

**REPORT ON A VISIT TO  
GERMANY: WITH A VIEW OF  
ASCERTAINING THE RECENT  
PROGRESS OF TECHNICAL  
EDUCATION IN THAT COUNTRY**

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Report on a Visit to Germany: With a View of Ascertaining the Recent Progress of Technical Education in that country by Various

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**VARIOUS**

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REPORT ON A VISIT TO  
**GERMANY,**  
WITH A VIEW OF ASCERTAINING  
THE RECENT PROGRESS  
OF  
**TECHNICAL EDUCATION**  
IN THAT COUNTRY,

BEING

A LETTER TO HIS GRACE THE DUKE OF  
DEVONSHIRE, K.G.,  
Lord President of the Council.

*Sir Philip Magnus, Gilbert R. Redgrave, Swire Smith, and  
William Woodall, M.P.*

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Presented to Parliament by Command of Her Majesty.

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To Edward Atkinson Esq L.L.D

with <sup>3</sup> some Smith's Fund regard.

25/1/97.

Report on the Recent Progress of Technical  
Education in Germany.

TO HIS GRACE THE DUKE OF DEVONSHIRE, K.G.

MY LORD DUKE,

A CORDIAL invitation having been extended to a member of our party to visit the Electrical and Industrial Exhibition at Stuttgart, and to proceed thence to Nuremberg, where a national exhibition of arts and industries was also taking place, we arranged for a short stay in Germany, in the course of which we had several opportunities of inspecting schools and factories, and of comparing the existing state of arts and industries with the conditions which prevailed 14 years ago, when, as members of the Royal Commission on Technical Instruction, we made an exhaustive inquiry into these subjects. As the time at our disposal was limited, we were forced to confine ourselves to the inspection of a few representative schools and factories, as furnishing examples of the character of the changes which have taken place since our more thorough examination of these countries at an earlier date. We were able, however, to supplement our observations by an inspection of the contents of two important exhibitions, as typical of the existing state of the manufactures of Württemberg and Bavaria. We had from time to time also the opportunity of discussing some of the questions which interested us with influential educational authorities, manufacturers, and merchants. During our stay, we had, moreover, the advantage of the guidance of Chief Councillor von Diefenbach, whose knowledge and experience of the schools and manufactures of these two countries was of the utmost value to us. Mr. von Diefenbach, it will be remembered, had an important share in the continuation of the great educational movement, inaugurated by the late Dr. von Steinbeis, a movement that has resulted in the creation of numerous thriving industries throughout Württemberg, which, until the middle of the present century, was largely an agricultural country.

At a time like the present, when the effects of German competition have recently been prominently brought into notice and have attracted so much attention in this country, it was natural that this question should occupy our minds; but as in the case of the Royal Commission on which we had the honour to serve, it was our present task rather to compare the means of education available for the industrial classes, and the influence of such instruction on manufacturing and other industries, than

to endeavour to ascertain the general causes or the actual results of commercial enterprise. We are aware that any systematic investigation into these causes would necessitate the consideration of such questions as hours of labour, rates of wages, and the economic conditions under which different trades are carried on; and, although in the course of our inquiries we were able to gather information on these subjects, to which reference is made in this report, we have no desire to convey the impression that the accuracy of such information has been scientifically sifted, or that the extent of our inquiries would justify any final conclusions. We may, however, at the outset, state that we were greatly impressed by the progress which has taken place in many of the leading branches of manufactures since we passed through these countries in 1882.

It is satisfactory to be assured that our exports of manufactured goods to Germany compare so favourably with our imports, and that, moreover, the German empire is our largest customer. And while it is possible that the aggregate value of the foreign commerce of Germany in comparison with that of Great Britain has been overestimated, there can be no doubt that in certain industries our supremacy is seriously challenged. Germany is making enormous strides, and notably in those manufactures in which superior knowledge, technical skill, and the agency of the expert in chemistry or other sciences can be brought to bear. This holds good to a remarkable degree in certain industries concerning which we had special means of forming an opinion, namely, in the electrical trades and in the cognate branches of electrical engineering, as also in the colour manufacture and in various applications of printing involving artistic and scientific skill.

We were also struck by the marked improvement in the standard of living of the wage-earning classes, and by the growing tendency to the shortening of the hours of labour. There would seem to be a more prevalent opinion among manufacturers and factory inspectors that there is a maximum "labour day," and that any increase in the number of hours of labour beyond that maximum is bad in its effect on the quantity as well as on the quality of the output.

In the year 1882, we were present at the opening of the Fine Art and Industrial Exhibition at Nuremberg, and the exhibition buildings again this year occupied the same site in the beautiful park to the north of the city.

In certain of her industries, on the occasion of our first visit, Bavaria was still, so to speak, in her infancy; now we found large and populous factories, employing thousands of workpeople, where formerly there were workshops with but a sprinkling of artisans. Where once she relied upon machinery imported from England, now she produces a steadily increasing quantity of that required for the home trade, and finds new markets in other lands. Her railway system has been greatly developed and extended, and the disadvantage of her inland position and



her comparative remoteness from colonial and other markets is to some extent compensated for by very low railway rates for raw materials.

We may mention, as typical examples of progress, two industries which have practically been created since 1882. In that year there was not a single Portland cement factory in Bavaria, but now at one of the works alone 300 hands are employed, and about 50,000 tons of cement are produced annually. This business was founded only in 1885. The electrical works of Messrs. Schuckert & Co. (now the Elektrizitäts-Aktien-gesellschaft) were only just beginning on a small scale in 1882, and now they employ 3,500 workpeople, and export optical and electrical machinery to all parts of the world.

The development of lithographic colour printing works, such as those of Mr. E. Nister, of Nuremberg, affords another illustration of German enterprise resulting from the readiness of Germans to at once apply new inventions to productive industry. In these works, which are typical of others in Germany, numbers of illustrated books, besides large quantities of almanacs and Christmas cards, intended for the English-speaking markets, are printed, and the success of this industry is no doubt largely due to the scientific skill displayed in the processes of colour printing, as also to the ready supply of well-trained artistic operatives, of whom 140 were engaged in this factory at the time of our visit; the entire staff comprising 750 workpeople. It is worth noting, however, as indicative of the progress of art education in our own country, that nearly all the designs reproduced for the English market were the work of English artists. This very fact, however, only affords an illustration of another cause of German material progress, viz., the intelligent care displayed, and the efforts made to adjust the wares exported to the tastes and requirements of the market in which they are to be sold.

Among the many causes that have contributed to the advancement of German industry, we would particularly refer to the educational conditions upon which Germany has relied so largely in the past for the maintenance and development of her industrial progress.

The Commissioners set forth in their Second Report in 1884 the conclusions at which they had arrived with respect to the educational activity of Germany and the Continent, and it is important to record that since that time there has been no disposition to remain satisfied with past achievements. On the contrary, in nearly every case we found evidences of a determination on the part of the municipalities and of the State to increase and extend their schools, and to equip them with the most modern and improved apparatus. In these days of rapid intellectual progress the school becomes antiquated and obsolete almost as quickly as the factory or the workshop, and again and again we found that schools which had awakened our envy in 1882 and 1883 were being entirely rebuilt and replaced by

larger and more serviceable edifices. We shall have to mention, even in the few towns we visited, several instances where we found this to be the case, and the manufacturers who assured us of the importance of these institutions during our previous visit, were not a whit less convinced now of the urgency of the need of the additions and extensions which had since been made.

The great industrial art schools of Munich and Nuremberg vied with one another at the exhibition in the variety and extent of the works of their students, and we found that for the school at Nuremberg an entirely new building is in course of erection at an estimated cost of 45,000*l.* Separate departments are being provided for the day and the evening students, and special well-lighted class-rooms have been designed for all the different branches of art instruction, as well as for art in its varied applications to wood-carving, metal work, and general decoration. This school, when it is finished, will be one of the finest and most complete of its kind in Germany.

The Gewerbe Museum of Nuremberg has likewise outgrown its former habitation, and a handsome new edifice, conveniently situated, is even now partly occupied by the libraries and collections. In addition to the new buildings already finished, it is proposed to erect a separate range of laboratories and class-rooms for the section devoted to chemical technology, which since our former stay in Nuremberg has increased greatly in importance. These buildings when complete will cost over 50,000*l.* In connexion with the Gewerbe Museum there are courses of popular lectures, similar in character to those given at the Conservatoire des Arts et Métiers at Paris, on all new inventions likely to prove useful for trade purposes, and on other developments of science and art processes, which lectures are attended by large numbers of the working classes. In the laboratories a staff of professors and their assistants are employed on chemical research, and students desirous of conducting experiments under the direction of the professors in any special applications of chemical science to trade purposes receive gratuitous instruction. A special feature of this trade museum is the collection of specifications of patents carefully tabulated and open to all inquirers. This collection forms part of the statistical department of the museum, which also contains a history of all the factories of Bavaria, arranged in classes, giving a full account of the processes of manufacture, the number of machines used, the trade marks and patents owned, the horse-power employed, supplemented by any details which the owner may care to furnish respecting the number of the workpeople and the annual output.

At Stuttgart a somewhat similar museum, only opened in May last, has cost close upon 200,000*l.*, and contains specimens of the art products of different countries, arranged after the manner of the South Kensington Museum. We have given a more detailed account of this museum in connexion with our description of the exhibition.

If we turn from art to science we find similar evidence, in the various towns visited, of the remarkable development of educational institutions and of such aids to industry as education is able to provide. We are led to believe that much more is being done for the training of those destined for the higher ranks of industry in many parts of Germany than in England, and this, too, notwithstanding the large sums entrusted to county councils and borough authorities under the provisions of the Local Taxation (Customs and Excise) Act of 1890. At Stuttgart we found that an entirely new group of buildings had been added to the Technical High School, one side, the chemical institute, reserved for the practical study of pure chemistry and the other for practical training in electro-technology. The Commissioners reported in 1884 that this Polytechnic had recently been enlarged at a cost of 75,000*l.* The erection and equipment of these new buildings has cost about 100,000*l.* Every new appliance that can aid the student in his scientific work is found in the series of laboratories of which this range of buildings consist. It is noteworthy that the instruction given in the Chemical Institute is exactly of the same kind as that given in the Universities, and, although a special feature of the teaching and of the equipment is the prominence given to electrolysis and to electro-chemistry generally, no attempt is made in these new laboratories to teach chemistry in its application to special industries, that part of the instruction being provided for in the main Polytechnic building. The electro-technical laboratories, housed in a separate part of the building, are perhaps only inferior to those still more recently erected in Darmstadt, and are splendidly equipped with every appliance for advanced practical instruction in all branches of physics.

At Darmstadt, a city of 57,000 inhabitants, the Polytechnic or Technical High School has been entirely reconstructed at an expenditure of about 120,000*l.* It consists of a main building for the study of mathematics, drawing, natural sciences, and engineering, and of two separate detached buildings, similar to, but larger than, those at Stuttgart, for the study of chemistry, pure and applied, and of physics and electro-technology. No thought nor money appears to have been spared in the erection and equipment of these buildings, which are the most complete of those we have yet seen. It must be remembered, in connexion with the expenditure on the above-mentioned institutions, that the cost of building in Germany is undoubtedly very much less than in this country.

Since this was written, we learn that a new Electro-technical Institute has been added to the Royal Technical High School in Hanover, opened by the Minister of Education in October 1895, which ranks side by side with these splendid establishments.

To the instances already quoted may be added the Technical High School of Charlottenburg, at Berlin, which was in process of erection in 1884, and which has since then been completed and extended (at an estimated expenditure of over 450,000*l.*),