

Further, the Bill is regarded as a good beginning on the path of provision for coming generations, and, as medical science progresses, it states, the list of inherited diseases may be supplemented. It is forgotten, apparently, that only so long as an inherited disease remains incurable does it constitute a social and racial problem. Surely the aim should be to find a cure and not to enlarge the list. The German Government, it is reported, not only approved of this Bill, but specifically decided that a special Bill, which shall come into force simultaneously with it, shall authorise the compulsory emasculation of dangerous criminals.

The value of eugenic sterilisation could be tested much more thoroughly and completely in Germany than in the United States, and certainly it is most desirable that its worth should be assessed; but, for the present, it is impossible to avoid the thought that here is provided a most frightful opportunity for those politically strong at present to outrage the politically oppressed. 'Fit' and 'unfit' are defined differently at different times and in different places. The Bill, as it reads, will command the appreciative attention of all who are interested in the controlled and deliberate improvement of human stock, but the power that it gives is such as should be possessed only by the almost omniscient and by the most moral. The problem is to find them.

#### 'External' Degrees in Engineering

SINCE 1902, the University of London has conferred the degree of B.Sc.(Eng.) on 1,890 external students who have gained this degree by examination only. Many of these students passed the necessary examinations without having received any instruction in the laboratory, drawing office, or field, although such teaching is generally recognised as essential if the student is to understand the scientific principles underlying the subjects studied and is not being merely crammed to pass an examination. The external examiners for the degree were well aware of the common deficiency in this instruction as shown continually in the answers of the students, and the usual examination methods, special papers and 'orals', were practised to try, if possible, to ensure that the candidates' knowledge was not derived merely from textbooks.

The necessity of real evidence that the student had followed properly organised courses of instruction was apparent and it was felt that the granting

of the external degree in engineering on the results of an examination alone could only be a temporary expedient. The continual improvement in the standard of teaching and equipment of the technical colleges and institutions throughout Great Britain had made them generally available for the necessary laboratory training of those seeking London degrees and so, in 1931, after serious consideration of the whole subject, the Senate agreed that the time had come when the University could, without undue hardship, insist that candidates for a degree in engineering should be trained by the best methods and so should follow courses of study at approved institutions and present records of their course-work when taking their examinations. This decision has recently been the cause of considerable discussion and comment in the columns of the *Engineer*.

Teachers in engineering colleges and others interested in the preliminary training of young engineers have looked forward to this change, which really was a little overdue. It is quite true that many excellent candidates have taken the external degree by private study without any of the advantages which are now so easily obtained at the numerous colleges and technical schools. This external degree examination has produced special teachers, special textbooks and special students. Engineering employers generally have welcomed the college-trained student, and a degree in engineering is no longer the handicap which we are told it was in the old days. It is necessary therefore that the degree should mean that the holder has been trained by the most up-to-date methods, and not that he has merely passed an examination. In defence of the continuation of the former method of granting an external degree in engineering, it has been said that the examiners could devise tests to ensure that those receiving degrees are worthy engineers. Devising suitable examinations leads unfortunately to devising, teaching and learning suitable answers.

The degree should not be the prize for a competition between the examiner and the student and, in any event, the university degree does not say that the recipient is a worthy engineer, though it should indicate that he has had a sufficient training in the sciences underlying the practice of engineering. The object, therefore, is to see that this training is as effective as possible. No one would dispute that laboratory training is necessary for the student studying chemistry or physics, and the teaching of mathematics has been completely

revolutionised by adopting laboratory methods. In fact, at the present time, we find it difficult to understand how it was ever possible to think that the engineering subjects now taught in schools and colleges could be learned by reading textbooks only and that an examination could find out if a candidate had gained a certain knowledge in engineering science. Doubtless the difficulty in designing suitable apparatus and the cost of the necessary plant delayed for a time the equipment of many college laboratories, but few would care to assert that such subjects as strength of materials, theory of structures, hydraulics, electrical engineering, heat engines and surveying can be studied properly without exercises in the laboratory, field and drawing office.

There is sometimes a confusion of ideas introduced by calling such exercises practical work. These exercises are part and parcel of the instruction in the science which the engineer must have before he can practise his profession successfully. It has been suggested that machine work in an engineering shop, testing in an electrical works, or field and routine work in a surveyor's office, may be the equivalent to the laboratory work in a college. In fact, some may claim that it is more useful because it is 'more practical'. However useful such work may be, it can never take the place of the laboratory instruction and graduated course-work of the engineering school, where the training is not in the practice of engineering, but in the principles on which engineering science rests.

Moreover, by the change now brought about in engineering education, the external student will benefit not only in his technical studies, but also by obtaining a broader education. He will necessarily attend a school or college during his course of study and must derive much benefit from associating with the other students. In every branch of the profession, the leading engineer is the one who can deal most successfully with men, and the hard-working student loses much when his private study deprives him of the companionship of his fellows. Knowledge of human nature and tact, as well as engineering science, will be learned in the college.

The University's offer to inspect any college with the view of granting recognition in a subject in which teaching and equipment is found adequate, should obviate hardship. Moreover, while no doubt the result of such inspection will be gradually to raise the standard of teaching in some cases,

there is no reason why it should influence unduly the work of the college or its relations with the neighbouring universities. The sole object of the change is the laudable one of insisting that external candidates shall obtain the teaching which is now regarded as requisite for the B.Sc.(Eng.) degree.

The action which the University of London has taken will ensure that the best possible means available will be at the service of those who wish to take an external degree, and possession of the engineering degree will indicate then not only that the candidate has passed certain examinations, but also that he has followed courses of study and worked in laboratories properly equipped for the work in hand, and that this work has been carried out with the assistance of qualified teachers. As a result of this change, those who possess the London degree of B.Sc.(Eng.), 'external', will have received that thorough theoretical training necessary for the practice of engineering as much as the 'internal' students have.

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### Gas Calorimetry

*Gas Calorimetry.* By Major C. G. Hyde and F. E. Mills. Pp. xvi+376. (London: Ernest Benn, Ltd., 1932.) 42s. net.

THE supply of towns gas in Great Britain is nowadays controlled in conformity with the Gas Regulation Act, 1920, supplemented, where necessary, by the Gas Undertakings Act of 1929. Practically the whole of the gas supplied by statutory undertakings in Great Britain is now sold on a thermal basis, and charges to individual consumers are based upon the value of the total thermal energy supplied to each. It is open to individual undertakings to declare the calorific value of the gas they desire to supply; thereafter such calorific value must be maintained, subject to specified notice being given of any intention to alter it. Under the Acts, penalties are inflicted upon the gas undertaking, if on any day for a period of two hours or more the calorific value of the gas actually supplied is more than six per cent below the declared calorific value, or if in any quarter the average calorific value is less than the declared calorific value. Such, in brief, are the main thermal clauses of the Gas Regulation Act, 1920, the Act, which, as Prof. Boys says in his introduction to this volume, "gives importance to the subject of gas calorimetry as an everyday or an all-day and all-night operation".