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NEW ZEALAND.

TECHNICAL AND ART INSTRUCTION AND DRAWING IN PRIMARY SCHOOLS

(REPORT ON) IN AUSTRALASIAN COLONIES, BY MR. A. D. RILEY.

Presented to both Houses of the General Assembly by Command of His Excellency.

REPORT upon TECHNICAL and ART INSTRUCTION and DRAWING in PRIMARY SCHOOLS in SOUTH AUSTRALIA, VICTORIA, and NEW SOUTH WALES; with additional information and papers. By ARTHUR D. RILEY, National Scholar and Gold Medallist of South Kensington, London; late Art Examiner and Lecturer to the Education Department of New South Wales; Art Director of the Wellington School of Design and Education Board of the Wellington District.

Mr. A. D. RILEY to the Hon. the MINISTER of EDUCATION.

SIR,— Wellington, July, 1888.

In accordance with the request contained in your letter of the 13th of December last, I have the honour to submit my report upon the various technical schools of Victoria, New South Wales, and South Australia, including drawing in primary schools. I have included with the report matter and papers relative to other institutions not in the colonies, but which I consider to be of value, and to have especial bearing upon the subject of this report. In the following pages I have given the full programme of study followed at the chief institutions visited, considering it necessary that such should be cited *in extenso* if it is intended to make any practical use of information of the kind.

I have, &c.,

The Hon. George Fisher, Minister of Education. ARTHUR D. RILEY.

THANKS.

My thanks are due to the under-mentioned gentlemen, who very kindly gave me every assistance and information in their power: The Hon. C. H. Pearson, the Hon. J. Inglis, and the Hon. the Ministers for Education respectively of Victoria, New South Wales, and South Australia: the Under-Secretary for Instruction; J. H. Hartley, Esq., B.A., &c., Inspector-General of Schools; and H. P. Gill, Esq., of South Australia: J. W. Brown, Esq., Under-Secretary for Instruction, Messrs. Ball, Fraser, Campbell, and Cox, connected with educational institutions of Victoria: E. Johnson, Esq., Under-Secretary for Instruction, H. Maiden, Esq., Curator of Technological Museum, Professor Warren, Messrs. Hennessy and Henry, and the officers of the Technical Board of New South Wales: J. R. Blair, Esq., Chairman of the Wellington Education Board: also to the Railway Departments of Victoria and New South Wales, for railway-passes.

SUMMARY OF RECOMMENDATIONS.

1. That drawing-books, Standards I. and II., sanctioned by the department as class-books, be dispensed with, but that some of the exercises in Book II. might be used by the teachers as blackboard exercises for class-instruction.

2. That all schools be required within two years to be provided with efficient drawing-models.

3. That boys holding the full first-grade drawing certificate, or showing special aptitude in drawing, receive free instruction in the central schools of design or workshop, with a view to technical training.

4. That the first-grade drawing examination be held in primary schools throughout the colony.

5. That no applicant for the office of pupil-teacher be accepted unless holding a full first-grade drawing certificate, or undertaking to complete the same within twelve months of appointment. To take effect from January, 1890. This is provisional upon recommendation 4 being adopted.

6. That second-grade drawing be taken as the standard of examination for pupil-teachers and teachers of primary and secondary schools, and that the same should be separate and distinct from the ordinary classification certificate; or, should the same be combined, that the ordinary

classification certificate be withheld in the case of teachers until a satisfactory pass has been obtained in one section of the drawing certificate: present head teachers and teachers over forty years of age to be exempt from the rule.

7. That instruction be given to assistant teachers in modelling and elementary design, with a view to the introduction of these subjects into the primary schools. This, of course, can only be done where schools of design or art already exist.

8. That the Government obtain full information as to the nature and methods of the sloyd system of "handiness," and place this information in the hands of all teachers. That a trial be made of "sloyd" in one school in each educational district, with a view to the system being adopted if proved to be satisfactory.

9. That an Art Department be established upon the lines of the South Kensington Department, with a view to having technical schools and schools of art and design established in educational centres where no such schools exist. That this department be affiliated to the Science and Art Department.

10. That the suggested department consist of a Director directly responsible to the Minister of Education, and an advising Board, to consist of not more than four experts.

11. That where schools of design or technical schools are unable to raise sufficient funds for the efficient working of the school a subsidy of pound for pound shall be given upon fees received for technical classes only, in order that the fees may be brought within reach of apprentices.

Drawing in Primary Schools.

The importance of drawing in industrial education is now fully realised, and is established as a branch of primary education throughout the schools of Europe. No industry can wholly dispense with drawing; and, such being the case, a child should commence drawing at the same time that he learns his alphabet. If a child can learn to write or read he can learn to draw. The faculty of imitation should be developed from the earliest stages, as, for instance, drawing the shapes of large block-letters with single strokes upon the slate by an infant-class, and learning the name of the letter at the same time: the eye, the mind, and the hand are then at once brought into play, and drawing, as it should be, commenced.

It is necessary that the teachers of our schools take every opportunity to improve themselves in drawing. I fully understand the difficulties to be overcome in a country of the physical formation of New Zealand, so much divided and isolated, especially in the case of country teachers; but these difficulties are year by year being removed. Incompetence of teachers in this branch of education will shortly need strict attention, especially in cities where schools of art and design are established. Where national interests are concerned the whims and caprices of individuals must be made subservient to the general interest and welfare, and teachers must be required to qualify themselves to teach drawing thoroughly, or their position should undoubtedly be filled by those who have the requisite knowledge.

Mr. Walter Smith, in his evidence before the Royal Commission on Technical Instruction, says, "People have a false idea that a drawing or a painting is the result of a great deal of labour and work. It is really not so: it is only the result of what an intelligent person of taste knows, and can express. A good drawing is not made by accident—it is the representation of the intelligence of the person who makes it; and if the person's intelligence is in a very low condition the work will be low: and the process of education is to clear up the thinking-power, so that if a person wants to make a drawing he shall make it from something he knows and understands. It does not matter really whether the drawing is good or bad, because the process going on is the improvement of the thinking-powers of the students. The manipulation—the handling—of any process in art comes as of necessity from right thinking, and from nothing else. Improvement comes with time. The teaching of drawing is of great collateral advantage in other subjects of education. It develops the intelligence and the power of observation. The process of dictation drawing, for example, is the most educational subject taught in a public school, because it involves the habit of the correct use of language by the teacher, and the closest attention upon the part of the scholars. If a word is left out by the teacher in giving the lesson it is shown in the drawing; for the scholar has left a line out, or placed it wrongly, and you see he was not attending when that feature was described. It involves upon the part of the teacher a correct and clear and even economic use of language, and it involves on the part of the student the habit of patient attention; and in that alone it is of great advantage to education. But drawing is of great advantage also in other branches, such as cultivation of taste and opening of the eyes to see the beauties of nature; and the very irritating process of teaching design, exciting the faculty of originality at an early age, entirely irrespective of whether the work is good or bad, is emphatically education, or leading out."

Mr. Smith considered modelling an important part of art work, and that it should be carried on simultaneously with drawing. Modelling in sand and clay should commence with school-life. He further says, "I find, for instance, this: that if children were allowed to make a map in sand or clay they never forget geography of the district represented; or they might make a model of the route from home to school, showing how the road goes up and down, and where the houses are situated. Take a bunch of beautiful leaves to school, and explain their form and construction, give the common name, show by illustration their capacity for design, and how they have been used to ornament vases or buildings. Then ask the children to draw or model a leaf, and you will have no difficulty in keeping them to work. They feel so intensely interested in doing anything from nature that they require no watching."

Regarded aright, drawing in general education is the most potent means for developing the perceptive faculties, teaching the student to see correctly, and to understand what he sees. Drawing, if well taught, is the constant practice of the analysis of forms. By this practice the eye is quickened, and rendered incomparably more accurate; and, as the eye is the most open and ready

road through which knowledge passes to the mind, the full development of its powers is a matter of no small importance to all. In this respect, then—as an education of the eye—drawing is a most valuable means, irrespective of any service the power may be in itself. Drawing, therefore, is a most valuable discipline in early education, if it be viewed merely as a means of development of the faculties, and one equally fitted for all ranks and both sexes; and this must be constantly borne in mind as one of the causes of its utility, that it teaches to see and do all things more perfectly, and that it is a development of the general intellect of the country in an eminently practical direction.

A very prominent member of the English Government, in distributing prizes gained at Oxford and Cambridge examinations, stated that he should no more think of advocating that every one should study mathematics than he should of advocating the teaching of music and drawing. This speech appearing in the Press drew forth severe criticisms, among which appeared one from Sir Henry Cole containing the following: "As to drawing, it is next in use to writing, and even of more importance than writing in handicrafts."

Mr. Nasmyth, the inventor of the steam-hammer, wrote as follows: "Sixty years' experience with engineering works, and with mechanics and other classes of workmen engaged in such occupation, enables me to say that of all the useful acquirements beyond those of the 'three Rs' is that of drawing. By the term 'drawing' I mean the art of representing forms of natural or artificial objects by lines which, when even rapidly sketched by a practical hand and educated eye, can bring an object before you with a distinctness and rapidity such as no oral or written description could accomplish. During a long and active life, engaged in occupations in which I have had daily occasion to communicate definite ideas to others in respect of forms and combinations of forms, the possession to a certain extent of the power of rapidly sketching such in order to convey ideas of what I desired to communicate to others has done me more real service than any other acquirement or faculty I may be in possession of. If we desire to produce really useful and effective men by means of our schools, let the pupils, by every opportunity, acquire this valuable art of hand-sketching."

Charles G. Leland, in an article on practical education, states: "It was found by the most careful inquiry that the pupils who attend the drawing-classes had the highest averages in other studies, such as arithmetic, geography, and composition. This fact is the more striking from this: that the School Board, having made inquiries, found that among 110,000 pupils the 200 which attended the Industrial Art School were amongst the first in everything."

Regarding drawing as at present taught in the schools of New Zealand, considering it to be the basis of technical education, and also that drawing and elementary science are the only two subjects possible to be taught in our schools with a view to technical training, it behoves the Education Department, seeing how much depends upon drawing, to see that it is thoroughly taught. The most serious drawback I found in every technical and art school visited in Australia was the fact that with very few exceptions the students had no ground-work upon entering, and consequently a great amount of elementary work was entailed upon the instructors, and valuable time wasted. I am convinced, if this work was efficiently done in the primary schools, as it should be, fully nine months' work would be saved in the technical school, and greater benefits be derived by the students.

Taking the standard work in drawing as at present organized, the infant-classes are looked upon by many as being too young to learn drawing. Such, however, is far from being the case: these children are quite capable of not only drawing straight lines, squares, angles, &c., but of understanding their nature and applying the knowledge to facts—as, for instance, upright lines and surfaces to the sides of the walls, angles to corners; also of knowing and even illustrating facts in regard to shape of objects, as, for instance, drawing a square from a square, drawing the shapes of block letters in single lines from solid or paper letters. I would not urge efficient drawing of lines as being requisite, but that the children should be taught simply to look about, make use of their eyes and hands, and then to draw out the impressions made upon their mind, in this way cultivating their powers of discrimination, the true aim of the best education. This would from the first be in the right direction. Further, it is well to allow the children to feel the object, so that by touch, say, a triangle, square, or oblong might be described as having so many corners and so many sides. The teacher in such cases should have the models in her apron, and the child should be asked to take one with eyes closed and describe it. The First Standard children coming up from the infant classes would have then formed a correct idea of the simple figures, and would more readily draw them. I am convinced that insufficient attention is paid to position in drawing, and method of holding the pencil. It is of the utmost importance that these should be carefully attended to in the first class, as an improper position and use of the pencil, when it has been allowed to crystallize into habit, has a continuous detrimental influence on the scholar and his or her work.

The First and Second Standard drawing-books issued for class-use under the authority of the Education Department should be at once withdrawn if success is to be obtained. Some of the examples in Book II. might be used by the teacher as blackboard exercises for class-instruction. However good the copies contained in these books may be, there is no application to objects: simple lines and figures are given upon closely- and faintly-ruled lines, to be followed or traced over by the scholars. The faint lines are decidedly injurious to the sight, and the closeness of some of the copies set is a further serious objection. It is simply a question of copying: there is no attempt to train the eye to see, the memory to retain the impression made, and the hand to convey that impression to paper. The mere fact of copying is not drawing. The course of work for First Standard should be a continuation of the infant course, to include a thorough knowledge of the sphere, cube, cylinder, and triangular and square prism, taking lines in various positions applied to surrounding objects, lines parallel, division of lines into parts, and formation of simple patterns by straight lines used in construction of above solids. It is not intended that the

models named should be drawn, but that the children should know the object or model when seen, and describe it. The lessons should be taken as follows: (1.) Sketch from model, copy, or from dictation. (2.) Drawing of same figure at next lesson from memory. (3.) Simple combination of figure or lines used in previous lesson, or arrangement of shapes geometrically, using paper patterns cut from previous forms by the scholars. With reference to the knowledge of object-form, it would be an excellent plan to allow each child a lump of clay (say a cube inch), and ask for a copy of the model before the class. Further, say once a month, ask the class to draw some familiar object, it matters not what. No doubt some very funny drawings would be made, but that is not the point—the great gain is in having exercised the mind, the eye, and the hand together. A subject might be given as a study for the month, to be drawn by the class from memory at the end of that time. Blackboard-practice by the scholars should be constantly given. When the blackboard is not in use scholars should be sent to draw thereon the exercise given.

The Second Standard work would be a continuation of the First, with circle, ellipse, oval, and reversed curves introduced. All drawing up to Third Standard should be done upon slates. The Third Standard would be a continuation of First and Second, and possibly a course of elementary geometry might be commenced in this standard. Blank drawing-books, without lines, or drawing-book issued by Lyon and Blair, should be used by this class. I do not approve of the use of freehand-drawing copy-books as at present defined by the department. I am strongly of opinion that the work should be carried on by the aid of the blackboard, using the copy-books as a guide to the teacher only. I find that the books, in many cases, are simply handed out to the class to work upon; and the teacher is satisfied so long as the class is at work. The attention of the teacher is required just as constantly—perhaps more so—in drawing than in other subjects, if good results are to be obtained.

The Fourth Standard should deal entirely with plane, solid, and geometrical drawing, and scale-drawing from copy, enlarging and reducing, and from actual measurement of objects and the room—such, for instance, as the floor, door, fireplace, maps, windows, &c. The solid geometry will be of immense advantage to the scholars in dealing with models, and should receive very careful attention upon the part of the teachers. The Government plane and solid geometry text-books by David Blair, and "Scale-drawing," published by Lyon and Blair, are suitable books for this standard work.

In the Fifth Standard elementary perspective, as applied to model-drawing, would be commended. Wire and solid models would be necessary. The wire model of, say, a cube placed beside a solid cube is a great help, not only to the scholar, but to the teacher, who is able to demonstrate in a very practical manner the reason of lines at the back of the cube appearing smaller than in the front. The children are able to measure the far side of the object with the pencil, and so assure themselves of the difference between the actual facts as learnt in former standards, as compared with its appearance to the eye in the present instance.

In model-drawing the principal fault in class-instruction is that insufficient attention is given to the analysis of the actual form of each object drawn. Every object to be drawn should be thoroughly analysed previous to being drawn. Ground-plan and elevation should first be sketched, and the difference between its geometric and perspective appearance fully explained. (See "Text-book on Model-drawing," by David Blair.) Once this is understood, and the actual facts of each object fully dealt with, little difficulty will be experienced in model-drawing. At present too much reliance is placed upon perspective appearance only; the actual facts are not sufficiently considered.

The Sixth Standard work should be principally from models, objects, and casts of simple ornament. In this standard the work should be made as practical as possible consistent with the keeping up the interest of the scholars, and for this purpose the more severe lessons might be alternated with a lesson in light and shade, sketching from buildings, details of architecture or decoration; and the various sketches exhibited, and criticized by the art-master.

The drawing-syllabus of the Wellington District will be issued as an appendix to this report in a few months' time, giving clear and concise views of the nature of instruction suitable for standard work in the primary schools. I am satisfied that, should the teachers give the attention to drawing that is necessary to produce satisfactory results, they would find a very great advantage gained in the fact that the intellectual faculties of the children have been considerably developed, and generally more adapted to receive ordinary education. The time allowed for drawing in the schools should not be less than one and a half hours in the three lower standards, divided into two lessons per week, and two to two and a half hours in the three upper standards. Should the syllabus be considered too full to permit this time to be devoted to drawing, I would urge that less time be given to formal grammar, history, and geography, as at present taught, especially in the upper boys' standards, where the additional time spent in drawing would be a great advantage and gain to the lads in after-life.

About twenty lads, holding the full first-grade certificate in drawing, are given one afternoon's free instruction in the Wellington School of Design, the course of study being continued to an advanced stage. Any boy expressing a desire to draw from engineering or architectural models is permitted to do so, and every possible help given him with a view to practical training. Should a workshop be eventually attached to the School of Design, a genuine course of technical training, so far as "construction" goes, would then be possible, such "construction" being based on drawings executed by the student. Construction on any other lines is simply manual training, which can be done very much better under apprenticeship.

I have carefully considered the question of what is termed "technical training" in connection with our primary-school system, and I am compelled to say that, even as the term is generally understood, it is impracticable, consistent with devoting the necessary time to the present standard teaching. I have no desire to underrate the value of handiness—and this is the definition of the term "technical training" as it is applied and understood by the greater bulk of the public; but there is nothing

technical about it unless it rests upon principles and is governed by the rules applying to form, proportion, strength of materials, &c.: and it seems to me that this is impossible in primary schools if, as I have already said, the syllabus in use in these schools is to be carried out. If the syllabus can in any way be altered to allow of the introduction of a system of handiness, I would then strongly urge the adoption of the "sloyd system" as being the best possible means of teaching form, proportion, and handiness. From what I have been able to gather this system is the most appropriate for the introduction of handiwork in our schools, and preferable to the ordinary form of carpentering and joinery. Sloyd is applicable to both sexes, and aims at the following results: viz., to implant respect for work in general, and even for the coarser kinds of honest labour; to develop activity; to foster order, accuracy, cleanliness and neatness; to encourage attention, industry, and perseverance; to develop the physical powers; and to train the eye and the sense of form. Simple models, such as wooden spoons, paper-knife, penholder, ink-well, flower-stand, &c., are placed before the class, the children making copies of the same with the simplest tools. By this means a fair amount of manipulative skill is obtained, and the simplest form of manual instruction introduced.* Already a certain amount of practical work has been introduced into the school system by the teaching of drawing, which if practically and thoroughly taught will equip our boys with that part of technics which is the foundation of and the very essence of all the constructive arts from the technical point of view. I would not urge a long course of manual training either in our primary or secondary schools even if time could be found for the same: my desire is to introduce handiness and at the same time relieve the dulness of ordinary school-routine. The introduction of handiwork must be of considerable benefit in after-life, making a child practical, and considerably developing ordinary faculties. When it is realised that a very large percentage of those attending the primary schools leave about the age of twelve years, it must be apparent that to seriously abridge by an extensive course of manual training the all-too-short period available for mental training would be a serious injury instead of a benefit to the rising generation. With regard to the argument sometimes used against the existing system, "that it unfits our boys for manual labour," this cannot be sustained by an examination of existing facts, for it must be patent to any one who wishes to learn the truth that the question is not how to obtain boys for the various trades, &c., but how to find employment for them. The very fitness of our boys is represented by trades-unions complaining of their too liberal employment, and endeavouring to restrict it.

With regard to the country schools, my remarks apply equally with those of towns. I may, however, be permitted to suggest that for use in the country schools the Government should have compiled a technical manual dealing in a simple manner with the chemistry and application of manures, the theory and practice of the rotation of crops, lessons on tree-planting, gardening, fruit-growing, the features and qualities of the land in the various provincial districts, and its appropriate use, with a short account of the various breeds of sheep, cattle, and horses, &c., their value and suitability for different districts. A book of this kind, carefully compiled with special regard to New Zealand particulars and wants, would be of the greatest value and service to our country scholars.

If drawing is to be satisfactorily taught, models must of necessity be supplied. I would suggest, therefore, that the Department of Education supply the necessary models at cost-price. The economy in getting a large number manufactured would justify the department in asking the Boards to take their requirements from the department, let alone the advantages to flow from a proper system. The models required would be about eight wire, eight solid, and twelve plaster casts.

With regard to examinations, I would urge the Department of Education to adopt the first- and second-grade drawing examinations of the South Kensington Science and Art Department for Public Schools, allowing all private and secondary schools not under Boards or governing bodies to participate in such examinations upon payment of a small fee for each section taken. The introduction of such examinations would give a great impetus to drawing in schools throughout the colony. In the Wellington Education District, at the last June examination, 1,461 papers in drawing were worked; and I am thoroughly satisfied of the great value and importance of this examination to our system of education.

In the examination of teachers it is important that a change should be made in the method of the department with regard to the issue of certificates. At the present time, certificates to teachers are issued as having satisfied the department in drawing, and consequently giving a license to teach that subject; but I find in many cases where passes in drawing have been obtained that the teachers are deficient in knowledge and unfitted to give the necessary instruction. I would urge the adoption of the Science and Art Department second-grade drawing certificate, as defined in "Examinations," page 11, and that the same should be considered separate and distinct from the ordinary classification certificate; or, should the same be combined, that the classification certificate be withheld until certain sections of the drawing be satisfactorily passed. The standard of examination to be that of the second grade instead of the present standard. Head teachers at present in charge of schools to be exempt from such regulations. The pupil-teacher course being a four-years course, I would strongly urge the Department of Education to adopt the following course of study: First year, freehand drawing upon the blackboard and upon paper; second year, plane and solid geometry; third year, elementary perspective, with application to simple models; fourth year, model-drawing. This, I am certain, would prove efficient not only as a means of instruction to the pupil-teachers, but in enabling them to teach more thoroughly. Applicants for the office of pupil-teacher should, in my opinion, hold a full first-grade drawing certificate.

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* Articles upon technical training and upon sloyd will be found in the Appendix, so that comparisons may be made by readers of the same.

SECONDARY AND TECHNICAL SCHOOLS.

I do not see that a technical school upon the principle or scale of either Sydney or Melbourne could well be established in New Zealand—that is to say, a central school in Wellington or other large centre, entirely supported by the State. This school, being of a strictly technical character, would entail considerable cost in buildings and apparatus; further, it would be impossible for lads in other parts of the colony to take advantage of such an institution without considerable cost to themselves. Again, the number of lads joining any special class—as, for instance, carriage-building, plumbing, cabinet-making, &c.—would be insufficient to support such classes, taking into consideration the present population of the various centres. I therefore suggest that schools of design and technical drawing-classes be established in all the principal centres of New Zealand. Many Education Boards could afford a sum of, say, £100 per annum as a salary for an instructor to their teachers during the week, £100 should be obtained in such townships from classes in art subjects during the day, and £100 from evening technical drawing-classes; making a total of £300 per annum. Special classes in architecture, building, construction, and applied mechanics should be attached to these schools, and classes should, if possible, be formed for any special branch of industry connected with the district, to include workshop practice.

Technical training is undoubtedly necessary, and, if this colony is to be equal in the race with Australasia, technical classes must be established and well supported. New South Wales and Victoria, as will be seen by information herein contained, spend respectively £21,000 and £16,000 annually upon education of this character: are we to be left altogether behind? If not, then State-aid is necessary. If our trades and professions are to maintain or are to reach the standard set up by other colonies, these classes must be energetically carried on, and our workmen and apprentices given every opportunity of perfecting their knowledge with regard to their various vocations.

It would be an advantage, in accordance with the above suggestion, and, indeed, for the benefit generally of this branch of education, that an Art Department directly responsible to the Government should be established. This should be upon the lines of the Science and Art Department of South Kensington, and should be affiliated to that institution, as suggested in my report of 1887: "1. Object of the Art Department—(*a.*) To establish a thorough system of drawing for the primary and secondary schools of the colony. (*b.*) To supervise the training of teachers in such schools in drawing. (*c.*) To formulate a proper standard of examination in drawing. (*d.*) To establish schools of art and technical-drawing classes. (*e.*) That the system to be formulated shall provide for a gradual development and connection from the primary to and through the technical and secondary schools. 2. Departmental—(*a.*) The department of art to be a separate and distinct department from the present educational one, in order that fees may be charged for instruction in art and technical classes. (*b.*) Salaries of officers of the department not to exceed the sum of £800 per annum. (*Note.*—If the clerical work is done by the Government clerks this amount would be less.) (*c.*) The head of the department shall be responsible to the Minister of Education for the organization, development, and results of the department. (*d.*) The Inspector-General of Schools and the headmasters of the Dunedin, Christchurch, Auckland, and Wellington Schools of Art to be constituted a body for consultation, if necessary." Local or branch schools should be controlled by a committee. The classes may be held in mechanics' or literary institutions, schools, or other educational institutes.

Full information with reference to all the classes here suggested is given in the following pages, with text-books, courses of study, &c. The syllabus of the Sydney Technical School will be found especially useful in this respect. With regard to existing institutions, these might or might not, as they thought fit, place themselves under the department, though I see no reason why they should not do so. Many advantages would be gained by them that under present circumstances they would be unable to obtain. The fact of their obtaining their funds from various sources need not interfere with their joining the department, as their funds would be entirely under their own control, and they would be governed by Boards or committees as at present.

The following rules are adopted for formation and continuance of local or branch School Committees in the Wellington District, and could apply to the colony: 1. Every art-school or art-class in connection with the Science and Art Department or District Education Board must be under the superintendence of a Committee. The Committee must consist of a Chairman, a Secretary, and at least three other members. The offices of Chairman and Secretary cannot be held by the same person. All the members of the Committee must be well-known, responsible persons, who have no personal interest in the teachers of the school. The following are not eligible to be members of the Committee: Candidates for examination by the department or Board or their teachers in any subjects, relatives of such a teacher, and all persons who are disqualified by the Education Act from being members of Boards or Committees. 2. The gentlemen* who intend to act on a local Committee must sign and complete this form. No one can be a member of a Committee or assist in the conduct of an examination whose signature to the undertaking below has not been previously approved by the department or the District Board of Education. Care must be taken that the members who sign the form are properly acquainted with their duties, a summary of which is given below. 3. When a school or class is first formed the following undertaking must be signed at a general meeting of the Committee. 4. The department or Board requires that the local Committee shall—(*a.*) Be responsible for the safe custody on the school-premises of all apparatus and examples towards the purchase of which the department or Board has granted aid or which it has lent. (*b.*) Provide a room or rooms of sufficient size to carry out the examinations, and advertise such examinations. To these examinations all persons who wish to present themselves, and not only those attending the school or class, must be admitted, provided that they have given due notice according

* Ladies may act on a local Committee. On signing this form they should state whether they are spinsters, married women, or widows, and give the occupation of their fathers or husbands.

to the rules. Persons who do not belong to the school or class may be required to pay the authorised fee for each subject in which they register their names for examination. (*c.*) Appoint a member or members to visit the school twice monthly during the attendance of the art-classes, sign the attendance-register and enter in it the number of students present, and take care that the school-registers, showing the occupations of the students, their attendances, payments of fees, &c., are kept from day to day, and sent to the Secretary of the department or District Education Board. (*d.*) Send, when required, to the Secretary of the department or Board a list of the students to be examined, specifying the subjects in which they are to be examined; superintend the examinations in accordance with the rules of the department; give out the examination-papers which will be sent for that purpose; see them fairly worked and certify the same, the number of members of the Committee required by the regulations to act as superintendents being always present; and send the worked papers, under seal, by the day's post to the Secretary of the department or Board. (*e.*) When required, transmit to the department or Board for examination works executed in the school or class during the previous year, and make an annual report of its proceedings. (*f.*) Devote all payments received from the department or Board or public bodies to the maintenance and instruction of the classes. (*g.*) Be responsible for all expenses connected with the school, including advertising, lighting, cleaning, &c. (*h.*) Undertake that the school, with all its apparatus and examples, shall be at all times open to the visit and inspection of the officers of the department or District Board. 5. The school or class shall be inspected periodically by an officer of the department or District Board, who will report whether the regulations are strictly carried out. A meeting of the Committee must be held to receive the Inspector, if he should so require in giving notice of his visit. At such meeting as many of the members as possible are expected to attend.

Form of Application to act as a Committee for an Art-school or Art-class.—Directions: This form is to be filled in, signed at a general meeting of the Committee, certified by the Chairman, and returned to the department immediately on the formation of a school or class. This form must be sent in before the 31st January, and any alterations considered necessary by the department or District Board be made before the 1st March. Undertaking: We, the undersigned, declare that we have read the rules for formation and continuance of local Committees, the summary of duties, the directions and the undertaking given herein, and that in accordance with them we propose to act as the local Committee for the [*school of art or art-class*], held at the [*name of institution or building*], [*name of street or place*], [*name of city, town, or village: if not a post-town, state post-town*], [*name of educational district*], and taught by [*give the names of all the teachers*].

Committees once elected continue to act; but if it is thought desirable, or becomes necessary through resignation of any member, to elect other members of Committee, this form should be signed by such new members only, and certified by the Chairman. N.B.—If this Committee acts for more than one school the names of the different buildings in which they are held must be distinctly stated above.

Small grants would undoubtedly be necessary to continue the satisfactory working of such suggested schools. I would therefore recommend a grant of £1 per £1 for all evening or technical fees received. The question of fees is a serious drawback to many. Students, as a rule, cannot afford to pay a fee of, say, a guinea. If State-aid were given to the amount suggested, the fees of all classes might be considerably reduced, and hence the greater benefit to the general class of students, for whom such classes are especially intended. It would be necessary also to provide models and apparatus; but this in all cases should be paid for by local Committees, the department allowing about 25 per cent. on full value, but providing the apparatus in order that nothing but good subjects may be placed before the students, and to further insure an equality of work. The cost of the department would be about £1,500 per annum.

Examinations.

Primary schools to be examined in first-grade drawing in accordance with the requirements of the "Science and Art Directory," as follows: Drawing to scale, freehand drawing from copies, freehand drawing from models, and geometric drawing.

1. *First-grade Freehand Drawing.*

By freehand drawing is meant drawing without the aid of any kind of mechanical means of execution, such as ruling, measuring, or tracing. The specimens given to be slightly enlarged, reduced, or drawn about the same size.

2. *First-grade Model-drawing.*

Candidates are required to draw the outlines only of two or three simple solids or other objects of different form, arranged so that candidates may have to draw both curved and straight lines. The candidates must be so seated as to be able to see more than one side or end of at least one of the models, and are expected to be able to make a freehand copy of the models as they appear from the position in which each candidate happens to be placed. No ruling, measuring, or use of instruments is allowed in working this exercise. .

3. *Drawing to Scale.*

Drawing to scale consists of—(1) To draw a line at right angles to another from a point in it, by instruments and by construction; (2) to draw and take dimensions from a scale of a foot to an inch, divided to show 3in. or more; (3) to draw a plan on squared paper from a sketch with figured dimensions; and (4) to enlarge or reduce plane figures to scale.

4. First-grade Art Geometry.

This stage is intended to teach elementary notions of practical geometry, and the use of simple drawing-instruments. The pupil should be taught to draw clean, join lines passing fairly through indicated points, and the greatest care should be exercised to prevent the formation of slovenly habits, such as using both hands to the dividers, or forcing their points into the paper. He should then be shown how to take given distances from the scale, and step them along a given line, and he should be practised in the use of set squares for drawing lines parallel and perpendicular to each other. By the help of the blackboard the teacher should explain and define an angle, a triangle, a square, a rectangle, a circle, &c. The pupil may then be practised in such simple exercises as the following: Construct a square or rectangle, the lengths of the sides being given in inches and eighths. Divide them when drawn into a given number of equal parts. An irregular four-sided figure is roughly sketched on the blackboard; the dimensions of its sides and diagonals are given. Draw the figure its proper size. Neatness and accuracy should be insisted upon, and, if unsatisfactory in these respects, the figures should be redrawn. It is desirable to accustom the pupil to the erasure of superfluous lines or portions of lines, and to the employment of "dotted" or "chain-dotted" lines and arcs to distinguish lines drawn for constructional purposes. The examination will be confined to examples in the following constructions, and equal value will be attached to neat drawing and to geometrical accuracy: (1) The division of a given line into a given number of equal parts by trial with the dividers, and also by construction; (2) to draw lines parallel and perpendicular to given lines by means of the set squares, and also by construction; (3) to construct an equilateral triangle and a square of given sides; (4) to construct an angle equal to a given angle; (5) to bisect a given angle; (6) to construct a triangle, given the sides, or sides and angles; (7) to construct a triangle similar to a given triangle and standing on a given base; and (8) to describe two circles of given radii touching each other.

Second-grade Art.—The subjects of examination comprised in the second-grade course are as follows: (1) Freehand drawing from flat examples, (2) freehand drawing from models, (3) practical plane and solid geometry, and (4) linear perspective. The second-grade examinations are of a considerably higher standard than those of the first grade, though still elementary. Teachers of public elementary schools are also required to pass in (5) drawing on the blackboard. First, second-grade freehand: An advanced freehand copy to be enlarged or reduced. Second, second-grade model-drawing: The exercise consists in drawing from a group of three or more objects of well-defined form, such as geometrical models, simple vases, or objects of plain construction. The candidate is required to draw the objects placed before him as they appear from the point of view in which he may be seated, and is expected to show a knowledge of the effect of perspective in modifying the appearance of the models. No ruling, measuring, or use of instruments is allowed; but the pencil may be held between the eye and the objects for the purpose of estimating their apparent size.

Second-grade Art Geometry.—This stage is intended to embrace simple plane geometrical constructions relating to lines, circles, and tangents to circles. The pupil should be shown how to hold a drawing-pen, and practised in ruling ink lines and describing ink circles of different strengths. Indian-ink should be used, as ordinary inks corrode and destroy the nibs of the pen. A general idea of the form of such simple solids as the cube, pyramid, prism, cylinder, cone, and sphere, is to be imparted at this stage. For this purpose models should be employed. By means of sketches on the blackboard the elementary notions of orthographic projection and of section should be explained. The examination-paper will embrace the following: — Plane geometry: Elementary constructions required in geometrical-pattern drawing and simple tracery; construction for circles passing through three given points, or touching three given lines; tangents to two circles; construction of regular polygons by any general method, together with their inscribed and circumscribed circle; construction of irregular polygons from given sides, diagonals, and angles; proportional division of lines; reduction and enlargement of plane figures; the use of plane scales and scales of chords; elementary construction of the ellipse. Solid geometry: Plan, elevation, and section of the solids above named, in simple positions; projection of plane figures. Four, perspective: In this exercise candidates will be required to show a knowledge of the use of vanishing- and measuring-points used in horizontal planes; and to represent simple solids, or objects on the ground-plane in any position. Fifth, drawing from memory on the blackboard: This exercise is intended to test the candidates' power to use, in aid of their general teaching, the skill which they may have obtained in drawing. In addition to facility in the use of chalk and the blackboard, it is required that they should be able to give a fair representation of the form of any familiar object. To do this from memory should be the result of sound instruction in model-drawing, in the course of which teachers of drawing should form in their pupils habits of observation enabling them to represent familiar objects in any point of view. Candidates will therefore be required to draw from memory one of three or four objects of ordinary household furniture, or domestic utensils of well-defined form, to be named by the examiner. Candidates will also be required to draw Roman or Italic letters about nine inches high. Ten or fifteen minutes are allowed for working this exercise.

Recent regulations issued by the Science and Art Department in Form 590, and dated 4–88, relating to the elementary school-teachers' certificate D (drawing), state as follows: "The certificate is granted to candidates who (*a*) obtain a first-class in the second-grade freehand; (*b*) pass the examinations in second-grade geometry; (*c*) obtain a first-class in the second-grade linear perspective; (*d*) pass the examination in model-drawing with chalk upon the blackboard (the examination in this subject takes the place of the second-grade examination in model-drawing and in blackboard from memory); (*e*) pass the examination in drawing in light and shade from common objects and casts of ornament."

THE ART-CLASS TEACHERS' CERTIFICATE.

The holder of art-class teachers' certificate is qualified to give instruction in art. This certificate is granted to candidates who have submitted satisfactory specimens of four works, which must be on sheets of imperial size, in—(*a.*) Stage 1A.—A sheet of geometrical problems. These may be six or eight problems selected to show the power of working neatly and exactly with instruments; the problems to be stated in writing, and executed in ink. (*b.*) Stage 3B.—An outline of ornament in low relief from the cast. This may be done from the Madeleine or Louis XII. pilasters, or any large ornamental scroll, and must be executed with a steady hand and in a firm outline; the object being to combine correctness of drawing and precision of execution with an application of the principles on which foliated design is constructed. (*c.*) Stage 5A.—A drawing from a group of models drawn without background, to be executed with a black-lead pencil or chalk lightly shaded. This drawing should fairly fill an imperial sheet, and should include vases such as those produced by Wedgwood or Minton, or similar objects. (*d.*) Stage 5B.—A sheet of ornament shaded from the cast, in chalk. This may be done from a piece of ornament in high relief, or from casts of fruit. And have passed personal examinations in the following five subjects: (*e.*) Geometry, second-grade examination. (*f.*) Perspective, second-grade examination. (*g.*) Stage 3B.—Freehand outline-drawing of ornament from the "round." Third-grade examination. Candidates will be required to draw an outline from a cast. (*h.*) Stage 5A.—Shading from the "round" or solid forms. Third-grade examination. Candidates will be required to make a shaded drawing from models, either in pencil or chalk. (*i.*) Stage 5B.—Shaded drawing of ornament from the "round." Third-grade examination. Candidates will be required to make a drawing from a cast, in light and shade, in chalk.

Having suggested that the Art Department should be affiliated to the Science and Art Department for the purpose of having the advantage of its examination, I here give the rules as approved by the Right Hon. the Lords of the Committee of Her Majesty's Most Honourable Privy Council on Education: (1.) Upon the application of the Colonial Government or Educational Department, or other public authority of the colony, the Department of Science and Art will arrange for the examination of their schools, on the results of which examination certificates and returns of awards will be issued. (2.) The entire cost of the examination of the papers and works, and of their carriage, clearing in London, and conveyance to and from South Kensington, must be defrayed by the local authority concerned. (3.) The examinations are of two kinds, (*a*) personal examinations and (*b*) examination of works. (4.) (*a*) The personal examinations, the subjects of which are stated in the Science and Art Directory, must be held in the colonies and dependencies upon the earliest date possible after the receipt of the examination-papers. (5.) These examinations must be conducted by qualified and responsible persons not immediately interested in the results of the examinations, who should, on the conclusion of each examination, furnish a certificate that the examination has been fairly conducted. This certificate and the worked papers of the candidates must be despatched by the next mail to the Secretary of the Department of Science and Art, London, S.W. (6.) (*b*) The examination of works is held at South Kensington. Works to be examined must be forwarded to reach South Kensington not later than the end of April in each year. All works must be labelled or marked in such a way as to be easily identified with the entries of them made in the form of certificate that they have been wholly executed in the school, and by the students of the school named in the certificate. The department will supply labels and forms of certificate upon application being made to it for them. (7.) In making application to the department, the responsible authorities must state (*a*) the number of papers required in each subject of personal examination; (*b*) what arrangements will be made for the custody of the examination questions and for the conduct of the personal examinations; (*c*) how many and what class of school-works they propose to send for examination at South Kensington in April. (8.) The probable cost of looking over the papers worked at the personal examinations will be as follows: Personal examinations—For each paper in elementary stage, science, 1s.; for each paper in advanced stage, science, 1s. 6d.; for each paper in second-grade examinations in art, 4d.; for each paper in third-grade examinations in art, 1s. Examination of works sent to South Kensington—For each work examined, ¼d.

Under the above arrangement a selection of the works executed in the schools during the year might be made and forwarded for examination and classification. This would, I am certain, have a very beneficial effect upon the schools of design and art-classes, and would give at this juncture considerable impetus to the work. Further, if thought necessary, the whole of the first- and second-grade papers might be examined by the South Kensington authorities, though I hardly think this need be. Should teachers desire, after completing their certificate here, to obtain a Kensington certificate, they would already possess the knowledge, and might sit at any regular examination upon giving sufficient notice.

VICTORIA.

1. Drawing in public schools. 2. Working-men's College. 3. Schools of art and mines. 4. Schools of drawing and painting and Technical Laboratory, at Public Library.

1. DRAWING IN PUBLIC SCHOOLS.

At the request of the Hon. the Victorian Minister of Education, I made careful inquiry and inspection of the system of drawing taught in the Victorian schools, and visited one of the Melbourne model schools, being recommended to this school as one where the system might be fully tested. Extract from Education Report, 1887: "Drawing was taught in 190 schools by 18 visiting-masters and 127 members of the ordinary staff. Teachers receive a grant of £10 per head upon any student under them taking a full certificate." The special payments on account of drawing in State schools in 1887 amounted to about £4,969, as follows: Drawing (teaching of), £4,426 17s. 4d.;

travelling-expenses of teachers, about £396; bonuses for qualifying teachers, about £102; examination-expenses, about £45: total, £4,969 17s. 4d. The first and second, or elementary, classes or standards are furnished with printed sheets of exercises, from which they are expected to take their lessons. The First Standard test I consider was fairly satisfactory: the children understood the position of the various lines upon their slates, but were deficient in the matter of application of lines and angles to objects. The Second Standard drew a square and an oblong upon their slates; but this exercise was unsatisfactory. The Third Standard were deficient in the groundwork, having no knowledge of the various simple figures, and seemed to have little idea of proportion or construction. The Fourth, Fifth, and upper Standards were copying various exercises in their drawing-books, including landscape, and the figure with light and shade, and drawing from the model, or from a group sketched upon the blackboard. The drawing of the upper standards in the school visited I consider generally to be of an ornamental rather than useful character.

The work shown by the Education Department at the Adelaide Exhibition contained several good specimens of freehand, and a number of sketches of models, some taken from the actual group and others from blackboard sketches. From my inspection of the work and methods adopted in the model school visited, I should say that it would be far better to employ the present visiting-masters in giving good sound groundwork to elementary standards, or in giving instruction to the pupil-teachers and seeing that instruction carried out. There would then be a prospect of having something to work upon in the higher standards. I do not see how an efficient system of industrial drawing is to be established should the groundwork remain as it is. There is no doubt it is better to have all teachers certificated as teachers of drawing; but that the ordinary teachers are quite capable of doing the elementary work, after receiving a certain amount of instruction, is now proved beyond doubt. Again, the children have an idea that it must be something exceptionally difficult if the ordinary teacher cannot do it; and a specialist visiting a school does not know the individualities of the scholars, and often has little control: this must have, to a certain extent, a demoralising effect. Where no visiting-teachers are arranged for, the ordinary staff of the school are expected to give the necessary instructions. In a circular upon drawing recently issued by the department the following text-books are recommended: (1) Vere Foster's drawing copy-books, Books A1 and A2; (2) South Kensington Drawing-book; (3) American Text-books of Art Education.

2. The Working-men's College.

This institution is centrally situated in Latrobe Street, closely adjoining the Public Library and the Trades Hall, and conveniently situated as regards the principal lines of traffic. The building is at present incomplete, only the back portion—about one-half—being erected. From the plans and elevations shown the building will present a handsome appearance, and add considerably to the architectural features of the city. The portion of the building now erected has cost about £11,000, and a like sum, it is estimated, will be required to complete it. The initiation of this institution is due to the Hon. Francis Ormond, M.L.C., who subscribed £5,000 towards the building upon condition that the same sum was raised by public subscription. The site was granted by Government, as well as a vote of £2,000 for fitting up and maintaining the institution for the current year. The college is governed by a Council of eighteen members, consisting of the founder and representatives of the founder, the Government, the University, the Public Library, the Trades Hall Council, subscribers of £1 and upwards, and subscribers of from 2s. 6d. to £1 sterling. A subscription of from 2s. 6d. annually gives the privilege of a vote for members of the Council. The college is intended to improve the general and technical education of the working-classes; but it is open to all, women as well as men. The classes are conducted almost entirely in the evening, between the hours of 7.30 and 10.15 p.m. There are thirty-nine weeks of lectures in the year, divided into terms of about equal length. The institute was opened on the 7th June, 1887, with an attendance of 300 students, and at the close of December, or the second term, there were 985 students on the roll. The following table gives the subjects, nightly average attendances, percentage, and fees received, showing second and third terms:—

List of Enrolments, Average Attendances, Percentages, and Fees received for the Second and Third Terms, 1887.

Subject.	Second Term.				Third Term.			
	Enrolments.	Nightly Average Attendance.	Percentage.	Fees Received.	Enrolments.	Nightly Average Attendance.	Percentage.	Fees Received.
				£ s. d.				£ s. d.
1. Algebra	61	32·3	52·9	9 4 2	54	31·6	58·5	8 2 0
2. Arithmetic, elementary	77	44·2	57·4	..	..	..	..	..
" Division 1	..	..	..	..	71	31·3	44·08	..
" Division 2	..	..	..	..	96	50·3	52·3	..
" advanced	68	42·7	62·7	25 3 7	82	42·2	51·4	38 18 0
3. Bookkeeping, elementary	33	27·1	82·1	5 3 8	24	18·3	76·2	..
" advanced	..	..	..	..	31	27·9	90	8 12 10
4. Carriage-drafting	..	..	..	..	36	22·9	63·6	11 2 6
5. Cookery, elementary	..	..	..	..	18	15·1	83·8	..
" advanced	..	..	..	..	4	3·6	90	3 1 9
6. Drawing, architectural, elementary	63	44·8	71·1	11 1 10	..	..	..	13 19 8
" Division 1	..	..	..	..	60	37·5	62·5	..
" Division 2	..	..	..	..	37	22	59·4	..
" advanced	17	11·8	69·4	4 9 6	28	19·3	68·9	8 11 2
7. Drawing, mechanical, elementary	46	30·8	66·9	7 4 8	57	33	57·8	12 11 11
" " advanced	..	..	..	..	17	13	76·4	4 5 3
8. Drawing, freehand	52	37·3	71·7	8 0 6	61	30	49·1	11 16 4
9. Elocution	..	..	..	..	57	36·7	64·3	8 14 8
10. French, elementary	33	21·8	66·06	7 8 8	44	26·5	60·2	7 8 7
" advanced	15	6·7	44·6	..	10	6·8	68	..
11. German	..	..	..	..	22	15·4	70	3 5 9
12. Grammar & composition, elementary	72	37·3	51·8	..	83	41·9	50·4	..
" " advanced	55	27·3	49·6	18 13 4	57	27·3	47·8	18 11 5
13. Geometry, plane	65	34·3	52·7	9 8 10	47	28·9	61·4	8 8 3
" practical	41	26·2	63·9	6 12 4	64	32·7	51·09	10 11 3
14. Geography	..	..	..	..	17	8·4	49·4	2 0 11
15. Handrailing	..	..	..	..	17	14·2	83·5	8 13 9
16. Latin	28	18·5	66·7	4 3 3	31	17·9	57·7	4 13 9
17. Modelling	..	..	..	..	18	8·1	45	5 3 6
18. Mechanics	40	26·6	66·5	8 6 0	..	..	..	..
" applied	..	..	..	..	38	29·6	77·8	11 16 4
19. Mensuration	25	10·3	41·2	4 3 8	28	17·3	61·7	4 4 8
20. Photography	..	..	..	..	28	18·6	66·4	13 13 3
21. Shorthand, elementary	61	39·8	65·2	..	65	44	67·7	..
" advanced	11	8·6	78·1	11 17 8	36	18·4	51·1	20 8 10
22. Trigonometry	20	10·3	51·5	3 4 0	24	13	54·1	4 12 0
23. Writing & correspond'ce, elementary	69	46·7	67·6	11 9 8	66	41·3	62·5	..
" " advanced	..	..	..	..	57	28·8	50·5	15 7 5
24. Carpentry, elementary	29	20·9	72·06	6 10 10	44	24·6	55·9	..
" advanced	..	..	..	..	22	15·8	71·7	16 1 2
Total	981	..	..	162 6 2	1,520	..	..	284 16 11

Summary.—Total enrolments (individual students): Second term, 646; third term, 985. Number of females: Second term, 12; third term, 52. Number of juniors (under eighteen, and, apprenticed, under twenty-one): Second term, 275; third term, 414. Fees received: Second term, £162 6s. 2d; third term, £284 16s. 11d. Average fee per student: Second term, 5·03; third term, 5·78. Number of classes: Second term, 23; third term, 37. Number of instructors: Second term, 13; third term, 19. Salaries paid to instructors: Second term, £105 10s. 6d.; third term, £236 0s. 8d.

Occupations of Students attending the Working-men's College, Third Term.—Carpenters and joiners, 181; clerks, 144; fitters, turners, machinists, &c., 94; shop-employés, 91; masons and bricklayers, 53; coach-builders, 49; printers, engravers, and lithographers, 39; plasterers, 27; painters, 20; watchmakers, jewellers, and instrument-makers, 17; draughtsmen, 16; plumbers and gasfitters, 14; messengers and letter-carriers, 14; labourers, 14; stone- and wood-carvers, 14; blacksmiths, 10; surveyors' assistants, 9; bootmakers, 9; teachers, 6; sundry trades, 56; school, domestic duties, and no occupation, 108: total, 985. *Summary.*—Skilled labourers and artisans, 583; clerks, teachers, draughtsmen, 175; school, domestic duties, and occupations not given, 109; shop-employés, 91; unskilled labourers, 27: total, 985.

Ages of Students.—Fourteen to sixteen years, 84; sixteen to twenty-one, 493; twenty-one to thirty, 279; over thirty, 57; not stated, 72: total, 985.

The minimum age for admission to the literary classes is fourteen, and to the technical and special classes sixteen.

The following classes will be started providing a sufficient number of students enter: Physiology, domestic economy, music (vocal and instrumental), painting and graining, plumbing, forgework, ironplate-working, sewing- and knitting-machine instruction. Any student attending two classes, or two nights per week in one subject, is allowed a reduction of one-fifth, and any student attending three or more classes, or three or more nights per week in one subject, is allowed a reduction of one-third of total fees. Juniors (those under eighteen years of age), or indentured apprentices under the age of twenty-one, are admitted at half-fees.

Classes and Fees per Term.

1, *Literary:* English grammar and composition (elementary and advanced), writing and correspondence (elementary and advanced), geography, history, French (elementary and advanced),

German, Latin, arithmetic (elementary and advanced), algebra (elementary and advanced), geometry (elementary and advanced), trigonometry (including logarithms), mensuration, book-keeeping (elementary and advanced). Fee, 5s. per term for one lesson per week. 2, *Technical:* Practical geometry, architectural drawing (elementary), mechanical drawing (elementary), mechanics (including hydrostatics and pneumatics), sound light and heat, electricity and magnetism, freehand drawing. Fee, 5s. per term for one lesson per week. 3, *Technical:* Architecture, architectural drawing (advanced), mechanical drawing (advanced), machine-design, steam and the steam-engine, applied mechanics, modelling. Fee, 7s. 6d. per term for one lesson per week. 4, *Trade and Special Classes:* Theoretical and practical carpentry: Elementary (first), one lesson per week 6s. 6d., two lessons per week 10s.; advanced (second), one lesson per week 7s. 6d., two lessons per week 12s.; handrailing (third), one lesson per week, £1. Students in the first and second classes are recommended to attend twice a week. Carriage-drafting: One lesson per week, 7s. 6d. Pattern-making: One lesson per week, 7s. 6d. To be started if a sufficient number of students enrol. Photography: First class, two lessons per week, 12s.; second class, two lessons per week, 15s.; third class (advanced), two lessons per week, £1. Shorthand: First class, one lesson per week, 5s.; second class, one lesson per week, 5s.; third class, one lesson per week, 10s. Cookery (elementary): One lesson per week, 5s.; afternoon class (advanced), one lesson per week, 5s.; afternoon classes for State-school pupils, one lesson per week, 5s. Science-classes (Saturday morning, 10 a.m.—one lesson per week): Dynamics and heat, 5s.; sound and light, 5s.; electricity and magnetism, 5s.

The following is a complete list of text-books and recommendations from the instructors with reference to the various classes, from the prospectus of the college, and will, no doubt, be of considerable value to instructors in this colony engaged in class-work similar to that of the Working-men's College. The names of the instructors of the classes are given in order that they may be corresponded with by instructors of similar classes in this colony should they desire to gain information or compare notes:—

Arithmetic (Mr. G. B. Farlow, B.A., LL.B., Instructor).—The simple and compound rules, reduction, fractions, decimals, practice, proportion, interest and discount, averages and present ages, the measurement of area and solidity, square and cube root; practical problems relating to carpenters', bricklayers', plasterers', and painters' work. This course will be carried on in three classes—(1) commencing with such elementary work as may be found necessary, (2) commencing with fractions, (3) commencing with proportion. Text-book, Hamblin Smith's Arithmetic.

Mathematics (Mr. A. W. Craig, M.A., Instructor).—In all the mathematical classes students are expected to do the home-work prescribed at each lecture. *Mensuration:* Geometrical constructions; the obtaining of formulæ in connection with the areas of triangles, quadrilaterals and other rectilineal figures, the circle, the ellipse; Simpson's rule for irregular areas; the volumes and amount of surface in the chief solids—parallelopiped, prism, cylinder, pyramid, cone, sphere; practical applications to artificers' work. A knowledge of elementary algebra will be of service to students in this class. No text-book is prescribed, but Todhunter's "Mensuration for Beginners" is recommended to those who may wish to read the subject for themselves. *Algebra:* The fundamental operations; factors; highest common factor and lowest common multiple; simple and quadratic equations with one and two unknown quantities; involution and evolution; indices; surds; ratio and proportion; variation; arithmetical, geometrical, and harmonical progressions; permutations and combinations; the binomial theorem. This course will be carried on in two classes—(1) for beginners, (2) commencing (for the year 1888) with simple equations. Text-book, Todhunter's "Smaller Algebra." *Geometry:* Geometrical definitions; the chief properties of straight lines, parallels, triangles, parallelograms, rectangles, and circles, as contained in the first three books of Euclid. This course will be carried on in two classes—(1) for beginners, (2) commencing (for the year 1888) at Euclid, I., 27. Text-book, Andrew and Pirani's Euclid, Books I.–III. *Trigonometry and Logarithms:* The different units of angular measurement, the relation between the circumference of a circle and its diameter, the definitions of the trigonometrical ratios and the relations existing between them for one and two angles. Calculations by means of logarithms, and the method of using logarithmic and trigonometrical tables. The relations between the sides and angles of triangles, the solution of triangles, the measurement of heights and distances. Before commencing this course students should have read at least three books of Euclid, and be familiar with algebra as far as quadratic equations. Text-books, Lock's "Elementary Trigonometry," Chambers's "Mathematical Tables."

English (Mr. W. F. Gates, B.A., Instructor).—*Grammar:* A complete course of grammar will be gone through during the year (but in the elementary class only a little derivation will be done in the third term). Particular attention will be given to the correction of ungrammatical sentences. To join the advanced class, students should be able to parse fully and analyse easy sentences. In this class, during the third term, the critical study of an English classic will be taken up. That set for the present year is Book I., "Paradise Lost." Text-book, Morell's Grammar and Analysis. *Composition:* The structure of sentences and the laws of punctuation will be dealt with. Students will be expected to do the exercises set periodically. Text-book, Professor Nichol's "English Composition" (Macmillan's Primer Series). Addison recommended for style. *Geography:* The course will embrace political, physical, and mathematical geography. In political, particular attention will be given to Australasia. In physical, the laws of climate, currents, winds, rainfall, dew, distribution of vegetables, &c., will be studied. Mathematical will include form, motions, and magnitude of the earth, the cause of the seasons, calculation of latitude and longitude, &c. Text-book, Sullivan's "Geography Generalised." *Writing and Correspondence:* A definite system of writing is taught. The proper form for letters, business and official, receipts, bills, &c., is explained. A blank copy-book, with good paper, and an ordinary exercise-book are required.

Latin (Mr. J. S. Mackie, M.A., Instructor).—The course consists of the study of the Latin grammar, and easy translations from English into Latin and Latin into English. Text-books: Dr. William Smith's smaller Latin Grammar; "Principia Latina," Part I., of the same author.

French (Mons. A. Liet, Instructor).—Elementary (first): Text-books—"French Class-book and Reader," by Dejardin; French and English dictionary (Constanseau's recommended). Advanced (second): Text-books—"French Newspaper Reading-book," by Jeffcott; "Guide to French Translation," by Constanseau (prepared English text for translation); French and English dictionary (Constanseau's recommended). For lectures on French grammar, the order as found in Brachet's Public School Grammar is adopted; so that students of both classes might find it advantageous to get this work also.

German (Herr M. Schmidt, Instructor).—The study of the grammar, followed by simple exercises in translation. Text-book, Dr. Otto's Grammar.

Elocution (Rev. A. Macully, A.B., LL.B., Instructor).—(1.) Pure and distinct utterance. (2.) Smoothness in inflection and modulation. (3.) The *timbre* of the voice. (4.) Pausation: lung-power, and economy of respiration. (5.) Emphasis and poise. (6.) Physical expression, illustrated in simple and graceful exercises. (7.) The music of poetry, rhythm, scansion of English verse.

Bookkeeping (Mr. A. G. McCombe, accountant, Instructor).—A system combining single and double entry, practically worked out to the division of profits by the use of books and the entries of transactions common to the offices of general merchants. The necessary books for class-work can be obtained from the instructor. Students before entering this class should be able to write a good hand.

Shorthand (Messrs. Stott and Hoare, Instructors).—Pitman's system is that adopted. Elementary class (first): "The Phonographic Teacher (Jubilee Edition)," "The Phonographic Copy-book"—Mr. Hoare. Intermediate class (second): "The Manual of Phonography," "The Phonographic Copy-book"—Mr. Stott. Reporting class (third): "The Reporter's Companion," Note-book—Mr. Stott. The text-books may be obtained from the instructors.

Applied Mechanics (Mr. F. A. Campbell, C.E., Instructor).—*First Term.*—Introductory: Matter, mass, gravity, force. Strength and elasticity of materials; the physical properties of wrought- and cast-iron, steel, timber, stone, brick, cement, lime, mortar, concrete. Working-stress, permanent set, fatigue, factors of safety. Friction, the angle of friction, stability of piers, retaining-walls, chimneys, arches, &c., and the forces to which they are exposed. Beams (timber and iron): Bending-moments, shearing-stresses, and deflections under various loads; graphical representation of the same. *Second Term.*—Strength and construction of joints in wood and iron, struts and columns, ties and tension-rods. Framed structures; simple forms of roof and bridge trusses, latticed and plate girders. The graphic method of calculating stresses applied to framed structures. The strength of chains and cords; of tubes, pipes, and boilers; of buckled plates. *Third Term.*—Pressure of air: Fans, blowers, windmills. Pressure of water: Centre of pressure, pumps, hydraulic press, hydraulic lift. Measurement: True plane-surfaces; the principle of work, diagrams of work, energy, velocity, the fly-wheel. Conversion of motion: Straps, pulleys, toothed wheels, cams, quick return-movements, linkwork and parallel motion, trains of wheels, universal joints, special contrivances, machines in common use. This will be an elementary course illustrated by experiments. No great knowledge of mathematics will be required before entering, but to obtain the full benefit of the course students should have studied the first three books of Euclid, algebra as far as equations, and trigonometry as far as the solution of triangles. The course in theoretical mechanics should also precede this. Text-books: Tredgold's "Engineers' Pocket-book;" first and second terms, "Strength of Materials" (Anderson); third term, "Elements of Mechanism" (Goodeve); such portions of the above as may be recommended.

Architecture and Architectural Drawing, under the supervision of Mr. P. Oakden (Mr. Hillson Beasley, Instructor).—*Elementary Architectural Drawing:* The year's course of study in this class comprises—(*a*) the use of drawing-instruments and scales, including Indian-ink, (*b*) classic and (*c*) Gothic mouldings and combination of mouldings, (*d*) arches of various kinds, (*e*) projection of solids as applied to architectural drawing, (*f*) simple details of construction, (*g*) the Tuscan order in accurate detail. *Advanced Architectural Drawing:* In this class the course of study for the year comprises—(*a*) the classic orders in detail, both Greek and Roman, including the Doric, Ionic, Corinthian, and Composite; (*b*) Norman, Early English, Decorated and Perpendicular Gothic work in arcades, doorways, windows, and piers; (*c*) advanced constructional details (with instruction in the use of colours); (*d*) perspective and projection of shadows in their application to architectural drawing; (*e*) mounting and straining drawing-paper. Drawings, specially prepared by the instructor under the supervision of Mr. P. Oakden, are being lithographed for use in the above course of study. A course of architectural instruction will be commenced if a sufficient number of students join. *Practical Geometry:* This course is founded on the well-known text-book of Mr. E. Davidson, and is specially designed to prepare students for the various other classes in technical subjects. All students who have entered for architectural drawing, mechanical drawing, carpentry, or carriage-drafting, if not already proficient in practical geometry, are strongly advised to join the class during the coming term. Students should provide themselves with a drawing-board (about 30in. by 24in.), T-square, two set-squares (45° and 60°), compasses (pen and pencil), dividers, drawing-pen and box-wood scale, drawing-pins, Indian-ink, colours and brushes. In purchasing instruments, students should obtain the best: only a few are required, but they should be good of their kind. Drawing-paper, pencils, and indiarubber can be obtained from the instructor at fixed rates.

Mechanical Drawing—Steam-machine Design (Mr. W. S. T. Magee, M.C.E., Instructor).—*Elementary Mechanical Drawing:* The instruments, their construction, adjustment, and use; scales, shade-lines, inking drawings; orthographic projection, including mode of obtaining required sections, the methods of describing the peculiar curves generated by one solid body intersecting or

penetrating another, the development of curved surfaces, traces, normals, tangent points; the development of curved surfaces, the helix and screw, freehand drawing for machinists, drawing from rough sketches, methods of copying, isometrical projection. Students in this course should know as much practical geometry as is contained in "Linear Drawing," by Ellis A. Davidson. Text-books recommended—"Linear Drawing," by Ellis A. Davidson; "Orthographic Projection," by William Bains; "Drawing for Machinists," by Ellis A. Davidson. *Advanced Mechanical Drawing:* The projection of worm-, mitre-, bevel-, and spur-wheels; the principle of the formation of the teeth of wheels, and practical modes of constructing them; general remarks on the teeth of wheels. Screw-gearing: The practice of making working-drawings of pieces of machinery which will be provided for that purpose. Projection of shadows: Colouring of mechanical drawings. Perspective projection. Text-books recommended — "Machine-construction," by Tompkins; "Linear Perspective," by Hodge. The following will be found in the library, and may be used for reference: Gwelt's "Encyclopædia of Architecture," Sec. III., Chap. IV., Book II.; "Engineer and Mechanist's Drawing-book," by M. le Blanc and MM. Armengaud. Students should provide themselves with a drawing-board (28in. by 21in.), 27in. T-square; two set-squares, 45° with 8in. edge, 60° with 10in. edge; case of mathematical-drawing instruments, a sheet of double-elephant drawing-paper, Faber's No. 5 pencil, Indian-ink, drawing-pins, indiarubber, boxwood scale. *Machine Design:* Some of the physical properties of materials used in machine-construction; machines for testing the strength and elasticity of material; load in machines; resistance of machines to straining-action; riveted joints, bolts, nuts, keys, cutters, pipes, tubes, shafts, axles, journals, gudgeons, pivots, couplings, brushes, plummer-blocks, friction-gearing, belt- and rope-gearing, tooth-gearing, screw-gearing, chains, cramps, connecting-rods, pistons, stuffing-boxes, valves, cocks, lubricators, and cutting-tools. Text-books recommended—Unwin's "Elements of Machine-design," Rankine's "Machinery and Millwork," Kennedy's "Mechanics of Machinery;" "Workshop Appliances," by Shelley; "Cutting-tools," by Professor Smith. Students are advised to attend the class on applied mechanics. *Steam and the Steam-engine:* Remarks on the history of the steam-engine, nature of heat, heat a form of energy, example of conversion of heat into work, measurement of heat, quantity of heat, specific heat, British thermal unit, the mechanical equivalent of heat, Joules's experiments, Boyle's law, Charles's law, absolute temperature isothermal, expansion of steam, adiabatic expansion of steam, theoretically-perfect heat-engine, mechanics and mechanism of the steam-engine, valve-gears, the indicator, indicator-diagrams, fuel and combustion, boilers and fittings, principal causes of loss of efficiency in steam-engines and the methods employed to reduce the loss, superheating steam-jacketing, compounding. The gas-engine. Text-books—Rankine's "Steam-engine;" "The Steam-engine considered as a Heat Machine," by Cotterill; "McGregor on the Gas-engine." As soon as the mechanical laboratory is provided, experiments will be made with the steam-engine and boiler, and measurements made of their efficiency and economy, friction experiments, experiments on the form and efficiency of cutting-tools, experiments on efficiency of machines, the efficiency of transmission, &c.

Theoretical and Practical Carpentry and Joinery (Mr. B. Storer, Instructor).—*Elementary (first):* General instruction in the theory and principles of the trade; the construction and use of plane scales; the application of geometry to the trade, showing methods of obtaining proper joints, bevels, and cuts; the principles of framing, bracing, and trussing; the names and proportions of joints in structures; drawing to scale; doors, windows, floors, roofs, skylights, partitions, gates, &c.; enlarging and diminishing mouldings, raking and bevel mouldings; joints in circular work, showing methods of kerfing, bending, and building up and veneering of same; the framing of wooden buildings, and weatherboarding; bracketing for plaster cornices, and generally preparing work for other trades; the management and use of tools; drawing full-size sections of skirtings, architraves, mouldings, &c.; making joints, dovetailing, &c., in practice. *Advanced (second):* Advanced subjects of the elementary course, including drawing and making models of work to scale; setting out work from plans and specifications, full size and to scale; circular work on plan and elevation in doors and windows, &c.; the development of solids relating thereto; circular louvres; shutters, shop-fronts, shop and office fittings and furniture; timber, where grown, and its use for different purposes, the manner of seasoning—by natural and other means; measuring up work and writing out orders. *Staircasing and Handrailing (third):* Minimum age for admission to this class, eighteen. A knowledge of practical plane and solid geometry is necessary before entering. This class, which is thoroughly practical, comprises setting out and planning staircases, the construction of landings and position of trimmers, setting out stringboards for straight and winding stairs, development of well-holes, continued stringboards and moulding, enlarging and diminishing brackets, the manner of making curtail and bullnose steps, setting out and working handrails for wreathed and straight stairs; framing spandrels, balustrade, &c. The handrailing is on the square-cut system, and the best authors' works are used and explained. Students must provide themselves with the following instruments, &c.: Drawing-board (30in. by 22in.), T-square to suit, two set-squares (45° and 60°), scale and rule and mathematical intruments. Drawing-paper will be supplied by the instructor at a nominal charge, to secure uniformity in drawing. Students will also be expected to find all hand-tools, such as tenon-saw, planes, chisels, hammer, oilstones, compasses, gauges, squares, &c. The Council have provided machines for the use of these classes, and laborious work, such as ripsawing and mortising, &c., is avoided. Students have also the advantage of learning the use of machines.

Carriage-drafting (Mr. James Hambridge, Instructor).—*The Brougham:* Showing the various working-sections, explanation of the cant-board, and the best method of making patterns. *Buggies:* Of various kinds, with sections of the same. Method of hanging doors with concealed hinges; outrigger hinges, their use, and how to fix them. *The Landau:* Showing the various working-sections. Students before entering this class should have studied practical geometry.

Modelling (Mr. P. Ball, Instructor; Mr. Williams, Assistant).—Ornamental modelling from casts, designs, and photographs; modelling from nature—fruit, flowers, &c.—and from drapery;

composition of applied forms suggested from natural objects. Students before entering this class should have previously studied freehand drawing, plain and practical geometry. The modelling-room is open every night in the week, Saturday excepted.

Freehand Drawing (Mr. T. S. Monkhouse, Instructor).—The course is as follows: Elementary, for beginners and those needing to pass through a systematic first course. Outline-work from the flat—from simple ornate forms; advanced outline; shading from the flat, with pencil and crayon; drawing from objects in relief, teaching the rules of light and shade in practice with the point, stump and point, or the brush, in oil or water-colour. The study of natural foliation, fruit, flowers, and still-life generally, in black and white, or oil and water-colour. The principles which govern design and the harmony of colour. These classes are held twice a week, and all students are recommended to attend both lessons.

Photography (Mr. L. Hart, Instructor).—*First Term (Elementary):* Early history; sensitive surfaces and action of light thereon; apparatus, lenses, &c.; theory of development, fixing, &c. Gelatine, bromide, dry plates—boiling process; gelatine, bromide, dry plates—ammonia process; silver printing. Transparencies, bromide and chloride processes; pyroxyline and collodions, nitrate of silver baths. Development and intensification of wet plates, enlarging by wet processes, enlarging by dry processes. *Second Term (Intermediate):* Transparencies, wet plates; collodion, dry plates; platinotype printing. Cyanotype, aniline and anologue processes, stereoscopic photography. Collodio-chloride process, glass and paper, preparing canvas for photographing upon, carbon printing. *Third Term (Advanced):* History of photo-mechanical printing, chemical instruments and inks employed. Photo-lithography, photo-zincography, photo-typography or block-printing, photo-engraving, photo-etching. Fatty-ink processes, heliotype; albertype, antotype, mechanical processes; Woodburytype, stanotype, and their applications; photo-xylography, &c. Micro-photography, celestial photography, orthochromatic photography, heliochromy. General remarks on the study of photography.

Cookery (Miss Pearson, Instructress).—*Elementary:* Sheep's heart stuffed, boiled onions, baked onions, pancakes, stewed steak, how to boil potatoes, apple-dumplings, roly-poly, blackcap pudding, queen cakes, plain curry, how to boil rice, pancakes. How to boil meat—boiled mutton, caper-sauce, sago-pudding, mutton cutlets, —— celery, macaroni-pudding, beefsteak-pie, flaky crust, semolina-pudding, liver and bacon, savoury hash, fig-pudding. Stewed kidney, stewed tomatoes, princess pudding, hawker's pie, haricot beans, omelette, minced chops, boiled turnips, sultana cake, sick-room cookery. *Advanced:* How to truss a fowl for roasting and boiling, boiled fowl, egg-sauce, bread-sauce, beef-olives, Albert pudding, pancakes, curry, how to boil rice, amber pudding. Lobster cutlets, cabinet pudding, German sauce, rissoles, dressed fish, baked fish, Derby pie, rough puff paste, lemon-soufflé, croquettes, lemon-jelly, puff paste, tart. Boned fowl, macaroni and cheese, Victoria buns, dressed sweetbreads, Wiesbaden pudding, croquettes, flaky crust, tarts, Victoria buns, jellies, creams, cakes, ices. Sick-room cookery.

My visit being during vacation I had not an opportunity of seeing the students engaged in their work; but, through the courtesy of the Secretary, Mr. Campbell, I inspected the rooms, and, in some instances, saw the work of the students. The work of the modelling-class was to my mind *the* work of the school, and showed evidence of good practical teaching. Mr. Percival Ball, a sculptor of considerable repute in the Home-country, is the instructor, with Mr. Williams, assistant. The progress of this class is remarkable for the time the class has been in operation. The work of the carriage-drafting, under Mr. James Hambridge, was of a thoroughly practical nature. General working-drawings were shown me treating of buggies of various forms, and an English phaeton, showing working-sections. Geometry as applied to carriage-building is also given by the instructor. Mr. Hambridge complains of the time of the class being wasted by students not having the necessary elementary knowledge previous to entering the class. In the theoretical and practical carpentering class-rooms several machines, lathes, &c., are being and have been fitted for the use of the class, and Mr. Campbell informed me that this had done much to popularise the class, a large amount of time being saved by the use of the existing machinery. The class had been rather at a disadvantage owing to overcrowding. Several drawings were shown of plans, elevations, and sections of work, full size, and must prove of great value to these working carpenters. Here also the instructor, Mr. Storer, I ascertained, complained of a want of knowledge of elementary practical geometry in students entering the class. The freehand-drawing class-rooms were being enlarged. The arrangements of desks struck me as being cumbersome. The lighting-arrangements were fully complete. Models, plaster and wooden, are, I understand, now under order, and are sadly needed for these classes. A scheme for examination is being devised, coupled with definite courses of instruction, and the issue of class and expert certificates. A complete scheme for this is already in force in New South Wales, and I understand the Melbourne one will be open upon the same lines.

Weekly popular lectures have been delivered in connection with the college, admission being free by ticket. The majority of these lectures were well attended, many of the earlier ones being crowded, but towards the close the attendance was somewhat thin. The following were delivered from May to November, 1887: "Study of History," Hon. C. H. Pearson, M.P., Minister of Public Instruction; "The Air we breathe," C. R. Blackett, Esq., J.P., President of Pharmacy Board of Victoria; "The Story of Australian Discovery," A. Sutherland, Esq., M.A.; "Labour and Culture, or Learning and Working," Rev. L. D. Bevan, D.D., LL.D.; "India, with Observations and Reminiscences during a recent Tour," Joseph Bosisto, Esq., M.L.A., C.M.G.; "Failures in Life," James Jamieson, Esq., M.D.; "Heat," illustrated by experiments, Professor Andrew, Melbourne University; "Contrasts and Development in Industrial Arts," Rev. J. J. Halley; "The Influence of Environment on Animals," Professor Spencer, Melbourne University; "Story of Photography," illustrated, L. Hart, Esq.; "Theory and Practice in their Relation to Engineering Work," Pro-

fessor Kernot, Melbourne University; "Natural History as a Recreation," C. A. Topp, Esq., M.A.; "Tenants of Space," R. L. J. Ellery, Esq., F.R.S., Government Astronomer; "Story of Australian Exploration," A. Sutherland, Esq., M.A.; "The Drugs which kill or cure us," A. H. Jackson, Esq., D.Sc., Director College of Pharmacy; "Taxation, its Purpose and its Limits," Professor Elkington, Melbourne University; "A Lump of Common Clay," illustrated, S. H. Wintle, Esq., F.L.S.; "Story of Australian Settlement," A. Sutherland, Esq., M.A.; "Architecture," P. Oakden, Esq.; "The Art of Reading," Rev. Alex. Macully, M.A., LL.B.; "Music, with Illustrations," Henry Keiley, Esq.; "Photography," illustrated, redelivered, L. Hart, Esq.; "Physics of the Atmosphere," illustrated, E. Lloyd Marks, Esq., F.C.S.; "Alpine Climbing," Rev. T. F. Ewing.

It is pleasant to find a large number of trades and societies subscribing towards the funds of the college, considering the great benefit likely to be derived from such classes. I think this is as it should be, and is a worthy example, which I trust the New Zealand societies will ably follow, and not allow themselves to be outdone by Victoria. A library has been started in connection with the college. The Government kindly furnish copies of all papers and works issued from the Government Printing Office. Maps from the Lands Department, papers from the Secretary for Mines, 135 volumes from the Trustees of the Public Library, and nearly 250 volumes from private persons and booksellers, have been presented. The daily papers, from the proprietors, and the "Victorian Engineer" from the proprietors, are also supplied.

3. Schools of Art and Mines.

Schools of art and design are held under the auspices of the Royal Technological Commission: cost of Commission, £1,400. At the end of 1886 the number of schools or classes under the Commission was thirty-six, located in various towns, and meeting in schoolrooms and town halls. Of these thirty-six schools twenty-nine meet only once a week, and only one—Sandhurst—is open every day. The Royal Technological Commission pay 2s. 6d. per head for all students who attend eight nights per quarter. Four quarters in each year. The fees are low, ranging from 2s. to 2s. 6d., 3s., 5s., 7s. 6d., and 10s. 6d.; five schools only charging 7s. 6d. or 10s. 6d. During the session ending December, 1886, there were in the schools: Total students, 2,238; number of students attending eight nights during last term, 1,783. Fees received during 1886, £1,345 13s. 8d.; local encouragement, £116 13s.; amount of aid from Royal Technological Commission, £990 8s. 3d.: total income for year, £2,452 14s. 11d. Expenses: Amount paid to teachers, £1,642 6s. 9d.; expended on schools examples, £269 15s.: total, £1,912 1s. 9d. Leaving a balance of £540 13s. 2d. for working-expenses, &c.

At the time of my visit none of the schools were at work: I therefore take the following extracts from the report of Mr. Gill, of Adelaide, who made careful inspection, and reported to the Board of South Australia appointed to inquire into the system of technical and agricultural education:—

"These schools are under local Committees, and the examinations, when held, are under the separate local authorities, and consequently vary and are inconclusive. The local management is in the hands of some energetic local person or persons. I saw three schools: South Richmond (1885), 168 students÷4=42 per quarter; Hotham (1885), 742 students÷4=185 per quarter; and Fitzroy (1885), 822 students÷4=205 per quarter. I was accompanied to the Fitzroy School by the Chairman and the Secretary of the Victorian Royal Technological Commission. It is held in the large Town Hall, divided down the centre by a curtain; females on the left and males on the right, and the platform filled with boys. There were nine teachers. Attendance below the average—74 males, 65 females; total, 139. Forty per cent. of the students were children who attended the State schools, and who prefer the art-school to bed. Of the remainder, the girls were in four divisions, and each division contained beginners, elementary, middle, and advanced students, mixed; there was no attempt either to classify students or to give the teachers definite work. The same appeared to be the case with most of the males, with the following exceptions: An architectural class contained four students, two of whom had advanced as far as printing, one was copying building-construction, and one was working at geometry. One teacher was intelligently working, and had two classes at blackboard-work, three students at machine-construction (screws), and eight working at conic sections. Beyond the eleven students last named, there were not twenty who were doing work of value. A very few were copying from casts or drawing flowers. Of 139 students present, more than a hundred were engaged in work which was useless and deceiving, and would not fit them in any way for technical work—the aim of the Commission. Hotham is considered inferior to Fitzroy. There were large classes of building- and machine-construction, but all the students were working separately, and from flat copies. There were neither models nor sections of machinery. South Richmond possessed the best appliances, casts, &c., for teaching. Fitzroy and Hotham, beside flat copies, may be said to be perfectly destitute of all appliances for teaching. The following causes are against these schools of design: (1.) The masters have not, with scarcely an exception, had any training. (2.) The schools have no appliances worthy of the name, and the large schools no conveniences for dividing the classes. (3.) The time of meeting, one evening per week, is too short. (4.) That, as the appliances of the school are so inferior, and the teaching so unsystematic, it can hardly be expected that the future teachers, often raised from the present students, will be able to improve the work of their schools. (5.) The inflated number of these schools is due to the low fee and the regular attendance of children for whom the Government already provides State-school teachers: these earn the 2s. 6d. grant from the Royal Technological Commission for the night teachers. (6.) Many students remain only one session. (7.) To omit or debar the children, and raise the fees, so as to give a regular course of work, would cause an immediate loss of three-fourths of the students, bring the school to financial ruin, and the present masters would never be able to satisfy the remaining students, who might be willing to pay a higher fee. From what I saw I am led to think that the schools of design, as at present, are not fulfilling the expectations of the Royal Technological Commission; and I understand that it was intended to

apply to Government for a grant of £10,000, without which it is thought that no certain improvement could be made.

"*Schools of Mines, Ballarat and Sandhurst (Bendigo).*—I visited both of these schools, and saw Ballarat at work. About fifteen students were attending a chemistry lecture, a few were engaged in laboratory-work; there was a small lecture-class on botany (three students), and a full class were engaged in a well-arranged and ventilated room at mechanical and engineering drawing. Unfortunately, this class was so large that a great number of elementary students had to work their geometry alone instead of being taken in a body at blackboard-work. Sandhurst School was not at work; but I obtained some particulars. Both schools have large incomes. The following is the income of the Ballarat School for 1885: Government grant, £2,000; public subscriptions, £202 10s. 6d.; fees, £823 6s. 6d.; sundries—making assays, &c.—£186 6s. 3d.; endowment fund interest, £25 19s. 6d.: total, £3,238 2s. 9d. Number of students who paid fees, 484; free instruction of State scholars, 596: total, 1,080. The following is the income of the Sandhurst School for 1885: Government grant, £2,000; Royal Technological Commissioners, £74 5s.; public subscriptions, £15 15s.; fees, £520 15s. 8d.; sundries—making assays, &c.—£24 9s.; interest, fixed deposits, £111 5s.; prize donation, £1 13s.; capital absorbed, £1,000: total, £3,748 2s. 8d. Number of students who paid fees, 396; free instruction of State teachers, 54: total, 450. Great facilities are afforded these schools by the railway authorities granting second return-tickets up to twelve miles, at 6d.; up to twenty-five miles, at 1s.; up to forty-five miles, at 1s. 6d.; and up to sixty miles, 2s. These are obtained by the students from the school officials. The schools are thus brought within reach of the really earnest in a population of between 150,000 and 200,000. It struck me that these schools of mines, created to disseminate knowledge of a particular description, and drawing a considerable revenue from the Government for this purpose, are mainly used by students other than mining students. The following figures show this: Ballarat—Mechanical drawing, 194; telegraphy, 92; pharmacy and botany, 34; astronomy, 11; chemistry, 44; metallurgy, 35; natural philosophy, 5; mineralogy, 6; surveying, 13; electricity, 9; mathematics, 41: total, 484 students. Sandhurst—Mechanical drawing, 79; School of Design, 171; telegraphy, 27; languages, 17; modelling, 7; astronomy, 7; bookkeeping, 14; chemistry, 16; metallurgy, 5; surveying, 1; mathematics, 19; mechanics, 7; mining-management, 6; geology, 20: total, 396 students. Drawing-students are 40 per cent. at Ballarat, and 60 per cent. at Sandhurst. Students in subjects other than mining are 70 per cent. at Ballarat, and 80 per cent. at Sandhurst, and these last percentages give the schools credit for all the students in chemistry, metallurgy, natural philosophy, mineralogy, surveying, electricity, mathematics, mechanics, mining-management, and geology being mining students; but such is not the case, and the probable percentage of mining students at Ballarat would be 15, and at Sandhurst 10, per cent. of the total number. Further, in the report of examinations held, I find that Ballarat has, since its origin as a School of Mines, certificated 1 captain of shift in 1872, 1873, 1874, and 1882 (4); 1 in geology as applied to mining in 1876; 13 underground managers (none since 1884), 26 in assaying, and 29 winding and other engine drivers, up to 1884. And Sandhurst, in 1886, certificated 1 mining-manager. I would point out that there is serious danger in Government granting large annual amounts to any body educational unless some very direct supervision is used. This thought occurred to me at Ballarat; and again at Sandhurst this occurred with much force when I saw new workshops and machinery for working metal, obtained at a cost of £1,200 or £1,400, which had never been used. They were put up twelve months since to supply an apparent want, which, as experience proves, did not exist. Provision has been made for students who will not pay fees to learn that which they are paid wages to learn in the local shops."

4. School of Painting and Drawing and Technical Laboratory, at the Public Library.

The painting-school under Mr. Follingsby, with whom is associated Mr. McCubbin, is held at the Public Library. The period of studentship is limited to five years, but may be extended in favour of meritorious students. The school has two courses, the one for drawing, the other for painting. The year is divided into two terms of about five months each. Fee for painting-class, £2 per term; and for the drawing-class, £1 per term. Applicants for admission submit specimens of drawing to the director, and upon his recommendation the student is admitted as probationer, and afterwards, should the work continue satisfactory, is admitted as a registered student upon payment of a fee. If at the end of the fourth term the drawings of any student be considered unsatisfactory, he or she ceases to be a student. Before admission to the school of painting, students submit a figure from the antique, a figure from the life, a head from the antique and life, and a perspective drawing. Every third year a gold medal is awarded, carrying with it a travelling scholarship of £150 a year, tenable for three years. The holder shall study painting in one of the great art-schools of Europe, and shall during each of the first two years paint and present to the trustees a copy of some well-known painting by an old master; and during the third year an original picture is to be presented.

The technical laboratory, under Mr. Cosmo Newbery, has in connection with it a mechanical-drawing class and a telegraphy-class. The laboratory and shops are open for a fee of £3 3s. per session to any mechanic or other person who might wish to experiment, make or improve any industrial process, or perfect any inventions. The laboratory is, I am given to understand, used by persons of all classes, and is highly valued as a means of instruction. Experiments were also made here with the various Victorian clays, and as a result a terra-cotta building has now been erected in Collins Street.

The Government of Victoria contributed as follows towards art and technical education in 1887: (1) State schools, drawing, £4,969 17s. 4d.; (2) Royal Technological Commission, £1,400; (3) schools of mines £4,000, buildings and apparatus £2,000; (4) School of Art, Geelong, £500; (5) School of Painting and Design, about £1,400; (6) Working-men's College, £2,000; (7) laboratory and workshops, not known: total, £16,269 17s. 4d.

The present arrangement of educational matters, split up between the Education Department, the Royal Technological Commission, the schools of mines, and Trustees of the Public Library, each holding separate examinations and having separate control, cannot possibly have success; and I fully agree with Mr. Gill that united action is absolutely necessary to secure success. The Hon. the Minister of Education informed me that an effort would be made to combine some of the sections, and that an application had been forwarded to South Kensington for an art director. This gentleman has, I understand, been selected by the Science and Art Department since my return.

SOUTH AUSTRALIA.

1. Drawing in public schools. 2. Art-schools. 3. Art-gallery. 4. Evidence taken on technical education.

1. Drawing in Public Schools.

Practically speaking, there is no system of drawing in the public schools of South Australia, though in one or two of the schools the headmasters have taken considerable interest in the subject, and given instruction in all standards, notably Mr. Kennedy, of Marrytaville Public School. The matter of the introduction of drawing in public schools has been under consideration of the Instruction Department for some time, though I cannot see why there should be any hesitation in adopting a subject all educational authorities of importance deem not only desirable, but an absolute necessity, especially in young colonies. No definite action has, however, been taken. It is certain that until this step is taken the School of Design and its proposed branches cannot do legitimate work so long as the students presenting themselves have to be instructed in the simplest possible elements.

The following occurs in the report of the Minister of Education, 1886: "Industrial education has during the past years attracted much public attention. The Government appointed a Board to report upon the best means of developing a general system of technical (including agricultural) education in the provinces. This Board is still prosecuting its inquiry. A sum of £500 was voted by Parliament last session for the erection of a school-workshop; but, pending the report of the Board, no further action has yet been taken. It will be seen by the digest of evidence taken by this Technical Education Board, and given in section 4, that it is recommended that elementary drawing be made a compulsory subject in all classes. It is to be hoped this will be carried out without the least delay, and that Mr. Gill's system of drawing (which is a thorough and systematic one) will be put in force as speedily as possible. At present less than one-fourth of the public schools receive instruction in drawing, and in those cases the system is not universal and receives no direction; so that these efforts, not being directed by a competent head, lose the greater part of their value."

The training students under the Department of Instruction receive instruction at the School of Design weekly; the first-grade work, of a slightly higher standard than that of South Kensington, being the first or elementary course, and the second-grade afterwards, with special instructions as to the method of giving the lessons in the public schools. There is not the slightest doubt but that the giving of first-grade subjects first is a decided advantage. The students find the work simple, and so gain confidence—a matter of great importance both to teacher and student. Want of confidence, and consequently insufficient energy upon the part of the teachers of schools, is one of the greatest difficulties we have to contend with; and I am pleased to find Mr. Gill dealing successfully with this difficulty, and by such simple means.

2. Art-school.

The Schools of Design and Painting are in connection with the Public Library, Museum, and Art-gallery of South Australia, and are controlled by the Fine Arts Committee of the Board of Governors, this Committee having also the control of the art-gallery. All are in the same block of buildings, designated the Public Library, Museum, and Art-gallery of South Australia. The schools of art comprise an Elementary School, conducted by Mr. George A. Reynolds, late of Birmingham, and a certificated South Kensington teacher (the whole of the work of this school being superintended and directed by Mr. Harry P. Gill, the principal of the School of Design); a School of Painting, conducted by Mr. Louis Tannert; and a School of Design—art-lecturer, examiner, and principal, Mr. Harry P. Gill, late of South Kensington, with the following assisting-masters and instructors of special branches: Artisan and modelling-classes master, George A. Reynolds; assistant, James Keane; machine-construction instructor, Robert A. White; building-construction instructor, Isidor G. Beaver. The system of instruction afforded in these schools is similar to that practised in the art schools of England in connection with the Science and Art Department of the Committee of Council on Education, South Kensington. The year is divided into three sessions, each consisting of thirteen working weeks: Spring session, from Monday, 19th September, to Friday, 16th December, 1887; autumn session, from Monday, 13th February, to Friday, 19th May, 1888; winter session, from Monday, 5th June, to Friday, 1st September, 1888. Intending students are required to fill up the following form: "Form of application to be filled up by intending student, and forwarded to the principal, School of Design, Public Library, Museum, and Art-gallery, Adelaide. Name in full, ; address in full, ; age last birthday, ; present or proposed occupation, ; any previous teaching, ; object of study, ; state which school you propose to join . Date . Folio No. . Reg. No. ." All applications are required to be made for admission to the Elementary School, from whence students are transferred to the other sections of the school upon passing a satisfactory test given by the principal. When applicants have already received instruction the application-form is expected to be accompanied, if possible, by works executed by the applicant. The following is a complete list of classes, course of study, and fees charged:—

Elementary School.—The classes meet as follows: Monday and Thursday, 10 a.m. to 12 noon; fee, £1 per session. Monday and Thursday, 2 to 4 p.m.; fee, £1 per session. The course of study includes—Plane geometry, geometric designs, and the flat colouring of the same; elementary freehand from flat and diagrams, and the flat colouring of the same; designs made by combining geometric with freehand forms, and the flat colouring of the same; elementary perspective as far as the representation of simple geometric solids; model-drawing in outline; outline-drawing from casts, and flowers and foliage from nature; shaded drawings in chalk and sepia from groups of solid models, and from casts of ornament, natural forms, fruit, flowers, &c.; filling spaces with naturalistic or conventional arrangements of plants, and colouring the same.

School of Painting.—The classes meet as follows: Morning and afternoon classes—Tuesday and Friday, 10 a.m. to 1 p.m.; fee, £1 10s. per session: Monday and Thursday, 2 to 5 p.m.; fee, £1 10s. per session: Tuesday and Friday, 2 to 5 p.m.; fee, £1 10s. per session. Life class, Tuesday and Friday, 10 a.m. to 12 noon; fee, £2 10s. per session. Students on entry to this school will have passed the first-grade and the second-grade perspective examinations, or will sit at the examinations next ensuing. The course of study includes: Painting, both in oil and water-colours; from casts of figures and details of figures, ornament, fruit, flowers, &c.; landscapes from copies and from nature; life drawing and painting.

School of Design and Artisan-classes.—The classes meet as follows: Morning and afternoon classes—Tuesday and Friday, 9.30 a.m. to 12.30 p.m.; fee, £1 10s. per session: Tuesday and Friday, 2 to 5 p.m.; fee, £1 10s. per session. Lecture-classes are held in plane geometry, solid geometry, perspective, theoretical perspective, and perspective projection of shadows, &c., on Thursday afternoons. The above fees for painting and design students include these lectures. Evening classes for model-drawing, geometry plane and solid, perspective, drawing from ornament in outline, and in light and shade from models and casts, and for designing. Monday and Thursday, 7 to 9 p.m.; fee, 10s. per session. Tuesday, 7 to 9 p.m.; fee, 5s. per session. This is a lecture-class for plane and solid geometry, perspective, &c.

Architectural Modelling-class.—Wednesday and Friday, 7 to 9 p.m.; fee, 10s. This class is for the modelling of architectural mouldings and their proper ornaments, and also ornamental modelling from casts, and designing of ornament.

Life and Antique Class.—Wednesday and Friday, 7 to 9 p.m.; fee, 10s. per session. Besides the fee students studying from the life contribute some sum not exceeding 10s. per session towards the expenses of the model.

Construction-classes.—Students entering these classes must satisfy the principal of their knowledge of plane and solid geometry, and must pass the first- and second-grade geometry examinations either prior to their entry or at the ensuing examination.

Machine-construction.—Wednesday and Friday, 7 to 9 p.m.; fee, 10s. The whole of the drawings made in this class are from actual measurements of machines and sections, and are drawn to scale. The student is instructed in the various strains and stresses and works on wheels, teeth, &c., from formula supplied. Permission is now given to students to measure machines in the locomotive-shops.

Building-construction.—Wednesday and Friday, 7 to 9 p.m.; fee, 10s. The spring course consists of a series of lectures on brickwork and masonry, foundations and concrete-works. Walls: The various kinds of bond used, stretching-bond, English and Flemish, brick quoins, footings and damp-courses, brick arches, window- and door-openings, reveals, chimney-breasts, shafts, jambs, &c.; ornamental brickwork. Masonry: The various methods of building stone walls, including rubble, coursed rubble, and cut-stone walls and arches; brick and stone piers and fireproof flooring. The work executed by the students in the building-construction class will be from blackboard-lectures, and the work of the students must be left each night for the instructor's corrections and certificate. Besides the above lectures students of various stages are taken on those points more immediately required by them, and the instruction will include geometric projection of shadows, the rules of architectural perspective, proportions and mouldings of the orders of classic architecture, &c.

Solid Geometry Lectures.—Tuesday evening, 7 to 9, and Monday and Wednesday afternoons, 4 to 5. Will be given each autumn session, commencing immediately after the Easter recess.

Perspective Lectures are given on Tuesday, 7 to 9 p.m., and on Wednesday, 2 to 4 p.m., during each winter session.

Fees for solid geometry and perspective for entire course, 10s. day, 7s. 6d. evening classes.

Etching-class, for copperplate-etching. *Pottery-class*, for modelling of forms, designing, colouring, baking, and glazing of pottery.

Designing-classes.—Students on entry to this class will have passed their first-grade and elementary-perspective examinations, or will sit at the examination next ensuing. They will have their studies regulated in accordance with their special requirements. Those who propose to carry out original designs, or who are artistic handicraftsmen, will take the second-grade certificate, whilst the mechanical student will take the second-grade geometry. Artisan students will enter the evening classes and pass to the various sections required by them in accordance with the rules specified under such section. The course of study for design-students will include—Plane and solid geometry and perspective; anatomising ornament from the flat and the round; studies of plants and flowers from nature, and designing arrangements of the same to fill given spaces; shaded drawings in sepia and chalk, and monochrome drawings from casts of ornament and figures; designing in imitation of given examples; designing ornamental arrangements to fill given spaces in monochrome, colour, or relief; designing solids, projecting and drawing ornament upon the same; life-drawing and anatomy; modelling; machine-construction; building-construction.

Students' Sketching-club.—Monthly sketches and designs, competitive, open to the whole of the students of the Schools of Art.

My visits to the School of Design and Elementary School were unfortunately during the vaca-

tion; but, through the courtesy of Mr. Gill, I was enabled to see the whole of the best work of the students, and also made a careful inspection of the work exhibited at the Adelaide Exhibition.

The average number of students of the School-of-Design classes was 151:*—

Class.	No. of Students.	Description of Work.
Monday and Thursday	12	Elementary geometry, model-drawing, freehand, and shading from the round.
Tuesday and Friday morning	14	Advanced classes, shading from the cast, drawing, painting from nature, and the carrying out of original design. These attend during the day—fee, £1 per session of thirteen weeks. Some few are engaged in trade, many are professionally engaged, and the majority are working with the object of acquiring knowledge, and all do original work.
Tuesday and Friday afternoon	17	
Solid Geometry Lectures.		
Friday afternoons	39	These students are in other classes, and attend these lectures so that they may be able to project their designs upon curved surfaces, and also in anticipation of the perspective lectures and the work of the construction classes.
Tuesday evenings, teachers and artisans..	19	
Pottery-class, Saturday afternoon, and Monday and Thursday evenings	15	These are students in other classes who have also worked at original designs in this class.
Artisans, Monday and Thursday evenings	37	All the various elementary and advanced branches of drawing that are required in trade and in art handicrafts, including modelling.
Life class, Wednesday and Friday evenings	11	Advanced students, drawing and painting the head in monochrome, from the model. These students pay the expenses of the model.
Building-construction	8	Under a practical instructor.
Machine-construction	20	Under a practical instructor. These attend during the evening—fee, 10s. per thirteen weeks. Most of the students are teachers, or artisans, or mechanics, while a small proportion use the classes to obtain knowledge previous to altering their vocation.
Training-college students	32	These are prepared for the examinations held under authority of the Board of Governors of Public Library, Museum, and Art Gallery, to be certificated as teachers.
		The whole of the students are taught by blackboard, lectures, and from the round, flat copies being only used to explain differences of style, &c.

The attendance of the students averages 92 per cent. The artisan classes are attended by iron-moulders, patternmakers, turners, fitters, smiths, cleaners, boilermakers, galvanised-iron workers, engravers, jewellers, modellers, brick and terra-cotta workers, architects, draughtsmen, carpenters, plasterers, bricklayers, masons, coach-body makers and painters, trimmers, upholsterers, woodcarver, and signwriters.

Free Studentship.—The principal may during each session award either nine artisan free studentships or three day free studentships, each tenable for one session. At the end of the year ending the 30th June, 1887, seven artisans and one teacher were registered as having been free students during the year.

The work of the Elementary School under Mr. Reynolds is of a very thorough character, and it is evident to me that the students are energetic and painstaking in their work, a considerable amount of enthusiasm being shown in class-competitions and lecture-work. In model-drawing the geometric plan and elevation is given first, so that the student must of necessity know the exact form previous to placing the same in its perspective representation. The shaded drawings in chalk and sepia from groups of models and from casts of ornament showed considerable appreciation of the difficulties of light and shade. It is expected of all students that they pass a first-grade course in model, freehand, and geometry as early as possible after entering the school; further, great importance is attached by Mr. Gill to the principles of plane and solid geometry being taught at the earliest stages, this knowledge giving a good idea of form, coupled with accuracy and precision in future work. From evidence given before the Board appointed by the South Australian Government to report upon the best means of developing a general system of technical education, Mr. Gill states, "I place more weight on geometry than the English do: for instance, with reference to the standards in public schools, my Standards I. and II. would include the whole of No. 3, No. 4, part of No. 5, and part of No. 6 in the English standards. We should get to freehand in No. 5." Mr. Gill's idea being that the English standards give, for instance, a square to draw, when the child has no idea of lines vertical, horizontal, or oblique, and, further, that objects are drawn without the actual facts being first given. I certainly agree with Mr. Gill upon this very important point. It is a deplorable fact that in a very large number of our schools copies or books are simply handed out to the class. The training of the powers of observation as to actual facts is, as a rule, not in the least considered—it is simply a question of a blind copying of symmetrical forms.

In the School of Design or secondary stage of classes, the same thorough grounding and good work was to be found. Amongst the work exhibited at the Exhibition there were several good chalk drawings from the cast, sepia drawings from groups of models, outlines from casts and models, and sheets of geometrical class lecture-sheets, including projection of shadows. Amongst the designs were plaques of considerable originality and skill, door-panels with naturalistic or conventional treatment, carved-wood bellows, designs for painted pottery, cartouche and strapwork borders, Indian and Greek designs for pottery, all of considerable merit, and showing a good knowledge of the principles of designing.

The *Architectural-modelling Class* has been the means of enabling young carvers gaining an insight into the designing and modelling of detail necessary for their work, panels being made up of

* This does not include School-of-Painting students. The above is an average number: thus, each class-day the total is taken of students who are in the class; directly one leaves he is struck off: so that the average number for thirteen weeks is, say, 19; whilst the highest number in the class might be 23.

draperies and objects, and modelled by the students, the usual class-instruction from the cast preceding this.

In the *Life and Antique Classes* there were charcoal sketches from the cast. The charcoal life studies were exceptional in their appreciation of form, and light and shade effects. There being no appearance of over-manipulation, the students had evidently been carefully instructed as to the characteristics of each individual model. Time-sketches from life were especially good.

In the *Machine-construction Class* the whole of the drawings were made to scale from actual measurements of machines, additional information being given by the instructor as to strains, &c., whilst the drawings were in progress. The following were some of the drawings inspected, in all cases worked as above: Drawings giving elevations and sections of Tangye pump and water-cock, steam-chest for donkey-pump, details of water-meter, hydraulic pump, &c. The Government Locomotive Department allow actual measurements to be taken from the various machines, engines, &c., at the locomotive-shops.

Building-construction.—In addition to the work given under the class-heading, the following work has just been gone through: Roofing, various forms of roofs, roof-trusses and the framing of roofs; description of strains on the several parts; and roof-coverings, and the method of laying slates, tiles, lead, zinc, galvanized iron, flashings for chimneys, eaves, gutters (box, valley, &c.). Floors, single, double, and framing; trimming for well-holes, hearthstones; ceiling-joists, and the methods of carrying, &c. Students are further taken in points more immediately required by them, and the instruction includes geometric projection of shadow, the rules of architectural perspective, the proportions and mouldings of the orders of classic architecture. Several models of scarfing executed by the students of this class were exhibited at the Exhibition.

Etching (Copperplate).—Although this class has only just commenced work, good etchings have been produced, including several street-scenes in Adelaide, and original work from the life. This class will, no doubt, prove one of the most useful in the school.

Pottery-class.—In this class-room I found a potter's wheel and usual appliances for ordinary potter's work. The principle of construction and geometric curves of vase-forms are thoroughly dealt with, the various curves and styles being fully explained. The forms are duly drawn and then the mould shaped. After the vase has been thrown the student ornaments, sometimes in relief, and sometimes in incised work. Examples of both were shown at the Exhibition. Several good designs for the decoration of pottery were also on exhibition, showing the style of treatment required in accordance with the shape of the object. Some difficulty has been experienced with reference to firing; but Mr. Gill informs me this will shortly be overcome. A potter and turner connected with a local firm have put in all their spare time in this class, and have improved to such an extent that a remarkable change has taken place in the character of the pottery now made, and work which at one time had to be sent away is now done by the firm. There is every appearance of the work of this class laying the foundation of a second Doulton, and thus providing the students with employment. The use of tiles in the architectural decoration of Adelaide should at no distant date give this class of student ample employment, and it is to be hoped the energy of Mr. Gill will not be wasted, but taken up by local persons, and the knowledge so painstakingly infused utilised to the fullest extent.

In the *Design-class* a large number of geometrical arrangements of natural plant-forms were good in design and colour, and several sheets showed considerable ability of adaptation to spaces given, and good art-feeling. The botanical treatment of each plant used is first given. The Board of Governors have given prizes for industrial designs, and the competition was, Mr. Gill informs me, very keen, no less than forty competing in one section, twenty-three in another, and eighteen in another, the latter being so close that a number of additional prizes were awarded. These sheets were executed away from the school.

Sketching-club.—The Board of Governors have placed at the disposal of the art-master a sum of £10 per annum, to be awarded as prizes for original designs and sketches executed away from the schools. The students are divided into elementary and advanced sections. The advanced may not compete in the elementary section. Each work sent in is marked according to its value, ten being the maximum. The student who at the end of the year has obtained the greatest number of marks in a section takes the prize in that section. The works sent in are criticized by Mr. Gill, and the best sketches in each section are retained for school and exhibition purposes. The following were some of the subjects selected:—*November.*—Elementary design: A geometric coloured design for a hall-floor, 8in. square; and a corner of the floor to be shown full size: scale, 1in. to 1ft. Advanced design: A stamped leather book-cover, about 9in. by 6in., to be painted in monochrome. Advanced sketch: A rug and an occasional chair, with a simple background. *December.*—Elementary design: A geometric coloured design for an octagonal hall-floor, 8ft. in diameter; scale, 1in. to 1ft.: a corner of the octagon to be shown full size. Advanced design: A gas-bracket, either in wrought- or cast-iron. Advanced sketch: A yard of satin. *February.*—Elementary design: A geometric coloured design for a fire-hearth. Advanced design: Painted design of flowers for a fan. Advanced sketch: Panel, 30in. by 6in., oleanders. *March.*—Elementary design: Conventional design for the back of a playing-card. Advanced design: Corner of a lace handkerchief, border 2in. broad. Advanced sketch: Bunch of grapes, glass of water, and a knife. *April.*—Elementary design: Conventional design for the border of a small plate 8in. in diameter. Advanced design: Back of hand-mirror, to be treated in low relief, wood or metal. Advanced sketch: Watch and chain, and pocket-book. *May.*—Elementary design: Design for serviette-ring in carved wood, to be shown as a flat strip, 6in. by 1½in. Advanced design: Border for a pot, 6in. in diameter, 2½in. deep, ornament to be projected upon the pot. Advanced sketch: Common penny ink-bottle, quill-pen, and an old letter. Designs bearing upon the subjects given are exhibited in the School-of-Design bookcase, and suggestions where to find others are posted up.

Art Examinations are held in May and November. First grade—model, freehand, and

geometry—in both months named. Second grade, including perspective, in November only. The examinations are extended to the public upon payment of a small fee per section. These examinations will be found fully described on page 7.

Affiliation with South Kensington.—The school is affiliated to South Kensington. Particulars of such affiliation will be found on page 9.

Regulations.—All students are required to pass the examinations of the first grade in model and freehand drawing and plain geometry, and also to possess a knowledge of elementary perspective, prior to their being passed to either of the advanced schools. Students in the advanced schools must prepare and sit for the second-grade perspective. Students passed to the advanced schools at their entry are passed conditionally on their taking the above certificates at the following examinations. Permission is given to students, properly qualified, to study in the schools daily between the hours of 9.30 a.m. and 5 p.m., provided that their presence does not interfere with any class that may be receiving instruction.

School of Painting.—Students entering this school must have passed the whole of the first-grade and the second-grade perspective examinations. Owing to the absence of the master, Mr. Tannert, I was unable to see the work of the students at the school; but at the Exhibition there were a number of paintings of considerable merit. The average number of students registered as being in attendance at the classes is about forty-six. The master may during each session award three free studentships, each tenable for one session. The art-gallery, although small, contains some excellent works, and is a great boon to the students of both Schools of Design and Painting. The total amount received in students' fees in the art-schools for the year ending the 30th June, 1887, was £458. The total expenditure was as follows: Art-gallery (salaries), £157 6s.; art-schools (salaries), £1,267 19s. 11d.; sundry expenses, £168 6s. 2d.: total, £1,593 12s. 1d. The greater portion of this is covered by Government grant of about £6,000, for the Public Library, Museum, and Art-gallery of South Australia.

In conclusion, I may congratulate the authorities upon having in their service a gentleman of Mr. Gill's sterling worth and ability—one who takes the deepest interest in his work, and spares no pains or hard work to attain good and sound practical results.

4. Technical Education.

The following is taken from the progress report of the Board appointed by the South Australian Government to inquire into and report upon the best means of developing a general system of technical (including agricultural) education. I have gone carefully through the evidence taken by the Board, and have here summarised a few of the leading points, as being of importance, and bearing directly upon the subject of my report. Other matter is further introduced as likely to be of service or suggestive.

Drawing.

Mr. J. A. Hartley, B.A., B.Sc., Inspector-General of Schools, South Australia.—Drawing given as the best possible groundwork for industrial pursuits, and a great assistance to children in future years. He would commence it at the same time as writing. He considered any ordinary teacher of intelligence should be able to teach the drawing necessary in the elementary stages. Decidedly of opinion that drawing would be applicable to the girls as well as to the boys.

Mr. H. P. Gill, Principal, School of Design, South Australia, held the view with regard to drawing in primary schools that in all matters relating to technical education, and bearing on the handicrafts, the instruction should be founded on an accurate understanding of drawing. Drawing is another means of expression, not nearly so laborious as writing. Undoubtedly facilitated teaching to write. It was a waste of time to send children into shops until they had learnt drawing. Two years would be required for the teachers to learn how to teach drawing up to the Sixth Standard, with elementary solid geometry as applied to trades and handicrafts. Drawing must undoubtedly be the basis of teaching in technical schools. Children to be taught drawing as soon as writing. All teachers teaching drawing should be certificated. Useful drawing, as a power of expression, more efficacious than writing. Found that all teachers who bestowed care on the geometric part of the work received such a training of the eye as to expedite their progress in other parts of the work. Never met a person of ordinary intelligence who tackled useful drawing but he mastered it, with care.

Professor Custance, F.C.S., Government Professor of Agriculture.—Very important indeed that children should be taught drawing.

Mr. J. T. Smyth, B.A., B.E., headmaster of public school.—Technical education unsuitable to primary schools, but something might be done towards it by the introduction of drawing, with practical geometry and lessons on elementary science. Children to draw from their infancy. Not less than three lessons a week should be given. Would compel teachers to pass an examination within a certain time or forfeit their positions. Did not think the amount of knowledge of drawing required in primary schools would be so elaborate that they could not manage to acquire it if they gave their mind to it. In Switzerland the teachers give lessons on the blackboard in practical geometry, and then give the children slips of cardboard, and make them cut out from their slips figures corresponding to the teachers' instructions.

Mr. W. J. Kennedy, headmaster of public school.—Drawing is the alphabet of manual science and manufacture, and should be commenced in the very lowest class, holding an equal position with writing. The children should be taught the art of designing in a simple manner, applying the forms presented to them, and combining them, so as to be able to make simple designs. Does not believe it is judicious to give children course of manual work until they have had a certain elementary scientific training and a good knowledge of industrial drawing.

Modification of Curriculum to admit of Industrial Drawing and other Technical Subjects.

Mr. J. A. Hartley, B.A., B.Sc., &c.—If any subjects were to be displaced, it would be formal grammar, as against practical grammar.

Mr. W. J. Kennedy suggests that a certain amount of history and poetry should be dispensed with to allow the necessary time for drawing, and is of opinion that too much grammar is taught, analysis being carried to an extreme. What was needed more was an improvement in the habit of speaking and a more intelligent acquaintance with literature.

Mr. C. B. Whillas, headmaster of public school, expressed views similar to Mr. Kennedy with reference to drawing. Was of opinion that grammar and history might be reduced to allow of drawing receiving full attention. Would put aside very much of the parsing and analysis. Had had considerable experience in teaching analysis, and did not think children ever comprehended it. Found it a hard matter even amongst pupil-teachers to get analysis properly taught. Was sure that most of the time devoted to analysis was wasted. Too much history to teach the children in a short time, so that the work was practically wasted.

Clay-modelling in Primary Schools.

Mr. J. A. Hartley, B.A., B.Sc., &c., Inspector-General of Schools, South Australia.—Something in the way of clay-modelling could be done.

Mr. H. P. Gill, Principal, School of Design, South Australia.—Something could be done with children under thirteen. Students must learn drawing before modelling. Weekly lessons for a year, in addition to drawing, would give teachers a fair idea of clay-modelling.

Manual Instruction in Primary Schools.

Mr. J. A. Hartley, B.A., B.Sc., &c.—Slöjd system of manual instruction only system worthy the name. It takes the children through a systematic course of work. Twenty or thirty models being arranged with great care, such as a wooden spoon, a little flower-stand, a paper-knife, a pen-holder, and things of that kind, which can be made with very simple tools, the children go through that course, and really acquire a certain amount of manipulative skill. Considers the use of ordinary carpenter's tools might commence at twelve years of age, but much earlier under the Slöjd system. Slöjd system would teach children to use their hands, and might be introduced in most of the schools. The system is applicable to both sexes.

Mr. H. P. Gill thought it would be a waste of time for the child to go into the shop and make a thing unless he knew it in the drawing. States that manual training to the children in the State schools is of infinitely more value than the mental training, provided you give them sufficient mental training to enable them to look about for themselves. Considers that two half-days a week is the least that can possibly be of any use. Proposed manual school in populous centre would have no permanent value if instruction limited to two hours a week for nine months in the year; in fact, would be useless.

Professor Custance, F.C.S.—Children eight or nine years old should be taught handicrafts. Nothing in the colony more important.

Mr. J. T. Smyth, B.A., B.E., &c., headmaster, public school.—Secondary schools should be established on industrial lines. Would show boys of ten how to use tools. Children should be taught to use their hands more. Disapproved of central classes for manual instruction, and children being drafted away during school days or hours.

Mr. W. J. Kennedy, headmaster, public school, states that in Sweden the children are taught manual instruction after the age of twelve, and in France also. Does not think that manual education can be applied to primary schools. Unsatisfactory to establish central workshops, and draft children from school during school-hours. Is of opinion that they should only be given such applied knowlege in science and drawing as would lead up to their afterwards going in for technical or industrial manual work.

Mr. C. B. Whillas.—Boys of ten or twelve hardly able to manage tools. Teaching manual dexterity an important matter. Would make more useful colonists; but was difficult of adoption.

Mr. T. C. Cloud, metallurgical chemist.—We should rather encourage children at the primary schools to take up some trade than augment the numbers seeking clerical appointments, and, if possible, encourage manual work either in or out of school-hours. Secondary schools should decidedly have a workshop attached.

Secondary Schools.

Mr. H. P. Gill.—Secondary schools only way of applying technical education. In any efficacious system of primary education secondary schools would of necessity follow.

Mr. J. T. Smyth, B.A., B.E., &c., headmaster, public school.—Opinion expressed that there should be a series of secondary schools on industrial lines, where the actual work should be carried out in shops specially suited to the various trades. If secondary industrial schools were established he would not have Fifth and Sixth Standards in primary schools, but draft to industrial school.

Mr. T. C. Cloud.—Workshops should be attached to secondary schools. Drawing, mathematics, science, and workshop-practice should be taught in secondary schools, with a view to technical education. The technical school proper might be divided into a sort of lower and upper class—the lower classes being more general, and the upper ones special classes applied to special trades or professions; the upper classes being principally attended by lads engaged or apprenticed during part or the whole of the day.

Technological Museum.

Mr. H. P. Gill.—Technological museum, if in connection with classes, would be very useful. If manufacturers could be interested, museums could be formed in districts applicable to principal trade of that district, and would be of great value. Should encourage teachers to form museums

in connection with primary schools. Enumerate the manufactures of the colony, and let the technological museum at first deal entirely with those. Immediately fresh manufactures crop up specimens should be obtained by the museum to illustrate this manufactory. Short time ago drain-pipes only were made; now endeavouring to make better pipes and terra-cotta ware. So as to give artists who work in terra-cotta an idea of the work done in other places, casts of terra-cotta could be obtained from England and Italy at a very small expense to illustrate ornament that was suitable.

Elementary Science.

Mr. J. A. Hartley.—It was desirable that the rudiments of science should be taught in public schools. Only the elements should be taught. Would teach girls and boys same elementary-science subjects. Teaching elementary science as a part of general education a great improvement on present system. Thought elementary science could not be taught generally by teachers, as they did not know enough about it. Might experiment with wheelbarrow system. Scientific training likely to develop new industries.

Mr. J. T. Smyth, B.A.—Elementary-science lessons might be introduced in present curriculum; simple facts taught to lower classes, and more elaborate instruction to higher classes. Was in favour of teaching applied science, adapted to the various classes and graded properly.

Mr. C. B. Whillas.—Science could be taught in fifth and sixth classes, but not earlier.

Mr. T. C. Cloud did not think that scientific matters could be taught by mere reading. Did not think the idea should be encouraged. Travelling lecturers could give efficient instruction of its kind up to a certain stage; but impossible to teach chemistry properly without proper means for the demonstrations. Did not believe in mere cram, nor in chemistry taught from books: neither chemistry nor physics could be taught from books.

Professor J. D. Custance.—Object-lessons should be given in chemistry, botany, geology, insect and animal life, &c.

Summary.

In the matter of drawing it will be seen that all the witnesses were of opinion that drawing was a necessity as a groundwork for technical education, and that drawing should hold an equal position with writing; that the ordinary teachers of the schools should be called upon to teach this subject, and would be capable of doing so with a certain amount of training. With reference to modification of curriculum to admit of extra time for industrial drawing and other technical subjects, the majority speak strongly with reference to grammar-analysis as being considerably overdone, and of little value as compared with other subjects; and, further, that history and geography should be taught as class-subjects, and in a different manner, with less cram, and not so much time given as formerly. Clay-modelling is suggested and recommended as being practical and useful. Manual instruction is considered as being valuable, but difficult to adopt owing to want of time, it being considered by several of little value unless a fair training could be given. It was generally considered that manual instruction could only be efficiently given at the present time in connection with secondary schools, classes for instruction being formed at the training college, and teachers trained. That drawing and science should be taught with a view to leading up to manual instruction. With reference to the question of manual instruction in agriculture, Professor J. D. Custance recommended that, where possible, gardens be cultivated in connection with country schools for the instruction of the children, so that they may have a practical acquaintance with farm-plants, and that a plot of land should be attached to the school, and the older pupils receiving some practical instruction in the methods of working the land. He would further recommend the adoption of farm-schools, and is of opinion they would meet a great want, and be of advantage to the colony, as many persons would be glad, for a moderate charge, to have their boys trained to useful work. Farm-schools could be established in different districts by making arrangements with good farmers to undertake the instruction of boys in practical farming, a teacher being attached to a number of these schools to give the boys instruction in other subjects when farm-work permitted, a fixed payment per head being made to the farmer in charge of such schools. The suggestion of Mr. Gill with reference to museums obtaining specially-selected specimens, with a view to illustrating the special manufactures of a district, is decidedly a good one, and of great importance to colonies of our own standing. The opinion with regard to elementary science is, generally, that it should be taught by a system of object-lessons, the difficulty of providing apparatus, and the fact of a large number of teachers being unable to give practical instruction, no doubt leading to the above result. Suggested that the wheelbarrow system be tried.

Recommendations made by the Board re *Primary Schools.*

No. 4. That elementary drawing should be made a compulsory subject in all classes, and that instruction in elementary science should be given to children in the higher classes. No. 5. The evidence indicates that drawing should be taught concurrently with writing, by the ordinary school-teachers. No. 6. That instruction in science should take the form of systematic object-lessons, due regard being given in the choice of subjects to their application to industrial requirements of the district in which each school is situated. No. 7. That encouragement should be given by the Education Department to head teachers to form in their schools museums of objects of industrial interest. No. 8. Having carefully inquired into the subject of manual instruction in primary schools, we are of opinion that such instruction, besides affording a pleasant and profitable relaxation from purely mental work, would prove valuable as a means of physical training, and would develop a taste for industrial pursuits. No. 9. That a class for manual instruction be formed in connection with the training college, and that, as qualified teachers become available, the system should be gradually introduced into primary schools. No. 10. That, where practicable, cooking-classes for girls should be established. No. 11. To make room in the curriculum for the subjects recommended, we suggest the omission of analysis, and the conversion of history and geography into class-subjects.

NEW SOUTH WALES.

1. Drawing in public and high schools. 2. Technical education. 3. Technological Museum. 4. Art-education.

1. Drawing in Public Schools.

In the public schools drawing is taught by the ordinary teachers; but, unfortunately, it does not commence until the Third Standard, and there is still time wasted in pictorial instead of industrial drawing, more especially in some of the country schools. At the Adelaide Exhibition there were several specimens of pictorial work. Considerable improvement has, however, taken place in the general system in the last few years. Some of the outline freehand drawings were good, and especially in the Paddington School, where I found drawings of groups of models, well executed, and showing sound instruction on the part of the teacher. The tendency towards pictorial work is gradually decreasing, and the appreciation for industrial drawing increasing. The pupil-teachers and training-students of both training colleges receive instruction every week from specialists; but there is no direct supervision from a thoroughly competent person. This I think the department would do well to remedy, as the work would be very materially benefited thereby. There are several Inspectors of the Public Instruction Department who, no doubt, fairly understand elementary drawing, and to a certain extent supervise it; but it is utterly impossible for any one to control or direct efficiently a systematic and practical course of industrial drawing unless he has the necessary experience and training in the same. No instruction is given to the first and second classes in drawing, and consequently the third class commences with simple figures from copy. The explanation of simple geometric forms, or their application to surrounding objects—a most important part of instruction in the elementary class—is not given. The Under-Secretary of the Public Instruction Department, Mr. E. Johnson, and the Chief Inspector, Mr. Maynard, are both anxious to remedy evils in this branch of instruction, and will, no doubt, soon have changes effected for the better.

The examination of teachers and pupil-teachers is of the Science and Art Department second-grade or full D drawing certificate, elementary blackboard drawing being the first necessary pass. One fact well worthy of note, and one which I would strongly urge the New Zealand department to take action upon, is this: No teacher receives his or her ordinary teacher's certificate without first completing the necessary drawing sections. Teachers are not necessarily failed on account of failure in drawing, but the certificate is withheld until a satisfactory pass is made in drawing. I understand that it is the intention of the Technical Education Board to supply sets of models to public schools. This will relieve an important want, as very few of the schools have the models necessary for the efficient instruction of drawing.

The Sydney high schools are instructed in drawing by a specialist, the course embracing freehand, model, geometrical, and perspective. Very satisfactory work has been produced in both schools, though the want of groundwork is here felt. If the lower standards of the public schools were efficiently instructed in lines, angles, and geometric figures, much better results would be obtained in these schools than can possibly be obtained under existing circumstances. I think that the introduction of first-grade drawing examinations for public schools would at the present time give a great impetus to the work, and would repay its introduction threefold.

2. Technical Education.

In 1878 the Government granted £2,000 to the Committee of the Sydney School of Arts towards the inauguration of the Technical College, and many new classes were then commenced. These classes largely increased in numbers, and in 1883, the Government having decided to establish a State system of technical education, the management of all classes was transferred to a Board especially appointed for that purpose. Classes have gradually increased in number until it was found necessary to obtain additional accommodation. A large block of buildings in Kent and Sussex Streets, the public school in Castlereagh Street, and rooms in the Royal Arcade were obtained as found necessary; and the whole of these buildings are now used for the purpose of giving technical instruction. The number of buildings used, however, being located in various parts of the city, must act detrimentally to the success of the classes. The Board consists of a President, two Vice-Presidents, and eighteen members. I fully concur with the recommendation made by the Hon. E. Combes, C.M.G., President, that a sub-department should be created under the Department of Education, the administration of the vote to be made by the Minister directly responsible to Parliament; and that an advisory Board, of at least three, but not more than five, individuals, be appointed for the purpose of assisting in matters requiring technical knowledge. The interests of a large body of members upon a Board of this character are far too various to allow of very successful working; and I believe in some cases subordinates have been appointed under instructors in charge of special departments, without consulting the head of the department, who is held responsible for the working of classes under him. I consider, further, that the post of Secretary should be held by a person of wide experience in technical matters generally, and one who has had Continental or English training. This would simplify to an enormous extent the working of such an institution.

The following were the departments in actual work at the time of my visit. Each department is under the control of an instructor, paid by salary and fees of classes taught by him. Teachers having classes under a department are paid at the rate of 10s. per lesson of one hour, with fees received from students taught. Assistants are paid at the rate of 10s. and 15s. per lesson:—

Departments.

1. *Department of Agriculture.*—Includes agriculture, botany, veterinary science, and wool-sorting.

2. *Department of Applied Mechanics.*—Includes applied mechanics, mechanical drawing, plumbing, naval architecture, metal-plate working, and fitting and turning.

3. *Department of Architecture.*—Includes architecture, carpentering and joinery, bricklaying, masonry, cabinetmaking, and carriage-building.

4. *Department of Art.*—Includes freehand drawing, modelling, practical plane geometry, solid and descriptive geometry, including orthographic and perspective projection, perspective, design, and house painting and decorating.

5. *Department of Chemistry.*—Includes practical chemistry, theoretical chemistry, and photography.

6. *Department of Commercial Economy.*—Includes bookkeeping, caligraphy and correspondence, phonography, actuarial science, German, French, and Latin.

7. *Department of Domestic Economy.*—Includes domestic economy, cookery, scientific dress-cutting, and tailor's cutting.

8. *Department of Geology, Mineralogy, and Mining.*—Includes physiography, mineralogy, and mining.

9. *Department of Mathematics.*—Includes mathematics and navigation.

10. *Department of Elocution.*

11. *Department of Pharmacy.* — Includes *materia medica,* and pharmacy, anatomy and physiology, and dentistry.

12. *Department of Physics.*—Includes physics, practical electricity, and telegraphy.

The following private classes are, by permission of the Board, held in the college-rooms during the day: Drawing and painting, chemistry, elocution, and biology. The year is divided into four quarters or sessions. Fees, at the rate of 6d. per lesson for seniors and 3d. per lesson for juniors. The following reductions are made to students attending several classes, and more than one night weekly:—

	£	s.	d.
Fees for one class per quarter—			
Students—			
One lesson per week	0	6	6
Two lessons per week	0	13	0
Three lessons per week	0	15	0
Four lessons per week	0	19	6
Five lessons per week	1	3	0
Juniors—			
One lesson per week	0	3	6
Two lessons per week	0	6	6
Three lessons per week	0	5	0
Four lessons per week	0	6	6
Five lessons per week	0	8	0
Fees for more classes than one per quarter—			
Students—			
Two lessons per week	0	13	0
Three lessons per week	0	15	0
Four lessons per week	1	0	0
Five lessons per week	1	5	0
Juniors—			
Two lessons per week	0	6	6
Three lessons per week	0	6	0
Four lessons per week	0	8	0
Five lessons per week	0	10	0

Branch technical schools, or science-and-art classes, are in operation at Lawrence, Coogee, Petersham, Paramatta, Granville, Bathurst, Goulburn, Newcastle, Lambton, West Maitland, Morpeth, Grafton, and Singleton. New classes are formed in the central school in any technical subject, providing that twelve intending students enrol their names and pay the fees, and in the country districts upon the same condition, and providing a suitable teacher can be found in the locality. Certificates of efficiency are granted at the annual examination in December to those who have completed courses prescribed in the curriculum. Diplomas for "industrial expert" are given in each department on passing examinations in prescribed subjects, and attending at classes for the several courses, as specified below:—

Departments for Industrial Experts.

A student passing through the required course in any of the following departments, and producing certificates for each class, will be granted a certificate as industrial expert:—

Agriculture.—Certificates required for expert in agriculture: Agricultural chemistry, agricultural mechanics, agricultural economy, horticulture, botany, forestry, elements of surveying, calculation of dams and earthwork, sugar-production, bee-farming, butter- and cheese-making, wool-production, lime-making, preserving animal and vegetable foods, soap- and candle-making, wine-making.

Architecture.—Certificates required for expert in architecture: Chemistry, practical chemistry, elementary physics, geometry and perspective, freehand drawing, detail drawing, principles of construction, composition, proportion; styles of domestic, civil, ecclesiastical; blacksmithing, bricklaying, carpentering and joinery, masonry, painting, paperhanging, plastering, plumbing, upholstering, English language, bookkeeping, carriage-building

Art.—Certificates required for industrial expert in art: Geometry and perspective, freehand drawing, styles of ornamentation, composition; designs intended for architecture, pottery, metal,

glass, house-decoration, and paperhangings; design intended for textile fabrics and China painting; modelling, casting, terra-cotta, stone-carving, chemistry, elementary physics, English language, bookkeeping.

Chemistry.—Certificates required for industrial expert in chemistry: Elementary chemistry, practical chemistry, technical chemistry, physics, mathematics, metallurgy, geometry and perspective, freehand drawing, English language, bookkeeping, assaying.

Dentistry.—Certificates required for industrial expert in dentistry: Chemistry, practical chemistry, physics, mechanical dentistry, dental pathology, surgical and constructive dentistry, English language, bookkeeping, demonstrations in operating-room, demonstrations in workshop, diseases of jaws, palate, and mouth.

Electricity.—Certificates required for industrial expert in electricity: Chemistry, practical chemistry, electricity and magnetism, applied electricity, instrument-making, elementary mechanics, English language, bookkeeping, mechanical drawing, mathematics, steam-engine and other motors compared.

Applied Mechanics.—Certificates required for industrial expert in applied mechanics: Chemistry, technical chemistry, elementary physics, mathematics, boiler-making, brass-founding and finishing, composition and alloys, coppersmithing, rock-drill making, fitting, machine-construction, English language, bookkeeping, mechanical drawing, moulding and casting, pattern-making, steam-engine, relative efficiency of steam and other motors, testing materials.

Mining and Geology.—Certificates required for industrial expert in mining and geology: Geology and palæontology, mineralogy, mining, chemistry, metallurgy, assaying, mathematics, surveying, mining-machinery, botany and use of microscope, elementary physics, testing materials.

Pharmacy.—Certificates required for industrial expert in pharmacy: Latin, French, chemistry, practical chemistry, physics (elementary), botany and use of microscope, *materia medica* and pharmacy, elementary therapeutics, elements of anatomy, elements of physiology, manufacture of drugs, elementary medicine and pathology, first help in accidents, English language, bookkeeping.

Photography.—Certificates required for industrial expert in photography: Chemistry, technical chemistry, elementary physics, photographic processes, photographic operating, photographic printing in permanent inks and silver, English language, bookkeeping.

Physics.—Certificates required for industrial expert in physics: Chemistry, practical chemistry, geometry and perspective, freehand drawing, mathematics, physics (complete course), English language, bookkeeping.

Reproduction by Printing.—Certificates required for industrial expert in reproduction by printing: Lithography, stereotyping, typography, electrotyping, photo-mechanical process; copper-, steel-, and wood-engraving; freehand drawing, chemistry, colour-contrasts, English language, mathematical use of symbols, printing-machinery.

The number of students, and average attendances in each class, were as follows during 1887:—

Subject taught.	Average No. on Roll.	Average Nightly Attendance.	Subject taught.	Average No. on Roll.	Average Nightly Attendance.
Agriculture, first year	17·6	14·8	Latin	29·5	11·3
" second year	5·6	4·6	Domestic economy	5·7	5·3
Veterinary science	9·2	4·1	Cooking (plain), day	16·5	8·9
Botany	4	3·1	" evening	7	4·5
Wool-sorting	6·5	5·7	" advanced	8·7	6
Applied mechanics	16·2	10·5	" elementary	14	6·4
Mechanical drawing	61·2	31·3	Geology	3	2·1
Plumbing	29·5	12·4	Crystallography	1	1
Naval architecture	6·7	4·5	Perspective	21·7	13·9
Metal-plate working	11·2	7	Freehand	139·5	59·9
Fitting and turning	29·7	17·6	Navigation	4·2	1·5
Architecture	57	28·7	Elocution	18	8·6
Carpentering	46·7	25·1	Inorganic *materia medica*	10·2	7·5
" afternoon class	24·5	9	Pharmacy	19·2	12·4
Deaf-and-dumb class	12·0	12	Organic *materia medica*	12	8·7
Bricklaying	7·5	4·9	Pharmaceutical chemistry	16·5	12·4
Masonry	18·7	9	Dispensing	12·2	8·3
Cabinetmaking	6·5	4·4	Anatomy and physiology	33	27·9
Carriage-building	5·2	4·1	Dentistry	9·5	7·2
Plane geometry	26·5	18·1	Physics, first year	15·5	9·6
Geometry, solid and descriptive	10·2	8·2	" second year	7·2	3·7
Architects' class	9	5·3	Physiography	3	2·2
Teachers' drawing	33	12·8	Mineralogy	2·6	2
Modelling	29·5	11·7	Mining	2·3	1·2
Design	17·2	11·7	Mathematics	30·5	5·5
House-painting	21	11·8	Actuarial science	7·7	4·9
" decorating	10	6·2	Telegraphy	10·7	6·5
Chemistry (practical)	18·6	7·6	Practical electricity	17·2	11·7
" (theoretical) first year	13	8·5	Dress-cutting	27	13·5
" second year	3·2	4·9	Tailors' cutting	23	11·1
Photography	10·7	7	Private drawing and painting	49·7	21·7
Bookkeeping	34·7	23·3	" biology	10	8·2
Caligraphy	28·5	16·5	" elocution	14·7	12·1
Shorthand	73	44·8			
German	6·7	3	Total	1371·8	769·9
French	49	26			

The number of individual students enrolled and who received instruction for at least one

session in 1887 was 1,930, being a decrease of 444 under those attending some of the terms in 1886. The following are the enrolments, attendances, &c., for the year 1887 :—

—	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	—
Enrolments	1,173	1,228	1,370	1,195	Average, 1,297·4
Attendances	13,154	13,206	18,638	14,383	Total, 59,381
Average attendance ...	612·3	661	769·8	711·8	Or 725·9, nightly average.

The occupations of the students attending the College during at least one session of the year were as follow: Accountants, 13; agents, dealers, &c., 22; architects' assistants, 40; artillerymen, 5; barman, 1; blacksmiths, 10; boilermakers, 14; bootmakers, 7; bookbinders, 2; boxmaker, 1; bricklayers, 19; builders, 10; butcher, 1; cabinetmakers, 3; carpenters, &c., 137; cement-tester, 1; chemists, &c., 39; Civil servants, 6; clergymen, 7; clerks, 229; coachbuilders, 9; coiner, 1; coopers, 2; curators, 2; compositors, 5; dressmakers, 3; decorators, 3; dentists, 6; draughtsmen, 31; drapers, 13; electricians, 4; engineers, 116; engine-drivers, 4; engravers, 6; farmers, 8; farriers, 2; feather-dresser, 1; firemen, 3; fitters and turners, 13; frame-maker, 1; gardeners, &c., 6; glass-stainers, &c., 4; grooms, &c., 5; grocers, 5; hairdresser, 1; hatter, 1; ironmongers, 13; jewellers, 7; journalists, 2; labourers, 6; ladies, 326; lithographers, 10; machinists, 3; mariners, 10; masons, &c., 38; matting-maker, 1; miller, 1; messengers, 26; modellers, 12; moulder, 1; musicians, 2; mineral-water maker, 1; operators, 6; painters, 47; pattern-makers, 9; photographers, 7; plasterers, 18; plumbers, 41: policemen, 4; printers, 14; potters, 2; railway employés, 3; reporter, 1; saddler, 1; salesmen, 13; shipwrights, 8; slaters, 3; signwriters, 13; stationer, 1; stereotyper, 1; storemen, 5; students, 243; surveyors' assistants, 23; tailors, 41; teachers, male, 34; teachers, female, 89; tinsmiths, 5; upholsterers, 4; veterinary assistants, 3; warehousemen, 6; wool-scourers, 2; wool-sorters, 2: total, 1,930.

Branch, Suburban, and Country Technical Schools.

There were 751 individual students entered in these schools. The following are the enrolments, attendances, &c., for the year 1887 :—

——	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.
Enrolments	545	496	529	556
Attendances	4,361	4,119	6,042	5,356
Average attendances	319·9	283·4	313·4	356

The following shows the average enrolments in country classes :—

District and Subject.	Average Enrolment.	Average Nightly Attendance.	District and Subject.	Average Enrolment.	Average Nightly Attendance.
Lawrence—			Coogee—		
Agriculture	13	8·2	Drawing	8·7	5·1
Physics	6	4·2	Petersham—		
Grafton—			Drawing	39·2	17·8
Physiology	4·2	3	Granville—		
Chemistry	5·2	3·3	Geometry	5	4·5
Physics	2·6	2·4	Mechanical drawing ..	4	3·7
Freehand	2·6	1·3	Parramatta—		
Geometry	2	1·9	Geometry	3·5	2·4
Perspective	1·5	1	Bathurst—		
Metallurgy	2	2	Mineralogy	4·7	3·1
Newcastle—			Geology	6·2	4·5
Mineralogy	6	4·1	Botany	5·2	3·4
Metallurgy	7	4·7	Chemistry	4·7	3·3
Geology	10	6·4	„ practical ..	3	2·6
Chemistry	7	5·3	Physics	21·7	12·4
Mechanical drawing ..	13	8·2	Mathematics	5·2	3·4
Shorthand	28	22·4	Drawing	20·5	11·1
Building-construction ..	7·5	4·7	French	33	22·1
Freehand	14·7	11·1	Goulburn—		
Perspective	12·2	7·8	Mineralogy	4	2·1
Geometry	13	7·4	Geology	3·5	3
Plattsburg—			Chemistry	23	9·3
Model-drawing	12·2	9·6	„ practical ..	4·2	2·3
Perspective	8·5	7·8	Mathematics	13·7	7·1
Lambton—			Drawing	66·2	22·8
Model-drawing	9·7	6·9	Architectural drawing ..	7·7	4·5
Geometry	8·5	6	Mechanical „ ..	4	3·3
West Maitland—			Morpeth—		
Drawing	35·2	15	Freehand drawing ..	22	13·9
Mathematics	13	8·8	Model „ ..	11	6·2
Singleton—					
Drawing	22·5	15·6	Total	591	353·5

The fees received from students amounted to £1,659 13s. from the Sydney Technical College, and £466 19s. 3d. from country classes, making a total of £2,126 12s. 3d. These fees were distributed among the teachers in addition to the salaries paid by the Board.

The following is a complete syllabus of class-work in the various departments, text-books suggested, and time of meeting.

Department of Agriculture.

Agriculture (Instructor, Mr. Angus Mackay).—Two years' course of study. Monday, at 7.30 p.m., from April to September. Instructor lectures in country districts during months of October to March. Syllabus, first term: 1, Agriculture, practice with theory; 2, physical features of Australia; 3, climate and rainfall of New South Wales; 4, winds and evaporation, New South Wales; 5, analysis of Australian soils; 6, chemistry of agriculture; 7, soils of New South Wales suitable for various crops; 8, ringbarking, clearing, and burning; 9, flooding dry lands by irrigation, for ploughing; 10, drainage and what it does; 11, mechanics of agriculture; 12, breaking land and preparing the seed-bed. Second term: 13, Sowing cereals, harrowing, and rolling; 14, cultivation of fruit-lands and the soils most suitable for fruit-growing; 15, planting trees and vines; 16, cultivation of roots and vegetables; 17, common crops of Australia; 18, cereal-farming and grass-farming; 19, irrigation—how to apply water to the soil; 20, quantity to apply to cereals and grass; 21, quantity to apply to orchards, vineyards, and vegetables; 22, conservation of water by weirs and reservoirs; 23, construction of ditches and reservoirs for irrigation purposes; 24, haymaking and harvesting. Third term: 25, Harvesting various crops; 26, farm-buildings suitable for protecting crops, animals, and machinery; 27, fruit-picking, packing, and marketing; 28, varieties of grapes suitable for raisin-making; 29, grape-picking for raisin-making and drying; 30, fruit-drying and preserving; 31, various methods employed to dry raisins and fruits; 32, budding and grafting, and pruning and transplanting; 33, propagation from seeds and cuttings; 34, various fruits suitable to Australian soils. Fourth term: 35, Application of manures; 36, the qualities of manures suitable to various soils; 37, cereals and stock-farming combined; 38, poultry-farming; 39, dairying, butter- and cheese-making; 40, the silo an aid to dairying; 41, plant and animal parasites, their prevention and destruction; 42, rotation of crops, native Australian fodder-plants and grasses; 43, steam on the farm, the handling and care of steam-boilers and machinery; 44, the honey-bee in Australia.

The course of instruction in agriculture includes a number of subjects, and is completed in two years. Students who wish to get the certificate of Expert in Agriculture must attend the whole course of instruction, and pass a satisfactory examination in each subject; must also obtain certificates for theoretical chemistry, practical chemistry, physiology, agriculture, wool-sorting, veterinary science, botany, and elementary surveying, and satisfy the examiners as to their knowledge of bookkeeping and the English language. A student may, however, attend any course of instruction in any subject mentioned, and, if he pass a satisfactory examination, will be granted a certificate. The course of instruction is: First year, first term—Agriculture, one hour per week; practical chemistry, two hours; theoretical chemistry, one hour; botany, two hours. Second term—Agriculture, one hour per week; practical chemistry, two hours; theoretical chemistry, one hour; botany, two hours. Third term—Agriculture, one hour per week; practical chemistry, two hours; theoretical chemistry, one hour; botany, two hours; wool-sorting, two hours. Fourth term—Agriculture, one hour per week; practical chemistry, two hours; theoretical chemistry, one hour; botany, two hours. Second year, first term—Comparative physiology, one hour per week; wool-sorting, one hour; agriculture, one hour. Second term—Comparative physiology, one hour per week; wool-sorting, one hour; agriculture, one hour. Third term—Comparative physiology, two hours per week; agriculture, one hour; veterinary science, one hour; surveying, two hours. Fourth term—Comparative physiology, two hours per week; agriculture, one hour; veterinary science, one hour.

Botany (Teacher, Mr. Oscar Katz, M.A., Ph.D.).—One year's course of study. Wednesday, at 7.30 p.m. Syllabus: Morphology of the cell, morphology of plants, root, stem, leaves; anatomical structure of plants (histology), fundamental tissue, epidermal tissue, fibrovascular bundles (secondary wood); general physiology (life) of plants—mode of nutrition, parasitic and saprophytic plants, diseases of plants; classification in general—agricultural and pharmaceutical plants, principles of cultivation; geographical distribution of plants, with special regard to the Australian flora; training in the determination of plants, excursions; theory of the microscope; practical microscopical course, as regards especially important objects out of anatomy and physiology of plants.

Wool-sorting (Teacher, Mr. A. L. Chillingworth).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. Syllabus: 1, On shearing; 2, on skirting and rolling; 3, classing on the station; 4, various breeds of sheep; 5, merino combing-wools; 6, merino clothing- and carding-wools; 7, cross-bred wools; 8, sorting for the manufacturer; 9, scouring wools; 10, fellmongering, &c.

Veterinary Science (Teacher, Mr. B. O. Meek, M.R.C.V.S. (Lond.), F.V.M.A. (Edin.), F.R.M.S., &c.).—Two years' course of study. Tuesday and Thursday, at 7.30 p.m. The course of instruction in veterinary science includes a number of subjects, and is completed in two years. Students who wish to get the certificate of Expert for Veterinary Science must attend the whole course of instruction, and pass a satisfactory examination in each subject; must also obtain certificates for botany, chemistry, pharmacy and *materia medica*, physiology and histology, and satisfy the examiners as to their knowledge of English and bookkeeping. A student may, however, attend the course of instruction in any subject under veterinary science, and if he passes a satisfactory examination a class-certificate will be granted. The veterinary classes will be divided into two divisions, one comprising anatomy (physiology and comparative), the other including medicine, pathology, and obstetrics. The first quarter will include—Syllabus: Tuesday evening—Symptoms

and signs of disease—(*a*) general; (*b*) connected with nervous systems; (*c*) connected with urino-genital systems; (*d*) connected with circulatory systems (1, pulse; 2, temperature and clinical thermometer); (*e*) connected with respiratory systems; (*f*) hygienic and general treatment (1, ventilation; 2, food and water; 3, exercise and grooming; 4, shoeing, &c.); (*g*) fevers, their causes, nature, &c. Thursday evening: Anatomy—(1.) The skeleton (1, spinal column; 2, anterior limb; 3, posterior limb; 4, thoracic cavity; 5, pelvic cavity; 6, head—(*a*) rough outline of bones, (*b*) teeth, &c.): (2.) Arthrology. Physiology—Physiological histology (1, epithelium; 2, pigment; 3, connective tissue; 4, cartilage; 5, bone—(*a*) chemical composition, (*b*) structure, &c.). Students wishing fuller information and advice should apply to the instructor in agriculture.

Department of Applied Mechanics (Instructor, Professor Warren).

Four years' course of study. A student who wishes to obtain the certificate of Expert in Applied Mechanics must attend the whole course of instruction and pass a satisfactory examination in each subject, unless granted exemption from lectures and instruction, in which case he must pass the examination only. He must also obtain certificates for chemistry, heat, electricity, pneumatics, hydrodynamics, and mathematics, and must also satisfy the examiners as to his knowledge of English and bookkeeping. A student may, however, attend the course of instruction in any subject under applied mechanics, and if he passes a satisfactory examination a trade certificate will be granted. He may take any period that he may require to obtain the necessary certificates for the degree of Industrial Expert, and as soon as he has obtained them the full certificate will be given.

The course of instruction is as follows:—Mechanical engineers: First year—first term—mathematics, 1, Wednesday; chemistry, 2, Monday and Thursday; freehand drawing, 1, Friday: second term, the same in continuation. Second year—first term—practical plane geometry, 1, Monday; physics, 2, Tuesday and Friday; mathematics, 1, Thursday: second term—practical solid geometry, 1, Monday; physics, 2, Tuesday and Friday; mathematics, 1, Thursday. Third year—first term—mathematics, 1, Monday; mechanical drawing, 2, Wednesday and Friday: second term—trade classes. Fourth year—first and second terms—applied mechanics, 2, Tuesday and Thursday; machine-construction and design, 2, Monday and Wednesday; trade classes: second term—machine-design lecture, 1, Tuesday; trade classes.

If a student wishes to obtain the certificate of expert in any of the under-mentioned mechanical trades under the instructor in applied mechanics, he must attend the following course of instruction and pass a satisfactory examination in each subject, and satisfy the examiners as to his knowledge of English and bookkeeping:—First year—first term—mathematics, 1, Wednesday; chemistry, 2, Monday and Thursday; freehand drawing, 1, Friday: second term—the same in continuation. Second year—first term—practical plane geometry, 1, Monday; physics, 2, Tuesday and Friday; mechanical drawing, 1, Wednesday: second term—practical solid geometry, 1, Monday; physics, 2, Tuesday and Friday; mechanical drawing, 1, Wednesday. Third year—first term—applied mechanics, 2, Tuesday and Thursday; mechanical drawing, 1, Wednesday; trade class, 2: second term—the same in continuation, and machine-design, 1. If there is no class for the trade of any student, he is to furnish evidence of workmanship. Students must obtain certificates in mathematics, physics, chemistry of metals, freehand drawing, geometry, and mechanical drawing, as well as for the trade. Mechanical trades referred to above: Agricultural-implement makers, blacksmiths, boilermakers, clock- and watch-makers, gunsmiths, locksmiths, metal-plate workers, mechanicians (fitters and turners), millers and millwrights, iron-, brass-, and type-founders. Students wishing fuller information and advice should apply to the instructor in applied mechanics.

Applied Mechanics.—First term: To be taken by students in their second year under instructors in architecture (A Division), geology, and mining; by students in their third year under mathematics (A Division), chemistry (A and B Divisions), architecture (B Division), applied mechanics (C Division); fourth year, applied mechanics (A and B Divisions). Second term: To be taken by students in their third year under physics (A Division—electric lighters), mathematics (B Division), applied mechanics (C Division); fourth year, applied mechanics (A and B Divisions). Classes under applied mechanics: Mechanical drawing to be taken by students in their second year; by students under geology and mining; by students in their third year under applied mechanics (A, B, and C Divisions); by students in their fourth year under mechanics (A and B Divisions). Naval architecture: To be taken by students in their third year under mathematics (B Division), mechanics (B Division). Boiler-making: To be taken by students in their third year under mechanics (C Division—boilermakers).

Syllabus—Applied Mechanics.—The principle of mechanical energy and its application in the mechanical powers and simple machines; units of work and horse-power; velocity ratio of a machine compared with its mechanical efficiency; friction, how determined in machinery; modulus of a machine; work done by variable pressures. Fluid-pressure, including description of the more important machines worked by air- and water-pressure; hydraulic hoisting- and lifting-machinery. Experimental demonstrations by means of the testing-machine on the strength and elasticity of materials used in engineering and building, with special reference to iron, steel, and colonial timber; ultimate strength and working-strength; limit of elasticity and factors of safety; bending-moments, shearing-stresses, and moments of resistance, and their application to cast- and wrought-iron girders and timber beams; graphical method of determining stresses in braced structures, such as trussed beams, lattice-girders, bowstring-girders; iron roofs.

Mechanism, Machinery, and the Steam-engine.—Definitions of spur- and bevel-wheels, belts, bands, guide-pulleys, screw-surface, worm and wheels, screw-threads; transmission of power by belting, wire-rope, &c.; conversion of circular into reciprocating motion, including crank and connecting-rod; eccentric, valve-motions, cams, reversing and quick-return motions; conversion of reciprocating into circular motions, including ratchet-wheels, feed-motions, escapement, &c. Teeth of wheels: General laws and principles; method of setting out spur- and bevel-wheels by various

approximations to the true curves; wheel cutting and moulding machinery. Parallel motions, including Watt's, Scott Russell's, and other parallel motions; exact straight-line motion. The copying principle in machinery; screw-cutting lathe, planing-, shaping-, slotting-, drilling-, and boring-machinery. Epicyclic trains and their applications.

Steam and the Steam-engine.—Heat as a motive-power; the history of the steam-engine; the mechanism and details of steam-engines; construction and use of indicator; indicator-diagrams; steam-passages; geometrical constructions relative to designing valves and valve-motions; the compound-engine for land and sea; locomotive-engine; gas-engines; combustion of fuel and evaporative efficiency of a furnace, general arrangement of furnace and boiler; construction and details of steam-boilers; testing of engines and boilers.

Mechanical Drawing.—Drawing to scale from dimensioned copies and sketches; preparing working-drawings of details of engines and machinery from models and actual examples.

Machine Construction and Design.—(Students entering for this course must have passed an examination on the subjects of first- and second-term applied mechanics.) Methods of proportioning the various parts of engines and machinery; designing machinery and engines for special purposes.

Text-books recommended: Students attending lectures in applied mechanics for the first time should read the following books: "Mechanics," by Dr. Ball, London Science Class-books Series, price 1s.; "Applied Mechanics," by Dr. Ball, Weale's Series, price 2s.; "Strength of Materials," by Anderson, Text-books of Science, published by Longmans, price 4s.; "Practical Mechanics," by Perry, price 4s.; Cassell's Technical Manuals. More advanced students should read—"Principles of Mechanics," "Elements of Mechanism," "Steam and the Steam-engine," by Professor Goodeve, price 6s. each; "Workshop Appliances," Text-books of Science, published by Longmans, price 4s.; "Machine Design," by Professor Unwin, price 6s.

Naval Architecture (Teacher, Mr. Walter Reeks).—One year's course of study. Monday and Wednesday, at 7.30 p.m. Syllabus: 1, laying down the lines of vessels; 2, construction and use of models; 3, full-size lines in the moulding-loft; 4, centre of buoyancy and metra centre; 5, centre of effort, and area of sails; 6, proportion of masts and spars; 7, designing.

Boiler-making (Teacher, Mr. W. Walker).—One year's course of study. Tuesday and Friday, at 7.30 p.m. Syllabus: The general construction of boilers, illustrated by model-making and by lectures; riveted joints; double and single shear; furnace-tubes; steam-domes; boilers (Cornish, Lancashire, locomotive, and marine); methods of strengthening; fuel and combustion. Text-books: "Steam-boilers," by Robert Wilson, about 5s.; "Nelson Foley on Boiler-making."

Turning and Fitting (Teacher, Mr. Charles Phillips).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. First course: Description and use of plane turning-lathes; construction and use of turning-tools for wood and metals; correct angles for cutting-edges; screw-cutting by hand; use of chipping-chisels and files; use of planing- and shaping-machines. Second course: Description and use of slide-lathes, sliding, boring, surfacing, and screw-cutting; calculating change wheels for screw-cutting; velocity in boring and turning; use of calipers in fitting work; application of surface-gauge; fitting to gauge and scraping surface. Third course: Cutting- and fluting-taps; rimers, rose-bits, and cutter-bar; milling-cutters; wheel-cutting; capping, &c. Fourth course: Construction and erection of machinery and machine-tools.

Department of Architecture (Instructor, Mr. J. F. Hennessy, Silver Medallist and Ashpitel Prizeman of the Royal Institute of British Architects, London).

Two years' course of study. Monday, Wednesday, and Friday, at 7.30 p.m. The course of instruction in architecture includes a number of subjects, and is completed in three years. Students who wish to get the certificate of Expert in Architecture must attend the whole course of instruction, and pass a satisfactory examination in each subject, and must also obtain certificates for physics and mathematics, and satisfy the examiners as to their knowledge of English and book-keeping. A student may, however, attend any course of instruction in any subject (A) under architecture, and if he pass a satisfactory examination shall be granted a certificate.

The course of instruction is as follows:—A. Architects and builders: First year—first term—Practical plane geometry, 1, Monday; freehand drawing, 1, Thursday; mathematics, 1, Wednesday; physics, 2, Tuesday and Friday: second term—mathematics, 1, Wednesday; physics, 2, Tuesday and Thursday; solid geometry, 1, Monday. Second year—first term—Architectural drawing, 3, Monday, Wednesday, and Friday; applied mechanics, 2, Tuesday and Thursday: second term—architectural drawing and design, 3, Monday, Wednesday, and Friday; perspective, 1, Tuesday. Third year—first term—Architectural drawing and design, 3, Monday, Wednesday, and Friday: second term—the same in continuation; architectural history; building-construction.

Architecture (A Course).—First year: First term—Technical drawing—use of drawing-instruments; drawing to scale; copying drawings; enlarging, and altering sizes; orders and styles of architecture: second term—technical drawing—working out complete designs of buildings from sketches and partial assistance, by means of blackboard lectures on building-construction, building-materials, ventilation, and the principles of design. Second year: First term—Draft specifications—colouring and neatly finishing set of plans; inch-scale, and full-sized detail drawings for foremen and clerks of works; perspective drawing; building with accessories, finished with pen-and-ink shading: second term—architecture—lectures and lessons to the individual student in designing buildings and objects, especially in the classic, Gothic and Italian styles.

Architectural Design.—The subjects are to be worked out at home. Pencil-drawings to be submitted to the instructor, who will criticize them, and after the alterations are completed they are to be handed in within the time allotted for each subject, or they will not be permitted to compete for prizes. First term: Porch for a village church, early English style—width inside, 9ft.; plan, elevation, and section; scale, 4ft. to 1in. (References: Brandon's "Analysis of Gothic Architecture," sketches in *Building News.*) Terrace-house, 20ft. frontage—plans, elevation, and section;

⅛in. scale. Open timber roof, 15th century—35ft. span; principals, 12ft. 6in. apart; ½in. scale. (References, Brandon's "Open Timber Roofs," Morris's "Gothic Roofs," Viollet le Duc's Dictionary.) Second term: Staircase to a mansion—height, 18ft. from floor to floor, ½in. scale; details of newels and balusters, 3in. scale; plan of hall, ¼in. scale. Portico of the Doric Order—width, 12ft.; height to apex of pediment, 24ft.; plan, elevation, and section. (References: Chambers, Gwilt's Encyclopædia, Stuart and Revett's.) Detached villa, to cost £3,000—site, 200ft. by 100ft.; plans, sections, and two elevations, ⅛in. scale.

Trades under the Instructor in Architecture.—If any student wishes to obtain the higher certificate of expert in any of the "trades" under the instructor in architecture, he must then attend the course of instruction given below, and pass a satisfactory examination in each subject.

B. *Building Trades—viz., Masons, Bricklayers, Carpenters and Joiners, Cabinetmakers, Carriage-builders, &c.*—First year: First term—Perspective, 1, Tuesday; freehand drawing, 1, Friday; mathematics, 1, Wednesday: second term—the same in continuation. Second year: First term—Plane geometry, 1, Monday; physics, 2: second term—solid geometry, 1, Monday. Third year: First term—Applied mechanics, 2, Tuesday and Thursday; trade-class, 2: second term—trade-class, 2. Students wishing for fuller information and advice should apply to the instructor in architecture.

Carpentry and Joinery (Teacher, Mr. John Gardiner).—One year's course of study. Theoretical, Monday and Wednesday, 7.30 p.m.; practical, Friday, 7.30 p.m. Elementary afternoon class, Monday, at 2 o'clock. First term: Instruction in the theory and principles of the trade, combined with making models of joints to scale; the construction and use of plain scales and scale of chords; drawing sections of solids in orthographic and isometric projection, and geometry applied to the trade; the management of tools; the principles of framing and trussing, and the names and proportions of joints in common structures, joints in beams, scaffolds, centres, floors, roofs, partitions, fittings, gates, doors, windows, skirtings; enlarging and reducing mouldings, raking and bevel mouldings and joints, circular work, kerfing, bending, building up, hinges and hinging and furniture, weather-boarding, preparing for plaster, lead- and slate-works. Second term: On advanced subjects of the first course, combined with making models of work to scale, complex floor roof and other structures, staircasing and handrailing, qualities of wood, cutting up and drying by natural and artificial means, measuring plans, setting out work, writing out orders.

Masonry (Teacher, Mr. John Howie).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. First term: Technical drawing—the drawing and methods of obtaining the joints and bevels of arches; explanation of the terms, the description and proper use of tools used in masonry; the nature and properties of bonding foundations, walls, moulded cornices, &c. Second term: Technical drawing—the application of geometry to masonry, and the methods of obtaining and applying moulds, templates, and bevels, by setting out in detail elliptical and oblique arches, domes, niches, groins, raking-mouldings, hanging-stairs, skew-bridges, &c. Practical instruction in the workshop in working the above. Text-books: "Masonry," Edward Dobson (Weale's series); "Masonry," Robert Scott Burn.

Bricklaying (Teacher, Mr. J. Broadhurst).—One year's course of study. Monday and Wednesday, at 7.30 p.m. First term: The proper use of tools, foundations, footings, bonds, air-bricks and cements, cavity-walls and ventilation, damp-courses, brick and stone combined; joints, thick and thin, and their evils; limes and cements; trammels and profiles; drawing, cutting, and setting arches; different kinds of pointing; drainage. Second term: Paving, tiling, the proper use of materials, scaffolding, relieving-arches, bakers' ovens, chimney-shafts; smoky chimneys, their cause; slaters' and plasterers' work; different forms and rules used for measuring brickwork, with examples; practical geometry so far as relates to brickwork; the methods of obtaining and applying moulds, templates, and bevels, in detail of different kinds of arches, raking-moulds, domes, niches, fire-work, tunnels and sewerage, moulded panels and finials. Practical instruction in building to all trades, including the subjects for an expert certificate. Text-books: "Bricklaying" (Cassell), "Bricklaying" (Weale).

Cabinetmaking (Teacher, Mr. Thomas Walker).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. First term: Geometrical and perspective drawing, as applicable to articles of furniture; the practical setting-out of working-drawings; tools and their application; method of jointing, including secret dovetailing and other joints; to prepare veneer and groundwork for veneering—laying veneer. Second term: Inlaying with coloured woods; the application of geometry to cabinet-work; marqueterie-work, buhl-work; glue and its use as applied to different woods; cabinet woods and their uses; the designing of original pieces of furniture.

Carriage-building (Teacher, Mr. Samuel Lownds).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. First term: Copying from diagrams of buggies and carriages, the use of drawing-instruments and implements for carriage-drawings, drawing to scale; to make cant-board and working-plans on the principles of French or square rule applied to carriage-building from side-elevations of buggies and ordinary vehicles, with proportions required for strength, appearance, and space; materials most suitable for these vehicles. Second term: Drawings required for the building of medium-class carriages, phaetons, and broughams, with dimensions and materials most suitable; drawings required for the building of landaus, with dimensions and proportions of all parts belonging to a carriage. Practical class, held on Tuesday evening: First term—Making sweeps, scrolls, and working-patterns from side-elevations; plain jointing and framing: second term—framing sections of bodies, making carriage parts, hanging and setting landau and victoria heads with automatic head-furniture, &c. Text-books: "English Coach- and Harness-makers' Journal," "American Hub and Carriage Journal."

Plumbing (Teacher, Mr. David Nelson).—One year's course of study. Monday and Wednesday, at 7.30 p.m. Syllabus:—First term: The special uses to which iron, lead, zinc, and tin, white- and red-lead, lead-oxides, cements, &c., are applied in plumbing. Solders and soldering; composition

and the use of the various solders, fluxes, and soldering-fluids; theory and practice of soldering; soldering-bits; blowpipes; brazing; autogenous soldering. The tools used in plumbers' work—their forms, uses, &c. Manufacture of the metals into the various forms in which they are used in plumbing; cast sheet-lead; milled sheet-lead; rolled zinc; galvanized iron; casting lead tubes; coating tubes internally. Gas-fittings; measurement of pressure of gas in a main or pipe; forms of burners; gas-meters, wet and dry; gas-valves. Second term: Sanitary arrangements in dwelling-houses (town and country) and other buildings; common defects; methods of testing drains, soil-pipes, &c.; principal points to be attended to in (1) fitting new houses, (2) remedying existing defects. Water-closets and their fittings; service-boxes; waste-water preventers; earth-closets, ash-closets, &c.; baths, sinks, urinals. Water-supply for houses; dangers arising from insufficient or impure supply; house-cisterns—their construction, position, management, and care; filters, water-meters; arrangements for collecting and storing rain-water. Roofing; rain-drainage of houses; external plumbers' work. Varieties of traps, D-traps, S-traps, bell-traps, &c.—their use and abuse; soil-pipes; connection with drain; connection of drain with sewer; ventilation of soil-pipes and drains; sizes of pipes; amount of fall required; objections to brick drains; proper materials and constructions for drains; joints for drain-pipes, and methods of laying the same.

C. *Plumbers and Gasfitters.*—First year: First term—Chemistry, 2, Monday and Thursday; mathematics, 1, Wednesday; freehand drawing, 1, Friday: second term—the same in continuation. Second year: First term—Physics, 2, Friday; plane geometry, 1, Monday: second term—physics, 2, Friday; solid geometry, 1, Monday. Third year: First term—Applied mechanics, 2, Tuesday; trade class, 2, Monday and Wednesday: second term—trade-class, 2, Monday and Wednesday. Text-books recommended: "The Plumber, and Sanitary Houses," and "Science and Art of Sanitary Plumbing," Hellyer, London; "Plumbing and House-draining," W. P. Buchan; "Plumber and Decorator," Davis, London; "Waterworks," Hughes (Weale's Series).

Department of Art (Instructor, Mr. Lucien Henry).

The course of instruction in art includes a number of subjects, and is completed in three years. Students who wish to get the certificate of Expert in Art must attend the whole course of instruction and pass a satisfactory examination in each subject, must also obtain certificates for physics and chemistry of colours, and satisfy the examiners as to their knowledge of English and bookkeeping. A student may, however, attend any course of instruction in any subject (A) under art, and, if he pass a satisfactory examination, shall be granted a certificate. The course of instruction is as follows:—

A. *Subjects.*—Geometry: Two years' course of study; Monday, 7.30 p.m. Perspective: Two years' course of study; Tuesday, 7.30 p.m. Model-drawing: Two years' course of study; Wednesday, Thursday, and Friday, 7.30 p.m. Freehand drawing: Two years' course of study; Wednesday, Thursday, and Friday, 7.30 p.m. Design: One year's course of study; Monday and Friday, 8 p.m. House-painting: One year's course of study; Tuesday and Friday, 7.30 p.m. House-decorating: One year's course of study; Thursday, 7.30 p.m. Modelling: Two years' course of study; Monday, Tuesday, and Thursday, 7.30 p.m. Instructor, Mr. Lucien Henry.

Art-classes.—7.30 to 9.30 p.m. First year, drawing: Monday, elements of practical geometry; Tuesday, elements of practical perspective; Wednesday, Thursday, Friday, freehand drawing. Second year, drawing: Monday, advanced practical geometry; Tuesday, advanced practical perspective; Wednesday, Thursday, Friday, advanced freehand drawing. Third year, design: Monday, theory, 8 p.m.; Friday, practice, 8 p.m. Certificates in physics and chemistry required (see above).

Pupil-teachers' Special Course.—First year: Monday, elements of practical geometry; Friday, model-drawing. Second year: Tuesday, elements of practical perspective; Friday, freehand drawing.

Teachers' Special Course.—Stage 1 (first half-year): Wednesday, geometry and perspective (this class meets at Castlereagh-street Public School, 7.30 to 9.30 p.m.); Saturday, model-drawing, 10.30 a.m. to 12.30 p.m. Stage 2 (second half-year): Wednesday, geometry and perspective (continued); Saturday, freehand drawing. Text-books: Burchett's "Practical Geometry," Humphrey's "Perspective," Burchett's "Perspective." Pass-tickets in the above courses are accepted by the Department of Public Instruction.

Modelling.—First year: First term—Modelling details in wax or clay; second term—complete simple subjects. Second year: First term—Friezes, panels, and capitals; second term—designs for mouldings, enrichments, brackets, centre-flowers, pilasters, &c.

If any student wishes to get the certificate of Expert in any of the trades under the instructor in art, he must attend the whole course of instruction laid down, and obtain certificates in each of the following subjects, and for physics and chemistry. Students wishing fuller information and advice should apply to the instructor in art.

House Painters and Decorators, Paperhangers, Designers for Textile Fabrics, China-painters.—First year: Same as first year of art course. Second year: First and second terms—Decorating-class, 2, Tuesday and Friday; freehand drawing, 1, Wednesday; chemistry, 2, Monday and Thursday. Third year: First and second terms—Decorating-class, 2, Tuesday and Friday; freehand drawing, 1, Wednesday; design applied to decoration, 2, Monday and Friday.

Modellers, Potters, Terra-cotta Workers, Plasterers.—First year: Same as first year of art course. Second year: First and second terms—Chemistry, 2, Monday and Thursday; modelling, 2, Tuesday and Friday; freehand drawing, 1, Wednesday. Third year: First and second terms—Design, 2, Monday and Friday; modelling, 2, Tuesday and Friday; perspective applied to decoration, 1, Wednesday.

House Painting and Decorating (Mr. P. W. Johnson).—*House-painting.*—One year's course of study. Tuesday and Friday, at 7.30 p.m. First term: Colours, brushes, painting, flatting, grain-

ing, marbling, varnishing, stencilling, oil-gilding. Second term: Sign-writing; gilding and ornamental work on glass; letters, setting out, shading; decorative designs; ornamental glass panels.

House-decorating. — One year's course of study. Class meets at Technical Institute, on Thursday, at 7.30 p.m. First and second terms: Art decoration, style, drawing examples and general principles of ornament; ecclesiastical and modern decoration; figures; original design. Text-books: "House-Painting" (Weale's Series), "Elementary Decoration" (Weale's Series), "Grammar of Colour" (Field), "Grammar of Ornament" (Owen Jones), Chevreul on "Colour."

Department of Chemistry (Instructor, Mr. W. A. Dixon, F.C.S., F.I.C.).

Two years' course of study. Practical chemistry: Mr. W. A. Dixon, Monday and Friday, 7.30 p.m. Theoretical chemistry: Mr. W. A. Dixon, Thursday, 7.30 p.m. Technical chemistry and metallurgy: Thursday, 8.30 p.m.

The complete course of instruction in chemistry extends over two years. Students who wish to get the certificate of Expert in Chemistry must attend the whole course of instruction, and pass satisfactory examinations in each subject; must also obtain certificates in drawing and physics; mathematics — algebra, simple equations; Euclid, four books; plane trigonometry; applied mechanics; and satisfy the examiner as to his knowledge of English and bookkeeping. A student may, however, attend the course of instruction in chemistry, and, if he pass a satisfactory examination, shall be granted a certificate.

First year: *Chemistry* (Thursday, 7.30 to 8.30 p.m.)—Hydrogen; manipulation, measurement, and properties of gases; fluorine, chlorine, bromine, iodine, oxygen, sulphur, selenium, tellurium, nitrogen, phosphorus, arsenic, antimony, boron, silicon, carbon. Second year: Thursday, 8.30 to 9.30 p.m.—Sodium, potassium, ammonium (rare alkali metals), barium, strontium, calcium, magnesium, zinc, lead, copper, silver, mercury, aluminium (rare earth metals), manganese, iron, cobalt, nickel, chromium, tin, bismuth, gold, platinum. The rare metals will only be mentioned. Technical chemistry and metallurgy: Special instruction to students who have gone through the second year's course.

Chemical Laboratory—Practical Chemistry.—First year: First term—Examination of the effect of reagents on known metals, non-metals, and acids: second term—qualitative analysis of simple salts. Second year: First term—Analysis of metals in admixture: second term—analysis of salts and compounds in admixture. Students are supplied with fuel and gas, the use of a set of reagent-bottles, the common reagents, and any of the larger and less-commonly-used apparatus, as balances, burettes, pipettes, measuring-flasks, condensers, &c.; also with a working-bench, cupboard, and drawers; except that in case of the cupboard and drawers being all occupied, short-time students must give place to those of longer time, and provide a box for their apparatus. Students are to supply themselves with what they require of beakers, blowpipes, crucibles, evaporating-basins, flasks, funnels, filter-stand, filter- and test-papers, test-glasses, test-tubes and stands, small tongs, triangles, glass tubing and rod, watch-glasses, platinum wire, foil and crucibles, towels, chloride of platinum, nitrate of silver, iodine and iodide of potassium (for standard solutions), and, if studying metallurgy, all crucibles, scorifiers, cupels, borax-glass, and assay lead and silver. Text-book: Fowne's "Inorganic Chemistry."

Trades under the Instructor in Chemistry.—If a student wishes to obtain the certificate of expert in any of the trades under the instructor in chemistry, he must attend the prescribed course of instruction and obtain a certificate for each subject, and must satisfy the examiner as to his knowledge of English and bookkeeping. The student may, however, attend the trade-class only, but he will then only be able to obtain the class-certificate. Students wishing further information or advice should apply to instructor in chemistry.

Smelters, Amalgamators Brick- and Earthenware-makers, Glass-makers, Aerated-water Makers.—First year: First term—Mathematics, 1, Wednesday; physics, 2, Tuesday and Friday: second term—the same, in continuation. Second year: First term—Architectural drawing, 1, Wednesday or Friday; chemistry, 2, Monday and Thursday: second term—the same in continuation. Third year: First term—Technical chemistry, 2, Monday and Friday; mechanics, 2, Tuesday and Thursday: second term — practical chemistry, 1, Monday; technical chemistry or metallurgy, 1, Thursday.

Bakers, Brewers, Sugar-boilers, Starch-makers, Food-preservers, Dyers, Bleachers, Paper-makers, Tanners, Wool-scourers, Glue-, Varnish-, Oil-, and Gas-makers.—First and second years as above. Third year: First term—practical chemistry, 1, Monday or Friday; mechanics, 2, Tuesday and Thursday: second term—practical chemistry, 1, Monday or Friday; technical chemistry, 1, Thursday; use of microscope, 1, Wednesday.

Photographers.—First year as above. Second year: First term—Practical chemistry, 1, Monday or Friday; chemistry, 1, Thursday; freehand drawing, 2, Wednesday and Friday: second term—the same in continuation. Third year: First term—Practical chemistry, 1, Monday or Friday; freehand drawing, 1; photographic processes, 1: second term—practical chemistry, 1, Monday or Friday; freehand drawing, 2; photographic processes, 1.

Photography (Teacher, Mr. W. H. Vosper).—Wednesday, at 7.30 p.m. One year's course of study. Syllabus: Lenses and cameras: Wet-plate processes—positives, negatives, opal plates, enlarging, printing, toning, transparencies for lantern, transparencies for enlarging; dry-plate processes—positives, negatives, opal plates, enlarging, printing, toning, transparencies for lantern, transparencies for enlarging; instantaneous photography, carbon process, solar enlarging, retouching, paper negatives, defects and remedies. Course of instruction for Expert in Photography — Mathematics, physics, chemistry (theoretical), chemistry (practical), freehand drawing, photography.

Department of Commercial Economy.

Caligraphy and Correspondence (Teacher, Mr. James Bruce).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. Syllabus: Introductory lectures — Position, movement, formation, analysis of letters, classification. The cursive hand, as applied to correspondence and book-work, its characteristics, the attainment of speed with legibility, modern defects and improvements. Exercises in speed, blackboard illustrations. The ledger-hand — size, style, and form, model headings, figures; exercises—bills, promissory-notes, headings, bills of lading, invoices, &c. Capitals, flourished and plain. Italian and script writing, their characteristics; exercises — blackboard illustrations. Correspondence — construction of sentences, phraseology, arrangement. Business-letter writing, its characteristics; the copying letter-book: exercises — social notes, business circulars, miscellaneous and official letters. *The Pupil-teachers' Class:*—Lectures on teaching the art—position, joint-movement, fore-arm movement, formation, analysis of letters and capitals, classification, treatment of curves, modes of instruction, faults and their treatment, the blackboard and how to use it.

Bookkeeping (Teacher, Mr. R. S. Cannon).—One year's course of study. Tuesday and Thursday, at 7.30 p.m. First quarter: Composition of entries for waste-book or transactions of first or simple set, invoices and posting into the ledger, and balancing. Second quarter: Composition of a more advanced set. The journal, commercial arithmetic in relation to accounts, interest, marking off goods at given rates per cent., finding cost-price, &c., cash-book. Third quarter: Posting and balancing the second set, commercial terms, &c., specimens of different systems of keeping accounts for various trades or callings. Fourth quarter: Composition of third or advanced set, including consignments, account sales, partnership transactions, Customs entries, and posting and balancing.

Shorthand (Phonography) (Teacher, Mr. Henry Graham). — One year's course of study. Friday, 7 to 9 p.m. 1, form; 2, alphabet; 3, pronunciation of consonants and vowels; 4, position of consonants; 5, placing of vowels; 6, correct vocalisation; 7, illustrations on blackboard; 8, writing-lessons; 9, reading phonography; 10, translations of selections from leading articles and letters published in the newspapers into phonograpny; 11, examination and correction of translations; 12, writing from dictation. Text-books: Pitman's Teacher, Reader, Manual, and Reporter's Companion.

Actuarial Science (Teacher, Mr. D. Carment, F.I.A.).—One year's course of study. Wednesday, 7.30 p.m. A class for the study of actuarial science, and the finance of life assurance, building, and friendly societies. Syllabus of lectures: The use of decimals and logarithms; present values and amounts of annuities certain; computation of building societies' tables; the collection of mortality statistics; construction of commutation-tables; values of life annuities; construction of tables of premiums for, and computation of values of, all transactions depending on the contingency of human life; valuation of the liabilities of a life office; the collection and arrangement of data relating to sickness and superannuation; construction of scales of payment for friendly societies' benefits, and valuation of their liabilities. Text-books recommended: Jones on "Annuities;" "Theory of Finance," Geo. King, F.I.A.; "Institute of Actuaries Text-book," Part I.

German (Teacher, Mr. A. Erythropel).—Two years' course of study. Monday and Thursday, at 7.30 p.m. Text-books: Dr. Emil Otto's "German Conversational Grammar," and "German Reader" (first year); Schiller's "Wilhelm Tell" (second year).

French (Teacher, Mr. R. Curtis).—Two years' course of study. Monday and Thursday, 5 p.m. to 8 p.m. Text-books: "Cassell's French Lessons," Noël et Chapsul's "French Grammar and Exercises," "Racine's Tragedies."

Latin (Teacher, Mr. G. E. Rich, M.A.).—Two years' course of study. Tuesday and Thursday, at 7 p.m. Text-books: First year, "Principia Latina," Part I.; "Latin Grammar" (Public School Primer). Second year, "Ihne's Latin Syntax;" Horace, Odes, Book III.

Department of Domestic Economy (Instructress, Mrs. A. Fawcett-Story).

The course of instruction in domestic economy includes a number of subjects, and is completed in two years. Students who wish to get the certificate of Expert for Domestic Economy must attend the whole course of instruction, and pass a satisfactory examination in each subject; must also obtain certificates for elocution, and satisfy the examiners as to their knowledge of English, bookkeeping, and elementary chemistry, physiology, and physics, as in specified text-books. A student may, however, attend the course of instruction in any subject under domestic economy, and if she passes a satisfactory examination shall be granted a certificate.

The following subjects under domestic economy and cookery, each lasting for one year, may be taken concurrently: Plain cookery, one year; high-class cookery, one year; domestic economy, one year; needlework,* course six months; dressmaking,* course six months. First term—Ele, mentary cookery, Tuesday; plain cookery, Monday, Tuesday, Thursday; domestic economy, Monday; high-class cookery, Friday. Second term—Plain cookery, Monday or Thursday; domestic economy, Monday; high-class cookery, Friday.

Domestic Economy.—One year's course of study. Monday, at 4 p.m. First term: The house and its furniture—situation, drainage, water-supply, arrangements for disposal of waste, accommodation, the air we breathe, ventilation, dirt, choice and cost of furniture, methods of cleaning, sanitary science for housekeepers. Food—its work, kinds, sources, machinery, cost, bills of fare. Clothing—uses, sources, purchase, preparation and care of, cleanliness, how to manage a wash. Second term: Health and sickness—infectious and contagious disorders, relative values of disinfectants; nursing; laws of health specially relating to women; common ills and simple remedies. Nurture and care of infant life—the lying-in room; management of new-born babe, food and feeding, clothes and dressing, washing and bathing, air and exercise, development, general manage-

* Not yet in operation

ment of childish disorders; physical and moral management of children. Housekeeping and thrift —management of work, management of income, helps to saving, investments. Text books: Johnston's "Chemistry of Common Life," Dr. Lancaster's "Food," Dr. Angus Smith's "Air and Rain," Dr. Mann's "Guide to the Knowledge of Life," Dr. Mann's "Health for the Household."

Cookery.—One year's course of study. Monday, Tuesday, Thursday, and Friday. Plain cookery: Roasting and baking, boiling meat and vegetables, soups and stews, cold-meat cookery, cheap dishes, fish (broiling and frying), bread and cakes, pies and puddings, preserving, pastry, sick-room cookery. High-class cookery: Trussing, boning, roasting, braizing, soups and purées, entrées, vegetables and salads, fish, omelettes and soufflées, entremets, pastry, puddings, sauces, jellies and creams, garniture in general. Course B for professional cooks, Course C for teachers, not in operation. Text-book: "South Kensington Official Handbook of Cookery." Students wishing fuller information and advice should apply to the instructress in domestic economy.

Department of Geology, Mineralogy, and Mining (Instructor, Mr. S. Herbert Cox, F.G.S., F.C.S.).

The course of instruction in geology includes a number of subjects, and is completed in three years. Students who wish to get the certificate of Expert in Geology or Mining must attend the whole course of instruction and pass a satisfactory examination in each subject; must also obtain certificates for chemistry, mathematics, surveying, and physics, and must satisfy the examiners as to their knowledge of English and bookkeeping. A student may, however, attend any course of instruction in any subject (A) under the instructor in geology, and if he pass a satisfactory examination shall be granted a certificate. One year's course of study, April to December, inclusive. (A) These subjects are—geology and palæontology, mineralogy, mining, mining-machinery, botany and use of microscope, underground surveying.

To meet the wishes of those who want to attend for special certificates under the Department of Geology and Mining, certificates for the branches hereunder named will be granted after attendance at the prescribed courses of instruction and passing satisfactory examinations. Certificate for —1, captain of shift, and, 2, underground manager (alluvial, quartz, and metalliferous mines); 3, battery-manager; 4, underviewer; 5, metallurgist and assayer; 6, mining surveyor; 7, field geologist; 8, geological expert; 9, mining expert.

Classes must be attended and examinations passed in the following subjects for the different certificates: 1. Captain of shift (alluvial, quartz, or metalliferous): Theoretical mechanics, applied mechanics, mechanical drawing, mining (second class): time required, one year, two nights a week. 2. Underground manager (alluvial, quartz, or metalliferous): Theoretical chemistry, theoretical mechanics, heat, applied mechanics, mechanical drawing, physical properties of minerals, metallic minerals, physical geography, principles of stratigraphy, metalliferous mining (first class): time required, two years, two nights a week. 3. Battery-manager: Theoretical chemistry, practical chemistry (first class), mechanics (theoretical), heat, electricity, applied mechanics, mechanical drawing, physical properties of minerals, metallic minerals, mining: time required, two years—one year two nights a week, and one year three nights a week. 4. Underviewer (coal-mining): Theoretical chemistry, theoretical mechanics, heat, applied mechanics, mechanical drawing, physical geography, principles of stratigraphy, coal-mining (first class): time required, two years, two nights a week. 5. Assayer and metallurgist: Mathematics, theoretical chemistry, practical chemistry (first class, which to include some quantitative), metallurgy and assaying (first class), mineralogy: time required, two years—one year two nights a week, and one year three nights a week; six months' day-work in laboratory. 6. Mining surveyor: Mathematics (first class), applied mechanics, mechanical drawing, mineralogy, rocks, physical geography, principles of stratigraphy, mining, mining-surveying (first class): time required, two years, three nights a week. 7. Field geologist: Mathematics, theoretical chemistry, physics, freehand drawing, mineralogy (first class), geology (first class): time required, two years—one year two nights a week, one year three nights a week. 8. Course of instruction for geological expert: Mathematics, theoretical chemistry, practical chemistry, physics, applied mechanics, mechanical drawing, freehand drawing, mineralogy (first class), geology (first class), mining: time required, three years, three nights a week. 9. Course of instruction for mining expert: Mathematics, theoretical chemistry, practical chemistry (first class), physics, applied mechanics, mechanical drawing, mineralogy (first class), geology (first class), mining (first class): time required, three years, four nights a week. In all cases where not otherwise specified a second-class certificate will be taken as a pass in any subject. The times specified for obtaining the different certificates may be indefinitely extended in any case, but never reduced.

All students wishing to obtain a certificate as mining or geological expert or other certificate (1 to 7) must, at some time during the course, satisfy the examiners that they have a fair knowledge of English and bookkeeping; but those who require one of the class-certificates only will receive it on having attended the classes and passed the specified examinations. The subjects necessary for the geological and mining branch of the College are as follows: *Chemistry:* Theoretical, practical, Mr. Dixon; day-classes—assaying, metallurgy, Mr. Dixon. *Mathematics:* Six books of Euclid, algebra to simple equations, simple plane trigonometry, Mr. Kinloch. *Physics:* Mechanics, light and sound, heat, electricity and magnetism, Mr. Hewitt. *Botany:* Dr. Katz. *Applied Mechanics:* Six months, Professor Warren. *Mechanical drawing:* Six months, Professor Warren. *Mineralogy:* Crystallography, physical properties of minerals, metallic minerals, non-metallic minerals, Mr. Cox. *Geology:* Physiography, principles of stratigraphy, stratigraphical geology, Mr. Cox. *Mining:* General principles of mining, coal-mining, metalliferous mining, Mr. Cox. Wherever either coal-mining or metalliferous mining is specified in the course the general principles of mining are included.

Scheme for the Geological, Mineralogical, and Mining Classes.—April, May, and June: Physical geography (physiography), Wednesday, 7–8; crystallography, Wednesday, 8–9; physical

properties of minerals, Thursday, 7–9; general principles of mining, Friday, 7–8. July, August, and September: Physical geography (physiography), Wednesday, 7–8; rocks—principles of stratigraphy and geological surveying, Wednesday, 8–9; metallic minerals, Thursday, 7–9; general principles of mining, Friday, 7–8. October, November, and December: Stratigraphical geology, Wednesday, 7–8; non-metallic minerals, Thursday, 7–9; coal-mining, Wednesday, 8–9; metalliferous mining, Friday, 7–8.

Geology.—Syllabus of subjects:—*Physical Geography (Physiography):* First term—The earth as a whole, its form, dimensions, and weight; the atmosphere; the sea; the land; volcanoes and earthquakes. Second term—Rain, rivers, ice, snow, and their work; sketch of geological record; climate, past and present; the earth's position in the universe. Text-book, "Physical System of the Universe," Skertchley. *Rocks and the Principles of Stratigraphy and Geological Surveying:* Eruptive and sedimentary rocks, their character and discrimination; structural movements in the crust of the earth, with attendant phenomena of anticlines, synclines, faults, &c., and the methods of delineating these on maps; elevations and depressions of the land, with conformities and unconformities. *Stratigraphical Geology:* A comparison of the European beds with those of Australasia, and the main distinguishing features (lithological and palæontological) of the different systems; development of life in time. Text-book, "Text-book of Geology," Dana.

Mineralogy.—Crystallography: The forms of crystals, and the recognition of minerals by their crystalline form. *Physical Properties of Minerals:* Recognition of minerals by the following properties: taste, colour, lustre, hardness, specific gravity, transparency, translucency, refraction and double refraction, polarization, magnetism and electricity, fusibility, and blowpipe characters. *Metallic Minerals:* Gold, platinum, osmium, iridium, palladium, tellurium, silver, lead, mercury, copper, tin, titanium, tungsten, molybdenum, zinc, iron, nickel, cobalt, manganese, chromium, uranium, antimony, arsenic, bismuth, and their mineral species. *Non-metallic Minerals:* Carbon, sulphur, haloids and salts, earths, silicates, and precious stones. Text-books: "Mines and Minerals," Cox and Ratte; "Crystallography," Jordan.

Mining.—General principles of mining: First term—Surface-characters, and relations of lodes and coal-seams to the strata in which they occur; surface-prospecting; boring and blasting; driving levels: second term—shaft-sinking, pumps, drainage, winding and underground haulage; payment of men. Coal-mining: Occurrence of coal-seams; rules for tracing faults, dykes, and troubles generally; value of properties; working coal-seams; lighting and ventilation; surface-plant, screens, washing coal, &c. Metalliferous mining: Distribution of minerals, and occurrence of rich parts in lodes; working lodes; heaves, &c.; value of mining properties; working lodes; lighting and ventilation; alluvial workings and dressing machinery. Text-books: "Mines and Minerals," Cox and Ratte; "Coal-mining," Smyth; "Metalliferous Mining," Collins; "Coal-mining," André; "Lectures on Mining," Callon; "Mining-machinery," André. Students wishing fuller information or advice should apply to the instructor in geology.

Department of Mathematics (Instructor, Mr. J. Kinloch, M.A.).

Mathematical course, three years.—First year, Wednesday, 7 p.m. to 9 p.m.: First term—(*a*) Plane geometry without ratio; (*b*) algebra to simple equations, including fractions: second term—(*a*) plane geometry with ratio, and geometry of planes and solids; (*b*) algebra, quadratics series, binomial theorem, logarithms, plane trigonometery to solution of triangles. Second year, Thursday, 7 p.m. to 9 p.m.: First term—(*a*) Plane trigonometry, mensuration of some planes and solids, spherical trigonometry to solution of triangles; (*b*) analytical geometry: second term—(*a*) statics; (*b*) differential calculus, including maxima and minima. Third year, Monday, 7 p.m. to 9 p.m.: First term—(*a*) Differential calculus; (*b*) dynamics: second term—(*a*) integral calculus, &c., mensuration of surfaces and solids; (*b*) establishment of engineering and other formulæ. The (*b*) classes begin at 8 p.m. A student who wishes to obtain an expert's certificate in any subject in this department must attend the whole course of instruction as laid down above, pass a satisfactory examination in each subject, and obtain the class-certificate in each case. A student may, however, attend any course of lessons in any subject, and if he pass a satisfactory examination shall be granted a class-certificate.

Subjects in Mathematical Course.—A. *Surveying.*—First year: First term—Mathematics, 1, Wednesday; mineralogy, 1, Friday; drawing, 1, Thursday: second term—mathematics, 1, Wednesday; mineralogy, 1, Friday; drawing (scale), 1, Monday. Second year: First term—Mathematics, 1, Thursday; geology, 1, Friday, 7 p.m. to 8 p.m.; physics, 2, Tuesday and Friday, 8 p.m. to 9 p.m: second term—the same in continuation. Third year: First term—Mechanics, 2, Tuesday and Thursday; geodesy, 2: second term—the same in continuation. Class-certificates must be obtained in (B) mineralogy, drawing, geology, and physics. Students wishing fuller information or advice should apply to the instructor in mathematics.

Navigation (Teacher, Lieutenant Campion, R.N.).—First year, Monday, Wednesday, and Friday, at 7 p.m.: First term—Mathematics, 1, Wednesday; freehand drawing, 2, Thursday and Friday: second term—mathematics, 1, Wednesday; drawing (to scale), 2, Monday and Friday; physiography, 2. Second year: First term—Mathematics, 1, Thursday; teacher of navigation—navigation, 3, Monday, Wednesday, and Friday: second term—the same in continuation. Third year: First term—Applied mechanics, 2, Tuesday and Thursday; shipbuilding, 1, Friday; law (in relation to shipping), 1: second term—the same in continuation. Text-book, Ainslie's "Extra Master's Guide." Class-certificates must be obtained in applied mechanics and freehand drawing.

Department of Elocution (Instructor, Mr. John Conenry).

Six months' course of study. Tuesday and Friday, at 7 p.m. Students who attend the whole course and pass a satisfactory examination will be granted a class-certificate. The class

meets on Tuesday and Friday, at 7 p.m., and the course of instruction is as follows: First quarter—Articulation and pronunciation (exercises), pause and inflection of the voice (exercises). Second quarter—Quantity and emphasis (five kinds): 1, syllabic emphasis; 2, organic emphasis; 3, emphasis of sense; 4, emphasis of force; 5, the weak emphasis. Force or quality and chironomia (or complete system of gesture), with symbols (exercises): 1, The head and face; 2, the eyes; 3, the arms; 4, the hands; 5, the body or trunk; 6, the lower limbs; 7, the countenance. [Gesture suitable for the colloquial, rhetorical, epic, and dramatic styles.] Reading in prose or verse concludes each lesson. Orations, soliloquies, dialogues, and dramatic scenes taught as time may serve.

Department of Pharmacy.

Candidates for the certificate of Expert in this department must be, or have been, apprentices for a period of four years to a duly-qualified chemist and druggist, and must have passed a preliminary examination in English, Latin, French, bookkeeping, and arithmetic. They must, further, have attended the course of instruction in the department during three years, and passed the term examination in each year.

Candidates for the certificate of Pharmaceutical Chemist must be, or have been, apprentices to a duly-qualified chemist and druggist, or medical practitioner, or have been a student in a school of medicine, for a period of three years; must have passed a preliminary examination in Latin, English, and arithmetic; must have attended lectures in the Department of Pharmacy for a period of twelve months at least; and must pass satisfactory examinations in the following subjects: Practical chemistry, pharmaceutical chemistry, *materia medica*, medical botany, dispensing and pharmacy. Such examinations to be written, *vivâ voce*, and practical.

Candidates for the certificate of Dispensing Druggist must have been students in the Department of Pharmacy for a period of twelve months, and must pass satisfactory examinations in the following subjects: Pharmaceutical chemistry, pharmacy, *materia medica*, dispensing. All candidates for this certificate shall make a declaration that they have been employed in dispensing and compounding drugs for a period of three years before they shall be eligible to hold this certificate, though they may present themselves for examination after one year's attendance in the classes.

A student may, however, attend any class in pharmacy, and if he passes a satisfactory examination a class-certificate will be granted to him.

Instructor, Mr. F. Wright. First year: First term—Chemistry, Monday and Thursday; botany, Wednesday: second term—chemistry, Monday and Thursday; the use of the microscope, Wednesday. Second year: First term—Pharmaceutical chemistry, Thursday; *materia medica*, Monday: second term—pharmaceutical chemistry, Thursday; *materia medica*, Monday. Third year: First term—Practical pharmacy, Tuesday; therapeutics, Thursday: second term—the art of dispensing, Tuesday; therapeutics and toxicology, Thursday.

Certificates required for Industrial Expert in Pharmacy: Latin, French, chemistry, practical chemistry, *materia medica*, dispensing, pharmacy, elementary therapeutics, physics,* botany and use of microscope, English, bookkeeping, anatomy,* elements of physiology,* elementary medicine and pathology,* first help in accidents.*

Syllabus of Subjects, First Year.—Chemistry: This course shall comprehend instruction in the laws of chemical philosophy, a course of lectures upon the nature and properties of the chemicals used in medicines and the arts, and a knowledge of qualitative analysis of salts of the common acids and metals. Botany: This course shall consist of instruction upon structural, physiological, and systematic botany. Candidates for a certificate in this subject must possess an intimate acquaintance with the various organs of a plant, their arrangement and functions, as well as a general knowledge of the principles of classification, and be able to distinguish between the various natural orders to which the plants mentioned in the British Pharmacopœia belong. Use of the microscope: This course shall consist of instruction in the examination of botanical specimens and crystals of chemicals, the dissecting and cutting of sections, the mounting and preservation of specimens, and the use of the polariscope.

Syllabus of Subjects, Second Year.—Pharmaceutical chemistry: This course shall embrace the processes of the manufacture of chemicals used in medicine according to the directions of the British Pharmacopœia, and the testing of the same according to the directions laid down therein. The following shall be the course of study pursued: Acids, organic and inorganic; chlorine, bromine, iodine; carbon, phosphorus, sulphur; potassium, sodium, lithium, ammonium; calcium, aluminium, cenum; iron, manganese, chromium; zinc, magnesium, cadmium; arsenic, antimony, bismuth; copper, mercury, lead, silver, gold; chemicals used in testing; organic chemicals used in medicine; vegetable alkaloids. In the first term the theory shall be studied; but in the second term the student shall engage in the preparation of chemicals used in medicine, and the volumetric estimation of the strength of pharmacopœial preparations.

Syllabus of Subjects, Second Year.—Materia medica: First term—The following shall be the course of study: Entire plants, roots, woods, barks, leaves, tops, flowers, fruit, seeds, capsules, resins, oleo-resins, concrete oils, volatile oils, balsams. Second term—Vegetable *medica materia* (the natural orders): Class exogenæ—sub-class thalamifloræ, sub-class calycifloræ, sub-class corollifloræ, sub-class apetalæ; class endogenæ; class acotyledones. Animal *materia medica:* Class mammalia, class aves, class pisces, class insecta, class annelida. Examination in this subject shall include a recognition of fresh and dry specimens, and a recognition of plants from plates.

Syllabus of Subjects, Third Year.—The art of dispensing: Second term—Weights and measures of the pharmacopœia; weighing and measuring; reading autograph prescriptions; abbreviations and contractions in directions; principles of medical combinations; incompatibility; solubility; posology; mixtures; emulsions; draughts; powders; pills; plasters; liniments;

* These are optional subjects.

excipients; gargles; ointments; pessaries; bougies; suppositories; antiseptic dressings. Candidates for a dispenser's certificate will be required to pass a practical examination in translating and compounding autograph prescriptions; and neatness and quickness of work will be taken into consideration.

Syllabus, Third Year.—Practical pharmacy: This course of instruction shall consist of lectures, demonstrations, and practical work by students, and shall embrace the following course of study: Pharmaceutical processes—comminution, solution, crystallization, diffusion, dialysis, evaporation, fusion, calcination, distillation, filtration, precipitation, percolation. Pharmaceutical preparations—aceta, aquæ, chartæ, confectiones, decocta, emplastra, enemata, essentiæ, extracta, glycerina, infusa, injectio, linimenta, liquores, lotiones, mellita, misturæ, mucilagines, olea, pilulæ, pulveres, spiritus, succi, supposatoria, syrupi, tincturæ, trochischi, unguenta, vapores, vina.

Third Year.—Therapeutics: This course shall consist of lectures upon the following: Antacids, anthelmintics, astringents, cathartics, caustics, diaphoretics, diuretics, emetics, emmenagogues, emollients, epispantics, expectorants, narcotics, refrigerants, sedatives, sialogogues, general stimulants, special stimulants, tonics; the principles on which the administration of remedies are founded. Toxicology: This course shall consist of lectures upon the following: Phosphorus, chlorine and iodine, acids, alkalies, lead, antimony, mercury, arsenic, metallic salts, opium, aconite, belladonna, digitalis, Indian hemp, cantharides, chloroform, chloral, hydrocyanic acid, oxalic acid; the physiological and physical actions of poisons and their antidotes.

List of Text-books recommended to Students.—"The British Pharmacopœia," Squires' "Companion to the British Pharmacopœia," "Lessons on Prescriptions and Prescribing," by J. H. Griffiths; "Materia Medica and Pharmacy," by J. H. Griffiths; "Materia Medica and Therapeutics," by Garrod; "Materia Medica and Therapeutics," by J. M. Bruce; "Materia Medica and Therapeutics," by W. Whitla, M.D.; "Pharmaceutical Chemistry," by J. Attfield; "Aids to Pharmacy," by J. A. Sempill; "Aids to Materia Medica," parts 1 and 2, by J. A. Sempill.

Students are cautioned that all text-books used in this department are the editions in which are embodied the recent additions to "The British Pharmacopœia." Students wishing fuller information or advice should apply to the instructor in pharmacy.

. . . *Anatomy and Physiology* (Lecturer, Dr. Anderson Stuart).

One year's course of study (commencing on 6th July). Tuesday, at 7.30 p.m. A student who has attended the course will be granted a certificate if he passes a satisfactory examination. The course of instruction is—*Anatomy and Physiology:* Lectures 1–4, General and introductory view of the structure and functions of the human body; Lectures 5–7, The blood and lymph, vascular system and the circulation; Lecture 8, The blood and the lymph; Lectures 9, 10, The respiratory system; Lectures 11, 12, The sources of loss and gain to the blood; Lectures 13, 14, The alimentary organs and their functions; Lectures 15–17, Motion and locomotion, including joints, muscles, various special muscular actions—*e.g.*, voice, walking, &c.; Lectures 18–20, Sensations and the organs of the senses; Lectures 21, 22, The eye and the sense of sight; Lecture 23, The coalescence of sensations with one another and with other states of consciousness; Lectures 24–26, The structure and functions of nerve-fibres and of the central organs of the nervous system. The minute anatomy is distributed over the entire course, and is demonstrated by preparations under the microscope. Diagrams, models, dissections, and experiments are freely used to illustrate the lectures. The text-book for the course is "Elementary Lessons in Physiology," by Professor Huxley. The lecturer will be in the room some time before the lecture begins in order to explain the various exhibits, and will remain for a little while after the conclusion of the lecture for the purpose of answering any questions, &c.

Mechanical Dentistry (Teacher, Mr. H. G. Low).—Friday, at 7.30 p.m. Uses of vulcanite and celluloid in dentistry: one year's course of study. Uses of metals in dentistry: one year's course of study. Working metals and celluloid and vulcanite bases: one year's course of study. To obtain the certificate of Expert in Mechanical Dentistry the student must have attended the classes and passed in the subjects above specified, and the first year in chemistry, and also satisfy the examiners as to knowledge of English and bookkeeping.

Department of Physics (Instructor, Mr. T. E. Hewett).

The course of instruction in physics includes a number of subjects, and is completed in two years. Students who wish to get the certificate of Expert in Physics must attend the whole course of instruction and pass a satisfactory examination in each subject; must also obtain a certificate in chemistry, card-certificate for first year in art course and mathematics, and satisfy the examiners as to their knowledge of English and bookkeeping. A student may, however, attend any course of instruction in any subject under physics, and if he pass a satisfactory examination shall be granted a class-certificate. Subjects (under instructor in physics): Sound, heat, light, electricity and magnetism, pneumatics, hydrostatics.

Physics.—Two years' course of study. Monday and Friday, 8 p.m. First year: The order of lectures will be as follows—1, a course of introductory lectures on the general properties of matter, the laws of motion, units of measurement, and the chief physical forces; 2, pneumatics and hydrostatics; 3, sound, and the physical theory of music; 4, light, and optical apparatus generally; 5, heat, and relation of same to work; 6, electricity and magnetism. Second year (Tuesdays, 8 p.m.): 1, Electricity and magnetism—the C.G.S. units, measurement of capacity, quantity, electro-motive force, current, resistance, theory of voltaic cell, action of currents on currents, dynamic machines, secondary batteries, mode of determining magnetic inclination and declination, secular and diurnal variations, dia-magnetism; 2, sound—indirect method of determining velocity, tuning-forks, vibrations of rods plates and membranes, beats and interferences, resonance and harmonics, analysis and synthesis; 3, light—the undulatory theory, vision through lenses micro-

scopes telescopes, conditions of achromatism, interference and double refraction, polarization, spectrum analysis and colour-sensation. These lectures are experimentally demonstrated. Text-book (first year only), Ganôt's "Physics" (abridged edition); first and second year, Ganôt's "Physics" (complete edition).

Applied Electricity.—A student who wishes to obtain a certificate as Expert in Applied Electricity or Telegraphy must attend the following course of instruction and pass a satisfactory examination upon it, and obtain certificates for—chemistry, elementary; mathematics—logarithms, simple equations, elements of plane trigonometry; freehand drawing; English and bookkeeping. One year's course of study. Wednesday, at 8 p.m. Syllabus: Frictional electricity, the voltaic pile; current, its detection, effects, and measurement; conduction and resistance, electro-magnetism; induction; the principles underlying and detail of construction of the following apparatus—galvanometer, electric bell, telephone, microphone, carbon transmitters, and dynamic machinery; the thermopile, BA units, lightning-conductors; secondary batteries.

Telegraphy.—One year's course of study. Thursday, at 6 p.m. Syllabus: The Morse system of telegraphy; theory of the voltaic cell; batteries used in telegraphy; current, conduction, resistance; the elements of electro-magnetism and induction, use of the galvanometer for faults and breaks, earth-plates, lines, connections; the principles underlying the instruments in use.

Text-book for applied electricity and telegraphy, "Lessons in Electricity and Magnetism," S. P. Thompson. Students wishing fuller information or advice should apply to the instructor in physics.

In the agricultural department the Board have examinations made by experts, free of charge, of specimens of diseased plants, supposed poison-plants, insects believed to be injurious to plants or animals, and other things forwarded to the Board which may be of use to those engaged in agriculture or mining. The agricultural laboratory contains diagrams, models, samples of soil, wool, appliances required for the agricultural, wool-sorting, and botany classes. Popular lectures are delivered by the instructor in the College-hall every week, admission being free. Lectures are also delivered in the country districts from September to March. Any agricultural society or school of arts committee may have, upon application to the Board, any two of the following lectures given, providing that they provide the hall and lights and advertise the lecture effectively. The lecturer has further instructions to examine soils, &c., of the district in which he is lecturing, and give all information.

Course of Popular Lectures on Agriculture.—1, Science and practice of agriculture in Australia; 2, soils, Australian, their nature and constituents; 3, soils and their relation to the indigenous vegetation for pasture and for farming; 4, some native grasses; 5, timbers of New South Wales; 6, botany, and study of the indigenous vegetation of the country; 7, mechanics of agriculture, tools, implements, &c.; 8, agricultural divisions of the colony, the rainfall and winds; 9, stock-raising; 10, cultivated grasses and pastures; 11, sheep and wheat-farming; 12, our competitors in the wool-trade; 13, grain-crops, wheat, barley, oats, rye, their diseases, &c., including the nature of wheat-rust; 14, maize as a crop, its nature, diseases, &c.; 15, wool-sorting; 16, droughts—water-supply and water-storage; 17, draining and irrigation, Californian and Australian practice; 18, pumps and machines for raising water; 19, grape-culture for table use, wine, and raisin-making; 20, fruit-farming, budding, grafting, &c.; 21, our fruit-soils, their defects, diseases of fruits, insect enemies, &c.; 22, fruit-preserving, raisin-making, &c.; 23, ordinary crops of New South Wales; 24, sugar-farming and manufacture; 25, tobacco- and arrowroot-farming and manufacture; 26, fibre-yielding crops; 27, veterinary practice; 28, dairying, with nature of siloing, and crops for cow-feeding; 29, pig-feeding, bacon, hams, &c.; 30, fencing and fencing-materials, &c.; 31, manures—how to make and to use them; 32, poultry-farming for New South Wales; 33, bee-farming and honey-making in Australia; 34, insect pests on plants and animals; 35, harvesting and storing Australian crops; 36, flower-gardening for town and country; 37, old crops with new faces; 38, science in farming—is it profitable?

These lectures are of a popular character, and are interesting, as well as instructive. Diagrams or blackboard-illustrations are employed when practicable. The Board also offer to agricultural societies and other bodies in the country districts to educate pupils sent by them, free of charge, in all available classes of the Board at the Sydney College. A portion of land near Sydney has been set aside for the purpose of treating with artificial manures.

The department of applied mechanics is ably conducted by Professor W. H. Warren, of Sydney University. I found upon my first visit about twenty students engaged in machine-drawing, preparing working-drawings to scale of details of machinery and engines from copies, and in many cases from the actual model. The work of the students in this section seemed thorough. The rooms are well supplied with models (principally Schroeder's) and a large number of diagrams. The ventilation of the rooms was extremely bad, and must be injurious when such large bodies of students are at work. At my second visit Professor Warren was lecturing to about thirty students in applied mechanics, and I must say, as a class, I found a greater amount of energy and enthusiasm displayed than is usual in such classes. The clear and concise remarks and clever blackboard-illustrations of the professor, however, will no doubt account for the amount of appreciation shown by the students. Professor Warren informed me that a large number of students have distinguished themselves in connection with these classes. Several have already received good appointments, one student having just been sent to Melbourne at the request of an engineering firm, to be employed in the construction of one of the large new bridges now being built in that city.

The workshops are situated in Kent Street, and are fitted with special appliances of the latest type. The whole of the machinery and fittings were designed, obtained, and erected by and under the personal supervision of the Vice-President of the Board (Mr. Norman Selfe). The arrangements in connection with the fittings and machinery are admirable, and admit of extension to much larger premises.

The principal workshop consists of a centre and wings carried on wooden columns. The motive-power occupies the end of each of the wings—a gas-engine being on one side, and a steam-engine on the other. The tools for ironworking are ranged in the south wing, and the woodworking machinery in the north wing. The whole plant is driven by a system of counter-shafting carried on iron pillars entirely clear of the building, so as to be easily removed when necessary. An important point in connection with the arrangements of plant is that all vibration is kept from the framework or walls of the building. The pillars have a wide-spreading plate bolted down to heavy stone and concrete foundations, above which they rise square for several feet, when they emerge into octagonal sections of about 3ft. length. Above this they are round, for taking the cantilevers. The brackets are secured in pairs by clamping the head of the column, and at their outer ends carry a line of wrought-iron tubing, which serves as a girder upon which to fit the counter-shaft hangers. The pillar-heads are stayed together by tie-rods across the shop, and are devised to carry the line-shaft from which are driven the counter-shafts. These work in specially-designed brackets, and may be secured anywhere on the tubular girders. The machinery consists of a six-horse-power Crossley gas-engine, Smith and Coventry's planer, Olson's testing-machine, Smith and Coventry's milling-machine, American hand-drill, shaping-machine, and English lathes, Marshall six-horse-power vertical engine and boiler, band- and fret-saw, and variety worker. The testing-machine is one of the most perfect of its kind, and will test all kinds of building-materials. Any person may, upon application to the proper officer, go to the shop and test the strength of any material free of charge. This must be a valuable advantage to the building-trades of Sydney. Several students in the boiler-making class were at work in the shop, constructing boilers upon a small scale, and furnace-tubes. This class, one student informed me, had proved of great value to him as a practical boiler-maker. In the turning- and fitting-shop every machine was at work. The portions of machines in progress of construction by the students shown me by Mr. Phillips, the teacher, were well made and accurate in detail and finish. Here, also, I found the students (the majority of whom were engaged in the shops during the day) thoroughly interested in their work, and fully appreciating the value of such instruction with regard to their future welfare.

The architectural department is under the direction of Mr. J. F. Hennessy (Medallist and Prizeman of the Royal Institute of British Architects, London). In this class there were about twenty students engaged in copying and enlarging drawings, copying orders and styles of architecture, working out complete designs of buildings from sketches with the aid of the instructor. The work throughout seemed of excellent quality. In the design section, pencil-sketches are worked out by the students at home, and criticized by the instructor, and, when alterations suggested are complete, the sketches are worked out and handed in for competition. In the national competition of the South Kensington Science and Art Department a carpenter in this class won a bronze medal for a design for a city club-house, two carpenters and an architect's assistant won third-grade prizes, and two architects' assistants, one carpenter, one draughtsman, and one plasterer won second-grade prizes, all in connection with Mr. Hennessy's class.

In the trades under the architectural instructor, the first class visited was that of Mr. John Gardiner, teacher of carpentering and joinery. Here the students were receiving instruction upon scales, sections of solids, and geometry generally as applied to the trade. The advanced section were making models of window-frames, handrails, &c. In the Adelaide Exhibition there were a large number of good exhibits from this class, including window-frames, doors, handrails, fanlights, ventilators, joints, mitre-boxes, &c., made to various proportionate sizes. The exhibitors were mostly carpenters' apprentices ranging from fourteen to nineteen, and carpenters and joiners ranging from twenty to thirty-two years of age. There were also a large number of drawings from the theoretical class, several of considerable merit.

In the masonry-class some of the students were at work upon drawings of bevels of arches, others were practically working out the same to scale in Oamaru stone. A zinc plate is first cut to scale, and the various stones worked down to the size of the model, and afterwards fitted together. The class-room was well supplied with diagrams and models of mouldings, arches, domes, bridges, and other architectural detail requisite for the class. A number of drawings and models of arches were exhibited at the Adelaide Exhibition by masons of the class, and showed how practical the instruction was.

The bricklaying-class have practical instruction with ordinary and other bricks in bonds, joints, foundations, &c., arches, chimney-shafts, ovens, tunnels, &c., combined with proper use of tools and scaffolding, each student building up a portion of the work.

The cabinetmaking and carriage-building classes were both at practical work at the time of my visit, the latter constructing the framework of a carriage from working-drawings.

In the plumbing-class eight or nine students were engaged in practical work, making to full-size siphon and other traps, double-branch pipes, and plumbing required in ordinary sanitary arrangements. Very satisfactory work was exhibited at the Adelaide Exhibition. I was glad to find this class working so successfully, considering this to be one of the most important of all trade-classes. I was informed by one student that the instruction upon sanitary arrangements had been of the greatest value to him as a workman. If our young plumbers would give a little time to ordinary sewage arrangements, and the prevention of escape of sewage-gases into houses, health would be considerably benefited, and fevers far less prevalent.

The department of art, under the direction of Mr. Lucien Henry, is doing good work. A two-years course of geometry and perspective is given, and a two-years course of freehand and model drawing. The art section is well supplied with models, English and French. A special course of instruction is arranged for teachers aud pupil-teachers. The classes are suffering from the same complaint as other art-classes visited—viz., want of instruction in the simplest elements previous to entering. If the instruction in the primary schools was efficient from six to nine months' work would be saved, or possibly more. This, in a two-years course, such as given at the Sydney

classes, where the larger number of students are artisans, is a valuable saving. Many students, no doubt, hesitate at two years' work, but would gladly undertake a fifteen- or eighteen-months course.

Although a number of students (less than half those attending the evening art-classes) pass through the geometrical and perspective sections, the majority upon entering do not appreciate the necessity of going through the courses of study, and do not consult the instructors sufficiently as to the best course to pursue. In technical drawing generally geometry and perspective should undoubtedly be the first subjects dealt with, and it is a pity advantage is not taken by industrial students to obtain at least the simplest elements. There is no excuse in the case of these students, the fees being extremely low. In the design-classes the instructor, Mr. Henry, has arranged a complete series of historical styles of ornament for the use of the class. Although the class has only been in operation for twelve months, some very creditable designs have been produced. Australian flora is also used for the purpose of decorative designs. The members of this class should prove valuable as industrial designers at no distant date.

The modelling-class has been, and is, of considerable service to plasterers, moulders, carvers, &c. I inspected the works executed by the students at the yearly examination, those of the second-year students, with perhaps two exceptions, producing good work. A plasterer and a mason in this class have each won a bronze medal at the national competition of the South Kensington Art Department for ornaments modelled from the cast.

The house painting and decorating classes were engaged in graining, marbling, stencilling, sign-writing, and ornamental work, some of the work shown in the decorative class being of considerable merit. The walls were hung with various panels, marbled and grained, as examples, and a large number of coloured diagrams illustrating historical styles of ornament. Ordinary painting, varnishing, gilding, and glass-writing and painting form a part of this class-work.

Throughout the whole of the classes excellent apparatus, examples, tools, machinery, models, &c., have been provided. The students have therefore every advantage, with the efficient staff of instructors and teachers provided, and the low fees.

There were a large number of classes I was unable to visit owing to want of time, several of which I do not consider are at all technical in character, and others I think might just as well be taught at the University, where such classes are already held, as, for instance, pharmacy, physics, chemistry, and mathematics. Evening-classes are, I believe, held at the University at reduced fees, under the professor of the University. In any case I am sure it would be better to relegate these subjects to that institution, and utilise the expenditure thus incurred in advancing strictly trade subjects. I understand the fees are considerably higher at the University; but if the demand is sufficiently large it would be to the interest of that institution to popularise the evening instruction in these branches, and relieve the Technical College of this work. The department of commercial economy should, I think, be entirely distinct from a college of this description, and, if necessary, established upon a separate basis, or taught in connection with secondary schools.

The examinations of the College and country classes are conducted by independent examiners appointed by the Central Board. The examinations are held in December yearly. Arrangements have been made with the City and Guilds of London Institute for the Advancement of Technical Education to extend their system of examination to New South Wales. The first examination was held in April of last year. The following rules have been framed by the Committee of the Institute for the conduct of these examinations: (1.) That the examination be held in the colony on a date to be approved by the Institute in the last fortnight of April, within five weeks before the date of the examinations in the United Kingdom. (2.) That a fee of 2s. 6d. be charged for each candidate examined. (3.) That the Board forward to the Institute, so that the information may be received not later than the 1st March in each year, particulars of the number of candidates to be examined, and of the subjects of examination. (4.) That all practical examinations be held in New South Wales in accordance with the rules of the Institute, and under the superintendence of persons appointed by the Board. (5.) That a certificate of having passed the examination in technology in the first or second class of the ordinary or honours grade be given to each candidate who satisfies the examiner in the written examination. Arrangements are made so that any person may enter for these examinations in various centres throughout the colony on payment of the fee of 2s. 6d. charged by the Institute, and obtain a certificate of theoretical or practical knowledge of such subjects as the following, in which papers are set: 1. Alkali and allied branches—(*a*) salt-manufacture, (*b*) alkali-manufacture, (*c*) soap-manufacture. 2. Bread-making. 3. (*a*) Brewing, (*b*) spirit-manufacture. 4. Coal-tar products. 5. Sugar-manufacture. 6. Fuel. 7. Oils, painters' colours and varnishes, manufacture of. 8. Oils and fats, including candle-manufacture. 9. Gas-manufacture. 10. Iron- and steel-manufacture. 11. Paper-manufacture. 12. Pottery- and porcelain-manufacture. 13. Glass-manufacture. 14. Dyeing—(*a*) silk, (*b*) wool. 15. Bleaching—dyeing and printing of calico or linen. 16. Leather—(*a*) tanning leather, (*b*) boot- and shoe-manufacture. 17. Photography. 18. Electro-metallurgy. 19. Textile fabrics—(*a*) manufacture of cloth, (*b*) cotton, (*c*) linen, (*d*) silk, and (*e*) jute. 20. (*a*) Lace-manufacture, (*b*) framework-knitting. 21. Weaving and pattern-designing. 22. Electrical engineering—(*a*) telegraphy, (*b*) electric lighting and transmission of power, (*c*) electrical-instrument making. 23. Metal-plate working. 24. Plumbing. 25. Silversmithing. 26. Watch- and clock-making. 27. Tools—(*a*) wood-working, (*b*) metal-working. 28. Mechanical engineering. 29. Carriage-building. 30. Printing—(*a*) typography, (*b*) lithography, &c. 31. Ores, raising and preparation of. 32. Mine-surveying. 33. Milling—flour-manufacture. 34. Carpentry and joinery. 35. Brickwork and masonry. The examination will be in two grades—1, ordinary; 2, honours. The ordinary examination is intended principally for apprentices and journeymen; the honours examination for foremen, managers, and teachers of technology: but candidates may enter themselves for either grade, except in certain subjects hereinafter indicated, in which they are required to obtain a certificate in the ordinary grade before being

examined for honours. Candidates who pass in either grade will be arranged in two classes—a first and a second class. Candidates who obtain a second-class certificate in either grade may be re-examined in any subsequent year for a first-class certificate in the same grade; but, failing to obtain sufficient marks to entitle them to a first-class certificate, their names will not be entered on the pass-list. Candidates who have obtained a first-class certificate in the ordinary grade will not be re-examined in the same grade. There is no limit to age, and intending candidates should apply to the Secretary to the Board of Technical Education, Sydney, who will forward their names to the offices of the Institute in London, and through whom all information will be furnished. All written examinations will be conducted by means of printed papers, and the answers must be written upon paper especially provided for the purpose. The question-papers will be sent in sealed envelopes to the gentlemen appointed by the Board to receive them, on or immediately before the day of examination, and the envelopes containing these papers must be opened in the presence of the candidates on the evening of the examination. A number will be allotted to each candidate, and he will be known to the examiner by that number, and not by name. The worked papers must be sealed up immediately on the termination of the examination, and despatched to the Secretary of the Board without delay. No candidate will be examined in the same year in more than one subject. In the subjects numbered 1, 3, 14, 16, 19, 20, 22, 27, 30, candidates must select one branch only—(*a*), (*b*), (*c*), (*d*), or (*e*)—in which to be examined. The examinations will be distinct from the annual examination of the classes of the Sydney Technical College and Branch Technical Schools in New South Wales, at which the candidates are required to have attended classes for the subjects in which they are to be examined. At the technological examinations of the City and Guilds of London Institute in 1885, 3,968 candidates were examined, at 167 different centres throughout Great Britain, in forty-two subjects, and of this number 2,168 candidates satisfied the examiners and received certificates. Candidates who have passed in any subject may be examined in a subsequent year in any other subject, and candidates who have passed in any one branch of the subjects referred to in the preceding rule may, on a subsequent examination, obtain a certificate or prize in the same, or in a higher, but not in a lower, grade in any other branch of the same subject.

The works of students attending the art, architecture, and applied mechanics sections are forwarded annually to the Science and Art Department for examination and to compete in the national competition of that department. At the last year's examinations there were 1,164 entries. In first-year's-course subjects 954 entries were made—87 obtained honours, 122 the first-grade, and 440 the second-grade. In the second-year's-course subjects 210 were examined—33 obtained honours, 51 the first-grade, and 89 the second-grade. The works sent to South Kensington for examination received two modelling and six architectural prizes. In the Technological Examinations of the City and Guilds of London Institute for the Advancement of Technical Education 48 New South Wales candidates were examined—31 passed, 19 obtaining the first-grade, and 12 the second-grade. The subjects for which certificates of technical efficiency were awarded were as follows: Brickwork and masonry, 2; carpentering and joinery, 20; mechanical engineering, 5; gas-manufacture, 1; watch- and clock-making, 1; photography, 1; bread-making, 1.

Regulations for Scholarships and Prizes.

The following regulations have been drawn up by the Board for the scholarships and prizes awarded to successful students at the annual examinations:—

Scholarships.—At the annual examinations held in December two scholarships, each of the annual value of £75, and tenable for three years, are open to competition. In order to obtain one of these scholarships a student must have attended satisfactorily for two years the classes in one of the following subjects, viz.: Architecture, applied mechanics, chemistry, physics, or mining; and must obtain the greatest number and not less than 90 per cent. of the possible marks at the coming examination. He must then pass the matriculation examination at the Sydney University, and, subject to his attendance at lectures there for B.Sc. or B.E., the money will be paid him quarterly. It must be distinctly understood that inattention to lectures at the University may, at the discretion of the Board of Technical Education, be deemed sufficient reason to withdraw the scholarship. It will, however, be optional with the Board to require attendance at lectures in the Sydney University or some technical school in the United Kingdom. Further, in any case the continuance of the scholarship depends upon the annual vote for that purpose by Parliament.

Prizes.—At the annual examinations in December prizes in books or instruments of the undermentioned values will be open to competition in each class: First prize, £3; second prize, £2; third prize, £1. In order to obtain one of these prizes a student must have satisfactorily attended for twelve months the course of instruction and pass the examination in one of the following subjects, or in other subjects that may be added: Agriculture, applied mechanics, architecture, chemistry, design, domestic economy, *materia medica*, geology, mineralogy, mining, or physics (including practical electricity). None of the above prizes will be awarded to a student who does not obtain at least 80 per cent of the possible marks.

These scholarships and prizes are open alike to city and country students.

Popular lectures are delivered in the large hall of the Sydney College by the lecturers specially engaged by the Board. These lectures are intended to popularise the various subjects, and are intended chiefly for the working-classes. There is no doubt much practical information is diffused, as all kinds of subjects are dealt with, and the lecturers have free use of all the properties of the Board for the purpose of illustration, practical or otherwise. The number of lectures given last year was 183, the average attendance at the city lectures was 270, the total attendances being 49,494 persons. Lectures are also delivered in the country districts by the instructors in geology, mining, and agriculture, as also by the resident science-masters in the various country towns, in addition to conducting the ordinary classes.

Private day-classes are held in the College-rooms by permission of the Board in the following subjects: Drawing and painting, chemistry, elocution and voice-building, geometry, and biology. The last three classes conform to the scale of fees adopted by the Board.

The following balance-sheet shows the disbursement of advances to Board of Technical Education from the vote for technical instruction for the year 1887:—

Receipts.	£	s.	d.
Credit by Government vote—			
Amount paid into bank by Colonial Treasurer	16,971	15	7
	£16,971	15	7

Expenditure.	£	s.	d.
To Administration—salaries, general, &c.	2,691	10	2
Salaries, instructors and teachers ..	6,190	9	5
Rent	3,124	19	2
Apparatus	584	5	10
Printing	76	7	6
Advertising	393	14	6
Library	7	12	6
Fittings	99	15	9
Lectures	289	16	0
Examiners' fees	272	6	0
Prizes	101	13	11
General expenses	143	1	5
Lighting	412	8	8
Stationery	90	16	4
Analysing	59	17	0
Experimental manures on Rookwood farms	89	18	5
Petty expenditure	70	15	2
Country technical school-teachers ..	1,760	10	6
Class-expenses	95	19	4
Rent	137	0	0
Printing	6	0	0
Advertising	26	12	0
Apparatus	83	13	4
Lectures	162	12	8
	£16,971	15	7

The Technological, Industrial, and Sanitary Museum of New South Wales.—Founded, 1880. (J. H. Maiden, Curator and Secretary.)

This Museum, which already contains over twenty-five thousand specimens, is intended to occupy a similar position and fulfil the same purpose in this colony which the South Kensington Museum, the Bethnal Green Museum, the Museum of Practical Geology, the Patent Office Museum, and the Parkes Museum of Hygiene do in London. A complete synopsis of the scope of the Museum would be too voluminous. The following notes will, however, probably give sufficient information:—

1. *Animal Products* (exclusive of foods), and specimens to show the methods followed in their preparation and manufacture.—Products of (*a.*) Mammalia: Wool, hair and bristles, horns, hides, skins and leather, furs, bones and ivory, oils, fats, and perfumes. (*b.*) Birds: Feathers, down, bird-skins, eggs, oil, and fat. (*c.*) Fisheries: Sponge, coral, pearls, shells, fish-oil, furs, whalebone, fish-culture and apparatus. (*d.*) Reptilia: Tortoise-shell.

1A. *Economic Entomology.* (The specimens are arranged so as to enable the public to discriminate between insects which are injurious to man and those which work for his benefit; and show their life-history and specimens of the materials which they have destroyed or injured.)—Insect ornaments; insects used in medicine and dyeing; silkworm, honey-bee, &c.

2. *Vegetable Products*, from the raw material through the various stages of manufacture to the finished fabric or other article. (This section includes gums, resins, oils, woods, fibres, tans, dyes, drugs, perfumes.)—Forestry and forest products.

3. *Waste Products*, whether of animal, vegetable, or inorganic origin, with illustrations of their utilisation.

4. *Foods*, animal and vegetable, their constituents, and illustrations of their adulterations; dietary tables and information concerning the chemical composition and other important particulars regarding the human foods of the world.

5. *Economic Geology.*—Metallic ores; building and ornamental stones; gems and precious stones; mineral combustibles; lime, cement, and hydraulic cement, raw and burned; artificial stone; clays, kaolin, silica, and other materials for manufacture of pottery, glass, &c.; refractory materials; substances used for grinding and polishing, pigments of inorganic origin; collections of minerals, rocks, and fossils, to illustrate well-known text-books; collections of minerals to illustrate physical properties—*e.g.*, colour, lustre, diaphaneity; woven fabrics of mineral origin—*e.g.*, wire-cloth, asbestos-cloth.

5A. *Ceramics, Pottery, Porcelain.*—Bricks, drain-tiles, terra-cotta, architectural pottery; fire-clay goods, crucibles, pots, furnaces, chemical stoneware; tiles for ornament, pavements, roofing, &c.; earthenware, stoneware, art pottery and porcelain.

5B. *Glass.*—Glass used for construction and for mirrors, window-glass, plate-glass—rough-ground or polished, toughened glass, chemical and pharmaceutical glassware, decorative glass-ware.

6. *Original Specimens of Artistic Workmanship* in wood, metal, and other substances.—Coins, and medals.

7. *Photographs, Electrotype, Plaster*, and other reproductions of examples of art-workmanship where originals are not to be obtained.

8. *Ethnological Specimens.*—Musical instruments, national costumes, historical costumes, lace and embroidery.

9. *Metallurgy.*—Metals in a crude and refined state, with specimens illustrating the various stages of production, also samples of products of working alloys; products of washing and refining precious metals; electro-metallurgy; products of the working of metals (rough castings, wrought-iron, &c.); manufactured metals (blacksmiths' work, wheels and tires, &c.); wire-drawing, needles, pins, &c.

10. *Mine-engineering.*—Boring and drilling rocks, &c.; construction of shafts, &c.; hoisting; pumping and draining; ventilating; hydraulic mining; quarrying; models of mines, veins, &c.; geological maps, sections, and plans of gold and other fields.

11. *Specimens illustrative of the Mechanical Properties of various Kinds and Qualities of Structural Materials.*

12. *Military and Naval Armaments, Ordnance, Firearms, and Hunting-apparatus.*—Military small-arms, muskets, pistols, and magazine-guns, with their ammunition; light artillery, compound guns, machine-guns, mitrailleuses, &c.; heavy ordnance and its accessories; knives, swords, spears, and dirks; firearms and other implements used for sporting and hunting; traps for game, birds, vermin, &c.

13. *Naval Architecture, &c.*—Railway apparatus; aerial, pneumatic, and water transportation.

14. *Agriculture* (Agricultural tools, appliances, and machinery; also soils, manures, &c. In this section will be included mineral fertilising substances—*e.g.*, gypsum, phosphate of lime, marls, shells, coprolites, &c., not manufactured).—Specimens to illustrate the life-history of animals useful to man.

15. *Instruments of Precision, and Apparatus for Observations, Research, Experiment, and Illustration.*—Instruments for physical diagnosis; surgical instruments and appliances, with dressing; dental instruments and appliances.

16. *Sanitary Conditions, Appliances, and Regulations.*—Industrial designs; domestic architecture and building-construction; architectural designs in general; decoration of interior of buildings; vehicles and appliances for the transportation of the sick and wounded during peace and war, on shore or at sea; apparatus for heating and lighting; apparatus used for cooking; laundry appliances; bath-room and water-closet; manufactured parts of building (sashes, &c.).

17. *Educational.*—Arrangements, furniture, appliances, and modes of training of kindergarten, schools, colleges, professional and technical schools, institutions for deaf, dumb, blind, &c.

18. *Chemical and Pharmaceutical Products.*—Organic and inorganic preparations which are put to some useful purpose.

19. *Models, Drawings, and Descriptions of Patents.*—Special attention will be paid to those which are likely to prove of use in the colonies, or which have been taken out in Australia.

20. *Exhibition-catalogues, Trade-journals, Price-lists, and Descriptions of new Processes or Industries.*—The information afforded to manufacturers, merchants, and tradesmen by a collection of this kind is of great value.

Series of specimens illustrating all the stages of a manufactured article are especially desired. Sufficient concise information is attached to each exhibit or group to satisfy, without wearying, the visitor; a full description is given in the catalogues. The prices paid for specimens and their commercial value are indicated wherever possible, as it is a matter in which visitors usually take very great interest. The value of gifts is never affixed where donors express wishes to the contrary.

This Museum reflects the highest credit upon the curator and managers. In September, 1882, the whole Museum was destroyed by fire. An entire fresh start was at once made, and the Museum opened to the public in the latter part of 1883. The number of specimens is now something over thirty thousand. The building, or, rather, shed, in which this valuable collection is contained is a disgrace to the Government of New South Wales. Strong measures should at once be taken to have suitable buildings erected, or the same fate may again overtake them. It is impossible to inspect the exhibits, owing to the crowding-together of cases containing specimens, which in many instances cannot possibly be displayed, owing to want of room. From an industrial point of view, there are very valuable illustrations and specimens, especially of New South Wales timbers, polished and unpolished, samples of wool, stone, clays, &c. Electrotype reproductions of examples of art-workmanship from South Kensington and other museums, tiles, earthenware, stoneware, art-pottery and porcelain, including several valuable specimens from Doulton and Co., Lambeth Pottery, industrial designs for wood, iron architectural and other decorations, textile fabrics, metalwork, &c., are displayed upon screens, and should prove an excellent advantage to the students of the Technical College. Technological Museum expenditure: For maintenance and additions, £1,690; specimens, models, &c., £1,089; salaries, &c., £921: total, £3,700.

Fine Arts.

The Art-gallery of New South Wales contains a large number of excellent works in oil and water-colour, black-and-white, sculpture, modelling, and art-pottery. Students are permitted to copy portions of pictures upon application to the Trustees of the Gallery, submitting with each application satisfactory specimens of work. No picture may be copied the same size or in its entirety. Expenditure in connection with National Art-gallery: For buildings, £1,000; works of art, £3,326 6s. 4d.; maintenance, £924 2s. 5d.; salaries, £892 12s.: total, £6,143 0s. 9d.

The Art Society of New South Wales.

This society is established for the encouragement of the fine arts, and is similar to our New Zealand art societies, holding an annual exhibition of works. The rooms of this society are in Pitt Street, where the exhibitions are now held. Classes are held as follows: Antique, 10s. 6d. per quarter, two evenings; life, £1 1s. per quarter, two evenings; painting, £1 1s. per quarter, Saturday afternoon. The above classes are open to members of the society, who pay an annual subscription of one guinea, and the above fee in addition to each class joined. Student-members of

the society are admitted at 10s. 6d. per annum subscription, and the fee of any class joined especially for the purpose of studying in the classes, such student-members not having the right to exhibit at the annual exhibition or vote at its meetings. A sum of £250 is voted annually by the Government towards the maintenance of the society.

Total Expenditure of Institutions dealt with.

Drawing-schools, including cost of examinations, about £500; Technical Board, £16,971 15s 7d.; Technological Museum, £3,700; Art-gallery, £6,143 0s. 9d.; Art Society, £250: total, £27,564 16s. 4d.

APPENDIX.

The following are attached as being of interest upon the subject of this report: (*a.*) Extract from the report of the Department of Public Instruction, New South Wales, 1887. (*b.*) From the report on technical education by Edward Combes, C.M.G., New South Wales Legislative Assembly, 1887. (1.) Law relating to the organization and management of practical schools of agriculture and farm-schools in France. (2.) Mr. Pearce's report on the system of art-teaching in the Kunstgewerbe Museum and Schule and Kunst Schule. (3.) "Uses, Objects, and Methods of Technical Education in Elementary Schools," by Henry H. Cunynghame. (4.) "Sloyd, or Handwork, as a Factor in Education," by Evelyn Chapman.

EXTRACT from the REPORT of the DEPARTMENT of PUBLIC INSTRUCTION, NEW SOUTH WALES, 1887.

THE term "technical education" in its fullest meaning denotes the special education and training requisite to enable a person to rightly and thoroughly learn the theory and practice of any art, science, or profession; but, in organizing and carrying out a State system of such education so that it may quickly be of the most advantage to the great majority of the working population of a country, the subjects and teaching introduced in its initiatory and early stages should chiefly be those pertaining specially to agriculture and to the useful and mechanical arts practised by tradesmen. Moreover, it appears to me that any State system of education for this colony should be carried on as a branch of the Department of Public Instruction under direct Ministerial control. This could be done by appointing for its organization and management a staff of educational experts, selected, most probably, in the first place from among the paid officers of the department, such staff to include a Chief Organizer. With the Minister's approval this staff might be required to perform the following duties: To take cognisance of, and extend where practicable, the preliminary technical work done in elementary day-schools, such as kindergarten, science-lessons, drawing, commercial education, needlework, cookery, &c.; to organize evening schools for technical education in advance of that imparted in day-schools; to arrange for the establishment of model-farms in suitable agricultural districts, and of workshops for manual training in connection with the large public schools of Classes I., II., and III.; to provide for systematic courses of lectures on industrial and scientific subjects being delivered in Sydney and the principal country centres; to see that the technical instruction in the training-colleges for teachers includes lectures and teaching such as would qualify future masters and mistresses for that part of their primary-school work; and to organize, when necessary, secondary or high schools for the advanced scientific and technical teaching necessary to prepare students for a polytechnic or a technical college in connection with the University.

Organized and managed in this way, technical education would be fully recognised as an essential part of our public-school system; it would be effectually and economically administered under the direct control of the Minister of Public Instruction, existing public-school buildings being to a large extent utilised for the work; and the teaching would be systematically carried on from the infant-school or kindergarten to the secondary or high schools of a special character, which would prepare pupils for entering upon such an advanced stage of their work as should properly be taken up by the University.

The following is an outline of what is now being done in technical education in the principal European countries and America:—

In France.—Technical education is provided for by special and technical schools (including evening and Sunday schools and classes for adults and children of both sexes), and by lectures instituted expressly for the promotion of industrial and scientific knowledge. Special pains are taken to develop the manual genius of the artisan classes by blending industrial theory and practice in the primary-school course of study, by evening, Sunday, apprentice, and continuation schools and classes; by science-and-art schools for adults and others; and by lectures of all kinds. The evening-school system is one of the most striking features in the organization.

In Germany.—It is provided for by supplementary or continuation schools (Fortbildüngsschulen), held in the evenings and on Sunday mornings, for extending the knowledge of apprentices after leaving school; by modern schools (Realschulen) preparatory for the upper modern schools (Ober Realschulen), especially preparatory for entrance into the Polytechnic to continue scientific education; and by polytechnic schools or technical universities. There are also apprentice-schools. Drawing is universally well taught in the primary schools, but workshops have not yet been added to such schools.

In the United States of America.—It is provided for by aiming in the common schools to give the pupils the great art of receiving and communicating knowledge, and by teaching in such schools drawing and the rudiments of national science; by having high schools with a science division distinct from a Latin or English division; by devoting great attention to colleges of agriculture and mechanics; by commencing the blending of mental and manual instruction in primary schools; and by establishing certain free evening, industrial, and drawing schools.

In Great Britain.—It is provided for by drawing being made a class-subject in primary schools; by optional special subjects taught in such schools; by introducing manual training into some of the larger schools for special classes of pupils who have passed the Sixth Standard; and by the Science and Art Department's work. In official reports (that of the Royal Commission on Technical Education, &c.) special stress is laid upon the importance of teaching drawing and agriculture; and as to free technical instruction, Professor Huxley is inclined to think that such instruction should be supplied free to the artisan population. In 1887, a Technical Education Bill for Scotland was passed by Parliament; and one for England and Wales was introduced into the House of Commons, and passed as far as the second reading, but was subsequently withdrawn to be reintroduced in the next session. During the discussion on the Bill it was argued that technical education would be well restricted to agriculture and to other subjects which are of a really practical character, such as practical plane and solid geometry, machine construction and drawing, building-construction, &c.

Ireland.—In no part of the British Empire has such complete and satisfactory provision been made for imparting technical instruction as in Ireland. There the Commissioners of National Education have made technical instruction an essential part of the ordinary school-course, and have agreed to pay for results in this as in other subjects. Workshops have been established in connection with the Marlborough Street Normal Schools, and the students are practically trained in handicraft. The idea underlying the Commissioners' scheme is, not to teach trades to pupils—that would neither be practicable nor desirable—it is merely intended to train the pupils in linear drawing, and in such practices of handiness as will enable them to learn trades with comparative ease and become successful in them afterwards.

OFFICIAL EXPLANATION of the LAW relating to the ORGANIZATION and MANAGEMENT of PRACTICAL SCHOOLS of AGRICULTURE and FARM-SCHOOLS in FRANCE.

To the Director of the Farm-school of .

SIR,— Paris, 12th August, 1875.

A law of the 30th July, 1875, has just reorganized the practical elementary teaching of agriculture. While establishing schools of an intermediate grade between State schools and farm-schools, the law has permitted these latter schools to remain, and has even given them a new departure. Whatever may have been the opinion which has been formed respecting the utility of the instruction they provided, such of the schools as have withstood the tests to which they have been submitted have exercised a real influence for good upon agricultural progress, and we have cause to be thankful to them for the services which they have rendered, not only by the example they have furnished of a model system of cultivation, but also for the instruction given by them to their pupils. But, inasmuch as the old farm-school had no *raison d'être* in districts which were, from an agricultural point of view, most advanced, this type of school ought also to cease to be carried on under its original organization in certain departments in which its work has been accomplished, and where it has prepared the way for an intermediate system of instruction which the legislation of 1875 was especially designed to provide.

Farm-schools are recruited in a great measure from among the rural workmen, and this should be the case; for, on the one hand, the apprentices execute all the laborious work of cultivation which would otherwise have to be done by hired labour, and, on the other hand, the instruction does not there rise beyond the most elementary. The resources of these schools under this head are insufficient for young persons prepared to receive a more advanced education, such as the sons of farmers in easy circumstances, and of the small proprietors who are so numerous in our country. But, while the farm-schools cannot offer them what they have the right to demand, the State schools of agriculture are difficult of access, and too costly for a large number of people. Thus professional agricultural instruction of the high scientific character which is imparted in the State schools, and that having the exclusively practical direction which is maintained in the farm-schools, are equally wide of the middle degree of education which would suit a large class of cultivators—precisely that class, in fact, which can contribute most powerfully to stimulate agricultural progress. The principal object of the law of the 30th of July, 1875, was to fill this gap.

The schools created in pursuance of the 1st Article of that law will, however, preserve a practical character. The time in them will be divided into two nearly equal parts; the one devoted to a superior primary instruction, to which natural sciences and special courses will be added; the other being assigned to working on the farm. The teaching will not, however, be regulated in accordance with any uniform programme. On the contrary, the endeavour will be to render it appropriate to the cultural conditions of the different districts, and to make it, so to say, reflect the particular features of each. The same variety is also to be introduced in the programmes of the farm-schools.

There can be no doubt that an instruction thus constituted must have a considerable influence in perfecting the methods employed in the cultivation of the soil; and it is much to be wished, also, that the sons of small cultivators, once provided with a good primary instruction, may have the desire to acquire such knowledge as is indispensable to an intelligent and reasonable practice of the profession which they will one day exercise. If you consider, sir, that the time has arrived when you can advantageously transform your farm-school into a practical school of agriculture, such as is defined by the law, my department will lose no time in considering the question, and will gladly give you its support, under these circumstances, before the General Council of your department. Allow me to add that I earnestly look forward to the moment when this change may be effected, for I shall see therein the proof that progress has been realised in your neighbourhood. In the meantime the farm-schools will continue to be administered by the law of the 3rd October, 1848, with the exception of some modifications which I am about to bring under your notice.

A Committee of Supervision will be instituted over each farm-school. This Committee will be composed of the Inspector-General of the district as president, of a professor of science attached to an establishment for public instruction of the department, of three members of the General Council elected yearly by that body, and, lastly, of two members chosen from among the principal agriculturists of the department. The member belonging to the teaching-staff will fulfil the duties of secretary. The functions of the Committee are defined in the 9th Article of the law. Its duties will consist chiefly in considering the programme of instruction, and the attainments to be required from the candidates.

The immunity accorded by Article 11 to those holding the certificate of apprenticeship is such as to make it more sought after, and perhaps this will have the effect of attracting a larger number of young people to the farm-schools. The same Article 11 (sec. 2) ordains that, in the case of apprentices entered after the promulgation of the law, the premium on departure (*prime de sortie*) should be withheld if they do not obtain the certificate for completion of studies. This provision is intended to extend the privilege which existed under the old state of things to the apprentices entered up to this date, notwithstanding the Ministerial circular of the 23rd February last.

The action of the Committee of Supervision will naturally take place on the occasion of the visits which they will make to the establishment for the various examinations. It is at this time especially that they will be able to ascertain if the programmes have been faithfully followed; if the results obtained show a good method, and testify to the solicitude of the masters on behalf of the pupils. It will also be possible for them to assure themselves by the bearing of the young men whether, by a firm yet paternal hand, the necessary discipline is maintained, and a wholesome moral influence is exerted over the farm-school. But the Committee will not interfere in the farming-operations. The directors of the farm-schools conduct the farming at their own risk and cost; having the personal responsibility of their management, and it is essential that they should exercise their unbiassed judgment. If I should think it right to advise you further on this point it will be to your interest to consider the same. In order to preserve unity in the management, I should recommend the Committee to show themselves very circumspect in offering direct opinions in their relations with you. They will record their remarks and criticisms, if there be any occasion for them, in an official report of their meetings, which will be transmitted to the authorities.

The pupils of the farm-schools had not formerly the right to one year's voluntary service. This privilege is now acquired by those who obtain the certificate of apprenticeship. Nevertheless, this favour has not been accorded without conditions. Military exercises will be instituted in each farm-school (Article 7), and an officer of the army deputed by the Minister of War will attend the farm examinations. I shall have to consult with my honourable colleague on this subject, and I will forward to you special instructions as soon as I shall have decided upon the practical means of realising the prescriptions of the law. It is part of the programme of farm-schools to improve the primary instruction of apprentices. The 10th Article will permit them to have good masters, whom they may borrow from the Public Instruction Department without breaking their engagement with respect to military service. Several of your colleagues have expressed regret at different times that this power did not exist; you will now be able in future to intrust to a teacher the functions of a responsible superintendent.

Such are, sir, the explanations into which it has appeared necessary that I should enter to show precisely the spirit of the law of 30th July, 1875. The wise and benevolent provisions which it promulgates will, I hope, mark the beginning of a new era of prosperity in professional agricultural instruction. I shall be obliged to you if you will be good enough to acknowledge the receipt of this letter.

Receive, sir, the assurance of my distinguished consideration.

The Minister of Agriculture and Commerce,

C. De Meaux,

For despatch, the Director of Agriculture.

Law relative to the Departmental and Communal Instruction in Agriculture in France.

The Senate and the Chamber of Deputies having adopted, the President of the Republic promulgates, the law of which the text follows:—

Article 1.—Within a period of six years following the promulgation of the present law a chair of agriculture shall be established in accordance with the following rules, in the department not already possessing this institution. The programme of instruction shall include all branches of agricultural industry, and more specially the study of the methods of cultivation of the region.

Article 2.—The departmental professors of agriculture will be chosen by competition, and upon the report of a jury selected by the Minister of Agriculture, and constituted in the following manner: 1, The Inspector-General of Agriculture, President; 2, the Inspector of the Academy; 3, a professor of chemistry or physics; 4, a professor of natural sciences (these two last examiners will be chosen from the teaching-staff of the Agricultural Institute or of any agricultural school, and, in their default or absence, they must belong to the State University); 5, a professor of the Veterinary College or of the nearest school of medicine, or a certificated veterinary surgeon; 6, three agriculturists, chosen by the departmental commission from amongst the members of the agricultural associations of the department, who are nominated by each of these associations; 7, a Councillor-General, designated by his colleagues. The professors of agriculture will be appointed by an order concerted between the Minister of Agriculture and the Minister of Public Instruction.

Article 3.—The competition will take place at the chief town of the department. The examination will turn upon the general principles of agriculture, vine-growing, arboriculture, and horticulture, and on the sciences in their application to the situation, the productions, and the climate of the department.

Article 4.—The programme of the competition will be decided upon by the Ministers of Agriculture and Public Instruction, in accordance with the advice of the Agricultural Associations and the General Council of the department.

Article 5.—The candidates must (in order to be admitted to the competition) be Frenchmen, and be at least twenty-five years of age. If they can produce the diploma of Bachelor of Science or that of the Agricultural Institute, or of any agricultural school, a certain number of marks fixed by the Minister of Agriculture will be allowed to them.

Article 6.—The professors of agriculture must give lessons at the normal primary school (near to which they ought to reside, if this is possible), also at other establishments of public instruction where they are required, and they must give agricultural lectures in the different communes of the department to the teachers and agriculturists of the region.

Article 7.—The salary of the departmental professor of agriculture will be paid from the funds of the Budget of the Ministry of Agriculture and from those of the Budget of the Ministry of Public Instruction. The expenses of the journeys will be chargeable to the department.

Article 8.—The functions, as also the dismissal, of the departmental professors of agriculture will be determined by public administrative enactment. The order in question will determine the salary of the departmental professors. It will also fix the minimum expenses of the journeys of the professors of agriculture with reference to each department, in accordance with the advice of the General Council.

Article 9.—The professors of agriculture already actually employed, whether they have been nominated after competition or not, will not have to undergo the test of a new competition.

Article 10.—Three years after the complete organization of agricultural instruction in normal primary schools elementary instruction in agriculture will be included in the obligatory subjects of primary education. In those departments, however, in which instruction in agriculture has already been organized at the normal primary school for more than three years the Departmental Council of Public Instruction may decide whether the same instruction shall be compulsory in all the primary schools of the department. The programmes of this instruction in each department will be drawn up after consultation with the Departmental Council of Public Instruction. The present law, deliberated upon and adopted by the Senate and the Chamber of Deputies, will be executed as a law of the State.

Given at Paris, 16th June, 1879.

JULES GRÉVY,
President of the Republic.
P. TIRARD,
The Minister of Agriculture and Commerce.

MR. PEARCE'S REPORT on the SYSTEM of ART-TEACHING in the KUNSTGEWERBE MUSEUM und SCHULE and KUNST SCHULE (Plates XVII., XVIII., XIX., XX., and XXI.), Berlin, Königgrätzer-Strasse.

THE Kunstgewerbe Museum and School in Berlin are in a large handsome building, the materials of which are brick and terra-cotta, in the style known as the "Hellenic Renaissance." It stands free, and has uninterrupted light on all sides (Plates XVII., XVIII., and XIX.). It contains a large Industrial Art Museum, and possesses school-accommodation for eight hundred students. The museum is specially arranged to suit the trade-requirements of Berlin. The school is divided into day- and night-classes, but, as with us, most of the students attend both. The students attending the night-classes only do work of an elementary character. The professors, masters, and teachers are forty in number—twenty for the day and twenty for the evening classes. They are appointed specially on account of their capabilities as teachers and their high attainments in the various departments of technical art they represent. The whole system of instruction is under the superintendence of a director, whose word is absolute law, who is never interfered with in his professional work, and is responsible to the Minister only for the success of the school. The director of this school is also director for the schools which train the art masters and mistresses known as the Kunstschulen. The school-year is divided into two sessions, summer and winter. The fees for attending all classes during these sessions would be 72 marks, or £3 12s., for the summer session, and 36 marks, or £1 16s., for the winter session. The school-year consists of nine months, the remaining three months being spent by the pupils in working at their various trades. The school and museum, too, are largely supported by substantial yearly grants of money from the State. The director can spend the money granted to the school in any manner he thinks suitable; generally it must go to the working-expenses and in granting scholarships to deserving pupils. Every advantage is given to the pupils of the school to study in either the museum or the library of the museum. The museum is under a director and two assistant directors. The school is essentially a trade art-school, no pupils being allowed to study in it unless they are preparing to become trade designers. Male and female students may attend the classes. In the ordinary school-classes the male and female pupils work together—a great advantage to both: the men work harder and play less, and the women talk less and profit by observing the stronger work of their associates. Owing to the number of drawings exacted from each pupil in a given time by the teacher, idle gossiping, loitering, &c., are avoided. Order and discipline are perfect in all the rooms, from the fact of the great interest taken by the teachers in the work of their pupils. In the studios of the professors men only work, except the one devoted to textiles, where the students are mostly women. The hours of study are from 8 in the morning to 9.30 in the evening on all days of the week excepting Sundays, when the school closes at 12 o'clock noon.

All pupils on entering the schools work from Jacobsthal's copies. These are arranged in a most systematic manner so as to allow of a gradual development of the student's power. The broad divisions are frets, mouldings, including the volutes of the Greek and Roman Ionic orders of architecture, anthemions, scrolls, Renaissance ornament, principally Italian, and naturalistic foliage.

These, again, are subdivided into frets, single, double, and triple; mouldings, painted and sculptured; anthemions, of the single unit; then a combination, as on the hypotrachelium of the columns of the Erectheum; and then flat combinations of several, forming a design; Roman scrolls; Renaissance intarsia patterns, some copied from Meurer's examples of the choir-stalls of the church of St. Maria in Orcagna, in Verona—care being taken by the teacher to explain thoroughly the treatment of the acanthus foliation, and the contrast between the work of this period and that of the Greek and Roman; then the more ornate style, where animal and figure forms are introduced; naturalistic foliage; flat treatment of such plants and shrubs as the acanthus and laurel; then sculptured treatments of the same. After the second copy of Greek frets has been made, the pupil must do at home either a memory study of one of them or a design combining the principles already learnt. Thus, at an early period, his future as a designer is kept in view. Prizes to a small amount are offered for the best drawings. Tinting, too, especially if the student intends to be a decorator or lithographer, is also insisted upon, and here could be seen a great advantage in commencing with the fret. The tint has to be laid on with one stroke of the brush, the various changes of direction of line enabling students to combat the difficulties of flat washing, and no retouching or stippling is allowed. The intelligent pupil was not permitted to remain long in merely copying what was before him, but soon had to translate and adapt. Thus the start of the ornament may be a shield, as at Figure A, Plate XX.—the student is required to put a leaf or boss instead, as at A; the shape of the panel may be rectilineal, as at B—the pupil is required to adapt the ornament to fill such a shape, as at B. The tinting, too, had to be done differently, and the harmony brought about by succession instead of contrast—a subject previously explained by the teacher. In this elementary room there were several pupils learning lettering, and, as they were lithographers or writing-engravers, this study would be extremely useful to them.

The next step was to draw from simple casts, mostly of Renaissance details and special forms of ornament designed by the teacher, in a firm and vigorous outline—some using the brush, others the charcoal and chalk point. Large casts, like the Madeleine and Louis XII. pilasters, were not allowed to be copied. All drawings had to be larger or smaller than the example. The student had to supply any defect in the cast, and could introduce light shading if it assisted in giving the expression. Throughout the whole system of the work pupils were told to try and make the drawings "look nice," and for this reason good examples done by the teacher, or published under the direction of the director, treating the same or similar casts, were shown them. Designs had to be done at home introducing the details learnt in the class, and the pupils were expected to show excellent *technique*, as well as judicious adaptation. The work done in this department corresponded to our Stage 3*b*, and was certainly nothing like so good in neatness of finish, excepting when done by special handicraftsmen—for instance, lithographers or engravers.

Shading from simple forms, such as prism and casts of high-relief ornament, came next, corresponding to our Stages 8*a* and 5*b*. These forms had been designed by the director and modelled and cast in the schools. Figs. 1, 2, 3, 4, and 5, Plate XXI., represent some of the shapes and the order in which the pupil had to study them. The shading throughout every department in the school is done on grey paper, the colour of the paper being used as the half-tone, the broad shades drawn with the stump, the dark shadows and high lights being then touched in with the chalk point and white chalk or Chinese white. The reason for using the tinted paper in preference to the white is this: Tempera painting is largely done, the method adopted being—first, an uniform flat tint, equal in depth to the prevailing half-tone, is put over the whole drawing, the shades being then added, the deepest parts of the shadows and the brightest lights coming last. If students are accustomed from the beginning to shade in this manner they are better able to overcome the difficulties in the more advanced work. As will be seen from the illustrations, the objects and casts were simple in character, and great care was taken by the teacher to explain the broad planes of light and shade to the pupil—*e.g.*, the cylinder must be first studied as an object of many sides, where the gradations of tint are easily seen, and in shading even from the perfect sphere or cylinder the forms of such gradations are drawn first. This system was carried to a very advanced stage in all departments—life, antique, and still-life painting.

There is no kind of work in the schools corresponding to our Stages 6 and 7,* which are with us practically obsolete. Stage 8, with the necessary accompaniment of Stage 9, forms the longest and most important period of study, all pupils, excepting the architectural, being compelled to pass through this course. The times of practice in these stages were so arranged as not to interfere with the daily work in the ateliers of the professors; thus the primary object of the Kunstgewerbe Schule was not lost sight of. Continuous daily or weekly study in either an antique or life room would not be allowed. The times of study were—antique, 4 to 7; life, 7 to 9.30, on four days in the week, the fifth being devoted to anatomy, both lecture and practice. In the atelier for figure-decoration a living model—generally female—would be posed, and rapid time-sketches made, to be afterwards adapted to a design; but this was the only exception to the general rule forbidding figure-drawing between the regular working-hours of 8 to 4.

In Stage 8*b*[1] the model of the cast, in planes only, was placed by the side of the finished example, so that the student could comprehend the largeness of surface, a useful plan for decorators who do not carry on figure-study to an advanced point. The shading, as before stated, was done on grey paper. The general result obtained from most of the drawings by the pupils is an exact imitation of plane and firm outline, but at the same time a general character of conventionality. From the life model—always male—in the general class-room the highest credit was given for the study treated in a large manner and best expressing the action and pose. When the drawing was unusually good, the teacher suggested an adaptation of the figure to a design, the study being placed side by side

* Stage 6, drawing the human figure and animals' forms from flat examples; Stage 7, drawing flowers, foliage, and objects of natural history, from flat examples.

with the adaptation when submitted to the director. Some of the students worked in outline only, in the stye of Dürer, others on grey paper. Before pupils began their drawings the teacher gave a capital lesson upon the proportion, pose, and character of the model, illustrating his remarks on the blackboard. Where the long bones of the limbs were subcutaneous, special reference would be made to the form in these parts. The accommodation in this life-room was excellent, more than forty students being able to get a good view of the model; and, as the seats and stands were fixed, no time was lost, as with us, in the unnecessary arranging of places every time there is a different model. The model sat for four nights only. The poses were excellent. A cast of a figure from the life, excepting the head, is sometimes placed in a position for pupils to draw instead of the living model.

One day in each week after 4 o'clock is devoted to the study of anatomy. The room used was the same as that devoted to study from the life. Lectures were given, and in this order: Bones, ligaments, muscles, and tendons, surface-forms—their causes, &c. Between the lectures pupils are obliged to prepare a series of drawings to submit them upon the evening of the lecture to the teacher. Life-size drawings, with the lengths of the principal long bones of the extremities and groups of bones marked, were drawn in oil-colour upon a blackboard in three positions, front, side, and back. The teacher explained from these drawings and the skeleton, pupils making notes especially of the character of the bones from an artistic point of view, and their subcutaneous parts. All the drawings are done life-size from actual measurement of the bones. In teaching the muscles the pupils had to come with drawings inked in similar to those upon the blackboard, and to a proportionate scale. The teacher explained the origin, insertion, and use of muscle, then made a drawing of it upon the blackboard in red chalk over the bones previously drawn there, the pupil carefully following upon his own drawing. This seems to be an excellent method, and the students greatly profited by it, as their life-studies testified. Studies, full size, from casts of muscles and large diagrams designed by Professor Ewald had to be made in the intervals of the lectures, most of the men devoting Sunday mornings to this purpose. Lectures on advanced perspective (most of the pupils, if not all, learn the elementary principles of perspective in the "Fortbildung" schools) were given, the method adopted being similar to the one used by architects. All students must attend this course either before or after—generally before—the anatomical, but must not do the two together. Architects, furniture-designers, ironworkers, and figure-decorators were expected to enter upon this course most thoroughly, and no objection was raised to the ordinary day-work being given over in the atelier, and this taking its place, so important was it considered. The course consisted of some twenty lectures; and large objects and subjects, sideboards, bookcases, interior of a room, flight of steps, arches, &c., were drawn in perspective, our small objects being strongly condemned as being unpractical. The drawings were always done to scale, and the advanced students often made measurement-drawings of suitable subjects selected by the professor; thus the student comprehended the actual shape and the appearance of the object at the same time. Surprise was expressed at our adopting a method that could never be applied to a large subject, and which made prisms, cylinders, cones, &c., 12ft. long and 10ft. diameter—dimensions of a gigantic character, and never seen in reality. Sciography formed a portion of this discourse, and was most excellently taught. Modellers and applied-relief designers, decorators, and architects made very elaborate studies in this department. The tinting is done in a series of flat washes, commencing with the lightest, no softening with a water-brush being allowed. The gradation of rounded forms is expressed by a series of flat washes, the greatest care being taken by the teacher to explain the true shape of the most subtle tint either on a sphere or vase. Excellent models afforded pupils every possible chance of thoroughly understanding this subject.

If pupils had not determined their trade before entering the schools they were permitted to study for two years: at the end of that time were compelled to inform the director as to their choice. No pupil is allowed to remain longer than this period without making known his or her decision. Should the pupil wish to be trained as an artist or sculptor instead of a designer for trade purposes after this preliminary course of study, he or she was at once requested to leave and join the academy schools. The line of demarcation between a school of fine or painting art and a school to train designers was always firmly marked. In addition to the subjects already mentioned, these pupils, necessarily younger than those in the ateliers, painted in sepia and made studies from groups of still-life. These studies, especially the sepia, were of large size, and painted in a manner suitable for decorative purposes. The still-life groups were arranged as compositions in colour, but on purely decorative principles—*e.g.*, in festoons from one and two points of support—and were most useful for means of reference to the student in his or her subsequent career. Some painted in oil, but the greatest number used water-colour, and a few, especially clever pupils, tempera. Directness of aim and precision of touch were the primary considerations in the *technique*, and no retouching or stippling was allowed. All the studies in this, as with the other departments, were timed.

Every study made in the schools proper—that is, not in any of the professors' ateliers—had to be submitted to the director, who had an opportunity of regulating the whole of the school-teaching. Marks were given, and at the end of the school-year added into one total to tell in favour or otherwise of the student should he or she apply for a scholarship. When a high standard is reached, and consequently a large number of marks gained, scholarships to the value of 75 marks a month (equivalent to £48 a year) are granted. Pupils, besides showing decided ability in design, must also be comparatively poor to earn these scholarships. Lectures upon the principles of design and the history of art in its reference to industry were given, and most of the students were requested to attend. They are given annually, and the course seems to extend only for one year, so as not to compel a student to spend more than that time in attending them. The lectures upon the history of art given by Professor Lessing were of a most practical character. His system was to take a feature of decorative art—*e.g.*, panels—divide them into kinds, shapes, and chronological groups,

illustrating the lecture by photographs, printed examples, and admirable drawings on the board. Quattro-cento, cinque-cento, and the purer portion of the Barcque styles came in for a large share of attention, the last-named style because many firms in Berlin and Dresden had somewhat revived it. One noticeable feature at these lectures was the excellent manner in which the pupils took notes of the drawings and remarks of the teachers. After each lecture these notes had to be submitted for inspection.

The most important element, and, no doubt, the principal cause of success, of the wedding of art to trade in Germany by the Kunstgewerbe schools lies in having technical professors, the best in the country, to teach in the schools. These professors are men of recognised ability in the several departments of trade-art—architects, engineers, ornamental and figure decorators, modellers, &c.—well known throughout the country as being at the head of their several professions, and are thus able not only to give thorough practical teaching, but to assist in getting employment for their pupils. Generally their experience in the matter of design has not been confined to a knowledge of German art, but from a large acquaintance, by the means of personal study extending over several years, of similar work in France and Italy. Their salaries range from £150 to £300 a year, according to the importance of the subject taught. A splendid studio, with appropriate fittings (see plans) for private work, and an adjoining atelier for pupils are also given them. They are supposed to be present daily. The director holds them responsible for the pupils' work, though he does not in any way interfere, and it may happen that the whole time of the pupil is occupied by doing private work of the professor, providing the director's approval has been previously obtained. Employment is always found for the pupil during the three months' vacation by either the professor or his personal influence with the manufacturers, or the manufacturers applying to the school, or by the director; and the careful pupil is able to provide sufficient money during this period of practical work to keep him the remaining months of the year, supposing he is not in receipt of scholarship-allowance. In the vacation of the year 1884 the pupils of Professor Schaller were occupied in assisting him in the decoration of the theatre at Leipsic; the year previous the advanced ones were sent to Verona to copy some frescoes, also for the professor. The instances, unfortunately so very common in our own country, of seeing the skilled and trained designer, after being educated in the Government schools, not able to get employment, and obliged to turn to picture-painting, are unknown.

Architectural Atelier.—The system here adopted was to train the pupil into excellence of technical work first, designing to come after a perfect mastery of the pen and brush as far as these implements are necessary to the architect. Most exact studies of the orders were therefore done as preliminary work to the measurement-drawings and designs. These orders were drawn, as is usually the case, in orthographic projection to a scale of mètres and modules; but in all cases perspective drawings showing the position of the order in the whole building had to be shown. Important details, such as the capital, base, and cornice, had to be drawn full size. The pupil then would be able to form a thoroughly good idea of the practical portion of his work in this stage of study. The measurement-drawings (corresponding to our Stage 23*a*) were taken from models made to scale of a recognised building. One model of the Parthenon was most splendid, as it could be taken to pieces, and its construction perfectly understood even to the details of the tiles, method of stone-jointing, roof-construction, &c. No expense was spared to make this study of a thoroughly comprehensive character, so that the student would learn construction and design together. Upon the same plan as the Parthenon were classic and Renaissance doorways, window-openings, and models of ceilings (also used in the ateliers of the decorative artists), besides modern buildings. None of the finished drawings can compare pictorially for excellence of finish or truthful rendering of local colour to those done in our schools under Mr. Hagreen. A practical-looking drawing was all that the teacher required. The shadows—in fact, all shading—were expressed in lines, not in tint, for the reason of better reproduction in printing. Pupils wishing to become furniture-designers worked in this atelier. These were required to make, first, one or two careful drawings to scale of some existing examples considered by the teacher to be good. After this they were requested to make use of their own designs, doing, firstly, a sketch to scale of the whole; secondly, detail drawings, full size, of the most important features; thirdly and lastly, a finished perspective drawing with the shadows projected, and, in some cases, the tinting of the various woods. Designers for ironwork also spent some time in this atelier, their course of study resembling that of the furniture-designers, only slightly modified to suit their special craft. It was considered highly important to have trades closely connected with architecture taught by an architect; the same principle was carried out in the modelling department, all the modellers being taught by one of the leading Berlin architectural sculptors.

Ateliers for teaching Decorative Art.—Pupils to be trained for decorative artists were divided into two divisions, those painting ornament with little or no figure decoration combined with it, and those who principally painted the figure. Each division had a separate atelier and professor. The pupils to be trained for figure-work were selected from the best of those painting ornament. All the painting was done in tempera. The pupil entering the ornament-room had to work in the following systematic manner: First, paint an architectural moulding—*e.g.*, the echinus—then a cast, generally of cinque-cento ornament, both in monochrome; then copy in colour a study by the professor. The representation of the white plaster was admirably given. The studies were generally done on white cartridge-paper, or a fine canvas, strained, like ordinary prepared canvas for oil-painting, on stretchers, so that the underside could be easily damped. The teacher had prepared a series of tints, seven in number, which he considered necessary for a pupil to use in painting a white cast. These tints had to be matched, and a sufficient quantity of the colour mixed up before the pupil was allowed to commence his finished work. All the painting had to be done whilst the paper or canvas was damp, and at one painting. No retouching was permitted. The tempera medium, called "casein," was made up of the following ingredients: Six eggs, the white only; gum tragacanth,

dissolved in hot water, two or three tablespoonfuls; white-wine vinegar, half as much as the two previous compounds amount to; a few drops of thick turpentine; curd soap, to the amount of two or three tablespoonfuls dissolved in hot water. In colouring large surfaces size was recommended to be mixed with the colours. The brushes used were hog-hair and lion-hair, the latter taking the place of our camel- or sable-hair. After making a good copy from one of the professor's own studies (a study of a dead peacock, about 5ft. by 3ft. 6in. was a favourite), the pupil joined three or four others, and made a study in colour of the ornament of a white-plaster cast—say, a panel, or pilaster, or portion of a frieze, generally of a Renaissance ornament. He was allowed to use what colours he liked, but must first submit for approval a small sketch showing the general scheme. In teaching the principles of colouring the professor laid great stress upon the harmony to be brought about by "*verwandt*," "co-relative succession," instead of "contrast," and to support his teaching had a series of most splendid tinted measurement-drawings of good decoration done by him in the holidays in Venice, Paris, Verona, Vicenza, and other cities. Every study done by the pupil had to be worked to scale, and done larger or smaller than the cast. About a week was allowed for this study, and after completing it to the teacher's satisfaction the pupil was required to make his first attempt at design. Suppose it were a panel he had been copying, he would be required to design a similar one, harmonizing in form and colour, to be viewed at the same height, and then, perhaps, a frieze to harmonize in a similar manner with the two, but to be viewed from a much higher position, or a stencil pattern to agree both as to scale and colour with the panel; or, suppose rather naturalistic ornament—say, the egg-and-pomegranate portion of the frieze of the architrave of the Ghiberti gates—had been done, this was to be regarded as a frieze in a dining-room, and a body and dado of wall to be designed to harmonize with it. The technical work was all that could be desired, and the greatest finish was insisted upon. The professor had a very large business connection in Berlin and throughout Germany generally; so he was able to find employment for, often, as many as twenty of his pupils to assist him in fulfilling his orders. Flowers, fruit, dead game, &c., were copied not so much as objects of still-life, but as suitable details for decoration. The professor insisted upon a careful imitative study of the object first, and then required a good adaptation to a design, the pupil submitting the sketch from the actual object side by side with the design. The pupils in this, as in all the ateliers in the school, had to submit once a month a design to the director, who adjudicated marks. These marks told greatly in favour of pupils when applying for scholarships. Money-prizes were also given to the first and second-best studies in the several departments. These sketches were on view in the schools for a few days and were publicly criticized (see plan for rooms in which these sketches were exhibited). The director gave out the subject a week before sending in, and wished the work to be done entirely at home. About fifty pupils worked in this atelier.

Atelier for teaching the Figure as applied to Decorative Art.—About twenty pupils worked in this room. Splendid casts of details of human and animal forms from the life and antique, specially obtained and arranged by the professor, were used by the pupils. Only on special occasions did the model sit, and then for not more than two days. Most of the time when the model was present was occupied by demonstrations upon the blackboard by the professor, illustrating composition of line, proportion, &c. The best pupil was selected from the class to work in the atelier of the professor. The work going on was specially adapted to trade-requirements. The senior pupils mostly executed orders sent either to the director or their professor, and were allowed to receive payment for them. Imitation of the surfaces of various materials was carried to a high point of attainment, being considered very necessary to the decorator. It was surprising to see how well armour, textiles of various degrees of thickness, different kinds of wood, &c., would be represented with simple pigments and on grey paper. The method recommended by the professor for painting, and the one universally adopted, it is said, in the "Kunstgewerbe" schools in Germany, was to first mix up a tint answering to the prevailing half-tone of the object to be copied, and paint first. Whilst this was wet the shade must be painted over it, also the light half-tone, then the reflections in the shade, and, lastly, the high light, taking care not to allow the paper or canvas to dry during the painting of one part over the other.

Atelier for Chasing and Engraving.—Pupils copied first, in a firm, clear outline, without any attempt at expressing light and shade in line, good examples of chiselled and engraved work, making the drawing larger than the original. The examples were either chosen from the works of "*les petits maîtres*," or good modern specimens. When the teacher was satisfied that the pupil could draw with ease a firm, clear line, he gave him to copy, on a piece of copper or other metal, a good bit of modern work, splendid specimens of such having been presented to the schools by the leading manufacturing firms of Germany. When this had been done well he was requested to make a design, first on paper, to be approved by the teacher, and then to do the same on copper. Many of the drawings upon the metal were most splendid for technical excellence. Of necessity they took a long time to do. Very little *repoussé* work was carried on in this school; but in Dresden and Munich it appears to take the place of engraving.

Atelier for Copperplate Engraving and Etching.—The copperplate engraving was of a semi-pictorial character, and so adapted for trade circulars, business cards, small advertisements, &c. The ornament was generally of a lively character, and interspersed with figures. Etching was much the same as with us, only more elaborately finished as to the rendering of conventional textures. The best objects in the museum were copied by the senior pupils, the more elementary confining themselves to copying works of their professor.

Atelier for "Kunst Stickerei."—"Kunst stickerei" is a generic expression, and is applied to the decoration of textile fabrics, generally meaning rather more than our "art-needlework." With a few exceptions all the pupils were women. The principal teacher was a woman. Pupils were trained to become designers for lace, embroidery, silk hangings, carpets, and furniture-decoration, answering to the work generally done by an upholsterer. There were about 350 pupils in the

various rooms devoted to these several studies. A girl was supposed to draw fairly well from the cast (Stages 3*b*, 5*b*, and 8*c*) before being allowed to settle into regular design-work. Broadly speaking, the course she would have to go through before following the special branch of design she desired to adopt would take about a year. Another six months would be spent in doing preparatory work—copying old designs, understanding the *technique* of her adopted trade, &c.—and then she would commence to design upon her own account. As a rule, after two years' study in the schools the majority were able to earn their own living. Manufacturers were only too glad to buy the designs done in any department of the schools, but especially those produced in these rooms. This was probably owing to the greater demand for them from the public. Specimens of designs—the actual material, photographs, &c.—were placed upon the walls for reference; but, besides these, at any time a pupil could procure for special study any object or objects in the museum, retaining such for any length of time—a great boon to the anxious student. A similar plan to this was adopted in Dresden, with the addition that the pupil could take the object home to study in leisure time. The director of the museum has never known of a single case of loss or damage. A great many designs—of course, all those for carpets—were done on squared paper. The lace designs were for hand-made only, the machine-made being condemned. Generally speaking, designs for machine-made work were not allowed to be done, perhaps for the reason that, owing to the inferiority of German machinery, they could not be successfully carried out. This may be an advantage to art, however, instead of a disadvantage. Paintings on silk are largely done, the technical skill exercised in the painting being most commendable.

Atelier for Modelling.—The rooms were very large, in the basement, because of the convenience afforded of keeping clay damp, easy transit of large models, &c. The lighting was extremely good. Nearly a hundred pupils learnt the various branches of modelling. The class was divided into two broad divisions—those who intended to be architectural sculptors, monumental masons, &c., and those studying to become designers for gold- and silver-smiths' work. The first worked in clay, the second in wax on slates, on wooden models. The workers in clay first copied, either larger or smaller, never the same size, parts of good classic or Renaissance casts of ornament. On no account whatever were they allowed to attempt the whole cast. The teacher contended that what the pupil requires is to know the principles regulating the construction of ornament, to be obtained from the lectures, and a thorough knowledge of the best details. Quattro- and cinque-cento Italian ornament seemed to be the favourite periods. When classes are crowded, as is the case with this one, the plan of attempting a portion of the cast enabled several students to work from the one example. After working from a cast the pupil was required to make an enlarged study of an important detail from a photograph, generally of Italian ornament. Here, again, only a portion had to be done. After ornament came details of the figure from the antique, Renaissance, good modern examples, or the life. Only parts of the figure were modelled, and it would be most exceptional for either the whole antique or life figure to be attempted. In one or two instances during a session the life-model may be posed for a lecture, and a quick-time sketch made; but a design had to be done at once with the figure forming an important feature, both being submitted to the director. Drapery was largely studied. Silk was used as the material to form the folds, as the teacher considered it specially adapted for working in clay or wax. If it were impossible to arrange the drapery in the position required in the design the nearest attempt at so doing was done first, and then the required adaptation made from this preliminary study. Ribbon-forms were studied from shavings. The training of designers for gold- and silver-smiths' work was something similar to that adopted for the sculptors, but the examples to be copied were more modern, and the scale of the work much smaller. The manipulation of the clay and wax was exceedingly good. Advanced pupils worked in stone, and executed orders for various firms in Berlin, and in some instances in London. To explain to them the manipulation modern examples of good work were shown them. A number of the designs executed as orders were modelled in the playful style of the rococo, owing to the great demand for such work at the present time in Germany.

The plans of the museum and school are attached. The German scale of mètres and the comparative scale of English feet are marked upon the drawing. The arrangements for cloak-room accommodation, such as the placing of hats, coats, cloaks, umbrellas, &c., are in each class-room.

KUNST SCHULE.—SCHOOL for the TRAINING of MALE and FEMALE ART-TEACHERS to INSTRUCT in the GOVERNMENT SCHOOLS.

THE whole system of teaching is adapted for the training of teachers, none but those intending to follow this branch of art being allowed to attend.

Elementary Room.—The teacher in training must first enter the elementary room, to pursue the following course of study: To copy from the blackboard capitally-drawn diagrams illustrating the principles of ornamental construction, somewhat answering to our Stage 2*b*, only the studies are not made from flat examples. All construction-lines had to be most carefully marked. This course was a progressive one, straight lines and simple curves first, these developing into the most advanced ornament in a somewhat similar order to that in Dyce's book. When two or three sheets had been well done the same drawings had to be drawn before the teacher upon the blackboard, with verbal explanation of how a class would be taught. Each pupil is required to submit for approval to the director some eight or twelve drawings executed during his or her stay in this room. The time usually spent over this preparatory course is from four to six weeks. After leaving this room they draw from models and casts of ornament, Stage 5. Pupils must make studies not so much in an imitative manner as one that is profitable to teachers, who at times are often called upon to correct a drawing away from the cast. This idea is also carried out in the Kunstgewerbe Schules in Dresden and Munich. Should there exist any defects in the casts—broken serrations of leaves,

&c.—the pupil must not copy them, but give a restored rendering of the part. The casts were the same as those used in the Kunstgewerbe Schule, and made upon the school-premises. Many good modern casts are in use both in this stage and that answering to our 8*b*[1]. In the latter stage the director considered that pupils who were in training as teachers learnt more of the actual form of eyes, noses, mouths, ears, and other details of the figure from very good modern examples than from the antique. Interesting models of hands and feet, in planes only, showing slightly-exaggerated treatments of subcutaneous parts, a head upon a pivot, with lines drawn through the eyes, mouth, nose, &c., to illustrate the principles of construction, the pupil is required to draw, besides giving a lecture before the director upon the object. Drawing leaves, flowers, fruit in outline, resembling Stage 10, and shading came next. The study of botany had to accompany this drawing from nature, in the same way as anatomy did that of the figure. The pupils worked in large classes, groups of eight or nine working from the one group of models or cast. They are expected in their own schools to always teach in classes; individual teaching, so common with us, is unknown. Geometrical and perspective drawing were taught, but in such an elaborate manner as could only be used in schools of a most advanced character. A model used for orthographic and perspective projection, and which all teachers of these subjects must demonstrate from, was one of the best that could be made, and extremely useful. The advanced pupils had to attend a series of lectures upon architecture by a leading Berlin architect. Seeman's "History of Art" was the text-book, and every third pupil attending the lecture was supplied for his and his fellow-pupils' use with three or more plates referring to the history or period intended to be explained by the teacher. Supplying these plates is one among many helps given to students, though it must be extremely expensive to the Government. No design was taught, and the ordinary school-teacher was not expected to know very much about this subject. The principles of colouring had to be understood, but only from diagrams. Owen Jones's method is not approved of, and teachers are not expected to teach any of the principles that he lays down in his "Grammar of Ornament." There is a most useful library belonging to the school, with a copying-room adjoining. About a hundred students could be easily accommodated in these rooms. The course of instruction is entirely in the hands of one man—the director—who sees every drawing and marks it, and grants diplomas of efficiency when he considers the would-be teacher is capable of teaching upon his or her own account. The time spent in the school varies according to the ability of the pupil, but the average time seems to be about three years. Before being allowed to enter any classes in the school all the male pupils must have passed very severe examinations in general knowledge, equivalent to the matriculation examination of the university student, which carried with it the privilege of serving only one year in the German army instead of the usual three. The number of pupils attending all classes is nearly five hundred. The building is very large, and affords ample accommodation. As in the "Kunstgewerbe" School, the staff of masters and mistresses is a very large one. Scholarships are largely given to help specially-deserving pupils. Often it may happen that a provincial town will send a promising pupil for even so short a time as three months to profit by the instruction and advantages offered by this school.

Uses, Objects, and Methods of Technical Education in Elementary Schools. By Henry H. Cunynghame.

No apology is needed for bringing to the notice of a society founded for the purpose of encouraging the arts and manufactures a subject so important as the education of our mechanics and artisans. A generation has not yet passed away since the necessity of educating the masses of the people was recognised, and only some fifteen years have elapsed since the subject was undertaken in earnest. Though England was late to begin, as compared with foreign nations, yet her progress in this respect has been surprisingly rapid, and bids fair shortly to place her in possession of a system of schools in no way inferior to those on the Continent of Europe or America. But an opinion is steadily growing up, and every day finding more adherents, that our elementary training, whether for rich or poor, is still incomplete, and that it will not become fitted to the wants of the time until it has undergone some grave modifications; for since the framework of our educational system was put together in the Middle Ages great modifications have taken place in modes of thought. The criterion of truth is no longer the voice of authority; the schoolmaster must therefore modify his system. He has no longer a right to require the assent of his pupils by a mere *ipse dixit*. His true province is now to teach his class how to observe and how to experiment and learn of Nature for themselves, rather than to supply them with an encyclopædia of facts supported only by the voice of authority.

In the universities this change of system is silently but rapidly progressing; science-laboratories are rising up everywhere for the experimental method of study, and mathematicians, imitating the example of men like Newton, Gauss, Pascal, Clerk Maxwell, or Sir W. Thomson, are going to experiment for the basis of their theories, instead of for ever proceeding by a deductive method based upon a series of unverified assumptions. So that it is no uncommon sight to see a senior wrangler in a physical laboratory. Even classics, the former stronghold of didactic teaching, is taking the same line. Visits are made to Greece, and scholarships awarded to enable egyptologists to study upon the spot; and, thus understood, classics, instead of being confined to an imitation of the styles of ancient authors, is becoming expanded over the whole field of ancient philosophy, history, and art, and therefore glows with a life, a truth, and a reality that it never previously possessed. In the great public schools, too, the same influence is spreading. Laboratories are being constructed, presided over not, as before, by the nearest country medical practitioner, but by men who have regularly taken their degrees in chemistry and physics. There are botanical and entomological clubs, and in the corners of the playground carpenters' shops are being erected. These shops are, it is true, not yet on a satisfactory footing. Patronised with perhaps a shade of contempt by the classical master, they are often left to the mercies of some superannuated carpenter,

who has never received any sort of scientific education. This neglect perhaps proceeds from the entire ignorance that the whole of the principles of geometry and mechanics can be learned in a carpenter's shop, with pieces of wood, nails, and string, in a manner in which they can never be acquired in the class-room.

Not for a moment is it intended here to deprecate the use of high mathematics, but the principle of virtual velocities, or the conservation of energy, is not half so vivid and real to a boy who has never gone beyond paper-work as it is to one who has been allowed to construct a wooden scale-beam, or been permitted to handle even a home-made gyroscope. Little children have nearly solved the question for themselves by refusing to learn except through the eye and hand; and for them the kindergarten system, when properly used, serves as a method of experimental education. Our Board schools have very properly been framed after the model of our best public schools, and will therefore probably have to follow in their wake. For, if some sort of experiment has been found beneficial in the case of those who are to follow learned professions, how much more valuable must it be to the artisan! Moreover, other influences are at work, making the need of it still more imperative. Up to the present century industries were secrets, they were the property of cliques and classes, they were mostly carried on on a small scale, and the workmen, as well as the industries, were localised in centres, often fixed for them by political considerations, but from which it was very difficult to move. But printing has almost destroyed the secrets of industries; the growth of ideas is destroying trade corporations and privileges; the invention of machinery has diminished small factories; and the railway, while it has increased the localisation of various trades, has enabled the population of artisans to flow freely from one place to another. And thus, in less than a century the whole industrial system of the country has been revolutionised and reconstructed.

This reconstruction has its good and bad sides. Manufactured articles of all kinds are incredibly cheaper than they used to be (regard being had to the change in value of the money-standard). Moreover, there is, for all who choose, far greater chance to enter the class of skilled artisans. But, on the other hand, the mechanic is kept week after week and year after year at the same monotonous employment; and specialisation of labour pushed over-far tends to the degradation of the workman and the diminution of the art-value of his work. This evil produces the result that, although the entry into any trade is more easily open to a mechanic, yet education in his craft becomes more and more difficult, and it becomes more and more hard for him to "rise from the ranks;" and in all trades in which individual skill, adaptability, and thought are required, complaints are increasing that the skilled workman will soon disappear. Under the old system, apprenticeship was the only road to learn a trade. A picture of it has been preserved to us by the pencil of Hogarth. The apprentice paid a fee for instruction, and received his board and lodging as an equivalent for his work. If idle, his master corrected him; if he ran away his chance of employment elsewhere was very small. The master who took an apprentice often gained a friend, a future partner, and perhaps a son-in-law. There was then every inducement for a master to teach his apprentice, and accordingly apprentices were carefully instructed. There were abundant numbers of good artificers in proportion to the demand for their work. The old watches of one hundred years ago show such exquisite taste and skill in the mere embellishment of the interior that the balance-spring covers were models of art-engraving. Thousands of those old watches have been recently broken up in order to turn these covers into ladies' necklaces, the brass being covered with a thick coat of electro-gilding, a fact which reflects anything but credit upon the state of the jeweller's art at present.

The apprenticeship system is now on the decline. This is due to three causes. In the first place, the apprentice rarely boards with his master—the factory system has rendered that impossible—and increased means of locomotion have raised the number of apprentices who live with their parents. In the next place, society is now so large, and trades are so scattered, that an apprentice can easily run away from one master and enter the service of another; so that it is hardly worth while for a master to expend pains in teaching him his trade. Moreover, the factory system creates a demand for half-educated lads, and, by offering wages which appear high to boys of eighteen, induces them to leave their masters just when they are learning most, and on the way to become accomplished masters of their craft. The result is, that formal indentures are now becoming rarer, and boys generally commence to learn a business by entering a shop at 5s. a week, which is an insufficient equivalent for the board and lodging that was once afforded them. There are other causes which also operate in the same direction. In the factory no provision is made for teaching; the master chiefly desires human machines. If he develops skill in a boy he will soon be met with a demand for higher wages, or a threat to leave and carry away some of the secrets of the workshop. It is therefore rarely the interest of masters to do much towards teaching apprentices. On the other hand, the men have a direct interest in doing still less; for each apprentice, when taught, becomes a rival, whose competition aids in lowering wages. Therefore we find that trades unions and societies, so far from facilitating the teaching of apprentices, frequently try and limit their numbers. The sole idea of parents is too often to get the boy to bring home as much money as he can to help the household, and consequently, when the question arises whether he shall go on at a low wage in the place where he is really learning, or leave it in order to obtain a higher wage at a place where his instruction will no longer be progressive, every home-influence is exerted to induce him to take the latter course, to the ruin of his career as a skilled artisan. And, lastly, the boy himself has rarely, at the age of nineteen or twenty, sufficient judgment to resist the alluring prospect of earning £1 or £1 5s. a week, and being enabled to marry and have a home of his own.

It is easier to point out these difficulties than to see how they are to be remedied. In part, no doubt, they will remedy themselves; for every year the industries of Great Britain take a more artistic direction. But true artistic work can never be done by machinery. The greater part of the subtle charm which an artistic object presents is the impress of the mind of the artist. This

tendency, then, of the industry of England to develop in an artistic direction can hardly fail to be of benefit to the artisan. But, still, comparing the immense relative progress made by France and Germany in the art and industrial education of their workmen with the slower progress of England in that direction, there can be no doubt that much requires to be done in this country. Moreover, an inquiry into the causes of the great increase of manufactures on the Continent during the last half-century will show that this increase has been to a considerable extent due to good artisan-education, and will prove that money expended upon technical education will be a profitable investment.

When once it has been decided that technical education is needful for the artisan, it becomes at once important to determine what the nature of it shall be; for, after distinguishing it from purely literary or scientific or art education, it may still be either of a theoretical or practical kind. It may merely endeavour to teach the workman how to apply scientific principles in the execution of his work, or else it may go far beyond this, and endeavour to educate him in manual dexterity. Now, for each of these two kinds of technical teaching there is a proper place. The technical school is the place to learn the application of theoretical and scientific principles to industry, but technical dexterity can only be acquired in the workshop; and, the boundary of them not being always very easy to define, all the more care is needed that neither of these shall intrude on the functions of the other. There is little danger that the workshop will ever become too theoretical, but there is great danger that the technical school may entirely miss its mark, by stepping out of its proper position and trying to become a workshop; and there is also great danger that the attractions of the technical school may blind us to the fact that no technical school can ever efficiently replace the workshop. The barrister is formed at the law-courts and in chambers, not in the lecture-room; the doctor by walking the hospitals, not in the study; and the engineer and mechanic must follow the course; for the generality of men trained purely in the laboratory will never learn to deal with the difficulties of life in the world of practice so well as those who have been brought up face to face with it. Moreover, it must be remembered that no technical school can possibly acquire all the plant and machinery necessary to teach various trades, and to keep constantly up to date in improvements; and, further, that, even if it could, it is impossible to see how a whole population of boys could be fed and clothed while they were learning; for the parents could not support them. And, as trade concerns, technical schools can never be made to pay. If these views be correct, it follows that the apprenticeship-school is to be condemned, and that all technical teaching should be carefully relegated to its true sphere—that of methodizing and systematizing practice, of teaching the reasons for empirical rules, and showing how to reach new ones by skilful inference.

The object of technical-school instruction should be not to make workmen, but to prepare men to become workmen; and, thus understood, it will at once elevate the mind and improve the wage-earning capacity of the artisan. This truth is generally recognised in Germany and in England; but in France a contrary opinion prevails, and apprenticeship-schools have been established there which cost the most fabulous sums to maintain, and which in no way return an equivalent for the money spent upon them. We therefore require a number of theoretical technical schools, well equipped, and adapted for boys and men of all ages from about fourteen upwards. To these schools those will go who can afford to spend some years without earning their bread, and to those schools also will go the cleverer boys who are fortunate enough to win scholarships. But, in addition to this school-course, they will, if their parents are wise, also go thoroughly through the workshop. They may, as is done in Scotland, spend the summer at the workshop and the winter in the school, or they may take two or three years of one, and then spend some time at the other. But for the mass of artisans, at least unless socialism is to come into force, this long course at day technical schools will be impossible. They have to earn their bread, even at fourteen; their parents cannot afford to support them; and, therefore, if elaborate day-schools are provided for them, the result is that these schools will gradually tend upwards, and become the property of the richer classes. It is no use providing for the artisan what he cannot make use of, and you cannot give scholarships for every boy in the whole nation.

This, then, brings us to the two things that we can do. We can at least prepare them in some degree in the elementary schools; we can provide them with evening-classes during their apprenticeship-years, and we can do all in our power to persuade masters and boys to take advantage of these advantages. I propose to consider what method is the best to adopt in the elementary schools. What we want is to prepare an artisan for his work. Now, after arithmetic, the five sciences which are probably most useful to the artisan are geometry, algebra, mechanics, physics, and chemistry. For instance, the making of a clock brings in simple geometry, algebra, and mechanics; a steam-engine requires these and some knowledge of physics also; while a gas-engine demands an elementary acquaintance with all of them. Now, as the first of these I have placed geometry. And I specially desire to include in this the art of looking at a thing, and then being able to remember how it was put together, to make a sketch of it, and to be able to show any one how to make one like it; and the converse—of being able to see a picture of a thing, and then make the thing from the picture. As an example of how much instruction is required in what appears so simple, I here exhibit five little clay models. They were done by five children (of from nine to eleven years of age) selected at random, and quite without any previous training in form, and executed from the drawing that you see of a pyramid. You will notice that there is no idea in their minds of the sharp edges of the pyramid. They have made pear-shaped cones. This shows at once how much they need instruction. Therefore it is here suggested that the elements of geometrical drawing should be taught in the elementary schools, using rulers and compasses, and closely in connection with a carpentry class. The course should not go far, but be thorough, and should include the principal properties of the straight line and circle. Repeated practice should be given in making drawings upside down, reversed, and of different dimensions. (It will be found that very many boys who can do a given problem in Euclid cannot do it if the figure is turned upside down.) The figures should

be drawn out neatly with ruler and compasses; and elementary proof should be given, depending generally merely on symmetry and proportion. The strict logic of Euclid is best reserved till the faculties are more developed. Splendid as is the training, it is too severe for boys of eleven and twelve, and rather retards than advances them in the subject.

Contemporaneously with the geometry class there should be a carpentry class: two lessons of two hours each a week is not at all too much to devote to this purpose. Short lectures should be given on the nature of woods and the use of tools, which should be introduced in proper order; first the saw, then the chisel, and then the plane. But all objects should be made to scale and measurement, and, if possible, little drawings of them made in a book, serving as practice in drawing and a record of progress. Then the jack- and trying-planes should be introduced, and the boys taught the principles of making rectangular blocks of substances, the rules for which are of course the same for wood, stone, or metal. The tests to show whether a surface is true or skew-shaped, &c., should be explained. The boys may then go through a simple series of joints, such as are here shown, in drawing, and made up. But with all this it must be remembered that it is just as easy to do unprofitable handwork as unprofitable headwork, and that technical education badly conducted may become more "mechanical" and stupefying than the worst-conducted book-lesson. The above instructions will probably be sufficient for most boys up to the time they leave the Board school.

The girls, and perhaps some boys, may be treated perhaps more on the artistic side. Instead of geometrical drawing and construction, they might be taught freehand drawing and modelling. I here exhibit a collection of work of a class of little girls at St. Jude's School, Whitechapel. It is not a good plan to place the work to be modelled on a flat table—it should be inclined at a steep angle like a desk, and the design to be copied placed sloping forward above it, so that the planes of both are about perpendicular to lines drawn from the eye to their respective centres. The good arrangement of light is also important. Stone, wood, or metal-work depends on cutting a form out; modelling depends on building up. Hence the procedure in these arts is fundamentally different—a fact which should not be lost sight of.

We lastly come to the question of cost. The annexed list is arranged for a class of thirty boys, there being supposed to be 300 in the school, of whom 150 had two lessons of carpentry each week. The set of drawing-instruments here exhibited has been found to answer very well, and costs, complete, 3s. The best form of bench, I think, is with an iron bench-screw. It is found in the French schools that the boys spoil wooden ones. Tools in carpentry may be divided into three classes—(1) necessary tools, (2) difficulty-saving tools, (3) labour-saving tools. An example of the second is, for instance, the "valet" and the mortising-chisel. An example of the third is the mortising-machine. It is obvious that the beginners should be furnished with the two first of these classes as much as possible, but not with the last. They should learn to sharpen their own tools. To fit up a room with thirty benches and iron screws would cost about £30, and, therefore, adding £1 10s. a head for tools, we have £75 as the price of outfit for the school, including wood. The yearly salary of the teacher would be about the same as the salary of School Board masters. It is earnestly to be hoped that attempts will not be made to introduce turning or ironwork into the schools: it only distracts the attention of the boys, renders the class much more difficult to teach, and ends by spoiling the courses of instruction. It will be quite enough if the boys learn to make a few joints thoroughly, and to do their geometrical drawing fairly well. And so, also, wood-carving and fancy work should be forbidden during school-hours. For the modelling for thirty children we need 5cwt. clay, thirty desks, thirty modelling-tools, thirty boards for clay, a selection of copies. The cost of this will be about £12. I have thus endeavoured to investigate the uses, objects, and cost of technical education in the Board schools; and it seems to me that these and other considerations, which will doubtless occur to the many gentlemen in the room of far more experience than myself in these matters, abundantly show that technical education in the Board schools may not only be made most beneficial to the children, but that this may be done at a cost that need in no way alarm the ratepayer, provided that the system is conducted with economy, and under due direction and limitation.

List of Tools required for an Elementary School for Thirty Boys in a Class.—30 12-in. rules, 1d. each; 30 gauges, 7d. each; 3 5-in. compasses, 9d. each; 3 dozen pencils, 9d. per dozen; nails (various), 4s. 6d.; screws (various), 2s.; 30 protractors, 6d. each; 30 awls, 3s. per dozen; 30 gimlets, 3s. 6d. per dozen; 6 pincers, 1s. 2d. each.; 30 iron wedges, 1s. each; 30 $\frac{3}{4}$-in. chisels, 10s. per dozen; 30 $\frac{5}{8}$-in. chisels, 8s. per dozen; 15 $\frac{1}{4}$-in. socket mortising-chisels, 1s. 6d. each; 15 $\frac{1}{2}$-in. socket mortising-chisels, 1s. 10d. each; 30 gouges (3 sizes), 11s. per dozen; 30 14-in. jack-planes, 4s. 8d. each; 30 20-in. trying-planes, 5s. 6d. each; 1 grindstone, £2; 1 axe, 2s. 6d.; 6 hones (with case), 4s. each; 2 oil-cans, 6d. each; 4 quires sandpaper, 6d. per quire; 1lb. glue, 10d.; 1 gluepot and brush, 2s. 6d.; $\frac{1}{2}$ standard of wood, £5; 1 broom and some brushes, 5s.; 1 spirit-level, 2s. 6d.; 6 screwdrivers, 1s. 6d. each; 6 rasps, 7d. each; 30 22-in. hand-saws, 5s. each; 30 10-in. tenon-saws, 5s. each; 30 Exeter hammers (No. 4), 1s. 6d. each; 30 5-in. mallets, 1s. 3d. each; 30 squares, 2s. 6d. each: total, £58 5s. 7d.*

Sloyd, or Hand-work, as a Factor in Education. By Evelyn Chapman.

At a time when so much is being said and done with regard to technical education, and when it has just been made the subject of a Bill in the House of Commons, which only fell through last session for lack of time for its due consideration, it surely behoves us to look abroad and see what is being done there in the same direction. We find that Sweden has succeeded in elaborating a system of manual instruction for her schools which serves as an admirable preparation not only for technical education, but for practical life. This system is called "slöjd," and is applied to the

* Less an average of 20 per cent. discount for cash gives £46 12s., or £1 10s. 9d. per head.

different kinds of handwork used in schools for educational purposes, though the original meaning of the word is "cunning," "clever," "handy:" compare "sleight of hand." The word "slöjd" is essentially Scandinavian, and an equivalent for it is not to be found in any other language. It is such a convenient term and embraces so much that it would be well to naturalise it in England and call it "sloyd." This word has already been adopted in France and Germany, and I believe in Belgium, Austria, and Russia. There are many different kinds of sloyd, or handwork, practised in the schools of Sweden, Norway, Denmark, Finland, Germany, and other countries. A table has been drawn up of these various occupations, and they have been compared under the following heads, by Herr Otto Salomon, Director of the Nääs Sloyd Seminary for Teachers:—

—	In Accordance with Children's Power.	Draws out Interest.	Objects made useful.	Trains to Order and Accuracy.	Teaches Cleanliness and Neatness.	Develops Sense of Form.	Strengthens Physical Powers.	Acts as Counterpoise to Sitting.	Allows of Methodical Arrangement.	Cultivates General Dexterity.
Smith-work	No	Hardly	Fairly	No	No	No	No, Yes	Yes	Perhaps	No
Simple metal-work ..	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Basket-work	No	Hardly	Fairly	No	Yes	No	No	No	No	No
Painting (trade)	No	No	No	No	No	No	No	Yes	No	No
Fretwork	Yes	No	No, Yes	Yes	Yes	Yes	No	No	Yes	No
Bookbinding	No	No, Yes	Fairly	Yes	Yes	No	No	Hardly	Perhaps	No
Cardboard-work	Yes	No, Yes	Yes	Yes	No, Yes	Yes	No	No	Yes	No
Turning	No, Yes	Yes	No, Yes	No, Yes	Yes	Yes	Partially	Yes	Yes	No
Wood-carving	Yes	No, Yes	No, Yes	Yes	Yes	No, Yes	No	No	Yes	No
Carpentry, wood, or sloyd..	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

It appears at once from a careful comparison of the manual occupations given in this table that, while several of them answer to the above tests in certain particulars, yet only the wood-sloyd can answer all.

I will endeavour to give a brief outline of the chief principles of the sloyd system as taught at the Nääs Seminary for Teachers, near Gothenburg, and which has thence been largely disseminated all over Scandinavia and Finland, and is taught even within the arctic circle. In Sweden alone wood-sloyd is practised in about a thousand national schools, has been introduced largely into the secondary schools for boys, is being adopted in the higher schools for girls, and is even practised with admirable results in the universities. It has also been introduced into France, Belgium, Germany, Austria, Russia, and the United States. A large number of Italians, elementary teachers, eighteen in number, have just been through the last course at Nääs. It will probably be taken up in Abyssinia through the instrumentality of the Swedish missionaries; and even far-distant Japan is showing an interest in the subject. Are we English to be left hopelessly behind in the adoption of handwork as an important factor in education? We have already accepted it—in a very limited way, it is true—in the adoption of the kindergarten system, the very soul of which is its response to the child's need of activity and production. Sloyd is the same principle at work, only in a form suited to the growing powers of our boys and girls.

Sloyd aims at the following results: (1.) To implant respect and love for work in general. (2.) To implant respect and love even for the coarser kinds of honest manual work. (3.) To develop activity. (4.) To foster order, accuracy, cleanliness, and neatness. (5.) To encourage attention, industry, and perseverance. (6.) To develop the physical powers. (7.) To train the eye and the sense of form.

The joining of the sloyd course should be voluntary on the part of the pupil; consequently the work should fulfil the following conditions: (1.) It should be useful. (2.) The preparatory exercises should not be too fatiguing. (3.) The articles made should offer variety. (4.) They should be executed without help. (5.) They should be real work, not play. (6.) They should not be knick-knacks, or so-called fancy-work. (7.) They should belong to the worker. (8.) They should be in harmony with his power and physical strength. (9.) They should be of such a nature that they can be finished with exactness. (10.) They should allow of cleanliness and neatness. (11.) They should demand thoughtfulness, and thus be more than a purely mechanical work. (12.) They should exercise and develop the physique. (13.) They should help to exercise the sense of form. (14.) Lastly, many tools and manipulations should be employed.

Such are the results aimed at; but here a very important question arises—Who is to be the sloyd-teacher? Teachers are already so overburdened with work that it seems too much to expect them to undertake another subject. But for them, too, a subject so novel, and necessarily so differently taught from ordinary school-subjects, would doubtless have its attractions; and, indeed, it has been found in those countries where sloyd has been introduced that it is as great a relief to teachers as to pupils. Whether this be so or not, sloyd-instruction must be undertaken not by an artisan, who would naturally regard it merely from its mechanical side, whereas the main object of sloyd is not the teaching of any trade, but the development of the faculties and the acquiring of general dexterity. It must therefore be given by a trained teacher, who understands the nature of the material on which he has to work—viz., child-nature—and, if possible, by the same teacher who takes the other school-subjects.

I may mention that by means of sloyd, which necessitates individual supervision and instruction, the teacher has an opportunity of obtaining an insight into the character and of establishing a personal relation between himself and his pupils which it is almost impossible to obtain by class-instruction. Numbers of teachers can bear witness to the truth of this statement. Sloyd also acts indirectly with beneficial effect on the other lessons, for it quickens the intelligence and causes children to think for themselves. It has been found in all schools where sloyd has been introduced that greater and more intelligent progress has been made in the ordinary school-work. The teacher

should lead, direct, and control the work, but should be careful not to put his hand directly to it. In order to be able to follow with advantage the course of instruction, the pupil ought to have reached a point of development usually attained about the age of eleven.

One word as to the main differences between wood-sloyd and ordinary carpentering, with which it is very apt to be confused. These lie—(1.) In the character of the objects made, which are usually smaller than those made in the trade. (2.) In the tools used: the knife, for instance, the most important of all in sloyd, is little used in ordinary carpentry. (3.) In the manner of working: the division of labour employed in the trades is not allowed in sloyd, where each article is begun, carried out, and completed by the same pupil. (4.) But the fundamental difference is in the object of sloyd, which is not to turn out full-blown, or half-blown, or even quarter-blown young carpenters, but to develop the faculties, and especially to give general dexterity, which will be useful whatever line of life the pupil may afterwards follow. As individual instruction is generally required, and as this manual work cannot be taught simultaneously, the same teacher can only superintend a limited number of pupils at the same time—generally speaking, there should not be more than twelve.

As to the choice of models: (1.) All articles of luxury are to be excluded. (2.) The objects made are to be of use at home. (3.) The children should be able to finish them entirely without help. (4.) The articles should be made of wood only. (5.) No polish should be used. (6.) As little material as possible should be employed. (7.) The children should learn to work both in the harder and softer woods. (8.) Turning and carving should only be sparingly employed. (9.) The models should develop the sense of form and beauty, and the series should therefore include a certain number of modelled objects, for instance, spoons, ladles, and other curved articles, which are to be executed with a free hand, and chiefly by eye. (10.) By means of going through the whole series the pupils should learn the use of all the more important tools. (11.) In the choice of models care should be taken that each one prepares for the next.

Classification of Models.—(1.) The series ought to progress without a break from the easy to the difficult, from the simple to the complex. (2.) There must be sufficient variety. (3.) Each model must be so placed in the series that the pupil shall be able to carry it out entirely without the direct help of the teacher, by means of what he has already made. (4.) The models should constitute such a series that at each step the pupil may be able to make not a passable, but a correct work. (5.) In making the first models only a few tools are to be employed, but as the series is carried out new tools and new manipulations are to be employed. (6.) The knife, as the fundamental tool, is to be the most used in the beginning of the course. (7.) For the first models rather hard wood should be employed. At the beginning of the series the models should be capable of speedy execution, and objects which require a considerable time should be gradually reached.

Let us now see whether sloyd, if the foregoing conditions be carried out, may be regarded as a factor in education, whether considered physically, mentally, or morally. It is essentially a form of work which calls forth every variety of movement, which brings all the muscles into play, and exercises both sides of the body. It is so arranged that the children can work with the left hand and arm as well as with the right in sawing, planing, &c. Thus all the muscles are strengthened, a more harmonious development attained, and there is less fear of their growing up crooked. There is no reason to dread their becoming left-handed; in more delicate manipulations the right hand will always remain the better of the two. Does sloyd forward the mental development? Surely work which draws out and exercises energy, perseverance, order, accuracy, and the habit of attention cannot be said to fail in influencing the mental faculties; and that it should do so by cultivating the practical side of the intelligence, leading the pupils to rely on themselves, to exercise forethought, to be constantly putting two and two together, is specially needed in these days of excessive examinations, when so many of us are suffering from the adoption of ready-made opinions and the swallowing whole, in greater or smaller boluses, the results of other men's labours. We want whole men and women, the sum-total of whose faculties is developed, who have learnt to apply their knowledge not only in the emergencies, but in the daily occurrences of life; and this readiness, this steadiness of nerve, the ordered control of that wonderful machine the body, the cultivation of the practical side, can only come by exercise, and this is given by means of sloyd. Let us also remember that all skilled work, however humble it may appear, is brain-work too. If any one doubt this, let him try to make, from first to last, some complete object, however insignificant—be it the modelling of a leaf, cube, or even ball, or the making of a wooden spoon, and he will assuredly gain a new respect for handwork, not only from its usefulness, but the skill it requires. What does sloyd do for the moral training of the child? It implants respect and love for work in general, including the rougher kinds of bodily labour. In the fierce competition which exists in all civilised countries—and nowhere fiercer than in our own—which springs in so many cases from the desire to push on to some fancied higher level of life, what a clearing of the moral atmosphere would be effected if the rising generation could be imbued with the feeling, deepening as they grow up into conviction, that it is the man who dignifies or degrades the work, that all labour which proceeds from a noble motive is of equal worth, and that the right work for each one of us, and, consequently, the noblest, is the work we can do best!

But this is not all which sloyd effects in the way of moral influence. It tightens and strengthens the bond between home and school. Everything which the child makes is for home use, is prized there as his own honest work and the product of the skill which he is gaining at school. Among the working-classes the actual use of the things made by the children—besides the wholesome pleasure and pride they call forth—is found to do much in the countries where sloyd is practised to reconcile the parents to their children remaining at school even when they are beginning to be of use at home and to be able to earn something. They have tangible proof in the objects brought home that their children are learning something which makes them useful and

handy, and which will make them readier in future in learning a trade.* I will only mention one other point in which sloyd bears good moral fruit. It implants in the child a sense of satisfaction in honest work begun, carried on, and completed by fair means, and by his own exertions. In these days of scamped work, of dishonest tricks to be found in all trades and manufactures, what can we say too much in praise of a system which will give our boys and girls a sense of the dignity of work—a scorn and contempt for what is slovenly or tricky? The sloyd system is completely opposed to the modern principle of division of labour, which is no doubt a necessity in the present conditions of life, but which would be disastrous in education, where the aim must be the development of each individual, not the getting through a given quantity of work in the shortest and cheapest way. I feel sure that a boy or girl who, at a period when impressions are most lasting, has had the solid satisfaction of carrying out a piece of work from beginning to end, will not be satisfied in adult life with becoming a mere machine for drilling holes, putting on pins' heads, or turning out chair-legs by the hundred, but will, in his leisure hours, vindicate his dignity and skill by doing some work, whether practical or intellectual, worthy of a human being. We must remember, too, that a large part of the distress in bad times is due to the fact that, if the particular fragment of work which a person is capable of is taken from him, he can do nothing else whereby to earn his bread. A man who has had the benefit of sloyd-training is full of resources and can with comparative ease apply himself to new work.

There can be no doubt that there is a real need for some such practical training as is given by sloyd. I wish I could transport my readers to the Swedish schools, so that they might see for themselves the earnestness and energy of the young workers, the dexterity with which they handle their tools, their extreme carefulness (for no damaged or careless work is passed), and the independent manner in which they work. We want something of the kind, suited to our national needs and character, and bearing the same fruit of trained intelligence and skill which sloyd is producing in the countries where it is practised. A great deal is being done in England for technical education, and a great deal is said as to its need, for there is a very real danger of English workmen being driven out of the field on account of the superior skill of foreigners and the great advantages they enjoy in the way of technical training. We can but rejoice that we are beginning to recognise this danger, and that so much attention is being directed to the need of technical education; but, even supposing the country were covered with technical schools, if our young people come to them with eyes and hands untrained, with little or no sense of form and beauty, with lack of perception and the habit of observation, how can they possibly hold their own against the youth of other countries, coming fresh from schools where eye and hand have been trained to general dexterity which will stand them in good stead whatever work they may take up, with trained observation and perception, and with a love for work and an interest in it which has been quickened and stimulated by many a victory gained by attention, perseverance, and energy? Sloyd, then, is the best preparation for technical education.

Should this sloyd-instruction be given to girls as well as boys? This question has already been answered practically in the affirmative in Sweden, and with excellent results. It is just as important for a woman as for a man to have the complete use of her hands. It may be said that girls have needlework, which is more suited to their sex and more useful to them in after-life. It would be a very sorry thing for our future wives and mothers not to learn the use of their needle; but why should they not learn needlework and sloyd too? The use of the tools would develop their muscles, and they would acquire a dexterity which needlework alone cannot give. And, besides this general development, which is of paramount importance, the positive knowledge gained would be of the greatest service to them when they grow up. Another consideration, not to be overlooked, is that a practical knowledge of sloyd would give them a growing experience of and sympathy with men's work. But, it will be objected, even granted that a universal hand-education should be given, including both sexes, and granted that teachers are forthcoming who are capable of giving it, how is it possible to spare time for another subject? I will only reply that the schools in Scandinavia are among the best in Europe, and yet they find time for it. For the girls of our higher schools it seems to me even more important than for their sisters of the working-classes. The latter have to help their mothers at home in many active ways, and get, at all events, plenty of movement and variety of occupation; but the former, who have not so many active games as their brothers, and who are often unable to be much out of doors in bad or severe weather, are lamentably in want of some interesting active work as a counterpoise to the continual sitting and poring over books and exercises. Sloyd of some sort is the very thing they need. I am persuaded that, if only we set our shoulder to the wheel, we shall find in this hand-education the true remedy for over-pressure of brain, which is not an invention of the doctors.

A small beginning has been made within the last year—which promises to shortly open out considerably—in introducing sloyd into this country. During the summer of 1886 I went to study it practically and theoretically at the Nääs Sloyd Seminary for Teachers near Gothenburg, with two friends, one of whom has contributed some valuable papers on the subject to the *Fortnightly* and *Saturday Reviews*. The other has only been able to work for the cause indirectly, as she is the headmistress of a large public school. While I was at Nääs, towards the end of the course, the directress, Miss Nyström, a very gifted teacher and sloydist, broke down completely in health, and, after trying in vain to see what a short rest would do for her, had to resign her post. Her doctors recommended her to leave Sweden for a time, so as to have an entire change of air, scene, and surroundings, and she accompanied me on my return to England last November. During the whole winter and spring she was too much out of health to undertake any active work, but we were not entirely idle. Soon after our arrival I gave a lecture before the Brighton Branch of the Teachers' Guild, which excited great interest, and I am happy to say that in some cases, at all

* In choosing apprentices masters always give the preference to those boys who have gone through the sloyd course, and this fact no doubt contributes greatly to the high esteem with which sloyd is regarded by the working-classes.

events, the interest has proved lasting. I will only mention one instance: Mr. Marshall, the head-master of the B. G. School, was so struck with what he heard of the sloyd system on that occasion that he determined, if possible, to introduce it into his school, and he has only been waiting for the completion of his new workshop in order to begin. He intends to make sloyd part of the regular school curriculum, so as to insure its taking its right place as an educational subject. I have since then given lectures and addresses at Balcombe, Brighton again, Cambridge, Bradford, Sheffield, Leeds, Bedford, and Oxford. Through the medium of the *Journal of Education*, which is always so ready to give a fair hearing to new ideas, and to further them if they are worthy, we were able to bring before the public the principles of sloyd, and to prepare them for the first attempt in this country to train teachers in its practice so as to enable them to introduce it into their respective schools. As this training can only be given in the holidays—for it means several hours' work a day—we resolved to give our first course during the summer holidays, and we chose Bedford for the purpose on account of its being an educational centre, and also within a few minutes' walk of the country—a great consideration to jaded teachers. Fourteen members joined the course, some of whom have already begun to teach sloyd in their turn.

As an indication of the remarkable way in which the wave is spreading all over the world in favour of manual training as part of education, I may mention that we have received invitations from the United States and even from Natal. I pass over the many we have had from different parts of this country. Another point worthy of remark is that we are beginning to receive applications from private families as well as schools for sloyd-teachers. These we have hitherto been unable to supply, but we hope soon to open a register for sloyd-teachers, so that we may be able to supply this demand. The numerous inquiries we continue to receive on the subject of sloyd, and the indications to be met with on every side as to the general interest attaching to the question of hand-education, have determined us not only to give another course of sloyd-training during the Christmas holidays, but to start an institute which we hope will become a centre for sloyd in this country. We intend, though on a small scale, to make the arrangements of this institute as perfect as possible, so that those who wish to introduce sloyd into their schools may be able to see the best kind of benches, tools, wood, and fittings for school purposes. We also hope to hold classes for boys and girls, as well as for adults, for it is impossible fairly to judge of the merits of sloyd unless it is seen at work on children. We have determined to establish ourselves at Birmingham, which, true to its motto, "Forward," is so ready to welcome new ideas and methods. We hope to be able to open the institute in time for our next course for teachers during the Christmas holidays. As few can spare six weeks during the shorter winter vacation, we propose to give a four-weeks course instead of six, but to devote six hours a day to the practical work instead of four, so that as many hours will be given to it as during the summer course. We trust that students will not find six hours a day more tiring in winter than four in summer.

Before drawing this pamphlet to a close it might perhaps be as well to mention some of the advantages to be gained from studying the sloyd system in England rather than in Sweden. I do not at all wish to deny the counter-attractions of going to study it in its native soil, such as change of air, scene, customs, and surroundings, and the satisfaction of feeling that one is acquiring knowledge of the system at head-quarters. On the other hand it is clearly an advantage to learn from a compatriot or from some one who possesses our language as thoroughly as Miss Nyström does rather than from those who either do not know English at all or very imperfectly. Secondly, we never mean to take more than a limited number, so as to be able to give each student thorough individual attention. Thirdly, the series of models given at Nääs, though admirable for Sweden, naturally enough does not in every particular suit this country, with its different ways and customs. Few teachers have time and experience enough to alter the series, for it demands much thought and care to replace certain models by others answering the same purpose with regard to sequence and processes, and yet of use in this country. We have begun to do this, and hope to get in time a series of models still more applicable to this country and yet strictly carried out on the Nääs principles. Lastly, at Nääs the students have often to spend considerable time and strength in sawing off the wood they require from rough logs. It does not so much matter in their case, as their course is a longer one. Still, this really hard sawing is severe work for women, and, in order to economize time and strength, we have the wood carefully prepared.

One word in conclusion. Here is a system of tried value which has already borne excellent fruits, and brightened and rounded many young lives. Shall we thankfully accept it, or are we going to have nothing to do with it, or, worse still, "damn it with faint praise"? The need of such a system is universally admitted; many of us feel that we have suffered all our lives from the want of some such practical training in our own young days. Are we not ready to give our boys and girls this training, which will make them more complete, and thus better equipped to fight the battle of life? Is there any other system ready and able to help us in this matter as it has been proved by years of trial that sloyd can do? If not, is it not our duty—shall it not be our pleasure—to do what in us lies to give it a hearty welcome in our midst? We are proud, and justly proud, of our position as Englishmen; but I think we can well afford to recognise more heartily and generously the quota which each civilised nation brings to the intellectual wealth of all. Even those who are small in population, and not so well endowed as ourselves with natural advantages, do their part relatively perhaps better than we do ourselves. Certainly Sweden has contributed largely to the progress of this century. I will only remind you of these three facts: It was a Swede, Captain Nordenskjöld, who, in the little "Vega," first made the North-east Passage; it was a Swede, Peter Henrilk-Ling, who has given to the world the most scientific and comprehensive system of gymnastics; and it is Sweden who again comes forward and offers us the hand-education which, if rightly used, will give our children a completeness in their training which it at present lacks.

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