

MANCHESTER'S REPORT ON TECHNICAL EDUCATION IN GERMANY AND AUSTRIA.

IN pursuance of a resolution of the Technical Instruction Committee of Manchester, confirmed by the City Council, a deputation, comprising Alderman James Hoy, Alderman J. H. Crosfield, Councillor Nathaniel Bradley, Mr. Ivan Levinstein, Mr. John Craven, Mr. Charles Rowley, with Mr. J. H. Reynolds (Director), recently visited certain institutions and schools on the continent devoted mainly to scientific and artistic instruction as applied to industrial and commercial pursuits. The Report of the Committee has just been published, and the following extracts from it will do much to show the British public the extent to which provision is made in Germany and Austria for the supply of instruction of a scientific and technical character in aid of the commerce and of the industries of these countries.

Since 1891, when a deputation from the Technical Instruction Committee visited some of the continental countries, the Council has undertaken the task of maintaining the Technical and Art Schools of the city; and with the purpose of giving full effect to this responsibility, has already not only greatly developed these institutions, but has embarked upon the erection of the largest technical school in the country, the proper equipment of which is a matter of the most serious concern and importance. The erection of the new school was begun in August 1895, and its completion, ready for occupation, is confidently expected at an early date. The Committee, therefore, felt that it was high time the question of the equipment of the school was considered, especially in respect of the important departments concerned with the textile industries, with the industrial applications of chemistry, and of physics in relation to electrical engineering.

The extraordinary development which has taken place within quite recent years in electrical science as applied to electrical engineering industries, and the certainty of great extension in the near future, make the equipment of a large technical school a responsible matter.

Hardly less important than electricity is the great textile industry in its various departments of spinning, weaving, designing, dyeing, and finishing, in some of which we find ourselves at a serious disadvantage (especially those in which chemistry plays a part) as compared with our foreign competitors.

It has been found necessary in the dyeing and finishing schools abroad to discard mere laboratory methods, and to equip them on a scale approaching that of the works themselves, and analogous to the practice obtaining in the spinning and weaving schools, so as to give the students who are trained in them a real, practical, and effective knowledge of the processes employed.

THE CREFELD DYEING SCHOOL.

Hence at Crefeld, where the Textile School already enjoys a world-wide repute for the splendour of its equipment, and the effectiveness of its influence in promoting the special industry for which Crefeld is famous, and which finds in this country its best market, the Prussian Government have built and equipped a large three-story building in the near neighbourhood of the present Textile School and Museum as a Dyeing and Finishing School. This School contains extensive chemical laboratories for instruction in qualitative and quantitative analysis, physical laboratories, drawing-rooms, lecture and testing rooms, chemical museum, reading-room and library. In the library are to be found technical books of all nations bearing upon textiles, all of which are introductory to the special work of the school, namely, the dyeing and finishing of textile goods, particularly those of importance to the special industries of Crefeld and the district.

Much attention is given to the examination of colouring matters, and to mordanting on all kinds of fibres and cloth; and constant experimenting, with a view to new materials and processes, is a special feature of the instruction. Experiments are undertaken in testing the colours employed, and in dyeing the yarns for exposure to light, adverse atmospheric influences, resistance to acids, alkalis and soaps; and investigations are made with a view to the production of colouring matters formerly employed in the dyeing of old tapestries. Every effort is made to assist the manufacturers and merchants; and on their behalf the school will undertake investigations as to the dyeing and finishing of materials submitted, which, when completed, are

reported to the manufacturer or merchant, with information as to the methods used, and the chemicals employed on the fabric, together with the cost of production. These investigations are carried on by the students under the direction of the teachers, and are of inestimable value to them as a training in solving real industrial problems.

THE CREFELD SCHOOL AS AN EXAMPLE TO BE FOLLOWED.

Your deputation is convinced, as a result of the inspection of the Crefeld School, that the Manchester district would gain materially by the development of the Textile School in the new building on the same lines.

(1) By the increase in the number and variety of the looms and of the goods woven upon them.

(2) By the establishment of a school of tinctorial chemistry, and of practical dyeing and finishing, upon an adequate scale, alike in respect of the completeness and the real efficiency of the machinery employed.

(3) By the establishment, in actual touch with the other departments of the school, of a well-organised museum, replete with examples of ancient, mediæval, and modern productions of the best type of workmanship, colour, and design.

It is to variety and excellence in these respects that Lancashire must look to maintain and increase its supremacy and reputation as a manufacturing centre.

HOW PRUSSIA DISSEMINATES TECHNICAL INFORMATION.

As showing the thoroughness and the zeal with which the Government supplies the means of technical training in the various industries of the country, it was stated to the deputation that if any paper—dealing, for example, with some department or detail of the textile industry—is read before any foreign society, and is published, or appears in any journal, the communication is immediately translated and circulated throughout the textile schools of Prussia, with directions to have it dealt with as a lecture to the students; and if models, illustrations, or lantern slides are required by way of illustration, they are prepared and sent with the paper. Moreover, in Berlin there exists a department of the Bureau of Education not accessible to visitors or inquirers, where models, diagrams, and other means of illustration are prepared and circulated to the technical schools of the country.

THE EFFICIENCY AND HIGH STANDARD OF TECHNICAL INSTRUCTION IN GERMANY.

Your deputation are convinced that the textile schools of Germany, so far as they have observed them, are of singular value in training up a supply of exceedingly well-instructed men, capable, by reason of the methods employed, the examples studied, the variety of the appliances used, and the investigations and experiments made, to take the lead as foremen, managers and manufacturers in the industries concerned.

The present and potential importance of the electrical engineering industry led your deputation to visit Darmstadt, where, in 1895, the Technical High School was entirely rebuilt on a greatly enlarged site at a cost of 130,000*l.* The school includes, in addition to the main building, and opposite to it, two fine buildings—one for physics and technical electricity, and the other for pure chemistry, electro-chemistry, chemical technology, and pharmacy.

It is important to remember that these figures referring to the cost of building represent a much larger corresponding cost in England—for example, the cost of the Darmstadt building, which is of stone, was only 5*l.* per cubic foot, which is about half the cost of similar buildings in England. This remark applies also to statements of cost of administration and of teaching—salaries being on a lower scale than with us. It is, however, important to observe that the principal professors enjoy the status and the advantages of civil servants.

It is to be noted that Darmstadt has only 57,000 inhabitants, and that the entire State, of which it is the chief city, has a population of not more than one million. This Technical High School is an institution of university rank, and is built on a scale of great liberality. Considerable as it is, it was felt by the authorities that the growing demands and development connected with electrical science and its adaptation to industrial needs and the general service of the community necessitated the establishment of special provision in suitably equipped buildings of means of instruction in electro-chemistry and electrical engineering. This has been done, as already stated, in two new and separate buildings (which are even now being enlarged), on an excep-

tionally complete scale. The efficiency, extent, completeness, and fine organisation of the equipment in the electrical building especially impressed the deputation.

Darmstadt undoubtedly possesses the means of giving the highest possible theoretical and practical instruction to electrical engineering and electro-chemical students, and that this is highly appreciated is shown by the fact that out of the 1100 day students in attendance in this school (all of whom are over eighteen years of age), more than a third of them are enrolled in the physics and electrical engineering division. The reputation and efficiency of the school attract a large number of students from various European countries.

The equipment of this school has set before the deputation an excellent example of the methods to be followed in equipping the electrical engineering and physical department of the new Technical School of this city, though we may not hope that it can be approached either in extent or completeness, for want of space and want of means. The cost of this department alone has been 28,000*l.*; and the building, which is three stories in height, stands upon a space of ground 123 feet by 140 feet.

The comparatively advanced age of the day students in German technical schools is especially remarkable as showing (1) the relative position of technical schools with respect to general education on the continent and in England; (2) the standard of attainment reached before entering upon specialised studies; and, lastly, as indicating the advance which is possible under such circumstances.

ADVANTAGES OF SCIENTIFIC AND TECHNICAL TRAINING.

Without doubt the general industry of the country gains immensely by the extended time given to scientific technical training in the supply of a large number of adequately educated men. Nothing is more striking than the provision of those responsible for the education of the German and Swiss people in providing the means for the best possible training in chemical science and its industrial applications.

The sense of the importance of chemistry as a predominant factor in future industrial developments, led to the establishment of large and costly laboratories, directed by the most eminent men of science of the day, where students were encouraged to devote five, six, or even seven years to study, with the result that it has unquestionably placed the German and Swiss manufacturers, especially the former, easily first as the greatest producers in the world of colours and fine chemicals.

The success of this policy may be realised from the fact that the great colour manufacturing works of the Badische Anilin and Soda Fabrik at Ludwigshafen, on the Rhine, alone employs nearly 5000 men and upwards of 100 scientifically trained chemists, its technical laboratories themselves being on the scale of the laboratories of a great university. In 1865 this firm employed only thirty workpeople. These works are but one of several on a similarly large scale.

The command of the world's market in colouring matters and pharmaceutical products derived from coal-tar, the value of which is estimated at about 10,000,000*l.* sterling, is in the hands of Germany to the extent of three-fourths, 75 per cent. of which is sent abroad.

The success in this great department of applied science has stimulated the educational and industrial leaders of Germany to further efforts, and the recent great advance in knowledge in the department of physical science has resulted in the erection and equipment of electrical laboratories on an imposing scale at Stuttgart at a cost of 100,000*l.* (including additional provision for the study of pure chemistry), at Hanover, where a new Electro-Technical School has been added to the Royal Technical High School, and again, as already stated, at Darmstadt.

It is clear that the educational advisers of the various German Governments are of opinion that the same success which has already attended the establishment of numerous and costly chemical laboratories in stimulating German industry, and placing the nation first in the manufacture of chemical colour products, will be repeated through the establishment of like laboratories for the study of technical electricity as applied to the field of chemistry and to engineering.

The real bearing of the importance of electricity in association with chemistry in the production of new organic and inorganic compounds, and by electrolytic action of the more economical production of chlorine and of such metals as zinc, nickel, sodium, potassium, and aluminium, is hardly fully grasped in this country, so far as means exist for its study; but there is abun-

dant evidence of the activity of Germany in the establishment of special schools and laboratories, splendidly equipped, with a view to important industrial developments in the near future, which will win for Germany a similar pre-eminence to that she has attained in the domain of chemistry.

PROGRESS IN GERMANY.

That Germany is in a prosperous condition, due to her successful manufacturing and commercial enterprise, was plainly evident on every hand in the extension of her cities—the making of new streets, and the erection of fine, handsome buildings which is going on everywhere in her large towns.

It is not less clear that the schools are the root and base of this surprising industrial development, and are the main contributors to this great economic result; it is no less certain that if we are to maintain our position as a great industrial community, it must be by following and adopting the same methods.

It is not, however, only in the domain of science that Germany is making great progress. In almost every town visited by the deputation fine industrial art museums were found, arranged with the express purpose of cultivating a knowledge of what has already been accomplished in the production of fine examples of colour, design, and workmanship. Every technical school has its special museum of objects applicable to its purposes. Notably was this the case in Berlin, Vienna, Nuremberg, Crefeld, and at Disseldorf, in which latter place the Industrial Art Museum is said to be the finest in the Rhine land. These museums help to preserve and hand down the traditions of past achievement and excellence, and stimulate the desire to reach to as high, or higher, levels to-day.

INFLUENCE OF TECHNICAL SCHOOLS ON INDUSTRY.

In submitting this report, your deputation are not insensible to the consideration that it may be thought that a too favourable view has been taken of the educational provision and the industrial advance observed by them in German States as compared with the position in England.

In deprecation of such possible criticism, they would observe that it is by no means a difficult matter to trace to the influence of the schools, and the system of education generally, the improvement which has marked the manufacturing progress of Germany and especially the unique position occupied by the chemical industries in that country.

Almost every industry has schools specially equipped and staffed—well described by the phrase Mono-technic Schools. Such schools are almost unknown here, or are to be found in connection with only one or two industries, as, for example, with weaving and dyeing, and one or two other industries, such as tanning; but even in these cases the number is very limited, and the day students are comparatively few, whilst the equipment is nowhere on the ample scale of Crefeld.

The German Mono-technic School is intended primarily for day students, and only incidentally for evening students. The knowledge, skill, and experience of the highly-qualified staffs are all directed to the advantage and cultivation of the day students, and your deputation are of the opinion that that policy must be followed here if any marked industrial advance is to be secured.

The attention of the deputation was frequently directed to the importance of another factor in the development of German commercial progress, namely, the careful attention given to the study of foreign languages, especially to English (which latter language is most successfully taught), with a view to their use in business transactions, and of enabling those engaged in commerce to come into the closest relations with customers in all parts of the world.

It is further desirable to draw attention to the advantages enjoyed by foreign nations by the adoption of the metric system. The ease with which the knowledge and use of it is acquired, and its universal adoption, in all scientific training and investigation, not to speak of its value in commercial transactions in foreign markets where, with rare exceptions, it is employed, make its universal adoption here much to be desired.

The excellent system of secondary education has greatly contributed to this, but, in addition, special commercial schools are found in all the largest towns.

LESSONS TAUGHT BY GERMANY.

Referring once more to Germany and especially to Prussia, your deputation cannot conceal their sense of the advantage whatever may be the ultimate drawbacks, of a centralised

bureaucratic administration which, taking a careful survey of the educational and industrial needs, places the schools here or there as circumstances require, brings them into mutual relation, supplies ample means, and effectively assists without loss of time the industrial advance. Something may be lost of "freedom, variety, and elasticity," and that loss may ultimately be serious in its effect upon individual initiative, upon which we as a nation so confidently rely. Which is the better policy the future can alone determine. It may, however, be safely asserted, that it is high time the effort was made in this country to give to our youth the educational advantages, general and special, which are enjoyed by their rivals abroad.

Exception has sometimes been taken to the size and cost of the new building now being erected by the Technical Instruction Committee for the Municipal Technical School, but your deputation have returned from their visit doubly confirmed in their conviction that every foot of space will be needed, and that even when fully utilised and equipped it will fail to rival in amplitude of resource the splendid industrial schools of Germany and Switzerland.

The report, of which the above is a summary, was presented to the Manchester City Council on Wednesday, October 20, when the following interesting discussion, abridged from the *Manchester Guardian*, took place upon it:—

Mr. Alderman Hoy, Chairman of the Technical Instruction Committee, moved the adoption of the report. The report, he said, contained the latest information as to the developments of technical instruction upon the continent, in the countries named, in respect of certain specific industries, more especially textile manufactures, dyeing and finishing, and electrical engineering, and, generally, what was being done in these countries under the name of technical education. It was to this point, and to this alone, that he wished to draw the Council's attention. The term "technical education," as generally used in this country, was much abused. It would appear to mean anything, as occasion might require, from an evening continuation school for teaching the elements of cookery or the practice of sewing and cutting-out, up to an institution designed to give the highest form of specialised scientific instruction. No doubt the grant of funds from the Exchequer, under the provisions of the Technical Instruction Act, and the vague and general definition of the objects of the Act, contributed to this loose interpretation of the phrase and to the application of the money in aid of almost every form of instruction. Let him give the definition of the phrase as understood in the Manchester Municipal Technical School:—"The chief object of the Technical School is to provide instruction in the principles of those sciences which bear directly or indirectly upon our trades and industries, and to show by experiment how these principles may be applied to their advancement." This object was carried out in two ways—first, by day instruction; second, by evening instruction. As with the country generally, evening teaching was at present by far the most important in point of the numbers taught and range of subjects, the numbers in the daytime being only the merest fraction of those in attendance at night. The object of the evening student was to supplement the practice of his daily occupation by an attempt to study and to understand the scientific principles which underlie it, in the hope of increasing his efficiency as a workman. Without doubt this was a most desirable object, and the schools which provided such instruction and those who took advantage of it, often under conditions requiring the greatest sacrifice of time and strength, deserved the highest praise. Nevertheless, important and valuable as was the provision made in this country for evening scientific and technical instruction, and useful as it undoubtedly was to the artisans who with scant educational equipment endeavoured to profit by it, it could not, when regarded from the wider view of the serious industrial and commercial competition among the leading nations of the world, be accepted as satisfactory or as sufficient to enable this country to maintain its position, especially in those industries where scientific knowledge and training were indispensable factors. Thus the efforts of the chief continental nations were directed to the highest scientific training of those who were ultimately to become the leaders and organisers of the great scientific industries. The main point of interest in the report now presented would be found, therefore, to lie in the emphasis (only faintly indicative of the real extent and wealth of equipment and teaching power which was observed) laid upon the abundance of the provision for scientific

instruction to day students preparing to enter upon industrial pursuits, and its quite extraordinary development within the past few years. In every industrial centre new buildings were rising, old institutions were being enlarged, and their equipment increased in order to keep pace with the demand for better and more advanced training in science and art, with a view to industrial and commercial advancement. The advance in scientific knowledge of the past half-century had changed the conditions of the industrial problem, and had gone far to equalise the struggle for industrial supremacy, or at least was tending to make countries once dependent upon us for supplies of manufactured goods more self-contained and self-supporting, and even to enable them to meet us in open markets. It was a case of steam dependent upon abundant coal supplies *versus* electricity dependent upon abundant water power. Germany had already found her reward in her command of the market for products requiring the aid of the highest scientific skill in chemistry, due entirely to the existence of her schools, and what she had done in the domain of chemistry she hoped confidently she would do in that of electricity also. The future of the manufacturing industry depended entirely upon the application of the highest scientific skill and experience in developing natural resources and products, and those nations which realised the truth of this and provided for the training of the leaders and organisers of industry would surely win the day. Nothing struck the English visitor to Germany more than the extraordinarily large number of well-educated young men in the day departments of foreign technical schools, clearly pointing to the recognition of the value of scientific training as the chief element and necessity for industrial efficiency and success. The report now presented was not written with any idea of depreciating the value or skill and efficiency of the English workman, but with the aim of showing how much more efficient would be the result of his efforts if directed by leaders and managers who were themselves thoroughly trained in the principles of science and of art in their application to the industries in which they were engaged. Without doubt we had the finest race of workmen in the world. Their fine qualities would be improved by education, and their opportunities of advancing to the front rank of leaders and managers in our great and varied industries would be well served by the facilities now increasing on every hand in every industrial centre of the country through the operations of the Technical Instruction Act, and he, as one of their sincere well-wishers, trusted that they would take full advantage of the facilities thus freely offered.

Mr. Alderman Crosfield, deputy-chairman of the Technical Instruction Committee; in seconding the motion, mentioned that the deputation was accompanied by Mr. Charles Rowley and by Mr. Reynolds, director of technical education, both of whom showed great interest and enthusiasm in the subject. The deputation found that since the deputation from the Corporation, headed by Mr. Alderman Rawson, went to the continent some years ago very great progress had been made, particularly in Germany. The paternal Government of Germany and the good sound sense of the German people had put that country far ahead of us in educational matters. The difference between the German artisan and the Lancashire artisan was very great, and if we did not take care we should be not only as far behind that country as we were at present, but a great deal further. The idea that students should go to the technical schools unprepared, which was a thing we suffered from very much here, was apparently entirely unknown in Germany. It was much to be regretted that in this country parents, preferring a few shillings now to pounds a few years hence, should take their children away from the day schools at such an early age.

Mr. N. Bradley, who also accompanied the deputation, said he was struck with the complete way in which the work was done in the technical schools in Germany. Every penny that could be spent in Manchester for the purpose of technical instruction would be to the advantage of Manchester and of the people of this country. The impression that entered his mind was that in all industrial pursuits where there was competition it was a great advantage to see the other side. Consequent on the kindness of the professors and the officials connected with the continental institutions which they visited, everything was shown to them, and the benefits of experience were placed unreservedly at their disposal. They found that the schools were conducted under a system in which cleanliness and discipline showed themselves on every side. The result of the teaching the pupils received was exemplified in this country, for it was a fact that foreigners came to England to fill places which ought

to be held by Englishmen. He believed it would be possible to save a very large sum of money to the ratepayers if the equipment of our technical schools were made far more efficient than they had been.

Sir Bosdin Leech supported the resolution. They had, he said, just heard what was being done on the continent. He had recently crossed the Atlantic and travelled in America and Canada, and he found that there the course of education was being greatly pushed forward. He saw what was being done there in the way of the introduction of labour-saving appliances, and in the efforts that were being made to oust us from the markets of the world, and unless we went forward much more quickly than we had done up to now, improving the minds of our children and increasing our scientific teaching, we should be distanced very materially. Already we were far behind the United States and Canada in the matter of electricity. In thirty or forty towns which he visited he did not see a single horse employed in traction. Electricity was used, and people were able to get about very rapidly. Electricity was also applied to the lighting of streets in a way that was most effective. He felt that we should strain every nerve to help forward the work of the Technical Instruction Committee.

Mr. Alderman Higginbottom said he had had an opportunity of seeing on the continent what Sir B. Leech had seen in America. The subject of electricity had occupied a great deal of the attention of the Technical Instruction Committee, and he wanted to emphasise very strongly that it was the duty of that committee to place every convenience before their students who were studying electricity. He regretted that he and those who accompanied him were forced to the conclusion that England was very much behind continental nations in regard to electrical work. Sir Bosdin Leech had said that electric traction was everywhere adopted in America. It was also almost universal on the continent. But besides electricity, we had something else to learn. We had been under the belief that we were the home of engineering, but we were nothing of the kind. He had travelled through the principal cities of France, Germany, Austria and Italy, and had visited fifty of the finest electric stations for traction and lighting purposes, and, with one exception, he found that all the machinery used in those stations was from the works of continental firms. The deputation had seen engines of 1000 and 1500 horse-power, vertical and triple-expansion engines—which we thought we could build in Lancashire better than anybody else—and he was bound to say that he had never seen finer. The whole secret of the success of the foreign engineer was that for many years the foreigner had been giving his students the best technical instruction possible. He said nothing about the capabilities of the German workman as compared with those of the English workman. The English workmen were superior to the German or Italian workmen in the matter of ordinary work, but as regarded technical training and in matters of detail they were far ahead of us. The workshops were kept in the cleanest and most systematic way, and they were able to turn out work cheaper than it could be done in England.

Mr. Alderman Rawson said the matter under discussion was not merely of local, but of national importance, and attention to it was requisite if we were to maintain the position we had hitherto held. Since the establishment of the textile department of the Technical School in 1882, the Committee had been dependent upon the foreigner in every case but one for the teaching of dyeing, bleaching, and printing, and they had paid higher salaries in that department than in any other, with one exception. The foreigner had anticipated us not only in technical matters, but in the preparation of men who were competent to teach in those subjects. He hoped the report of the Committee would be widely circulated and read. With regard to our general system of education, he hoped the time was not far distant when the clever child of the poor man would be able to proceed from the elementary school to the Grammar School, the Technical School, Owens College, and the University.

Mr. Trevor said he hoped the effect of the speeches that had been made would be to induce public men to pay more attention to the subject under discussion; then they would perhaps not feel called upon to subscribe so much in the way of amusement, and give rather more to matters of real profit. At the Owens College he understood they had an important section for giving instruction in steam-engine testing. The subject of steam-engine testing and the taking of diagrams was a most important one; yet last week the number of students from this great centre of

engineering, with its half-million of inhabitants, was only five, and the teacher told the students that unless they could make the number up to seven it would not be worth while to carry on the class. The fees, he understood, were only two guineas for a term of ten lessons. We possessed as much conceit as any country on the globe—he meant the thing that stood in the place of ability; it was very common—but we could only produce five young men interested in their work to the degree that they wished to perfect themselves in it. We were always talking about our being the best workmen in the world. Those who worked were the best, but men should do a little more for the honour of their work, and, apart from the question of wages, try to perfect themselves in it. It was time the British workman should try to improve himself individually, and not depend so much upon organisation. If he would take more advantage of the expensive arrangements that were provided for him, and study, we should get back our trade.

Mr. J. Phythian (Gorton) said that as a member of the Amalgamated Society of Engineers he went upon the deputation with a prejudiced mind. He believed the working men of England were capable of building engines and dynamos superior to any, but his opinion had been changed. He saw work done by continental artisans—and he thought he was a fair judge of good work—which would put to shame a great deal of the work done in this country. He was perfectly certain he never saw better engines built than those which he saw being constructed on the continent. He attributed this to the care with which the workmen were trained in details, which enabled them to excel in those niceties which were absolutely essential in the making of engines and boilers.

Mr. Mainwaring said as a member of the deputation he was glad some plain unvarnished truths had been uttered in that chamber. Twenty years ago he visited some of the towns visited by the deputation, and he was amazed at the great advances which had since been made. It was quite time the veil was torn from the eyes of the English workman, and that we abandoned the short-sighted belief that no one could touch us in our various industries. The deputation had not come in contact with a single foreman of works in Germany who could not speak to people in either French or English. He should like to know where they would find a foreman in works at home who would be able to speak to a visitor in German or French. They found that these foreign foremen could speak to them as easily in English or French as in their native language.

Mr. Wilson said he had seen engine work in America and Canada, and he had recently travelled on the continent, but he had seen nothing which, to his mind, was superior to English workmanship. He had heard it stated repeatedly that German workmen were not superior to English workmen when they came to work with the vice, and he believed that was an understood thing. He should strongly oppose the introduction of any foreign machinery into Manchester in connection with the extension of the use of electricity.

The resolution was adopted.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Sir W. L. Buller, F.R.S., has presented to the University a valuable skeleton of the Elephant Seal for the Museum of Zoology.

Dr. Hobson, F.R.S., Dr. Bryan, F.R.S., Mr. A. N. Whitehead, and Mr. A. Berry have been appointed examiners for Part ii. of the Mathematical Tripos.

The examiners for the Natural Sciences Tripos 1898 are: in Physics, Mr. Shaw, F.R.S., and Mr. J. T. Bottomley, F.R.S.; in Chemistry, Mr. A. Scott and Dr. W. H. Perkin, F.R.S.; in Mineralogy, Mr. A. Hutchinson and Mr. L. Fletcher, F.R.S.; in Geology, Mr. Teall, F.R.S., and Mr. Marr, F.R.S.; in Botany, Dr. Marshall Ward, F.R.S., and Prof. R. W. Phillips; in Zoology, Mr. Shipley and Mr. Jeffrey Bell, F.R.S.; in Anatomy, Dr. Barclay Smith and Prof. A. M. Paterson; in Physiology, Dr. Shore and Dr. Waller, F.R.S.

The examiners for the Mechanical Sciences Tripos 1898 are Prof. Ewing, F.R.S., Prof. Perry, F.R.S., and Mr. Peace.

Mr. Marr and Prof. Judd have been appointed examiners for the Sedgwick Prize in Geology.

The Rev. Prof. Wiltshire has given his extensive and valuable collection of minerals to the Mineralogical Museum. It contains a large number of beautiful and costly specimens.