

It is not surprising, then, that M. Fayol should have told the Paris audience to whom he addressed himself in November last that only those who possess technical and administrative ability combined are really capable of laying down scientific methods of administration and of erecting the framework of a scientific organisation. No practical person familiar with the requirements of modern technical enterprises is likely to quarrel with him for holding this view. It must be evident even to the most casual observer that we have now reached a stage in industrial development such that, in order to obtain the fullest measure of success from human effort, it has become imperatively necessary to secure from men possessing scientific attainments and a technical training the highest degree of co-operation in the administration and management of technical enterprises, whether privately owned or in the hands of the State; further, that any attempt to divorce the administrative from the technical control in such enterprises is mischievous, and must, if persisted in, eventually lead to national ruin.

W. A. J. O'MEARA.

"AFTER THE WAR."

THE final report of the Committee on Commercial and Industrial Policy after the War has now been issued; it necessarily deals with such a vast number of complex subjects that it has perforce to content itself with generalities, more or less vague, and gives but few indications upon which any definite line of policy can be based. It is notably weak in what should, perhaps, have been its most important inquiry—namely, as to the utilisation of the natural resources of the Empire to the best advantage in the future; it is significant that the title of the Committee is "on Commercial and Industrial Policy," instead of "on Industrial and Commercial Policy," as it logically should have been, seeing that a sound commercial policy can only be developed upon lines following industrial development, and not *vice versa*.

In most cases this Committee has merely summarised the reports of various Departmental Committees, without giving any indication of the relative importance of the subjects discussed. For example, the coal trade is thus briefly dealt with, and there is no indication in the report to what an overwhelming extent this is the essential industry upon which our Empire depends. Mr. Scoby Smith has, indeed, appended a very valuable note upon the importance of conserving our

supply of coking coal, but even this does not touch the larger question. Coal plays, in fact, a two-fold part; not only is it the raw material from which a host of important industrial and pharmaceutical products may be obtained, but, above all and beyond all, it is also practically the sole source from which we draw our mechanical energy. Without a continuance of the supply of abundant and relatively cheaply won coal that we have hitherto enjoyed, the industrial supremacy of Britain would be gone, and we should rapidly fall to a very subordinate position amongst nations. It is scarcely too much to say that the magnitude of this problem completely overshadows all the others; if the whole of the recommendations put forward by the Committee could be acted upon, and if they all produced the maximum of good effect that the most sanguine member of the Committee could expect, they would be powerless to save Great Britain from industrial ruin if she could no longer produce an abundant output of coal as cheaply as her competitors. The Committee does not appear to have realised that such coal production is the most urgent and the most vital of all after-the-war problems.

There are, it is true, some recommendations as to mineral production in general which naturally do include our coal production. Thus the Committee strongly recommends an intelligence and advisory bureau for dealing with metals and minerals, and a special letter from the chairman of the Committee to the Premier emphasises this recommendation, and supports the resolution of the Imperial War Conference to the effect that an Imperial mineral resources bureau should be established in London. It is satisfactory to know that such a bureau is in process of formation, and the general tenor of the Committee's views on the subject would seem to be quite sound, especially in respect of the principle which is laid down—that the functions of the bureau should be the dissemination of intelligence and advice, but be in no sense executive; and, further, that the utmost use should be made of the services of technical and scientific experts. The value of such a bureau to the mineral industries of the Empire should be very great, and its suggested activities are exactly what is required; hitherto the assistance that the coal-mining industry has received from the Governmental authorities has been essentially of the negative order.

Our mining engineers can be trusted to work out their own problems for themselves, as they have always done, but the increasing complexity of mining methods demands a far better supply of official information than has been forthcoming up to the present. It is only necessary to compare our meagre Home Office annual reports with the splendid volumes of the Prussian *Zeitschriften* to realise how greatly we have been handicapped in this respect. Of all national resources, mineral resources need the most scientific study, the most complete utilisation, and the most careful conservation, because, unlike other natural resources, they are not reproductive, and, once used, they