1898.

NEW ZEALAND.

EDUCATION:

MANUAL AND TECHNICAL INSTRUCTION.

NOTES AND SUGGESTIONS BY ARTHUR D. RILEY, DIRECTOR FOR TECHNICAL INSTRUCTION TO THE EDUCATION BOARD OF THE WELLINGTON DISTRICT, NATIONAL SCHOLAR AND GOLD MEDALIST OF THE SCIENCE AND ART DEPARTMENT, LONDON, ETC.

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

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INTRODUCTION.

THE present notes and recommendations are based upon many years of experience and a recent visit to some of the more important educational centres of England and Scotland.

Although I have visited a large number of institutions I have made no comments upon their work, nor have I included statistical information, but have contented myself by quoting such portions of their proceedings as are likely to be of service to our New Zealand institutions.

In every town visited I found great activity in the cause of technical education, from the simplest elements in the primary schools to the highest stages of university training; and, as an instance of this, while I was in Birmingham a meeting, held with a view to adding a Midlands University to the already splendid educational equipments of the district, realised the sum of £95,244. The London Technical Education Board alone spent last year the sum of £117,744 in this cause, and in every town of a few thousand inhabitants provision is made to improve the rising generation in matters pertaining to every-day life. In the larger cities enormous buildings of excellent design, with every possible convenience and accommodation, have been erected to meet the constantly increasing requirements.

I am forced to one conclusion, and that is, if New Zealand desires to maintain her position among British colonies this question of technical education will need serious attention, and must be placed upon much broader lines than are at present contemplated.

I trust that the suggestions contained herein may serve to promote the cause of this education.

TECHNICAL INSTRUCTION.

Technical instruction, as defined by the English Act of 1889, is as follows: "The expression 'technical instruction' shall mean instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to special industries or employments. It shall not include teaching the practice of any trade, or industry, or employment, but, save as aforesaid, shall include instruction in the branches of science and art with respect to which grants are for the time being made by the Department of Science and Art, and any other form of instruction (including modern languages and commercial and agricultural subjects) which may for the time being be sanctioned by that department by a minute laid before Parliament, and made on the representation of a local authority that such a form of instruction is required by the circumstances of the district. The expression 'manual instruction' shall mean instruction in the use of tools, processes of agriculture, and modelling in clay, wood, or other materials."

Primary Schools.—No part of the funds provided for technical education may be expended in Britain upon children in attendance at a primary school, the funds for such purpose being provided by the Education Department.

In New Zealand we are fortunate in having technical education under the control of the Education Department, which undoubtedly tends to strengthen the position, for upon the development of our primary-school system the success or otherwise of technical work greatly depends. There can be no doubt that one of England's greatest difficulties has arisen from the multiplicity of departments controlling education.

In this sense I am anxious to see the New Zealand educational course made progressive from the primary to the secondary and technical, and from thence to the university without such undue overlapping as has occurred in Britain.

Trade Instruction or Workshop Training.—The English Act distinctly states that "it shall not include teaching the practice of any trade." My inquiries upon this important point have elicited the following reply: "That instruction may be given in the actual practice of any trade so long as that practice deals with principles and methods of work; should the work, however, be continued for the purpose of obtaining manual dexterity it is trenching upon trade practice."

There is practically no difficulty found in the administration of this clause of the Act, wide interpretations being generally accepted by the authorities.

SECTION 1.—PRIMARY EDUCATION.

(1.) Kindergarten and varied occupations.
(2.) Drawing.
(3.) Brush-work.
(4.) Elementary science.
(5.) Manual instruction.
(6.) Domestic instruction.

1. KINDERGARTEN AND VARIED OCCUPATIONS.

Everything that can be devised in the way of higher technical instruction will fail if our primary and secondary schools are not efficient. Everything therefore that tends to promote the intelligence of children from the earliest age is of importance. In this sense I would urge the adoption of kindergarten schools in every district throughout New Zealand; for, to my mind, the methods of kindergarten work are of the truest educational value. With its clay-modelling, paper-folding, mat-weaving, stick-building, &c., the child's life is made interesting and instructive. Manual instruction is in fact commenced, for notions of work, order, and neatness are at once instilled into them.

Herbert Spencer once said, "The school courses of England leave out almost entirely that which most nearly concerns the business of life. Why is it," he asks, "that clerical work is considered more genteel than carpentry and similar occupations? Is it that fathers and mothers consider manual work degrading, or is it the fear of what society will say?" Such remarks were undoubtedly applicable a few years ago to English education, but the cause is rapidly disappearing. Great changes in methods and ideas of instruction have taken place within recent years. Kindergarten methods are widely adopted in the standard instruction, and in many districts are compulsory. Manual instruction in wood and iron, and domestic instruction, is now taught in every county in England. In no single instance have I found the primary-school teachers speak adversely of the new order of instruction, but, on the contrary, the highest and warmest praise has been given.

Our New Zealand system of primary instruction may, I am sure, follow with advantage the changes made in England. Our children undoubtedly learn to read, write, and cipher, but this is not all that is required in a colony such as New Zealand, where fully 90 per cent. of our school children must enter agricultural or industrial pursuits.

There can be no doubt that a child's school-life gives a bias to his future career. Why, then, should instruction not be given in those subjects which will aid more directly to fit a boy for his after-life? Children should be taught how to work and to love work—that is, if education means fitting a man for his future.

Many years ago I urged the introduction of varied occupations as a part of the Standard work, and having given special attention to this subject whilst in England, I return with a still stronger impression of the necessity of such a change in our course of instruction.

Between kindergarten work and the work of the Standards there is at present an unfortunate gap. Why should the occupations and methods of the kindergarten (the truest system of education) be completely dropped where they are likely to be most beneficial? I strongly urge the advisability of continuing such exercises as clay-modelling, paper-cutting and -folding, and use of coloured papers, bricklaying, wire-work, cardboard-work, brush-work, &c., in the Standards. I find that in some schools these lessons, combined with drawing, singing, and drill, occupy practically the afternoons of Standard I., and in many cases Standard II., including object-lessons; and opinions are strongly expressed as to the better efficiency of other work in consequence.

I suggest, therefore, as a means of bridging the gap between kindergarten and Standard work, that the following exercises be introduced as a part of the ordinary course of the Standards: (1) Modelling in clay; (2) cutting-out in paper and folding; (3) bricklaying; (4) wire-work; (5) modelling in cartridge-paper or cardboard; (6) brush-work, from a sketch or from the object. The materials for all such exercises should be provided by the Education Board of the district, or by the Education Department through the Board. In no instance have I found the schools supplying their own material; this fact has, undoubtedly, contributed greatly to the success of the work. Such stores as are required are applied for upon forms provided once or twice yearly at a given period.

There is no desire upon my part to increase the burden of teachers with regard to the number of subjects taught, as I have already stated a change in the syllabus is necessary if time is to be devoted to hand- and eye-training exercises. Nor do I suggest that all the exercises named should be introduced; freedom of choice and the gradual introduction of this work is all that I ask.

The course of work pursued varies in the different districts: In London freedom of choice is given, but it is necessary that work in varied occupations shall be continued as a part of the Standard work. The Burleigh Road School contributes excellent work in cardboard-modelling, mounting coloured papers in various design forms, and clay-modelling; Thomas Street School, a very systematic course of brush-work, cutting-out and modelling; Alma Road School, a very elaborate course of brush-work and design. Birmingham sets forth the work definitely in the following order: Standard I., paper-folding and cutting; Standard II., bricklaying and parcel-tying; Standard III., wire-work; Standard IV., cardboard-modelling.

No hard-and-fast code of work is laid down in any of the sections named, as it is considered it would only cramp the usefulness of the work in obtaining accuracy and intelligence. Discretion is left to the teacher to lead—not push—the children on to such exercises as they can accomplish intelligently. One hour per week is required to be devoted to the exercises in addition to the time set apart for drawing.

In the introduction of this work in our New Zealand schools the question of the time available is one of importance. I suggest that one hour per week be given in Standards I. to IV. for varied occupations, and two hours and a half per week in Standards V. and VI. for manual or domestic instruction. As a guide to teachers in this matter, I have obtained a copy of a time-table of the Rea Street School, Birmingham, which will be found in Appendix A.

The great importance of the subjects named as a means of training in handiness leads me to give brief information relating to each section, suggesting that one hour should be devoted to the course of exercises as laid down by the Birmingham Board for Standards I. to IV.

Paper-folding and Cutting-out.—As an exercise in accurate measurement and judgment paper-folding is one of the best methods of arousing the child's faculties, and one well calculated to develop the use of the fingers. The exercises are mainly in folding paper into the simplest possible figures, and gradually developing a system of modelling the simplest objects in paper, such as a cube, basket, box, pyramid, &c. The child's constructive faculties are brought into action, and the fact of it being able to make the shapes of useful articles gives it a sense of power and pleasure in having accomplished something.

Useful text-books are: "Practical Lessons in Paper-folding," A. W. Bevis (Newman and Co.); "The A.L. Kindergarten Scheme," Eleanor Lewis (E. J. Arnold and Sons); "Hand- and Eye-training," George Ricks (Cassells and Co.); "Hand- and Eye-training Cards for Class-work," Cassells and Co. Exercises in cutting-out may be obtained by cutting out as class-lessons the simplest figures drawn upon paper.

Bricklaying.—Drawing, in this as well as in the previous work, must be the medium of conveying the teacher's wishes to the class. The children should be taught to lay the bricks in the required position, from the drawing of the plan and elevation upon the board. Attention is also drawn to proportion, length, breadth, and thickness. Later exercises reverse the order of work, the teacher placing the bricks, the children drawing the plan and elevation. These exercises are capable of considerable development, and are most instructive. The only requirement is a small box of bricks for each child. A. W. Bevis's and G. Ricks's text-books contain all the necessary exercises.

Wire-work.—This series of exercises afford a complete relief to those of Courses I. and II., and as developed by the Birmingham School Board produce very satisfactory results. The simplest forms are executed in wire with the aid of a pair of flat pliers, the exercises are then elaborated until useful objects are made, such as letter-racks, bill-files, &c. The dexterity of the children is remarkable, and the pride and pleasure of the children in their productions is not the least pleasing feature of the work. The text-book used is A. W. Bevis's (Newman and Co.).

Modelling (Cardboard or Cartridge-paper).—Simple plane geometrical figures may readily be cut in either cartridge-paper or cardboard; this may be followed by geometric solids, commencing with the cube and following on with the square prism, square pyramid, cone, cylinder, and the many-sided prisms and pyramids. This work may be interspersed with the making of simple articles, such as blotting-books, square and hexagonal trays, small boxes, letter-racks, and other similar and useful articles. This work is an excellent training, as accurate measurement and careful drawing are required, as well as careful manipulation in cutting. It further furnishes elementary notions of construction, and is a valuable aid to practical plane geometry. Some of the forms constructed will lend themselves to decorative treatment either by drawing from memory some suitable exercise previously drawn, which will fit the space, or by using coloured paper to form suitable patterns. Useful text-books will be found in Heaton's "Cardboard-modelling," A. W. Bevis's "Cardboard-modelling" (Newman and Co., London); George Ricks's "Modelling Cardboard" (Cassells and Co.).

Modelling in clay will be found one of the most effective occupations, demanding as it does accurate observation. Clay- or sand-modelling may be used as an illustration of a geography lesson by modelling a representation of the country, showing the principal rivers, &c., or of part of a district. In many instances models may be made of the object used for object-lesson, particularly of fruits, seeds, vegetables, &c. Take a bunch of leaves, explain their form and construction, and show how they may be adapted to some simple design. Then ask the children to model a leaf or take impressions of several leaves upon a square slab of clay, producing some symmetrical form, and cutting away the superfluous clay. Such lessons as these will have great interest for the children, and prove invaluable from an educative point. Clay-modelling may readily be combined with drawing, suitable exercises being drawn with a modelling-tool upon clay slabs, the surplus clay being removed upon completion of the drawing. Such an example as the shamrock-leaf lends itself particularly to this method of treatment. All such exercises are of the best educational value, and are a relief to the ordinary methods of procedure.

Cutting out and forming Designs with Coloured Papers.—Excellent designs, from the simplest to the most complex, may be obtained by the use of a variety of shades of coloured papers; drawing, cutting-out, and mounting are combined in these exercises. An example of this work by a scholar of the Burleigh Road Board School, London, where I found excellent work in this and other varied occupations, is reproduced (see Illustration I.). These exercises might be used with advantage in the Sixth Standard and above, where the full first-grade drawing certificate is held by scholars, or as a relief to the ordinary drawing instruction, for a few lessons. The advantages are that it promotes a sense of harmony and proportion, accuracy and good taste, in colour and design. Care, however, should be taken that the exercises do not become too intricate, or the manipulation is likely to become very monotonous, and destroy the aim of such exercises. The most useful text-book is "Designing with Coloured Papers," by George Ricks, published by Cassells and Co., price 2s.

Brush-work is remarked upon in Part 3 of this section.

I cannot urge too strongly the careful consideration by all teachers of the value of the exercises suggested in this chapter. The high opinions held by English teachers, and the results obtained in the various districts, should be sufficient in itself to warrant their introduction in our New Zealand standards. The exercises are in every sense educative; not only will they relieve the present monotony of exercises, they will impart a knowledge of form, colour, and the properties of material, and at the same time foster a certain amount of manual dexterity, which may be made a stepping-stone to exercises in other materials, and, lastly, help to place in the hands of children something which may give them a love for occupations outside their ordinary school-life, and tend less to literary occupations. It is of interest to note that these occupations have been introduced into over five hundred departments of the London School Board.

Training of Teachers.—Special provision is made by the majority of the English Boards for the training of teachers in the subjects mentioned. Evening classes are, in addition, held by

many County Councils. I suggest that Saturday classes be established by the various technical schools in conjunction with drawing, and evening classes when a sufficient number of applicants present themselves, the instruction being provided free of cost.

Departmental assistance would be rendered by the payment of capitation upon attendance of teachers at the various classes held for special training in these subjects in accordance with the Technical Instruction Act. I further suggest the payment of a bonus of 10s. for every certificate gained for competency in any one of the occupations named, the maximum sum paid to any one teacher being £2. Such examinations should be set by the Education Department, or to the satisfaction of the same.

2. DRAWING.

If the public-school system is to be made the instrument whereby our future workmen are trained in technical work, then drawing must be thoroughly taught. The importance of drawing as an industrial subject cannot be overestimated.

Regarded aright, drawing is the most potent means for developing the perceptive faculty—teaching a student to see correctly, and to understand what he sees. Drawing, if well taught, is the constant practice of the analysis of form. By this practice the eye is quickened and rendered incomparably more accurate; and, as the eye is the most open and ready road to the mind, the full development of its powers is a matter of the utmost importance to all, bearing as it does upon the general intellect in a practical direction.

No industry can wholly dispense with drawing, for in almost every case something has to be made; the first step must therefore be either a drawing or a model—often both. Drawing must be accepted as a language common to all, and equally as indispensable as writing. As a basis of industrial education it is now recognised throughout the world. In France it is taught to every boy and girl in the primary schools for four hours each week, and in secondary schools for eight hours; and in Germany, Austria, Belgium, Sweden, and Switzerland it is compulsory throughout all schools. In New Zealand we are fortunate in having drawing taught throughout the primary schools. Unfortunately many teachers fail to appreciate its advantages, and from my knowledge of their work, and judging from the papers submitted by candidates for the annual teachers' examination, much remains to be done before the old prejudice is overcome. It is undoubtedly necessary that those teachers who show incapacity in this direction should be warned to give due attention to the requirements of the syllabus.

The old idea that talent is required is long since exploded. If candidates can write they can draw, at any rate, sufficiently well to meet all requirements of the syllabus, providing attention is given to the study of the same. I fully understand the difficulties of many country teachers, but these difficulties have almost disappeared. Text-books and diagrams are plentiful, and aids of every description are available. Why, therefore, should the whims and caprices of individuals be permitted to interfere with the general welfare of the State in its educational progress?

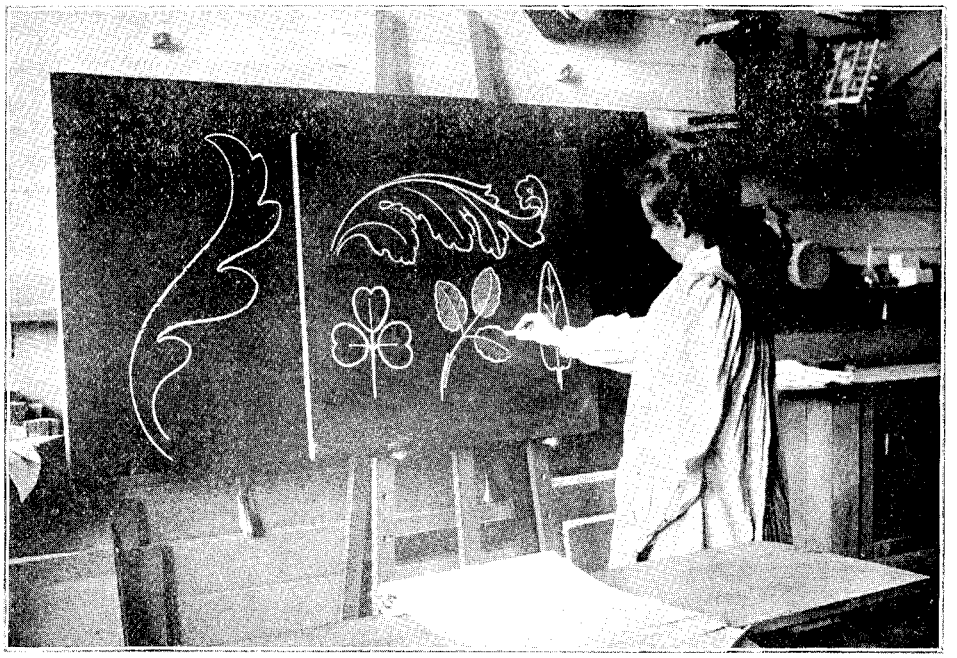
I would again recommend the department to make failure in drawing a failure in the general examination, and that each section of drawing in which a certain percentage of marks is obtained should entitle such candidate to a special certificate. This would enable him to devote his energies to one or other of the remaining sections, instead of, as required at present, the whole four sections.

Drawing in the Standards.—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 minds, 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.

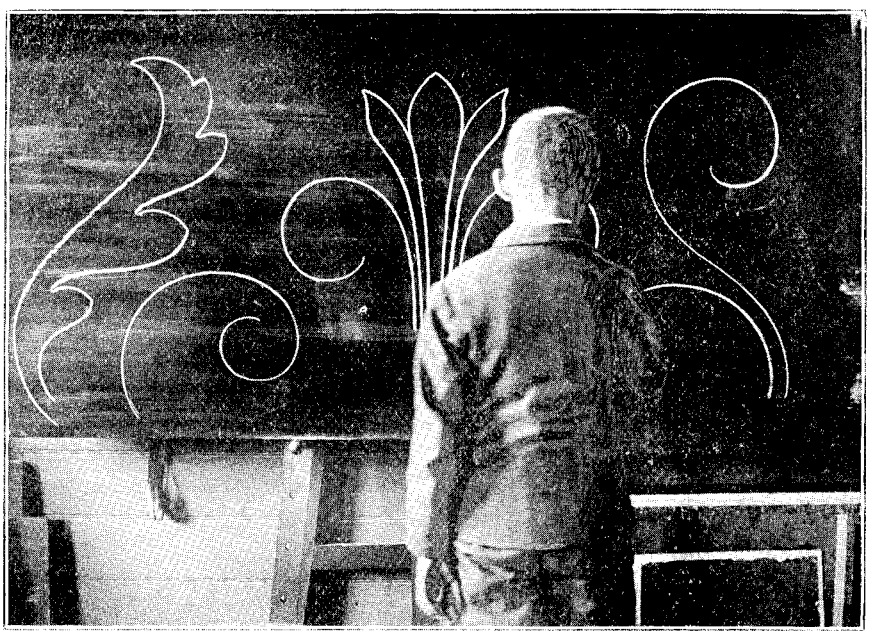
Standard I.: Throughout the standards I advocate the entire exclusion of drawing-copybooks—that is, books containing printed diagrams with a space set apart for the reproduction of the copy.

The child should be made to see and think for itself, not merely copy what others have done. In such cases 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. A certain amount of work from large diagrams is admissible, but should only form a minor part of the instruction up to Standard III. In all standards I strongly advocate the use of small solids as a basis of instruction, the children handling the objects and describing the same, with applications to surroundings, cutting-out of plane shapes, &c. In this standard I recommend the use of plain slates, using the whole side, or brown paper with white and coloured chalks, as suggested under "Shoulder-work." No exercise given should be less than from 3 in. to 4 in. in size. Memory, dictation, cutting-out, and clay-modelling exercises should form a part of the drawing-lesson.

Memory-drawing and cutting-out exercises combined will be found invaluable, as also will dictation-work. The latter is undoubtedly one of the most educational subjects; it involves the habit of the correct use of language by the teacher, and the closest attention upon the part of the scholar; it is really illustrative drawing in the truest sense. Application of simple exercises to borders on patterns should be given, say, upon brown paper, using white and one or two coloured chalks, or brush forms, as suggested under "Brush-work"; in these exercises the ruler might be used with advantage. 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;



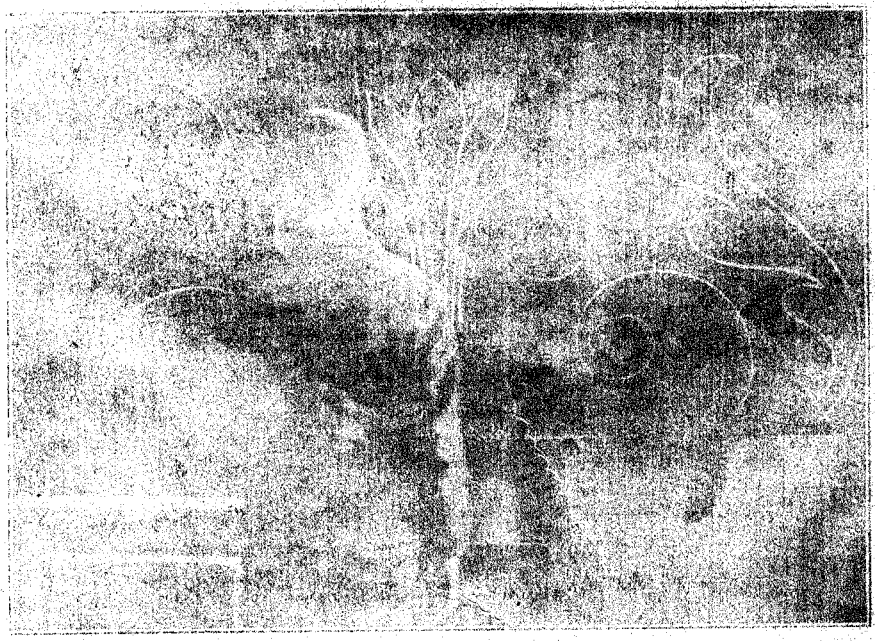
14.—SHOULDER WORK



15.—SHOULDER WORK.

To face p. 32





the great gain is in having exercised the mind, the eye, and the hand together. Blackboard practice upon a large scale should be given to the scholars when the board is not in use.

Standards II. and III. would be a continuation of the same scheme with more advanced exercises, using plain-leaved drawing-books, and shoulder-work upon brown paper. Modelling in clay or cartridge-paper should be given in relation to carefully selected exercises. The brown-paper and chalk work might well be continued for the first six months in Standard II., when the simplest brush-form exercises might be introduced, and continued more regularly in Standard III. The whole aim of the work in the first three standards should be expression of the children's ideas by the most varied and interesting means.

I recognise the fact that not less than two hours per week will be needed for this work, but my hope is that the Education Department will see the way to a rearrangement of other matter to enable this and the varied occupation exercises to be done effectively. The result of my inspection of the various schools in England has shown me that it can be done, not only without detriment to, but with increased efficiency to, other sections of educational work.

Standard IV.: This standard will deal almost entirely with plane and elementary solid geometry, combined with cardboard-modelling of the solids dealt with. In many schools one hour is also devoted to freehand exercises of the first grade, where reductions from large charts and enlargements from small cards are made a basis of instruction. This section should combine exercises in brush-work with the freehand, a description of which will be found in a separate chapter.

Standard V.: Scale-drawing, freehand, and brush-work will form the main work of this section. In scale-work there has been a tendency to rely too much upon Bacon's scale-charts, or upon Blair's or Hutton's books. Too little attention is given to the construction of the scale, and to the real requirements of the work—that of taking actual measurements from objects, a small rough sketch being made by each scholar in an upper corner of the drawing-book, the measurement being called by the boy who measures the object, and marked upon the rough sketch, and the drawing then made to a given scale from the sketch provided. Not less than two-thirds of the work in scale-drawing should be done from actual measurement, say, from school furniture, doors, maps, windows, fireplaces, shelter-sheds, &c., or using surveyors', builders', or engineers' drawings, which may generally be readily obtained from interested firms. Attention is required particularly to the condition of the instruments used. The freehand and brush-work exercises will be of a more advanced character.

Standard VI.: In Standard VI. solid geometry and model-drawing should be combined, as a knowledge of ground-plan and elevation of the objects to be drawn will insure success. Wire and solid models should here be used conjointly. Common objects such as table, box, cup and saucer, book, bottle, bucket, bell, flower-pot, saucepan, dish-cover, milk-can, coffee-pot, &c., should be combined with the models from the set of geometric solids usually provided.

In solid geometry, plans and elevations should be given of the various simple solids, using cardboard models made by the scholars. Application of these solids to common objects should be given as much as possible. This series of exercises should receive attention, as they are of the highest importance to the constructive trades.

The question of manual instruction and domestic economy for these standards is dealt with in separate chapters.

As it will be many years before the above subjects can be generally adopted, I here give suggestions for more advanced work for those scholars who are enabled to proceed.

Should my suggestion regarding the first-grade drawing examination be generally adopted it will be found that large numbers of scholars will in the Sixth Standard have completed their full first-grade drawing certificate. The following methods of occupation may be utilised in such cases:—

In brush-work more advanced exercises in flowers, foliage, and plant-form, particularly native plants, using several colours, as described and illustrated under "Brush-work"; flat-tinting of freehand exercises, as suggested by Bacon's new drawing-charts or Ricks's brush-work; modelling in clay from elementary casts, common objects, or foliage, or tracing simple designs upon slabs of clay about 6 in. square and ½ in. thick; application of geometrical patterns to simple tiles, using about three or four colours, or formation of patterns (Ricks's method), using coloured papers cut and mounted so as to form complete designs; transferring by pricking and pouncing with charcoal simple designs on borders (made from previous drawings) to aprons or clothing; adaptation of the same to stencil borders for boys; drawing to scale from mechanical models or machine parts borrowed from local foundries, or from actual measurement of school-buildings, &c.

Freehand Shoulder-work.—All the more modern school-buildings are now provided with large central halls, Manchester and London having special accommodation in this respect. The halls, particularly under the London School Board, are so arranged that drawing-blackboards are placed upon a ledge around the walls.

Shoulder-work in freehand drawing—that is, drawing done at arm's length—is thus permissible. (See illustration, Plates I*a*. and II.) Occasionally this is done upon the blackboard, but oftener the work is done upon brown paper with charcoal, white or coloured chalks. In two or three schools I saw classes at work. Headmasters and teachers generally speak highly of the results of this work. This method of work will, unfortunately, be impossible under our present condition of school-buildings. The next best available method is to obtain stout strawboard about 2 ft. long and 12 in. wide. This may be blacked as a blackboard upon one side and left plain upon the other. Insert this lengthways in the slot at the back of the desk. The scholar may then, by sitting upright, draw freely at arm's length. Should brown paper be used the same is fastened by means of patent clips to the strawboard. This method is adopted at the Alma Road Board School, London. Examples of work done in my presence are shown (Plates III., IV., and V.). Valuable suggestions from the supplementary drawing syllabus published by the Science and Art Department are also given in Appendix B. It will be noticed that all standards from I. upwards may be required to work in this manner.

The syllabus also states that the boards are not to be turned about, nor the position of

the body shifted, in order to draw curves or lines in various directions. The forms produced and their combinations will naturally suggest decorative and natural shapes, and it should be the object of the teacher to develop this association of ideas.

Special chalks are made by Messrs. G. Rowney and Co., London, samples of which may be seen at the Education Department or at the Wellington Technical School.

3. BRUSH-WORK.

The supplementary syllabus issued by the Science and Art Department for the use of primary schools (see Appendix B), and the importance attached to the same by a large number of schools, leads me to devote a special chapter to the subject.

The aims of brush-work are a cultivation of sense of colour and form, particularly in relation to "patterns and repeats," in which "the natural forms of plants and animals may be broadly treated as motives of ornament and employed to fill given spaces." Such designs are to be executed with chalk (used at arm's length), as just described, brush and water-colours, in a free, bold manner. For the purpose of such designs "large leaves and parts of plants may be drawn from in outline. Geometrical forms may be utilised and regarded as the foundation for ornamental arrangements of natural objects, animals, plants, and the like." The skill thus obtained may be applied to drawing from the round or the flat, and to memory reproduction. I visited the Alma Road Board School (London School Board), under the headmastership of Mr. Seth Coward, where I found excellent proof of the value of such instructions. The school has about three hundred scholars in the boys' department, which I inspected. All boys are taught brush-work.

Mr. Coward has overcome the difficulty of drawing at arm's length by inserting a piece of millboard 22 in. by 12 in. by ¼ in. in the slate-slot of the desk. This may be used either for drawing upon or for attaching paper to with clips, and has been found to answer all requirements. Brown paper of various shades is freely used for the white and coloured chalk-work; six colours being selected and sold in boxes, samples of which I have obtained. For brush-work each boy is provided with three sable brushes, it being found cheaper to do so than to provide camel-hair brushes. A palette, water-bottle, and box of water-colours is provided for each desk of two boys in the upper standards. In the lower classes—practically our Standards II., III., and IV.—bottles of coloured ink mixed by the teachers are provided. The boys of the upper classes mix their own colours, and white paper is used. Occasionally brown paper and sometimes squared paper is used.

I cannot do better than quote Mr. Coward's description of the work: "The size of the classes, ranging from fifty to seventy, has determined that in the main the teaching must be given to the class as a whole. The blackboard has had to play a very prominent part. Each elementary form, such as the oval, has been carefully demonstrated on the board. As soon as the class has attained some mastery of the particular form, whether produced by chalk or brush, practice is obtained by allowing each scholar to form a simple arrangement in different positions with different colours. Then half and quarter of the oval are similarly taught, arranged and combined with one another. In the case of the brush forms, the form which is being demonstrated is drawn on the board on a large scale with coloured chalks, and also drawn in colour with a large demonstration brush on a sheet of paper fastened to the blackboard. When forms are thus known they are also arranged and combined by the teacher at the board. The class then forms similar but not identical combinations. Elements and combinations are copied, not as the end, but as the beginning of the scholar's own work. All copying is preparatory for and subsidiary to reproduction in design." In the upper classes studies are sometimes made from nature—leaves, plants, and flowers being freely copied, and afterwards employed in design. The time given is two hours per week. The best drawings of the day are exhibited upon the class-room walls, and when all available space is filled a drawing to gain a place must be better than one of the same stage already on exhibition. The children are allowed to the full their play of the inventive faculty; and there can be no doubt the exercises greatly stimulate that faculty, and encourage a boy to believe in his own powers to a reasonable extent. The delight of the children in the production of these exercises is one of the pleasing features of the work, and leads one to conclude that design and artistic power are capable of production in every scholar.

By the courtesy of Mr. Coward I am enabled to show examples of this work done in ordinary class during my visit to the school. (See Plates VI. to XII.) The work shows that the new syllabus issued by the department is of the highest educational value. It is but fair to remark that exceptional conditions are required to have brush-work taught in the manner adopted at the Alma Road School. Each member of the staff has been carefully trained by Mr. Coward to obtain the required result, the excellence of the work in every standard being mainly due to his enthusiasm and able direction. The brush-work of Thomas Street School, under the direction of Mr. Gill, was also particularly worthy of note, a carefully graduated scheme having been prepared. This scheme, however, is not carried to the extent characteristic of Alma Road, which is exceptional in its working.

I do not suggest for one moment that the various sections of work described should all be tried. I have given them as instances of what is being done, with a hope that some of the work may be taken in hand as deemed advisable or suitable to the needs of particular schools. As to the value of such studies there can be no question, and nothing has impressed me more in my recent visit than the extent of this work, and the high value set upon it by the teachers by whom the instruction is given.

General Remarks with Reference to the Three Foregoing Subsections.

Special Instruction in Drawing and Modelling.—In certain centres there are higher-grade schools attached to the primary schools, where courses of science- and art-work are conducted, and grants obtained under the Science and Art Department regulations. Special instruction is here given under the London School Board regulations to scholars who have exceptional ability for drawing or modelling. Teachers who are desirous that scholars from their schools may attend these centres make application to the District Drawing Instructor. The centres are open from 9.15 a.m. to 12 noon, and from 2 p.m. to 4.30 p.m. Children attending go direct from their homes, the art teacher being responsible for the registration of attendance and forwarding a notification of

such attendances to the headmaster of the school from which the scholar comes, who, upon receipt of the same, marks his register with the letter D within a circle.

It would be possible that scholars in New Zealand showing special aptitude in this direction should be permitted to attend the local art schools where such are in existence, and that the Education Department should recognise such attendances as school attendance under the Education Act. I find every possible facility is now given in England to encourage special ability in any particular direction, and would recommend similar privileges in this colony.

Drawing Appliances.—If drawing and kindred subjects are to be efficiently taught, models, casts, and appliances must of necessity be supplied. I would suggest that the Education Department should define the number and nature of the wire and solid models and elementary casts, and such other appliances as are required in these subjects, in order that greater uniformity of work may be obtained, and that a firm in each district be appointed and registered as supplying the department's requirements. I make this recommendation knowing the difficulty many districts labour under from the want of knowledge of what is suitable or required, and how it may be obtained at a reasonable cost.

Pictorial and other Illustrations for School Use.—The wealth of illustration to be found in English schools, particularly in the larger centres, is a remarkable feature. In London and Manchester particularly was this the case. Autotype and photogravure reproductions of some of the best-known art-works were to be found in every school, as well as illustrations of wall-papers, calicoes, tapestry, and other decorative features, all neatly framed, and in constant use for class purposes. The following paragraph from the *Record of Secondary and Technical Education* will give some idea of the arrangement in Manchester: "In the belief that knowledge of nature and of beautiful products of human skill can, as a rule, influence life deeply only if acquired in childhood, that it is only through the elementary schools of a town that the majority of its children can be reached, and that pictures give much clearer ideas of things, and therefore greater interest in them, than words alone can give, the committee of the Manchester Art Museum began to lend pictures to as many of the elementary schools in Manchester as they could then afford to supply; and, after ascertaining by experience what kind of pictures are most useful in schools, they have formed a system of 'circulating' loan collections. The system is this: Twelve pictures are lent to each school department, and at the end of six months are replaced by another set of twelve pictures, and are moved on into another department in the same or neighbouring school. Thus, every half-year each department receives twelve pictures, which have the interest given by novelty for teachers and scholars. For convenience of circulation they have divided Manchester into five districts, each of which has, or will have, the same number of sets of pictures allotted to it." Here is a suggestion for our local art societies.

Drawing Examinations.—The first-grade drawing examination established by the Wellington Education Board has produced such excellent results, and given such an impetus to the study of drawing and its kindred subjects, that I suggest its adoption throughout the colony at the earliest opportunity. The aim of teachers, however, should not be to present the whole of a standard, but only those who are reasonably fitted to obtain a pass.

The subjects of examination are as follows: Freehand, plane geometry, scale- and model-drawing. The examination is best held about the month of September, the results being then available for the Inspectors' annual examinations, and utilised by them in lieu of their own standard examination in this subject. Should each educational district eventually appoint a superintendent of drawing, the examinations might then be personally held by the superintendents upon papers set and provided by the Education Department.

Scholarships (Drawing).—Every advantage in the way of scholarships is now available in Britain. In every stage of instruction they are amply provided for, this being one of the more striking features of modern education. The success generally in this direction leads me to hope that scholarships will be fully provided in New Zealand. In connection with drawing, I would recommend seventy scholarships in each of the larger districts, and a correspondingly smaller number in the lesser districts. Fifty of these, I suggest, should be available for one year at the Technical or Art School, as the case may be, for one afternoon's instruction; the monetary value to be 10s.; the examination should be confined to scholars holding the full first-grade drawing certificate. The subjects of examination being a more advanced paper in freehand and model drawing; the number of "goods" or "excellents" obtained in the first-grade examination being taken into consideration. The subjects of instruction during the scholarship should be what is known as the second grade in freehand and model drawing, light and shade, and elementary design.

Scholars who hold the fifty first year's scholarships should be entitled to compete for twenty of a second year of the value of £1, with instruction in more advanced stages of industrial drawing. Successful scholars leaving the primary schools to be entitled to attend evening classes in those subjects during the period of their scholarship.

Training of Teachers.—Attention must of necessity be given to this most important matter if we wish technical education to be successful, for it is by means of our primary-school teachers that the true basis of the work must be reached. Failure in this matter means failure generally. Every effort should therefore be made to insure efficient instruction to our teachers.

Classes in all sections of drawing should be absolutely free to teachers on Saturday morning; nor would I advise any limit to instruction in more advanced art subjects, for all such instruction is a gain to education.

Examinations and certificates should be available in all sections of work. I would urge further encouragement in the shape of a bonus of £2 to all teachers obtaining a full certificate, consisting of practical plane and solid geometry, model-drawing, freehand drawing, elementary light and shade, memory drawing.

Superintendents of Drawing.—In the larger centres where technical and art schools are established I would urge that the art master be made responsible for drawing in primary schools; his duty being to supervise the instruction of all teachers' classes, visit or cause to be visited the

primary schools, aid and advise teachers in the nature and method of the instruction given, undertake the examinations in drawing, and supervise all matters pertaining to this particular work. In the smaller districts where the advantages are not so great I would doubly urge such an appointment.

Departmental Assistance.—Capitation is paid upon all teachers' classes in accordance with the Technical Instruction Act. I further recommend a grant of 5s. for each first-year drawing scholarship; a grant of 10s. for each second-year drawing scholarship; a bonus of £2 for each full teacher's drawing certicate; and a grant of £50 per annum towards the salary of the drawing superintendent appointed by each district.

4. ELEMENTARY SCIENCE.

The main objects of this work should be the cultivation of habits of accurate observation and methods of investigation. Children are naturally inquisitive; this faculty in the elementary stages may be encouraged by lessons upon common objects and ordinary surroundings. The study of any isolated section of work should not be commenced in the primary school. There are, of course, many methods of instruction. With a view to giving information to teachers upon this point, I have included (1) the latest syllabus or code instructions issued by the Education Department of England; (2) a syllabus adopted by a section of the London Board schools, on what is known as the "heuristic" method (from the Greek *heurein*, "to find out"), being the antithesis of the "didactic" method; and (3) the syllabus of the Birmingham Board schools. Under the English Education Department elementary science is one of the optional class subjects.

The "heuristic" method is a scheme by Mr. Heller, formerly demonstrator to the London School Board, and now of Birmingham. The system is strongly advocated by Professor Armstrong, Inspector Gordon, of the Science and Art Department, Professor Fitzgerald, of Dublin, and many other eminent educational authorities. With Mr. Heller's permission I give the following extract from a letter of Professor Fitzgerald's upon the subject of the "heuristic" syllabus. He says, "I have had a good opportunity of comparing the methods of science instruction in several different places in England during my recent visit to England in connection with the Commission on Manual and Practical Instruction in Primary Schools in Ireland. I took keen interest in what I saw, and especially in your work in London. I have been most favourably impressed with the methods you are employing, and, from what I saw of its work in the schools, am convinced that it is working out in practice what it is designed to do, and is capable of being introduced into any school by intelligent and well-trained teachers. Your methods are intelligible methods, and can consequently be made the basis of an intelligible system which can control all the methods of the teacher, and give him an intelligible clue for developing the methods to suit the varying circumstances of his school and locality. In that respect it seems to me to have an overwhelming advantage over what I may describe as the hand-to-mouth methods of others." And, finally, "I have been so fully impressed with the advantages and workability of your system that I shall use my endeavours to have this rational system introduced wherever practicable in our Irish schools; and feel no doubt that, wherever any science education is practicable, your system, modified as to its details to suit localities, &c., but unmodified as to its ideals and essential methods, will be found by far the most practicable of any, and by far the most valuable as regards its results." Professor Armstrong, speaking of the same subject at a meeting of the Society of Arts, said "that this system had the advantage of being a method applicable to all subjects. It is only because chemistry offers opportunities which probably no other science offers to the same extent that it is advocated that this subject be largely made use of in schools."

(1.) Code Instructions issued by the English Education Department in Elementary Science (Class-subject, optional).

—	Standards I., II., and III.		
III. Elementary Science (Scheme A.) or	Thirty object-lessons on the chief tribes of animals and their habits, on common plants and their growth, and on common inorganic substances and their properties.		
III. Elementary Science (Scheme B.)	Thirty lessons on common objects, *e.g.*,— A postage-stamp; he post; money; a lead-pencil; a railway-train. Foods and clothing materials, as bread, milk, cotton, wool. Minerals; natural phenomena, as gold, coal, the day, the year.	Thirty lessons on common objects, such as animals, plants, and substances employed in ordinary life, *e.g.*,— Horse, Leaves, Sparrow, Candles, Roots, Soap, Stems, Cork, Buds, Paper.	Simple principles of classification of plants and animals. Substances used in the arts and manufactures. Phenomena of the earth and atmosphere.

—	Standard IV.	Standard V.	Standard VI.	Standard VII.
III. Elementary Science (Scheme A.) or	Simple mechanical laws in their application to common life and industries. Pressure of liquids and gases.	Simple chemical laws in their application to common life and industries	Outlines of physiology in its bearing on health and work.	Familiar illustrations of applied science: *e.g.*, the dwelling; fabrics and clothing; food; warming; lighting, &c.
III. Elementary Science (Scheme B.)	A more advanced knowledge of special groups of common objects, such as— (*a.*) Animals or plants, with particular reference to agriculture; or (*b.*) Substances employed in arts and manufactures; or (*c.*) Some simple kinds of physical and mechanical appliances: *e.g.*, the thermometer, barometer, lever, pulley, wheel and axle, spirit-level.	(*a.*) Animal or plant life; or (*b.*) The principles and processes involved in one of the chief industries of England; or (*c.*) The physical and mechanical principles involved in the construction of some common instruments, and of some simple forms of industrial machinery.	(*a.*) Animal or plant life; or (*b.*) The commonest elements and their compounds; or (*c.*) The mechanical powers.	(*a.*) Distribution of plants and animals, and of the races of mankind; or (*b.*) Properties of common gases; or (*c.*) Sound, or light, or heat, or electricity, with applications.

(1A.) Alternative Course, Elementary Science (Class-subject).

Any one of the following alternative courses may be chosen in schools in which the same subject is not taken up as a specific subject. The courses should be taught throughout the school by means of conversational object-lessons in the lower standards, and more systematic instruction with the aid of text-books in the higher standards.

The object-lessons given in Standards I. and II. should include, in mechanics, botany, and physics, some lessons on the phenomena of nature and of common life; in physiology, on the external structure and habits of animals; in agriculture, on food-substances, familiar animals, and common plants; in domestic economy, on the principal substances used for food and for clothing. Specimens of a few such topics are given.

If two standards are grouped together, the portion given to the lower standard may be taken one year, and that assigned to the higher standard in the next year, in cases where this is practicable and consistent with the relation between the two portions; or, the two portions may be taken in outline one year, and more fully in the next year.

It is intended that the instruction in elementary science shall be given mainly by experiment and illustration. If these subjects are taught by definition and verbal description, instead of by making the children exercise their own powers of observation, they will be worthless as means of education. The examinations by the Inspectors will be directed so as to elicit from the scholars, as far as possible in their own language, the ideas they have formed of what they have seen.

——	Standards I. and II.	Standard III.	Standard IV.	Standard V.	Standard VI.	Standard VII.
Course A. Mechanics ...	Thirty object-lessons, *e.g.*,— A pair of scales. A pair of bellows. A hammer. A clock. Carriage-wheel. Building of a house. Iron and steel. Gold.	Thirty object-lessons illustrating matter in three states: solids, liquids, and gases.	The mechanical properties peculiar to each state. Matter is porous, compressible, elastic	Measurement as practised by the mechanic. Measures of length, time, velocity, and space.	Matter in motion. The weight of a body, its inertia and momentum.	The lever; the wheel and axle pulleys; the inclined plane; the wedge; the screw. The parallelogram of velocities. The parallelogram of forces. Examples commonly met with illustrating the mechanical powers.
Course B. Animal Physiology	Thirty object-lessons, *e.g.*, on the external structure and the habits of common animals.	Thirty object-lessons illustrating the build of the human body.	Names and positions of the chief internal organs of the human body.	The properties of muscle. The mechanism of the principal movements of the limbs and of the body as a whole.	The organs and functions of alimentation, circulation, and respiration. The use and abuse of foods and drinks.	The general arrangement of the nervous system. The properties of nerve. Sensation.
Course C. Botany ...	Thirty object-lessons, *e.g.*,— Tea. Sugar. Coffee. Cabbage. Carrot. Potato.	Thirty object-lessons illustrating characters of the root, stem, and leaves of a plant, illustrated by common flowering-plants.	Characters of the parts of the flower, illustrated by common flowering-plants.	The formation of different kinds of fruits. Cells and vessels.	Functions of the root, leaves, and different parts of the flower. Food of plants, and manner in which a plant grows.	The characters of the larger groups and most important families of flowering-plants. The comparison of a fern and a moss with a flowering-plant.
Course C. Horticulture...	Thirty object-lessons on common garden-plants, tools, watering, effect of frost and heat.	Thirty object-lessons illustrating seeds and their requirements. Nature and composition of soils.	Nature and functions of roots. Stems and branches. Leaves.	Buds and tubers. Flowers and fruit. Operations connected with the land. Preparation of seed-bed. Potting and planting.	Propagation. Cuttings. Budding. Grafting. Layering.	Branch- and root-pruning. Fruit, flower, and vegetable culture. Fungus and insect pests.
Course D. Principles of Agriculture	Thirty object-lessons, *e.g.*,— The usefulness of the various animals kept on a farm, and how they repay kindness and care. Bees. Earth-worms. A grain of wheat. Hay. Work in a forge. The work to be done on a farm in the different seasons. Gardening. Garden tools.	Thirty object-lessons illustrating the supply of plant-food in the soil.	The necessity for cultivation, and the circumstances making tillage more or less effective.	The principles regulating the more or less perfect supply of plant-food.	Manures as supplemental sources of plant-food, and recapitulation of the course for Standard V.	The principles regulating the growth of crops, and the variation in their yield and quality.
Course E. Chemistry ...	Thirty object-lessons on familiar objects, *e.g.*, of the inorganic world.	Thirty object-lessons illustrating properties of the common gases, such as oxygen, hydrogen, nitrogen, and chlorine.	The chemical character and constituents of pure air, and the nature of the impurities sometimes found in it.	The chemical character and constituents of pure water, and the nature of the impurities sometimes found in it.	The properties of carbon, and its chief inorganic compounds. Non-metallic bodies.	Metallic bodies. Combination by weight and volume. The use of symbols and chemical formulæ.
Course F. Sound, Light, and Heat	Thirty object-lessons, *e.g.*,— Bell. Trumpet. Tuning-fork. Sunlight. Primary colours. Candle. A fire. Boiling water. Red-hot poker.	Thirty object-lessons illustrating the three modes in which heat may be conveyed from place to place.	Effects of heat on solids, liquids, and gases. Expansion by heat. The thermometer.	Propagation of light. Intensity, shadows. Reflection, mirrors, refraction, lenses.	Elementary explanation of the microscope, camera-obscura, and magic-lantern. Reflecting and refracting telescopes.	Propagation of sound. Elementary notions of vibrations and waves. Reflection of sound, echoes.
Course G. Magnetism and Electricity	Thirty object-lessons, *e.g.*,— Amber. Glass. Sealing-wax.	Thirty object-lessons illustrating attraction, repulsion, and polarity, as illustrated by the magnet. Mariners' compass.	Attraction of light bodies by rubbed sealing-wax and glass. Experimental proof that there are two forms of electricity. Attraction and repulsion.	Gold-leaf electroscope. Construction of electrophorus, electrical machines, and leyden-jar.	Voltaic battery and notions of a current. Magnetic effect of a current. Galvanometer. Electro-magnets.	Terrestrial magnetism. Chemical effect of a current. Electrolysis. Induced currents. The electric telegraph.
Course H. Experimental Arithmetic, Physics, and Chemistry. N.B.—Instruction in this subject should be experimental, the experiments being carried out by the scholars.	Thirty object-lessons illustrating addition, subtraction, multiplication, and division of whole numbers experimentally ascertained by measurement of lines in inches and centimetres, the number of squares in a given area of squared paper ascertained by counting.	Thirty object-lessons illustrating decimals. Inch and centimetre rulers to be used, the inches and centimetres being divided into ten parts. Addition and subtraction, the same method to be used as in Standards I. and II. Results in each case to be recorded in columns. Multiplication and division of above by whole numbers.	Metre, its subdivisions. Addition and subtraction of lengths containing them. Results to be recorded in columns as in Standard III. The gramme and its subdivisions treated similarly. Application of above to numbers generally.	Measurement of length, area, volume, and weight. English and French systems, relative weights of liquids and solids. Floating bodies. Barometer. Thermometers, graphic representation.	Distillation. Filtration. Evaporation. Wet- and dry-bulb thermometer. Solubility. The heat unit. Heat capacity. Latent heat. Substances burnt in air, such as coal, sugar, &c.; also metals, such as iron, copper, &c. Investigation into the increase in weight of certain metals when burnt. Rusting of iron. Candle, phosphorus, sulphur burnt in air confined over water. Active and inactive parts of air. Composition of air.	Dilute acids on zinc and iron. Inflammable air and the formation of water therefrom. Inflammable air over heated red-lead. Composition of water. Steam over heated iron filings. Chalk and lime, their properties. Heat and acids on chalk, limestones, &c. Chalk = lime + chalk-gas. Chalk-gas on lime and lime-water. Chalk-gas in the air. Mortar. Hardness of water.

(2.) "Heuristic" Scheme.

INSTRUCTION IN EXPERIMENTAL SCIENCE.—SCHOOL BOARD FOR LONDON.

Syllabus for Elementary Natural Philosophy, as defined in the Second Schedule (§ 101 (*f*) Course H) of the New Code.

Method of Instruction.—The science demonstrator for the Board gives one lesson fortnightly, of about forty minutes' duration, to the boys in the Fifth and higher standards in each school. These lessons are illustrated experimentally with apparatus belonging to the school. Between the visits of the science demonstrator at least one lesson is given to the same class by the teachers of each school (as a rule by the teacher who was present at the demonstrator's lesson, and who took full notes of it), and a written examination in the subject-matter of the lesson is also held. The answers are corrected by the teacher of the class, and submitted to the demonstrator at his next visit to the school. Courses for teachers of experimental work in this subject are held from time to time at the laboratory, Berner Street Board School, Commercial Road, E. Teachers requiring information regarding them should communicate with

W. Mayhowe Heller,
Science Demonstrator, Berner Street Laboratory.

Syllabus of Lessons.

Stage I.

I. Measurement. Length. English and French systems. Practical lessons. Decimals. *Practical work:* (1.) Measure slates, books, &c., in inches and in centimetres. (2.) Find dimensions of room with tape. (3.) Measure lengths of sides of triangles to show sum of two sides always greater than third. (4.) Measure circumference of circles by twisting cotton several times round cylinders, such as glass bottles, drawing-models, and show relation between circumference and diameter is constant for all circles.

II. The lever and experimental discovery of its law. *Practical work:* Construct a series of calico bags loaded with gravel, shot, or sand, so that the weights of bag and contents are as the numbers 1, 2, 3, 4, 5, 6. Hang these by strings from boxwood lever, making six experiments to discover law. Show use of adjusting-weight which slides along lever.

III. The balance. Mode of using and adjustments. Metric system of weights. *Practical work:* (1.) Adjust balance by screw-nut. (2.) Weigh the eight cubes of different wood, and draw lines proportionate to these weights on squared paper.

IV. The weight of measured volumes of water, and measurement of volume indirectly by balance. *Experiments:* Find the weight of 10, 20, 30, 40, and 50 c.c., measured from burette to show 1 c.c. of water = 1 gram.

V. Measurement of area. Experimental proof of rule for multiplication of decimals. *Experiments:* Mark off rectangular areas on sectional paper; determine its area in square inches and hundredths of a square inch by counting up squares. Show that we get same figures by multiplying length of rectangle by breadth. Meaning of 0·01 and 0·001.

VI. Volume. Section of unit of volume. Calculation of volume of rectangular solids. *Experiments:* Make cubic centimetre from soap. Find how many c.c. in 2 cm. cube, and how many in a 4 cm. cube. To count the unit cubes in a rectangular solid we multiply length, breadth, and depth together. Use of burette and graduated cylinder.

VII. The specific gravity bottle. Relative weight. *Experiments:* Find weight of water in bottle when full, and hence record capacity of bottle in c.cs. Fill bottle with methylated spirit and weigh. Find relative weight of spirit with regard to water. Division of decimals.

VIII. Relative weights of liquids. *Experiment:* Weigh bottle full of petroleum oil, vinegar, tea, salt-water, &c. Represent weights of liquids by lines on squared paper. Find weight of 1 c.c. of each.

IX. Relative density of solids by displacement. *Experiments:* Break up four slate-pencils and place in bottle and weigh. Find weight of water necessary to fill bottle now pencils are in it. Find room taken up by pencils. Knowing volume and weight of pencils, find weight of 1 c.c. of slate-pencil. Repeat with sand, lead shot, glass beads, pieces of glass tube or rod, &c.

X. Relative density of mercury by displacement, and by direct measurement of volume from burette. *Experiments:* Find volume of about 150 grams of mercury (not more) by displacement. Find weight of 12 c.c. of mercury, measured from burette.

XI. Discovery of law of U tube. *Experiments:* Show water stands to same height in U tubes (*a*) when both limbs are same bore, (*b*) when limbs are of different bore. Pour mercury into U tube and show it is a form of balance, the mercury surfaces acting as scale-pans. Put water in one limb; measure columns of water and mercury that counterbalance one another. Show water column is as many times longer than mercury column, as mercury was found in Lesson X. to be heavier than water. Repeat it, if possible, with tubes of unequal bore. Into other leg of U tube pour spirit until mercury surfaces are level again, measure columns of water and spirit, and calculate relative density of spirit; compare with result obtained in Lesson VII.

XII. Air has weight. Pressure of atmosphere. *Experiments:* Fit florence-flask (round bottom) with tightly fitting indiarubber stopper with glass tube through it. Put about 5 c.c. of water in flask and boil vigorously; while boiling, close flask with indiarubber tube and glass rod; allow to cool, and weigh; open flask and allow air to enter; weigh again. Determine volume of air that has entered and calculate weight of 1 c.c.

XIII. The siphon barometer. Its uses and variations. *Experiments:* Construct barometer with dry tube and dry mercury. Mount on board with short limb adjustable. Affix scale and mark zero line on board. (Systematic observations of barometer should be made every day and plotted on squared paper.)

XIV. The prineiple of Archimedes. Weight of a body of known volume in air and water. *Experiments:* Weigh ebony cube in air and water. Show it is lifted up by the weight of water displaced; hence it affords a means of determining the volume of an irregular solid. Weigh the 100-gram weight in water, and then in methylated spirit. Show how we can thus get weight of known volume of methylated spirit.

XV. The principle of Archimedes. Weight of a body of unknown volume in air and water. *Experiments:* Weigh glass stopper in air and water, and determine volume and density. Weigh same stopper in methylated spirit, and thus find weight and volume of displaced spirit, and hence, density. Counterpoise beaker of water, hang in it stopper supported by thread from retort-stand; add weights to restore balance.

XVI. Expansion of liquids and gases. General effects of heat on matter. Apparent expansion. Temperature. *Experiments:* Fit up flask and tube as (1) a water and (2) an air thermometer. Melt ice and note temperature.

XVII. Thermometry. Changes in state. Ice, water, and steam. Hidden or latent heat. Conversion of scales. *Experiments:* Construct an alcohol thermometer; make scale for ordinary ranges of atmospheric temperatures. Determine melting-point and boiling-point.

XVIII. Distillation. Purification and separation of liquids. *Experiments:* Distil solution of ink, sugar, salt, &c. Distil beer or weak alcohol solution; find density of the distillate.

XIX. Revision.

XX. Revision.

Stage II.

Lesson 1. Evaporation. Condition of atmosphere as regards moisture. Systematic observations. Weather-charts. *Experiments:* Find loss of weight of dish of water day by day. Record graphically. Repeat experiment with larger and more shallow dish.

Lesson 2. Changes in weight of a bag of seaweed, compared with results of Lesson 1. Wet and dry bulb thermometers. *Experiments:* Weigh day by day bag of seaweed or roll of flannel. Take readings of hygrometer, barometer, thermometer, &c.

Lesson 3. Solution and solubility. Distinction between melting and dissolving. Determination of solubility of common substances. Saturation. *Experiments:* Ascertain, by experiments with small quantities on watch-glasses, what common substances are soluble in water; also show that some substances, such as iron, litharge, and sulphur, though not dissolved by water, are soluble in other liquids, such as acids, vinegar, nitric acid. Make saturated sclutions of salt, soda, borax, alum, chalk, lime, &c. Evaporate in weighed dish 10 c.c. of each, and find weight of residue. Depict graphically relative solubilities.

Lesson 4. Crystallization. Saturation alters with temperature. *Experiments:* Prepare crystals of alum, sugar, soda. Examine small crystals under lens. Determine solubility of alum at 20° C. and at 100° C.

Lesson 5. Measurement of heat depends on the quantity of matter and temperature for the standard substance water. The heat unit or calorie. Water equivalent of calorimeter. *Experiment:* Place a small copper vessel inside a beaker, but separated from it by loosely packed cotton wool. Mix known quantities of hot and cold water at known temperatures, and determine how many heat units have been absorbed by copper calorimeter. Hence, determine number of heat units absorbed when calorimeter is raised 1° C.

Lesson 6. Heat capacity or specific heat. *Experiment:* By method of mixtures determine number of heat units required to raise 1 gram of mercury 1° C. Repeat with lead shot, tin tacks, &c. (Allow for capacity of calorimeter.)

Lesson 7. Comparative study of the action of water and lime, chalk and marble. Heat a sign of chemical union. *Experiments:* Add water to lime, chalk, and marble, and note all changes. See how many heat units are given to water when 50 grams of lime are mixed with 100 grams of water. Add excess of water to weighed quantities of lime, marble, and chalk; dry on oven, and determine the water each has permanently taken up.

Lesson 8. The lime-kiln and the changes concerned in the manufacture of lime. *Experiments:* Heat $\frac{3}{4}$ gram of marble or chalk in furnace for half an hour. Determine loss of weight. Leave the lime to slake in air for a day, add excess of water, evaporate and weigh.

Lesson 9. Preparation of the gas which escapes from the lime-kiln. Chalk-gas and its properties. *Experiments:* Heat chalk or marble in iron tube fitted with asbestos plug and delivery-tube. Collect gas, and examine with lighted match, litmus, and lime-water; show it is heavier than air.

Lesson 10. Comparative study of the action of acids on chalk, lime, and marble. Preparation of the gas evolved from chalk. Its identity with chalk-gas. *Experiments:* Make experiments with small quantities on watch-glasses of the action of acids on above substances. Collect several jars of gas by displacement of air and of water.

Lesson 11. Weight of gas obtained from 1 gram of chalk by action of acids. *Experiments:* Weigh a flask containing acid and chalk, before and after the evolution of gas.

Lesson 12. Determination of volume of gas evolved from 1 gram of chalk. *Experiments:* Allow gas evolved to displace water from an aspirator; measure water displaced, and note temperature. Repeat experiment to obtain a mean of results.

Lesson 13. Synthesis of chalk from lime and chalk-gas. *Experiment:* Leave a dish of good lime under a jar of chalk-gas over water. After some hours note rise of water, and examine the dish for chalk. Pass chalk-gas into a large volume of lime-water, filter, and collect precipitate.

Lesson 14. To prove the white precipitate obtained above is chalk. *Experiment:* Carefully dry ·75 grams, and heat in furnace for twenty-five minutes. Show loss of weight is about 44 per cent.

Lesson 15. The action of chalk-gas on chalk in the presence of water. *Experiments:* Continue to pass chalk-gas into lime-water until the precipitate which first forms is redissolved. Boil some

of the solution, collect and examine the gas evolved, and identify the white substance precipitated with chalk.

Lesson 16. Hard water and its effect on soap. *Experiments:* Dry some fur taken from the inside of a kettle. Find the percentage loss of weight, when treated with acid, or by heating. Add soap solution to distilled rain, tap, and artificial hard waters.

Lesson 17. Formation of chalk-gas in the lungs. Why does it not accumulate in the atmosphere? *Experiments:* Inspire air through one vessel of lime-water, and expire it through another.

Lessons 18–20. Revision.

Stage III.

Lesson 1. The hardness of water. Action of hardness on soap. Measurement of hardness. *Experiment:* Make artificial hard water by passing chalk-gas into lime-water till clear. Boil this solution. Add soap solution to it. Make standard soap solution, and examine tap, rain, and distilled water with it.

Lesson 2. Burning of animal and vegetable substances in the air. *Experiments:* Heat weighed pieces of fat and lean meat in furnace; also bread, wood, paper; determine ash. Heat some wooden splinters in hard glass tube; burn the charred remains in air on platinum wire.

Lesson 3. Heating of mineral substances in air. *Experiments:* Heat weighed quantities of iron, copper, sulphur, and red-lead (in bone-earth crucible) in furnace.

Lesson 4. The rusting of iron. The nature of the change. Is the air concerned? Is water concerned? *Experiments:* Leave weighed quantity of iron borings or small French nails to rust in air: after two days, dry and weigh again. Leave iron nails under boiled distilled water for several days. Leave a muslin bag of iron borings suspended in jar of air over water for twenty-four hours.

Lesson 5. Examination of inactive part of air. Burning of a candle, of phosphorus, and of sulphur. *Experiments:* Test inactive part of air with litmus lighted taper, lime-water, &c. Burn candle, phosphorus, and sulphur in bell-jar of air. Test products of combustion and residual gas in each case as above.

Lesson 6. The rusting of phosphorus in air. Composition of air. Immaterial nature of heat. *Experiments:* Burn small piece of phosphorus in round-bottomed florence-flask, fitted with india-rubber stopper. Weigh before and after. Open under water; measure volume of water entering. Leave a stick of phosphorus to rust slowly in jar of air over water. Examine residual gas.

Lesson 7. The rusting of copper in air. Identity of residual air with the inactive part found in other experiments. *Experiments:* Pass air from aspirators over a weighed piece of copper gauze strongly heated in hard glass tube. Collect and examine issuing gas. Seal up bright copper gauze in hard glass tube; heat one end of gauze.

Lesson 8. The inactive part of air obtained from rusting-iron experiment (Lesson 4) will not rust copper. *Experiments:* Prepare aspirator of inactive air by rusting iron. Pass gas slowly over heated copper gauze. Put bag of filings to rust in air in which phosphorus has been burnt.

Lesson 9. Active part of air. Synthesis of air. *Experiments:* Heat red-lead in iron tube with asbestos stopper. Collect the active part, and examine its properties. Fill up a jar in which iron has rusted with this gas, and examine the mixture.

Lesson 10. Preparation and examination of active part of air. *Experiments:* Prepare several jars of oxygen by heating a mixture of potassic chlorate and manganese peroxide. Burn sulphur, phosphorus, iron wire in the case. Examine products of combustion. Show identity with those obtained in Lesson 5. The names oxygen and nitrogen.

Lesson 11. The burning of bread and of charcoal in air or oxygen. Signs of chemical union. *Experiments:* Pass current of air over bread heated in glass tube; examine the gases evolved. Pass oxygen from aspirator over charcoal heated in boat; examine gas evolved. Show identity of charcoal-rust with chalk-gas.

Lesson 12. Action of acids on metals. Examination of gases evolved. Burning of "inflammable air." *Experiments:* Try action of nitric, sulphuric, and hydrochloric acid on iron, copper, lead, zinc. Collect several jars of "inflammable air" and examine.

Lesson 13. Preparation and identification of the liquid formed in Lesson 12 with water. *Experiments:* Burn inflammable air against well-cooled surface. Collect liquid formed. Find boiling-point and freezing-point. Hydrogen.

Lesson 14. Is water hydrogen-rust, that is, oxide of hydrogen? The removal of oxygen from oxide of copper. *Experiments:* Pass well-dried hydrogen from aspirator over weighed oxide of copper in boat (heated). Collect water formed in calcium-chloride tube, weighed before and after experiment. Determine composition of water and percentage of copper in copper-oxide.

Lesson 15. Analysis of water by heated iron. *Experiments:* Pass gentle current of steam over iron contained in heated iron tube. Collect gas evolved and show its identity with hydrogen. Weigh the iron before and after experiment.

Lessons 16–20. Revision.

(3.) BIRMINGHAM SYLLABUS.

INSTRUCTION IN ELEMENTARY SCIENCE.

SYLLABUS FOR MECHANICS, OR ELEMENTARY NATURAL PHILOSOPHY, AS DEFINED IN THE FOURTH SCHEDULE OF THE CODE.

First Stage.—"Matter in three states: Solids, liquids, and gases. Mechanical properties peculiar to each state. Matter is porous, compressible, elastic. Measurement as practised by the mechanic. Measure of length, time, velocity, and space."

NOTE.—Instruction in this subject should be purely descriptive and experimental.

First Year's Course.—Syllabus of Fortnightly Demonstrations.

1. Matter and its indestructibility; elements and compounds; three general properties of matter—viz., extension, divisibility, and weight.
2. The three states of matter: the solids, the liquid, and the gaseous; some of the characteristics of each; fluids.
3. Solid bodies; the force of cohesion; adhesion; powders. Structure of solids; molecules and atoms; crystals and crystalline bodies; amorphous solids; hardness of solids; alloys.
4. Effects of heat on solids; practical applications; welding.
5. Properties of liquids; viscous substances; surface of liquids; the spirit-level.
6. Capillary phenomena; pressure of liquids; the diving-bell.
7. Specific gravity of liquids and solids.
8. Buoyancy of liquids; floating bodies.
9. Effects of heat on liquids; the thermometer; conversion of liquids into solids and gases.
10. Properties of gases; use of the air-pump; pressure of the air; the sucker.
11. The barometer: its use in measuring heights and as an indicator of change of weather.
12. The siphon.
13. Valves and pumps.
14. Effects of heat on gases; winds.
15. Porosity, compressibility, and elasticity of matter.
16. Tenacity, ductility, and malleability of solids.
17. Measurement of length, space, and velocity.
18. Measurement of time; divisions of the day and year; sundial, clock, &c.

Recapitulatory lessons are given in each stage as time permits.

Second Stage.—"Matter in motion. The weight of a body: its inertia and momentum. Measures of force and work."

Syllabus of Fortnightly Demonstrations.

1. Force and matter.
2. The forces of nature; differences between the physical forces and the chemical force.
3. The force of gravitation, and the laws by which it acts.
4. Effects of the force of gravity.
5. Centre of gravity.
6. Falling bodies: their rates of motion.
7. Falling bodies—continued.
8. The first law of motion; inertia of matter at rest.
9. Inertia of matter in motion; friction.
10. Mass and momentum.
11. Representation of forces; composition of forces.
12. The second law of motion.
13. The third law of motion.
14. Work, and how to measure it.

Third Stage.—"The simple mechanical powers, viz.: (1) The lever; (2) the wheel and axle; (3) pulleys; (4) the inclined plane; (5) the wedge; (6) the screw. Liquid pressure; the hydrostatic press. Liquids under the action of gravity. The parallelogram of velocities. The parallelogram of forces. Examples commonly met with, illustrating the mechanical powers."

Syllabus of Third Year's Course of Fortnightly Demonstrations.

1. Specification of a force; nature and action of machines; principle of work.
2. The mechanical powers; conditions of equilibrium; the mechanical advantage; friction.
3. The lever; parts of a lever; three orders of levers.
4. Practical applications of a lever; double levers.
5. Weighing-machines; the balance; the steel-yard.
6. The wheel and axle; practical applications of this machine.
7. The toothed wheel; clocks and watches.
8. The pulley; fixed and movable pulleys; the three systems of pulleys.
9. The inclined plane; its principle and applications.
10. The wedge.
11. The screw.
12. Compound machines.
13. Pressure of liquids; surface of liquids; liquids under the action of gravity.
14. The hydrostatic press.
15. The parallelogram of forces.
16. The parallelogram of velocities.

SYLLABUS FOR CHEMISTRY, AS DEFINED IN THE FOURTH SCHEDULE (SPECIFIC SUBJECT, No. 10) OF THE NEW CODE.

First Stage.—"Elementary and compound matter. Illustrations of combination and decomposition in such bodies as hydrochloric acid, water, oxide of mercury, and rust of iron."

First Year's Course.—Syllabus of Fortnightly Demonstrations.

1. Division of matter into elements and compounds; the names and symbols of the most important elements; division of the elements into solids, liquids, and gases; and into metals and non-metals.

2. Chemical force (like cohesion) cannot act at a distance; it changes the properties of the substances on which it acts. Experiments to illustrate these facts.

3. Apparatus used in chemical experiments. Bunsen-burner and spirit-lamp; test-tubes and test-tube stand; test-glasses; Woulff's bottles; flasks; retort-stand; iron-wire gauze; beakers; evaporating-dishes; crucibles; tripods; crucible tongs: the uses of these pieces of apparatus.

4. Preparation of hydrochloric acid from common salt and sulphuric acid; the principal properties of this gas—it fumes in air; is heavier than air; has sour taste (is an acid); very soluble in water.

5. Illustrations of the difference between a mechanical mixture and a chemical compound. Forces which produce the chemical combination of hydrogen and chlorine—(*a*) light; (*b*) heat. Chemical union is termed combination or synthesis; and chemical separation is termed analysis. Heat always, light often, produced in chemical combination.

6. Meaning of decomposition or analysis. Examples: Decomposition of oxide of mercury by the aid of heat; chlorate of potash is also decomposed by heat. Decomposition of water by the aid of a current of electricity. Decomposition of hydrochloric acid by electricity.

7. Water: Exists in nature in three states; is a compound consisting of hydrogen and oxygen; synthesis of water—(*a*) burn hydrogen in oxygen; (*b*) explode a mixture of hydrogen and oxygen; (*c*) pass hydrogen over heated oxide of copper.

Decomposition of water—(*a*) obtain hydrogen from water by the action of sodium; (*b*) decompose water by a current of electricity.

8. Oxide of mercury: consists of mercury and oxygen. Mercury and its principal properties. Oxygen—recapitulation of properties. Synthesis of mercuric oxide by heating (to 600° F.) mercury to near its boiling-point, in air. Decomposition of mercuric oxide by heating to a still higher temperature.

9. Meaning of combustion or burning. Show that a burning candle is extinguished when placed in a vacuum. Take oxygen from a jar of air—no burning can occur in the nitrogen which is left behind. A body burning in air combines with the oxygen of the air and increases in weight. Experiments to illustrate this. Meaning of oxidation. Light generally, heat always, produced by burning, slow combustion—no light produced, and heat produced very slowly. Rusting of metals, particularly iron. Spontaneous combustion of finely divided iron and lead.

10. Iron-rust or oxide of iron: composed of iron and oxygen. Many iron-ores, as hæmatite and magnetic oxide, are iron-oxides. Synthesis of iron-rust. Burn iron wire (or steel spring) in oxygen—a black iron-oxide is formed, containing a little less oxygen than red rust. Show that a piece of iron increases in weight when it rusts. Rusting is slow oxidation. Iron does not rust when placed in an atmosphere free from oxygen. Pass steam over red-hot iron. Analysis of iron-rust. Pass dry hydrogen over heated iron-rust; water formed and metallic iron left behind. Meaning of the term reduction.

11. Meaning of word "binary." Other important binary compounds—carbon-dioxide or carbonic-acid gas—its synthesis and analysis. Production of carbon-dioxide from carbonate of lime. Properties of carbon-dioxide. Ventilation.

12. Sulphur-dioxide, its preparation and properties; common salt, its synthesis; sand as a binary compound; ammonia as a binary compound.

Recapitulatory lessons will be given as time permits.

Second Stage.—"Preparation and properties of the common gases, such as oxygen, hydrogen, nitrogen, and chlorine. The chemical character and constituents of pure air and pure water, and the nature of the impurities sometimes found in both. Effects of plants and animals on air."

Second Year's Course.—Syllabus of Fortnightly Demonstrations.

Lesson I.—Matter and its three states; the thermometer; changes of state; melting; evaporation; boiling; condensation; distillation and its uses; sublimation; volatility; filtration.

Lesson II.—General properties of gases; distinction between gases and vapours; gases have weight; gases have the power of expanding and producing pressure; pressure of the atmosphere; expansion of gases by heat; how pressure affects the volume of a gas; Boyle's Law; diffusion of gases.

Lesson III.—Oxygen, its occurrence in nature; preparation of oxygen (*a*) from mercuric oxide, (*b*) from a mixture of potassium-chlorate and black oxide of manganese, and (*c*) from the air. Properties of oxygen. Ozone, an allotropic form of oxygen. Its preparation and properties.

Lesson IV.—Combustion of substances in oxygen, as phosphorus, sulphur, sodium, carbon, and magnesium; products of combustion. Increase of weight after combustion. Chemical changes produced by heat.

Lesson V.—Hydrogen, its preparation from hydrochloric acid and zinc, and from water and sodium; properties of hydrogen.

Lesson VI.—Water as a binary compound; methods of proving the chemical composition of water (*a*) by analysis, and (*b*) by synthesis; properties of water; effect of pressure on the boiling-point of water. Papin's Digester.

Lesson VII.—The impurities usually present in water; solvent power of water; hard and soft water; matter in suspension in water; use of filters; matter in solution; inorganic impurities—carbonate of lime, sulphate of lime; common salt; mineral springs.

Lesson VIII.—Organic impurities in water, how to discover them; temporary and permanent hardness; methods of softening and purifying water.

Lesson IX.—Nitrogen. Methods of obtaining nitrogen from the air,—(*a*) Burn phosphorus in a bell-jar containing air, (*b*) pass air over heated copper; properties of nitrogen; its function in the air; nitrogen is contained both in ammonia (a strong base) and in nitric acid (a powerful acid).

Lesson X.—Chlorine, its preparation from hydrochloric acid and manganese-dioxide; and also from common salt, manganese-dioxide, and sulphuric acid. Properties of chlorine:—colour, solubility, power of bleaching, its affinity for hydrogen and metals. Bleaching powder.

Lesson XI.—The atmosphere—a mechanical mixture of nitrogen and oxygen, containing small quantities of other gases. Solubility of air. Carbonic-acid gas in the atmosphere; produced by combustion and respiration. Necessity for ventilation. How plants restore oxygen to the atmosphere.

Lesson XII.—Aqueous vapour in the atmosphere, proofs of its presence. Ammonia in the atmosphere; produced by the decomposition of nitrogenous organic matter; acts as a plant-food. Nitric acid in the atmosphere, how produced. Impurities in the air of towns. Sulphur-dioxide; produced by the burning of coal containing iron-pyrites. Organic matter in the air.

Recapitulatory lessons will be given as time permits.

Third Stage.—"The properties of carbon and its chief inorganic compounds. Differences between metallic and non-metallic bodies. Combination by weight and volume. The use of symbols and chemical formulæ."

Syllabus of Fortnightly Demonstrations.

Lesson I.—Definition of the term "symbol"; differences between symbols; symbols of the metallic and non-metallic elements.

Lesson II.—Comparative abundance of the elements; elements concealed in compounds; other uses of symbols; how to represent more than one atom of the same element.

Lesson III.—Nature of chemical formulæ; how formulæ represent compounds; how to express any given number of molecules; formulæ of certain binary, ternary, &c., compounds; composition and number of molecules; how to calculate the number of atoms in molecules.

Lesson IV.—Differences between metallic and non-metallic bodies; number of the known chemical elements; division of the elements into metals and non-metals; the fifteen non-metals; state of the non-metallic elements; the fifty-five metals; nature of metals; properties of metals—lustrous, good conductors of heat and of electricity, &c.

Lesson V.—The elementary body called carbon; meaning of the word "allotropic"; crystallized carbon—the diamond; graphite or plumbago; amorphous carbon; charcoal; charcoal as an absorber of gases.

Lesson VI.—Carbon contained in coal; coke as an amorphous kind of carbon; gas-carbon; lamp-black as an allotropic form of carbon; bone-black; how to prove that these various forms of carbon are all composed of the same element.

Lesson VII.—Inorganic compounds of carbon; meaning of the word "inorganic"; two important inorganic compounds formed by the combination of carbon with oxygen; carbonic-acid gas, its nature and preparation; action of acids upon carbonates; properties of carbonic-acid gas.

Lesson VIII.—Carbonic-acid gas (continued): It does not support respiration; also known as choke-damp; test for carbonic-acid gas; nature of lime-water; action upon carbonic-acid gas upon lime-water; carbonic-acid gas in the breath; composition of the air; how plants absorb carbonic-acid gas.

Lesson IX.—Carbonic oxide: Its preparation by passing carbonic-acid gas over heated coke or charcoal; carbonic-acid gas absorbed by caustic soda; the chemical changes in a coal-fire; preparation of carbonic oxide from oxalic acid, and also from a mixture of yellow prussiate of potash and sulphuric acid; properties of carbonic oxide.

Lesson X.—Carbonic acid proper; how carbonates are formed; carbonate of lime, and its occurrence in nature as chalk, limestone, &c.; use of limestone as a flux; quicklime, its nature and composition.

Lesson XI.—Chemical combination; chemical compounds are definite in composition; combination always takes place in definite proportions; Dalton's Atomic Theory; atomic weights and combining weights; chemical combination in multiple proportions; combining weights of compounds.

Lesson XII.—Chemical combinations by volume; use of the word "volume"; chemical equations express combination by volume as well as by weight; the metric system of weights and measures; equations correct for all weights and all measures; thermometer-scales; how to convert Fahrenheit degrees to Centigrade, and *vice versâ*.

Recapitulatory lessons will be given as time permits.

The following text-books in elementary science are authorised by the Birmingham School Board: Harrison's "Mechanics," Parts 1, 2, and 3, 1s. each, Nelson and Sons, London; Harrison's "Science of Home Life," Parts 1, 2, and 3, 1s. each, Nelson and Sons, London; Harrison's "Chemistry," Parts 1, 2, and 3, 5d. each, Blaikie and Sons, London; Harrison and Bailey's "Chemistry for All," 1s. 6d., Blaikie and Sons, London.

Instruction of Sixth and Seventh Standard Scholars.—In several districts I found that these boys were instructed at special centres, known as higher-grade centres, where every facility in the way of room and appliances was provided. This is, naturally, a considerable saving in expense. I would suggest similar centres being established at one of the larger schools in each city and at the larger country centres. (See "Higher-grade Schools," in Section 3.)

Training of Teachers and Peripatetic Demonstrations.—In Birmingham, Liverpool, and London peripatetic science demonstrations are employed. In Birmingham lessons are given once fortnightly, of about forty-five minutes' duration, to boys in the Fifth and higher standards in each school. These lessons are illustrated experimentally with apparatus carried from school to school in a handcart. Between the visits of the science demonstrator, at least one lesson is given to the

same class by the teachers of each school (as a rule by a teacher who was present at the demonstrator's lesson and who took full notes of it), and a written examination in the subject-matter of the lesson is also held. The answers are carefully corrected by the teacher of the class, and submitted by him to the demonstrator at his next visit to the school. A general examination in elementary science is held yearly, in June.

Whilst the success generally of this method is not doubted, the principle is an unfortunate one. The fact of a specialist being required to visit the schools to give this instruction places the subject above the level of ordinary school matter, and gives colour to the suggestion that the regular teacher is incapable of giving the instruction. The question of apparatus is, again, an important one: the appliances being carried from school to school leaves the teacher giving the bi-weekly lesson in the position of having to make the best of indifferent methods of illustration for the continuation of his experiments.

The training of teachers is of the utmost importance, and requires to be of a thorough character. I suggest the appointment of science teachers for each district, whose first duty should be the training of teachers by Saturday and evening classes, and who should in addition visit the schools for the purpose of assisting and advising the teachers in their class-work. The centres of instruction being the technical schools, it would be possible to utilise the laboratories for more advanced instruction to boys above the Sixth Standard in the larger centres.

Every inducement should be given to teachers to obtain the necessary instruction, if possible arrangements being made for the free instruction of teachers presenting themselves at the university or university college classes for advanced work. I would suggest as a further inducement a bonus of £2 for the completion of certificates in certain groups of science instruction. The fact must be forcibly recognised that upon the success or otherwise of the elementary instruction depends the success of the whole scheme of technical education, and that this mainly depends upon the training and experience of our teachers. Every possible effort should therefore be made to strengthen this work in subjects such as elementary science, drawing, manual instruction, and domestic science.

Departmental Assistance.—Capitation is paid upon all teachers' classes in accordance with the Technical Instruction Act. I further recommend a bonus of £2 upon the completion of certificates in groups of science subjects, a grant of £50 per annum towards the salary of special science teachers appointed by Education Boards, and a grant of one-half the cost of fittings and appliances for special centres of science instruction established for scholars of primary schools.

5.—MANUAL TRAINING.

For many years I have urged the adoption of manual training as a portion of our primary and secondary school work; I am satisfied that what other countries find a necessity will naturally force itself upon us sooner or later. Why delay, then, the introduction of this work? It is utterly impossible to expect success by teaching manual instruction after school hours: it must be a part of the ordinary school course, and taught within school hours. Every nation which has undertaken a system of manual instruction has proved this an absolute necessity. I therefore earnestly hope that the syllabus of the New Zealand Education Department will be so revised as to enable schools desirous of commencing this important work to do so.

The great object of teaching manual training in our public schools is to inspire a love of work, to make a child feel the importance of order, accuracy, and application, as well as dexterity in the use of his hands. Surely these are important points in our practical daily life, and of use to every person, no matter what may be his position in life. Manual training must be a training which places intellectual and moral results before mechanical skill. It is a special training of the senses of sight, touch, and muscular perception by means of its occupations. While the eye is being trained to accuracy, and the hand to dexterity and manipulative skill, the mind is being trained to observation, attention, comparison, reflection, and judgment. In manual instruction it is impossible to predict the immense advantages to be gained by the colony, or the increased happiness of those at work in back-settlements, to whom the use of the common tools must be an enormous advantage. Again, the time necessary to become proficient in any trade is shortened. Unfortunately, this point is often used by the opponents of manual work, their contention being that anything appertaining to trade should assuredly be left till after the ordinary school course.

Sir Philip Magnus, one of the highest authorities upon educational work, thus alludes to workshop practice as a part of education: "It cannot be too often repeated that the object of workshop practice as a part of general education is not to teach a boy a trade, but to develop his faculties, and give him manual skill; that although the carpenter's bench and the turner's lathe are employed as instruments of such training the object of the instruction is not to create carpenters or joiners, but to familiarise the pupil with the properties of such common substances as wood or iron, to teach the hand and eye to work in unison, to accustom the pupil to exact measurements, and to enable him by the use of tools to produce actual things from drawings that represent them. The discipline of workshop instruction may be regarded as supplementary to that of drawing, with which, however, it should always be associated, as teaching a knowledge of substance in addition to that of form. Moreover, under competent instructors it may be made an instrument of education similar in many respects to practical science. In the workshop the operations to be performed are less delicate, the instruments are more easily understood, the substances employed are more ordinary, but the training is very similar, and, in so far as the faculties exercised are those of observation rather than of inference, the training, educationally considered, is a fitting introduction to laboratory practice. But, whilst a certain amount of manual training is valuable in the education of all persons, the usefulness of this kind of training is much greater in the case of children of the working-classes, whose education is often too limited to admit of much practical science teaching such as older children obtain, and to whom the skill acquired is of real advantage in inducing in

them an aptitude and taste for handicrafts, in facilitating the acquisition of a trade, and possibly in shortening the period of apprenticeship, or of the preliminary training which in so many occupations takes the place of it. . . . . People often talk and write as if school time should be utilised for teaching those things which a child is not likely to care to learn in after-life, whereas the real aim of school education should be to create a desire to continue in after-life the pursuit of the knowledge and skill acquired in school. In other words, the school should be made as far as possible a preparation for the whole work of life, and should naturally lead up to it. The endeavour of all educators should be to establish such a relation between school instruction and the occupations of life as to prevent a break of continuity in passing from one to the other. The methods by which we gain information and experience in the busy world should be identical with those adopted in schools. It is because the opposite theory has so long prevailed that our school-training has proved so inadequate a preparation for the real work of life. The demand for technical instruction both in our elementary and in our secondary schools is a protest against the contrast which has so long existed between the subjects and methods of school-teaching and the practical work of every-day life."

The contention is often put forward that the time of the school is fully required for the ordinary school subjects. I have already urged a modification of the present syllabus, so that one half-day may be devoted to manual and domestic subjects. The evidence, however, of Sir Swire Smith, one of the Royal Commissioners on Technical Instruction, states that "the half-time children of the Town of Keighley, numbering about two thousand, although they received less than fourteen hours of instruction per week, and are required to attend the factory for twenty-eight hours per week in addition, yet obtained at the examinations a higher percentage of passes than the average of children throughout the whole country receiving double the amount of schooling." This surely is a sufficient answer to those who state that sufficient time is not given for ordinary subjects, and proves that the combination of practical work combined with literary work has the best possible influence upon school life.

The development of manual instruction in Britain during the last few years has been of rapid growth, and I am glad to say is of a permanent kind. In every district visited classes were in operation, and the work is, I understand, carried on in every county in England. The larger centres visited—viz., London, Manchester, Liverpool, Birmingham, and Glasgow—give instruction to the whole of the upper-standard boys, and the general opinion expressed was that the work had succeeded far beyond the expectations of the most sanguine. The headmasters and teachers generally spoke in the highest terms of the system, and in reply to my inquiries at each school as to whether they would if permitted revert to the old system of purely literary work, the answers were very decidedly in favour of the manual system.

There are, of course, slight differences in method, but in no case did I find the Sloyd system adopted. The system is that of English wood-work; and for general information I give the course of work adopted in (1) London; (2) Manchester; and (3) Birmingham; as well as (4) a Parisian primary school.

There is one very important difference relating to the drawing of the exercises worked—namely, in some centres it is done at the school previous to attending the workshop. I made a careful examination of the two methods, and unhesitatingly recommend the drawing being done at the workshop, small drawing-boards, &c., being provided, the instruction being in wood-work or metal-work, as the case may be. In London and Manchester drill in the use of the various tools formed a marked feature of the instruction. In every centre visited the whole of the appliances and material were provided by the various Boards.

The two principal centres in metal-work visited were Thomas Street School, London, and Rea Street School, Birmingham, the syllabus of both schools being given. In Birmingham there are three metal- and five wood-working centres.

In every case I find manual-instruction centres are established, generally in connection with one of the schools, a shed being erected in the playground, the boys attending in classes of either twenty or forty from the various schools, thus greatly economizing the expenditure in appliances as well as in instructors. The method of registration is that of having duplicate registers at the manual class, one of which is returned either by the senior scholar or by post. In London the day-school register is marked thus, O, against a boy at a manual class, and upon receipt of the duplicate manual register the letter M is marked within the circle—in red if punctual, in black if unpunctual. The manual instructor reports to the head teacher any boy committing any act deserving of punishment.

I would suggest, therefore, that centres for manual work be created wherever possible for the purpose of giving the necessary instruction daily, two hours' instruction being given to each class, to include the drawing exercise. I would further recommend that the class teachers should accompany the scholars, and generally assist in carrying on the work. The difficulty of mixed classes would not affect this suggestion, as the girls would at the same time be in attendance at the domestic-economy centre. An illustration is given of one page of the drawing-book used in class-work under the Manchester School Board, which will no doubt prove a useful guide. Tests should frequently be made in the power of using tools, and interpreting a drawing, or making one. Such exercises should, however, be capable of completion within the time allowed for the exercise or inspection, if by a public officer. The tests given by the Manchester School Board for 1897 are reproduced.

I have no doubt the people of New Zealand will soon appreciate (as the people of England now do) the fact that the industrial training of their children is the foundation of their future prosperity, impressing a child as it does with a taste and love of work.

(1.) Manual Instruction under the London School Board.

The following syllabus has been previously issued by the Education Department; in order, however, that the report may be used for reference, I include the syllabus of wood- and metal-work:—

Principles.

1. The aim must be educational rather than industrial.
2. The scholars must be given an intelligent knowledge of the principles which underlie their work.
3. Working drawings to scale, of every exercise, should be made.
4. All bench-work should be done to exact measurement, and every piece of wood correctly lined before being cut or planed.

Practice.

(*a.*) *Object-lessons.*—(1.) Woods commonly used—(*a*) their structure and conditions of growth; (*b*) their seasoning; (*c*) their special properties and the uses dependent thereon; (*d*) their geographical distribution. (2.) Nails and screws—some of the kinds in common use, and their particular uses. (3.) Tools—their form, structure, and manipulation.

(*b.*) *Drawing.*—Isometric projections and working drawings—plans and elevations—of the specified exercises.

(*c.*) *Bench-work.*—(1.) Measuring and lining on suitable wood. Tools: Two-foot rule, square rule, try-square. (2.) Sawing to line across the grain on suitable wood, not more than ½ in. thick. Tools: In addition to the above, bevel- and tenon-saw. Models: Some such test of the exercise as gluing pieces to imitate parquet flooring (for instance, the herring-bone, 3 in. by 1½ in. by ¼ in.). (3.) Sawing to line in any direction on suitable wood, not more than ½ in. thick. Tools: In addition, the marking-gauge and panel-saw. Joints and models: Open box, or soap-box, or small bracket—butt joints glued. (4.) Planing. Wood for "truing-up" generally should not exceed 2 ft. by 1½ in. by 1½ in. Tools: In addition, jack-plane, smoothing-plane. Joints and models: Such as halving joint at end. Square and triangular frame halved joints. (5.) Boring, nailing, and screwing. Tools: In addition, bradawl, gimlet, hammer, screwdriver. Joints and models: Such as nail-box, simple bracket, &c., butt joints. (6.) Hand-chiselling and plain chamfering with chisel and plane. Tools: In addition, firmer-chisels. Joints and models: Such as Oxford frame, half-lap joints. (7.) Mortise-chiselling. Tools: In addition, mortising-chisels. Joints and models: Bridle joint, single mortise joint, dovetail-halving, common box dovetailing; any simple models involving above exercises. (8.) Tool-sharpening. Instruction to be given in the sharpening of planes and chisels, but not saws.

The above syllabus is prepared for a year's work for the average boy of Standards V., VI., or VII. The boys who show greater aptitude will be allowed to proceed to more advanced exercises when the above have been thoroughly mastered. The examination at the end of the year to be confined to the syllabus, omitting the models.

In metal-work, after an exhaustive inquiry, the London Board adopted the following syllabus:—

Draft Tentative Syllabus of Elementary Metal-work.

Theoretical Work.—1. Drawing: Drawing of tools used, and exercises to be performed. 2. Object-lessons—Materials: Metals generally, and those used in the course in particular; chemical and physical properties and uses; method of manufacture; source of supply.

Practical Work.—1. Cutting simple objects from zinc plate. 2. Chipping cast-iron—(1) narrow flat surfaces; (2) broad flat surfaces. 3. Filing cast-iron—(1) narrow flat surfaces; (2) broad flat surfaces. 4. Chipping and filing concave surfaces. 5. Bending cold wrought strip-iron into (1) simple and (2) complex curves. 6. Drilling. 7. Very simple turning. 8. Riveting. 9. Bending hot wrought bar-iron. 10. Shaping hot wrought bar-iron into simple forms. 11. Cutting forms from thin saw-steel plate, such as a pair of callipers to be heated in forge, filed, drilled, riveted, and finished. 12. Soldering zinc and tin plates. 13. Metal-spinning (zinc or "Britannia" metal).

(2.) MANCHESTER SCHOOL BOARD: SYLLABUS OF WORK IN HAND, EYE, AND MANUAL TRAINING.

WOOD-WORK, DRAWING, ETC., FOR ELEMENTARY SCHOOLS.

Work Period.	No.	Model or Exercise.	Finished Dimensions.	Material.	No.	Drawing.	Theory of Tools and Materials.
			Course of Work and Time-schedule for First-year Scholars.				
First Quarter's Work	1	Planing exercise	9″ x 1″ x 1⅜″ ..	Scotch fir ..	1	Elements of parallel or orthographic projection, and isometric projection, and drawing	Tool positions of plane, saw, chisel, gauge, try-square, and elementary uses.
	2	Sawing exercise	8½″ x 1″ x 1⅜″ ..	″ ..	2		
	3	Door-button on base	2¾″ x ⅝″ x 1″ base 4¾″ x ⅝″ x 2¾″	Yellow-pine	3		
Second Quarter's Work	4	Half-lap cross-joint	4½″ x 1″ x 1⅜″ ..	Yellow-pine	4	Orthographic and isometric projections	Construction and uses of the above, and other tools now brought into use.
	5	Octagonal prism	8″ x 1⅜″ ..	Yellow-pine	5	Plan and elevation	
	6	Oblique sawing and paring	8½″ x 1″ x 1⅜″ ..	White spruce	6	Orthographic projection	
	7*	Hexagonal mat	5½″ x ⅜″ ..	Basswood ..	7	Plan and elevation	
Third Quarter's Work	8	Dovetail tee-joint	4½″ x 1″ x 1⅜″ ..	Yellow-pine	8	Orthographic and isometric projections	Growth of trees, structure of wood, soft woods in common use. The pines and firs.
	9	Pan-stand ..	6″ x 1½″ x ½″ ..	Walnut or pine	9	Plan, elevation, and working drawing of joint	
	10	Mortising exercise	9″ x 1½″ x 1⅜″ ..	Yellow-pine	10	Plan, elevation, and isometric drawing	
Previous to Govt. Examination	11	Bridle-joint ..	4½″ x 1⅛″ x 1⅜″ ..	Basswood ..	11	Orthographic and isometric projections	Basswood, walnut. Recapitulation previous to Government examination.
	12	Modifications, 4, 6, 11	Various for tests	Yellow-pine or white spruce	12	Various for test of principles	

NOTE.—Exercises or models marked * are optional, all others must be taken in numerical order.

(2.) MANCHESTER SCHOOL BOARD: SYLLABUS OF WORK, ETC.—*continued.*

WOOD-WORK, DRAWING, ETC.—*continued.*

Work Period.	No.	Model or Exercise.	Finished Dimensions.	Material.	No.	Drawing.	Theory of Tools and Materials.
			Second-year Scholars.				
First Quarter's Work	1	Mortise-joint ..	4½″ x 1⅛″ x 1⅜″ ..	Yellow-pine	1	Orthographic and isometric projections	Advanced tool positions, boring-bit, spokeshave, gouge, hammer, and bow-saw.
	2	Desk-tray ..	10″ x ¾″ x 2½″ ..	Satin-walnut	2	Working drawing ..	
	3	Halved and dovetailed cross	5″ x ⅞″ x 1½″ ..	Scotch fir ..	3	Orthographic and isometric projections	
Second Quarter's Work	4	Oblique sawing and inlay	10″ x ⅞″ x 1⅝″ ..	Spruce and satin-walnut	4	Plan, elevation, and section	Nails and screws; hard woods, varieties and uses; sharpening of saws and other tools.
	5	Dovetail-joint at 60°	4½″ x 1⅛″ x 1⅜″ ..	Yellow-pine	5	Orthographic and isometric projections	
	6*	Pen-tray and ink-stand	10″ x 2½″ x 5″ x ¾″	Satin-walnut	6	Working drawing ..	
	7	Bridle- and mortise-joint	4½″ x 1⅛″ x 1⅜″ ..	„	7	Orthographic and isometric projections	
Third Quarter's Work	8	Teapot-stand ..	6″ x 6″ x ½″ ..	Basswood and walnut	8	Working drawing ..	Glue. The beech, oak, ash, mahogany, and sycamore.
	9	Housing and grooving	5″ x 2¼″ x ¾″ ..	Yellow-pine	9	Orthographic and isometric projections	
	10	"Home pets" feeding-trough	12″ x 2¼″ x ½″ x 4″	Scotch fir ..	10	Working drawing ..	
Previous to Govt. Examination	11	Simple end dovetail	4½″ x 1″ x 1⅜″ ..	Satin-walnut	11	Orthographic and isometric projections	Recapitulation previous to Government examination.
	12	Fern-basket ..	8″ x 8″ x 4″ x ½″ sq.	Basswood ..	12	Working drawing ..	
			Third-year Scholars.				
	1	Simple 3-pin dovetail	4½″ x 2¾″ x ⅝″ ..	Yellow-pine	1	Isometric, joint apart	
	2	Knife-box ..	12″ x 8″ x 2¼″ x ½″	Scotch fir ..	2	Working drawing ..	
	3	Tenoned and rabbeted frame	8″ x 6″ x ⅞″ x 1½″	Yellow-pine	3	Isometric, joint apart	Preservation of hard and soft woods, chief methods in use.
	4	Bow-saw exercise	12″ x 3″ x ⅝″ ..	„	4	Working drawing ..	
	5	Wall-bracket ..	12″ x 6″ x ⅜″ ..	„	5	Isometric drawing	
	6	Stop-dovetailing	4½″ x 2¾″ x ⅝″ ..	Yellow-pine and walnut	6	Isometric, joint apart	
	7	Edge-jointing ..	12″ x ¾″ x ¼″ ..	Any white wood and satin-waln't	7	Working drawings	Chief natural timber-destroyers.
	8	Table-mat ..	12″ x 7″ x ¼″ ..	Ditto ..	8		
	9*	Dovetailed box..	12″ x 7″ x 4″ x ½″	Scotch fir ..	9	Isometric, with lid off	
	10*	Shallow tray ..	11″ x 6″ x ⅞″ x ¼″	Satin-walnut	10	Isometric and joint de	tails
	11*	Inlaid card-tray	6″ x 6″ x ½″ x ¼″	Satin-walnut and sycamore	11	Working drawing ..	

NOTE.—Exercises or models marked * are optional, all others must be taken in numerical order.

(3.) BIRMINGHAM SCHOOL BOARD: SYLLABUS OF WORK IN MANUAL INSTRUCTION.

In the drawing, care must be taken to follow the usual methods adopted; also in getting the boys to see the object as represented from the different views they draw. Models for this purpose should be shown to the class when possible. Occasional lessons, giving hints on the best way of doing any of the exercises, will be given by the director if he is desired to do so. The chief points of weakness in the past have been: First, not sufficient exercise with the black scales; second, wrong methods of construction, and carelessness in making tangent circles and lines; third, wrong projection. Properly projected, accurately drawn to scale, and carefully dimensioned drawings are what is wanted; but correct methods, and skilful handling of the tools in obtaining them, are as essential as accurate and neat work.

STANDARD V. (WOOD-WORK).

First Quarter.

Practical Work.—Truing-up a strip of wood 10 in. long to a rectangular section of given dimensions: First, face to be planed to the straight-edge, and winding-strips; second, face to be planed to the straight-edge and square; third, face to be planed to the marking-gauge and square; fourth, face to be planed to the rule-marking gauge and straight-edge. The right order in which these faces are planed, and proper face-marks put on the first two faces, is to be strictly observed.

Knowledge of Tools.—Straight-edge, winding-strips, square, and marking-gauge.

Woods.—Oak, beech, sycamore.

Second Quarter.

Practical Work.—Truing-up a strip of wood having a transverse section of an octagon, circle, hexagon, and triangle, &c.

Tools.—Bevel-, jack-, and smoothing-planes, hammer, compasses, and marking-point.

Woods.—Ash, mahogany, walnut, teak.

Third Quarter.

Practical Work.—Marking out to rule and sawing off with tenon-, crosscut-, and rip-saws; also use of chalk-line.

Tools.—Tenon-, crosscut-, and rip-saws, bench-hook, and chalk-line.

Woods.—Pitch-pine, willow, and cedar.

Fourth Quarter.

Practical Work.—Cutting to dimensions with a chisel, applying force (1) with palm of hand (2) with the shoulder, (3) with a mallet.

Tools.—Paring-, firmer-, and mortise-chisels, paring-board, bench-holdfast, and mallet.

Woods.—Yellow-pine, yellow-deal, and spruce.

STANDARDS VI. AND VII. (WOOD-WORK).

First Quarter.

Practical.—Joining together of two pieces of wood by simple common joints.

Tools.—Grinding, sharpening, and setting of tools.

Woods.—Elementary principles on the growth, structure, and classification of timber.

Second Quarter.

Practical.—Joining together of three or more pieces of wood by simple joints.

Tools.—The lathe, mortise-gauge, the brace and its accessories.

Woods.—Felling and conversion of timber.

Third Quarter.

Practical.—Pattern-making, small simple patterns, where no core-box is required.

Tools.—The lathe, gouge, bow-saw, bradawl, gimlet, screwdriver, nails, brads, and screws.

Woods.—Shrinkage and seasoning of timber.

Fourth Quarter.

Practical.—Pattern-making, small easy patterns, where a simple core-box is required.

Tools.—Sandpaper, glue, and varnish. How to make very simple casts from patterns in wood, lead, or plaster-of-paris, &c.

STANDARD V. (METAL-WORK).

First Quarter.

Practical.—Cutting sheet-iron or steel to any given size and shape, to form external templates or gauges. Before cutting, all lines must be scribed and centre-pops made on the sheet-metal, then cut to within $\frac{1}{16}$ of an inch to these lines, the plate strengthened and finished accurately with the file to the lines, using the straight-edge, square, and calipers. All parallel lines are to be scribed with the surface-gauge and marking-off table.

Knowledge of Tools.—Straight-edge, scriber, square, outside calipers, centre-punch, scribing-block or surface-gauge, and surface or marking-off table.

Materials.—Process of manufacture of sheet-iron and steel from cast-iron and scraps. Nature and properties of sheet-iron and mild steel.

Second Quarter.

Practical.—Cutting and filing sheet-iron or steel, as above, to form internal templates or gauges to accurately fit the external ones.

Drilling.—Before drilling, a circle must be scribed with the dividers the size of the hole, and four or more centre-pops put on the circumference to see if the drill is keeping true to the centre. In large holes two concentric circles should be scribed around the centre, one small and one the size of the hole.

Tools.—Dividers, drills, and simple drilling-machines; the lathe, used as a drill- or boring-machine; surface-gauge and marking-off table.

Material Tool or Cast Steel.—Its properties of tempering, and its manufacture. Use of oil, or soap and water, in drilling. Case-hardening.

Third Quarter.

Practical.—Cutting out, filing, and bending sheet-iron, steel, or brass. In bending, the thickness of the metal should be allowed for. Simple work in soft-soldering, using of letter- and figure-punches.

Tools.—Shearing- and punching-machines, the vice, and the soldering-iron.

Materials.—Solder, tin, brass: their properties and manufacture.

Fourth Quarter.

Practical.—Cutting-out, filing, and cold-riveting of sheet-iron or steel, single- and double-riveted lap-joints, single- and double-riveted butt joints, with straps on one or both sides. The joining of three and four pieces of plate together by riveting.

Tools.—Riveting-hammers and rivets, drifts, and rimers; cotters, keys, nuts, and bolts.

Materials.—Cast-iron: its manufacture and properties. Wood used chiefly in connection with metal: lignum vitæ, ash, hornbeam, greenheart, beech.

STANDARD VI. (METAL-WORK).

First Quarter.

Practical.—Chipping, filing, and surfacing cast-iron. Using cross-cut and flat chisels, bastard, second-cut, smooth, and draw files. Scraping and polishing with tool or emery and oil.

Tools.—Chipping-chisels, files, scrapers, emery-cloth, surface-plates, grindstone, and emery-wheel.

Materials.—Lubricating-oils, tallow and grease, emery and red-lead.

Second Quarter.

Practical.—Chipping wrought-iron, tapping, drilling, and screwing with stocks, dies, and taps. Hand-turning in brass and iron.

Tools.—The lathe, hand turning-tools; stocks and dies, taps, vice-clips.

Lecture.—Moulding and casting operations.

Third Quarter.

Practical.—Turning by hand and slide rest; simple chuck-work; forging, drawing out a chisel or drill, &c.

Tools.—Lathe, chucks, the forge and its accessories.

Materials.—Wrought-iron and steel in the bar.

Fourth Quarter.

Exercises combining a knowledge of all the foregoing work, but more advanced.

(4.) Parisian Manual and Occupation Exercises.

As an illustration of method I quote from a report by Consul T. Schoenhof upon French education, which may give some idea of the importance attached by that country to manual instruction: "The public-school system commences with the kindergarten schools, numbering in Paris alone over a hundred and thirty, with children ranging from two to six years. This system is continued in the standard-work of the regular schools by paper- and cardboard-work and clay-modelling."

I cannot do better than give the programme of one school as an illustration of the arrangement and methods employed:—

Manual Exercises intended to develop the Children's Skill of Hand.

Elementary Class, Seven and Eight Years old: One Hour per Day.

Elementary exercises in freehand drawing; symmetrical arrangements of forms; cutting out pieces of coloured paper, and applying them upon geometrical forms; exercises in colouring; cutting out geometrical forms in cardboard; representations of geometric solids: exercises to be done first on squared paper, and afterwards on plain paper. Small-basket work: Arrangement of strips of coloured papers (plaited). Modelling: Reproductions of geometric solids and simple objects.

Intermediate Class, Nine and Ten Years old: One Hour per Day.

Cutting out cardboard patterns; construction of regular geometric solids; cardboard models, covered with coloured drawings or coloured paper. Small-basket work: Combination of plaits; basket-making. Objects made of wire: Trellis or netting; wire-chain making. Combination of iron and wood: Cages. Modelling simple architectural ornaments. Object-lesson: Principal characteristics of wood and common metals.

Upper Classes: Two Hours per Day.

Drawing and modelling; continuation of the exercises in the preceding class; repetition of the ornaments previously executed in the form of sketches, with dimensions attached to them; drawing the requisite sections for this purpose; reproducing the sections as measured sketches; study of the various tools used in wood-working—hammer, mallet, chisel, gimlet, centre-bit, brace, screw-driver, compasses, square, marking-gauge, saws of different kinds, jack-plane, trying-plane, smoothing-plane, files and rasps, level. Theoretical and practical lessons in the above. Planing and sawing wood; construction of simple joints. Boxes nailed together, or joined without tacks. Wood-lathe; tools used in turning; turning simple geometric forms. Study of the tools used in working iron—hammer, chisel, cutting-tool, cold-chisel, squares, compass, files, &c. Theoretical and practical lessons concerning them. Exercises in filing, smoothing, and finishing rough forgings or castings (cubes, polygonal nuts).

The wood-working shop contains twelve carpenters' benches and four turning-lathes. At the latter they commence on a plain stick of a certain height, which is turned into as many as seventy-six different ornamental pieces, made either to stand separately or to fit into others. The workshop for iron contains twelve vices—four at each side-wall, and four at one end of the room. In addition, fully equipped schools are provided with a boring-machine, forge, and anvil. In the use of iron they start from a plain piece, and work this into various simple geometrical shapes and other forms by the application of the file.

Scholarships.—I would suggest that forty scholarships should be available in each district to boys in their third year's course of work, the value being 10s. and free instruction in evening classes for a period of twelve months, 5s. of this amount being contributed by the Education Department and 5s. by the Board. Should higher-grade schools be established these scholarships will be unnecessary, as the instruction will be given as part of the course of school work.

Workshops and Appliances.—One of the best centres visited under the London School Board for wood-work was Hasebrigge Road, Clapham, where accommodation is provided for forty boys.

The plan of the room is similar to the sketch printed with Plate XIII. The room being about 70 ft. long by 22 ft. wide; two boys to each bench, each having a clear 4 ft. of space. The number of instructors for a class of forty is—1 instructor, 1 assistant, and 1 pupil-teacher; for a class of twenty—1 instructor and 1 pupil-teacher.

The following tools will be required for twenty boys:—For each boy: 1 jack-plane, 5 firmer-chisels, $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in.; 1 tenon-saw, 10 in. long; 1 screwdriver, 1 hammer (No. 2),

1 iron rule, 1 try-square, 1 small mallet, 1 tool-basket, 1 marking-gauge. For general use: 3 smoothing-planes, 3 trying-planes, 2 try-squares, 5 bevels, 10 in.; 2 mortice-gauges, 1 rebate-plane, 2 firmer-chisels, 1 in.; 6 firmer-chisels, $\frac{1}{8}$ in.; 3 gauges, various sizes; 15 gimlets, various sizes; 2 pairs pincers, 2 pairs iron compasses, 1 quart gluepot, 4 oil-stones, 5 hand-saws, 22 in.; 20 bradawls, various sizes.

One iron brace, one countersunk bit, seven centre-bits (various sizes), one screwdriver-bit, two pin-bits, four files (two half-round, 10 in.; one round, $\frac{1}{2}$ in., 10 in.; one square, $\frac{1}{2}$ in., 10 in. long), three spokeshaves, two frame bow-saws, two spare blades for same, two sharpening-slips, two oil-cans, five punches (various), one iron cramp.

The cost of the benches will be about £12 10s.; the cost of tools for twenty boys, £20; the cost of timber, glue, nails, &c., £4; shelving, cupboards, &c., £9: total, £45 10s.

There are many text-books upon the subject of manual instruction in wood-work, amongst which are—Barter's "Diagrams and Wall-charts" (Cassells and Co.); Barter's "Manual Instruction" (Whittaker and Co.); Barter's "Drawing for Wood-work" (Whittaker and Co.); Ricks's "Manual Training: Wood-work" (Macmillan and Co.); "Cards for Class-work," by Messrs. Barter and Ricks, published by Cassells and Co.; "Educational Wood-work," by Richard Trainor, of Manchester Technical School.

In considering the cost of establishing manual instruction classes it must not be forgotten that the Government offer pound for pound upon sums raised for manual and technical instruction, thus considerably reducing the initial cost where amounts are subscribed.

I regret that I am not permitted to publish the view of the manual instruction class at the Kelburn Road Board School. I forward the original presented by Messrs. Cassells and Co. for departmental information. I include, however, a view of the class at Rochester and three views of the Cambridge Manual Training School for Boys (see Plates XIII. to XVI.), published with the consent of the National Association for the Promotion of Technical Education.

Instructors in Manual Work.—If the work of manual instruction is to be successful, special instructors must of necessity be appointed. I would recommend the appointment of an organizing teacher in each district, whose duty would be to conduct the classes formed for the present, and to immediately undertake the training of the regular school-teachers, who would attend with the boys and assist in the instruction given. The appointment of qualified instructors would be invaluable, and enable the whole system to be carried out upon the most approved lines, in both town and country schools. In every district I visited such instructors or organizers were appointed, and upon them depended the success of the system.

The training of teachers is of the utmost importance, for, although in many cases artisans may act as instructors, the knowledge and habits of a regular teacher are a necessity. Classes should be held, free to all teachers, on Saturdays and in the evenings should sufficient present themselves, and every inducement offered to teachers to qualify themselves to conduct manual classes, a bonus of £2 being paid to all teachers obtaining a certificate in accordance with the requirements of the City and Guilds of London Institute, the syllabus of which is appended to this chapter.

Departmental Assistance.—Capitation is paid upon class attendances in accordance with the Technical Instruction Act. I further recommend a bonus of £2 to every teacher obtaining the certificate in manual instruction; a grant of £50 per annum towards the salary of each organizing instructor appointed; a grant of 10s. to each holder of a manual instruction scholarship; a grant of one-half of the cost of furniture and appliances in fitting up the workshops for manual instruction in wood or metal; and a grant of one-half the cost of erection of special workshops as centres of instruction, subject to the department's approval of the plans and specifications.

Examination of Teachers in Manual Instruction.

In this respect I suggest that the department should establish an annual examination upon the lines of the City and Guilds of London Institute; the English examination being open to such teachers as desire to obtain their certificate, the syllabus of which is here given:—

Programme of the City and Guilds of London Institute Examinations for Teachers of Manual Training in Public Elementary Schools.

Manual Training—Wood-work.

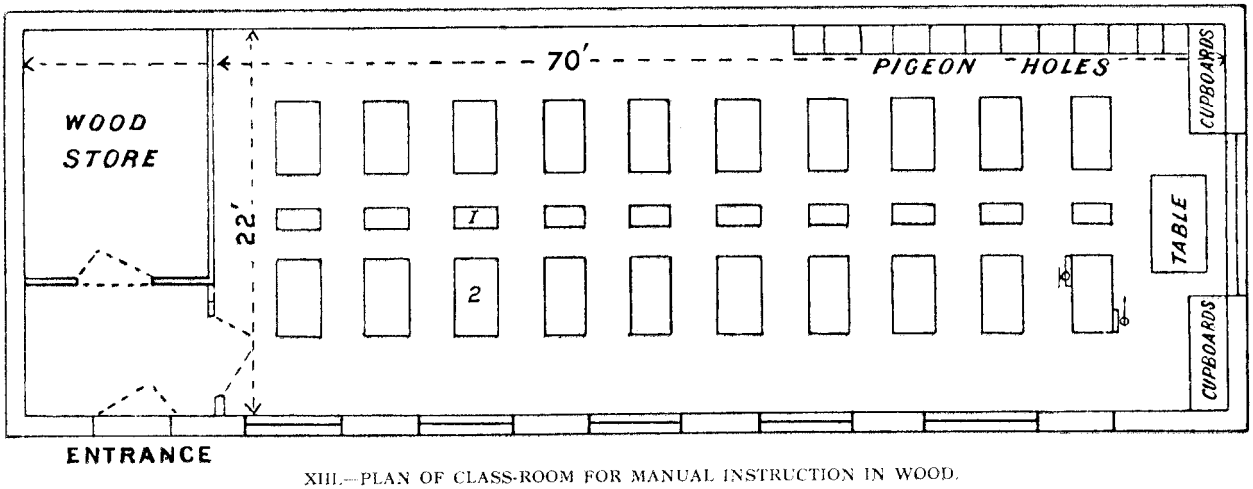
With the view of certifying to the efficiency of qualified teachers under the Education Department of public elementary schools to give instruction in wood-work in accordance with the provisions of the Code (1890), the City and Guilds of London Institute is prepared to issue certificates to such teachers on the following conditions:—

1. The candidates will be required to give evidence of having regularly attended, during the session preceding each examination, a course of at least twenty practical wood-working lessons given on separate days in a school or class registered by, and under an instructor approved by, the Institute. Each lesson should be of at least two hours' duration; and no two lessons may be given on the same day. In order that a class may be registered, it must be under the direction of a committee of a School Board, or Municipal Council, or technical school, or other public body.

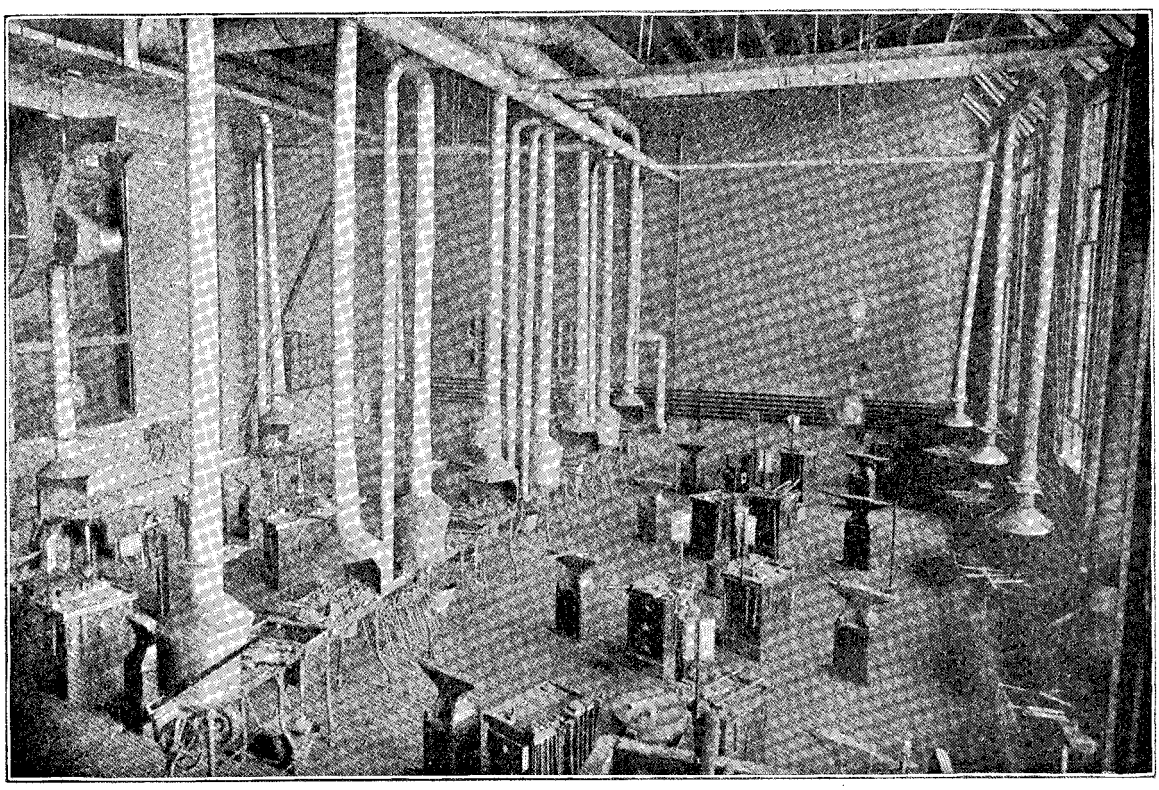
2. The candidates will further be required to pass two examinations, one at the end of each year's course, to be conducted by examiners appointed by the Institute, and to pay a fee of 5s. for each examination.

First Year's Examination.

The examination to be held at the end of the first year's course will consist of (1) drawing, (2) practical exercises in wood-working. Provision for holding the examinations and arrangements for



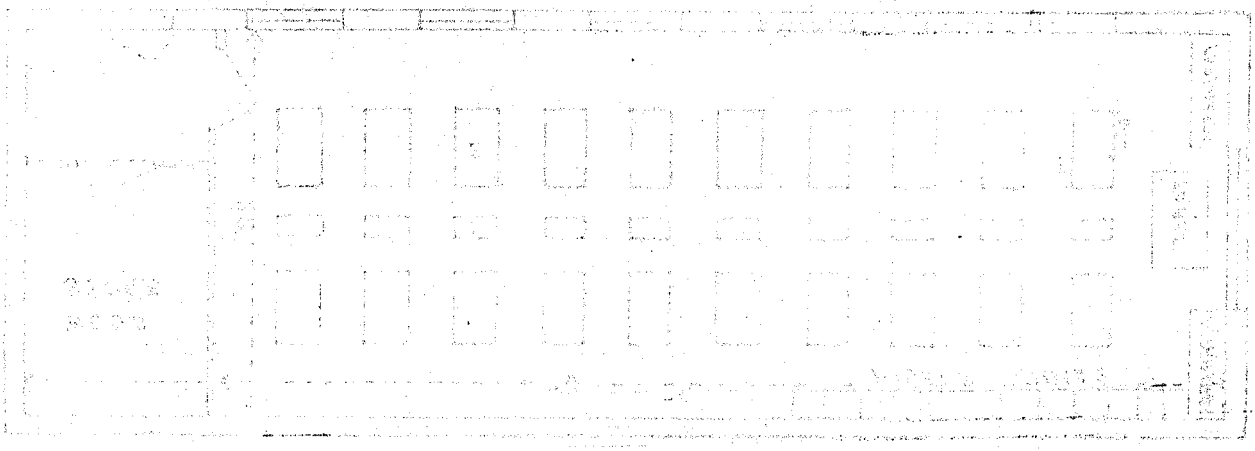
XIII.—PLAN OF CLASS-ROOM FOR MANUAL INSTRUCTION IN WOOD.

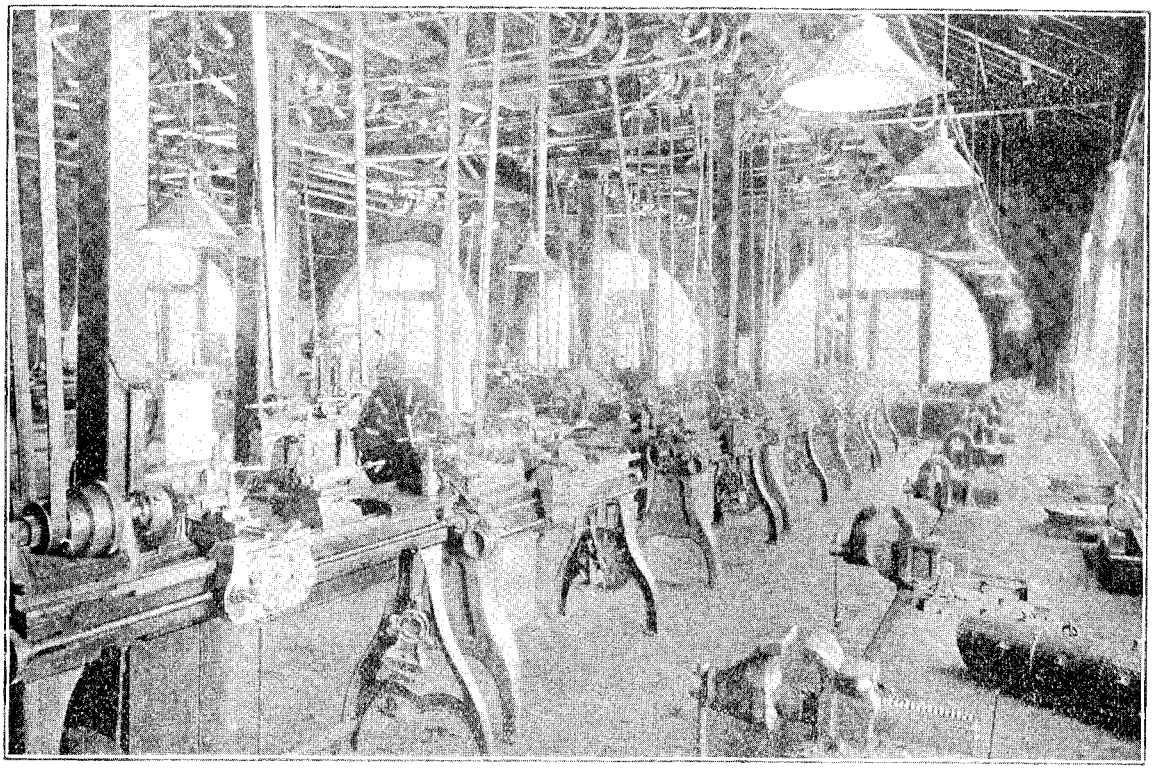


XIV.—THE CAMBRIDGE MANUAL TRAINING SCHOOL FOR BOYS, MASSACHUSETTS, U.S.A.—FORGE-ROOM.

[To face p. 22.

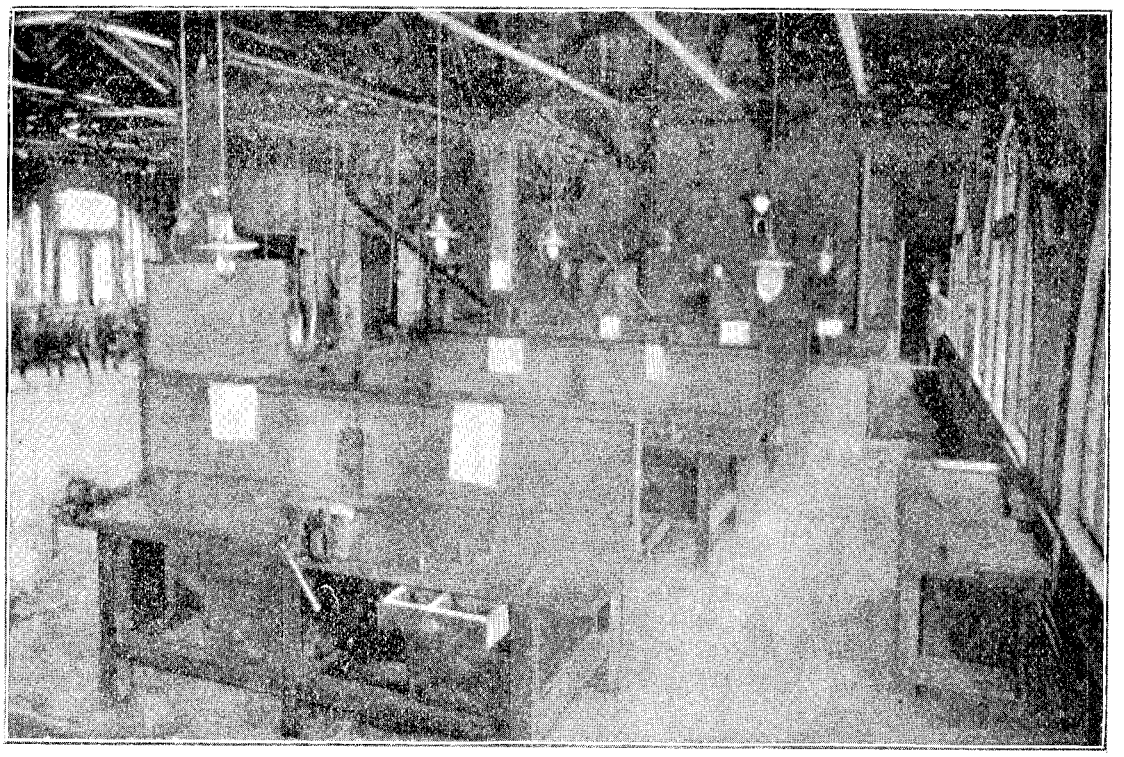






XV.—THE CAMBRIDGE MANUAL TRAINING SCHOOL FOR BOYS, MASSACHUSETTS, U.S.A.

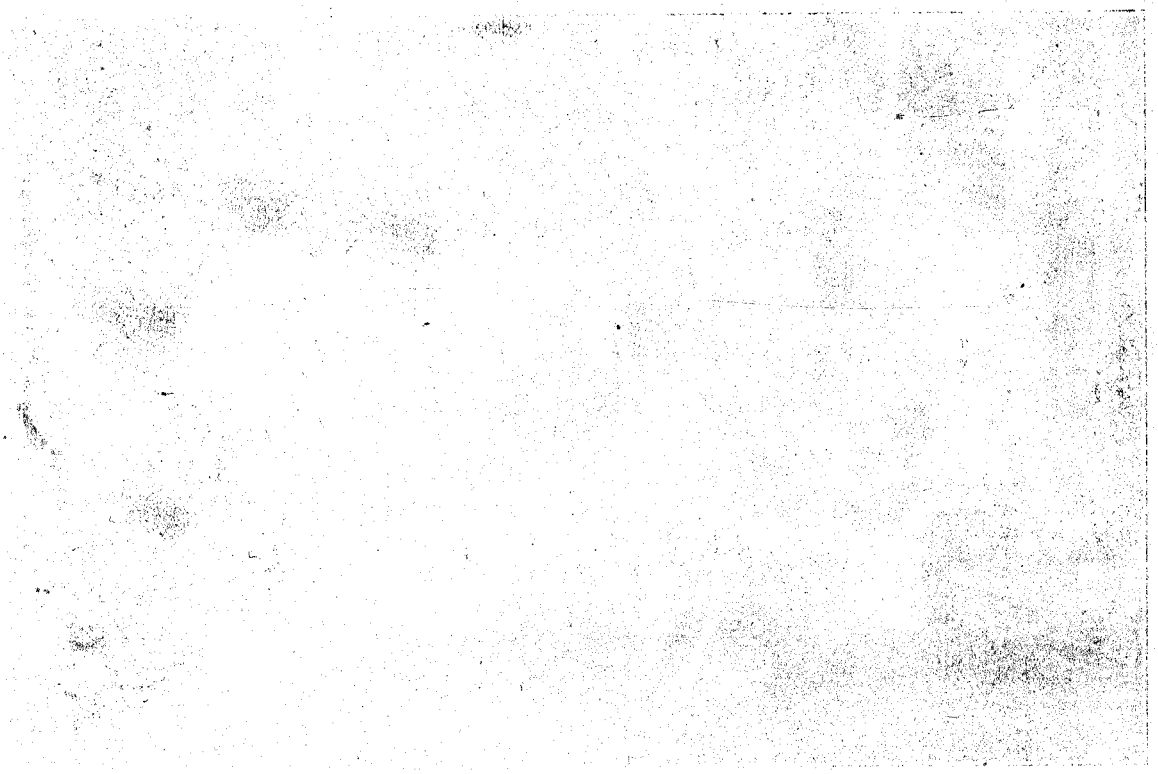
The Iron-working Room—Machine-shop.

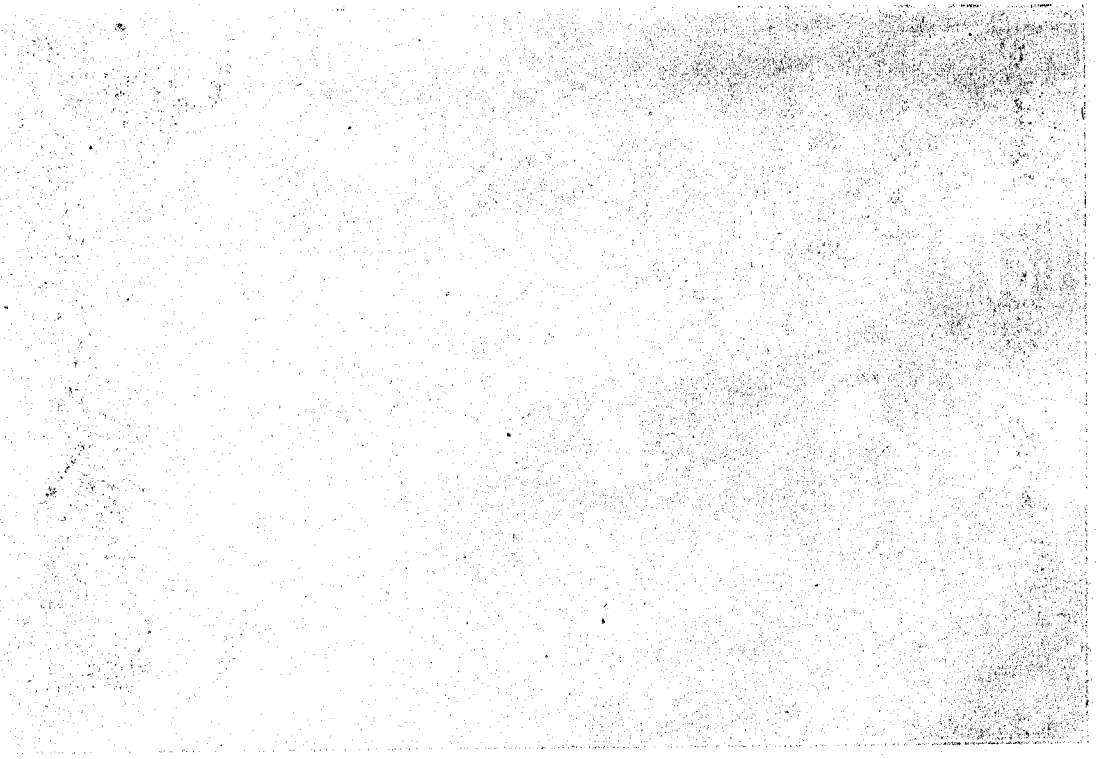


XVI.—THE CAMBRIDGE MANUAL TRAINING SCHOOL FOR BOYS, MASSACHUSETTS, U.S.A.

Iron-working-Room—Iron-fitting and other metal-work using hand-tools.

[To face p. 22.





supervision must be made by the committee of each school. Either tools must be provided for the practical examinations, or the candidates must be required to bring them.

1. *Wood-working.*—Candidates will be provided with suitable sawn pieces of wood, and will be required to reduce them by the plane, saw, or chisel to any simple forms shown by dimensioned sketches. They will also be required to construct from such pieces of wood any of the simpler joints, or any very simple combination of such joints, to dimensioned sketches.

2. *Drawing.*—Candidates should have clear notions regarding the accurate representation of solids on a flat sheet of paper. The nature of the following kinds of projection should be understood: (*a.*) Orthographic projection (plan, elevation, section), in which the projectors are at right angles to the plane of projection. (*b.*) Oblique projection, in which the projectors are parallel to each other, but oblique to the plane of projection. Candidates will be required to show ability to draw accurately to scale, in plan and elevation, simple solids, and some of the simpler joints, such as housing, angle-bridle, open mortise and tenon, dovetail-halving, lap-halving, &c.; also very simple frames or combinations of joints. The joints may be drawn in their simplest positions, compatible with the clear representation of their form and dimensions. Candidates must also show ability to represent simple joints in oblique projection, the plane of projection being parallel to one set of the principal faces of the object, so that the projection shows the true shape of these faces. Oblique projections, being intended to be pictorial views, may be simply neat freehand sketches.

To pass the examination, candidates must satisfy the examiners in each of the subjects 1 and 2. The number of marks will be apportioned as follows: Wood-working, 250 marks; drawing, 100 marks.

Final Examination.

Candidates for the final examination must have previously passed the first year's examination. The final examination will consist of more advanced exercises in wood-working and drawing, and also of questions on the technology of wood-work and methods of instruction.

1. *Wood-working.*—Exercises similar to those for the first year, but more difficult. Dimensioned sketches will be given as a guide to what is required. The accuracy of fitting, accuracy of dimensions, and the time taken will be considered in valuing the work done.

2. *Drawing.*—Making freehand sketches of, and drawing to scale from, dimensioned sketches, ordinary joints used in wood-work, or any simple frames or simple framed objects made of wood. Hand sketches of simple joints and frames as seen in oblique projection.

3. The written examination will include questions founded on such subjects as the following: (1.) Woods: Places from which some of the commoner woods are obtained; their characteristic properties and uses; the general structure of cone-bearing and leafy timber trees; the meaning of seasoning timber; effects of shrinkage and warping; identification of specimens of wood. The questions will be limited to oak, ash, elm, beech, mahogany, sycamore, basswood, white-deal (spruce), red-pine (Scotch fir), yellow-pine. (2.) Tools, &c.: Description of the construction and mode of using ordinary wood-working tools; methods of using nails, screws, and glue. (3.) School management: Fittings and cost of equipment of school workshop; arrangement of pupils; character of instruction and sequence of lessons; the special characteristics of Sloyd and of other systems of teaching.

To obtain a certificate candidates must pass in each of the three subjects 1, 2, and 3. The number of marks will be apportioned as follows: (1) Wood-working, 400 marks; (2) drawing, 100 marks; (3) written examination, 100 marks.

Works of Reference.—Barter's "Manual Instruction: Wood-work" (Whittaker and Co.); Goss's "Bench-work in Wood" (Trubner); Wood's "Manual Instruction in Wood-work" (Simpkin, Marshall, and Co.); Ward's "Timber Trees" (Macmillan); and "The Oak" (Paul, Trench, and Co.); Low's "Solid Geometry," Part I. (Longmans); Young's "Manual Training for the Standards," "Manual Instruction and Drawing" (G. S. Barter, Whittaker and Co.).

MANUAL TRAINING—METAL-WORK.

With the view of certifying to the efficiency of teachers to give instruction in metal-work, the City and Guilds of London Institute is prepared to issue certificates to qualified teachers of public elementary schools on the following conditions:—

1. Candidates must have already passed the the Institute's first year's examination in manual training, wood-work.

2. The candidates will be required to give evidence of having regularly attended, during each of two sessions, a course of at least twenty practical metal-working lessons given on separate days, each of not less than two hours' duration, in a school or class registered by, and under an instructor approved by, the Institute. In order that a class may be registered, it must be under the direction of a committee of a School Board, or Municipal Council, or technical school, or other public body.

3. The candidates will further be required to pass two examinations, one at the end of each year's course, to be conducted by examiners appointed by the Institute, and to pay a fee of 10s. for each examination.

Teachers of wood-work in public elementary schools (whether certificated teachers or not) who give evidence of having satisfactorily taught a class of pupils in wood-work for a period of not less than one year, and who produce a certificate from Her Majesty's Inspector to that effect, are eligible under the conditions given in paragraph 2 to sit for the first year's examination, and subsequently for the final examination in manual training, metal-work.

Teachers of metal-work who give evidence of having satisfactorily taught, for a period of two years, a class of pupils in metal-work at a public elementary school, and who produce a certificate from Her Majesty's Inspector to that effect, are eligible without attendance at any class to sit for the first year's examination in manual training, metal-work.

First Year's Examination.

The first year's examination will consist chiefly of practical exercises in metal-work, but candidates will also be required to answer in writing a few simple questions on the tools used and methods employed in working the exercises of the following syllabus, and on the chief properties of the common metals in their relation to workshop processes. The exercises for the practical examination will be such as are included in the following syllabus, and candidates should be able to complete any of the exercises mentioned, but they will be required to pass in two only of the divisions A, B, and C.

Division A : Vice-work.—The form and use of flat and cross-cut chisels; flat, round, square, and half-round files; scrapers; taps, stocks, and dies; screw-plates; measuring and other tools, including calipers, square, centre-punch, scribing- and V-blocks, straight-edges, and surface-plates. Different forms of vices for bench-work, and the grinding and keeping in order of the tools used. Chipping, filing, and scraping cast-iron, wrought-iron, steel, brass, and gun-metal to simple forms and given dimensions. Cutting keyways and holes from plates or blocks to fit a given gauge, and preparing and fitting taper- and headed-key, or other piece. Cutting out and filing up a hexagon or octagon gauge from thin plate, filing and preparing a straight-edge. Drilling, tapping, and filing to shape a square or hexagonal nut; screwing round bar with screw-plate and stocks and dies to fit a given nut.

Division B : Bench-work.—Composition of soft solders; use of copper soldering-bit; composition and use of ordinary fluxes; soldering simple joints in tin- and brass-work. The connection of plates and bars, and of joints, with rivets, single- and double-countersunk, hammered cold.

Division C : Forge-work.—The form and use of the ordinary forge tools, management of fire, precautions to be observed in heating metals, drawing out bars to square and round ends, parallel, and taper; bending iron to simple curves, or to square or circle of given size; jumping-up. Forging of simple examples, as headed-key, spike-nail, &c.; forging and tempering centre-punch, drill, and small chipping-chisel. Connection of pieces of bar by welding. Case-hardening with prussiate of potash. Annealing.

Final Examination.

Candidates for the final examination must produce a certificate of having passed the first year's examination. They will be required to undergo an examination in practical work, and also a written examination and a drawing examination.

1. *Practical Work.*—Exercises may be selected from the first-year syllabus A, B, and C, only that greater accuracy and finish will be expected; or more difficult exercises of the same character, including examples in brazing, may be set.

Candidates will also be required to work exercises requiring a use of the simple lathe and drilling-machine to the following syllabus: Form and use of hand-tools for turning iron and brass; centring of work and fixing in lathe; turning of plain cylindrical rod; simple taper- and collar-turning; use of V-centre for drilling; turning of simple curved pieces to template. Chasing screw-threads. Use of slide-rest and back gear; and of shifting headstock for taper-turning. Methods of screw-cutting. Exercises may set involving forge-, vice-, and lathe-work, and drilling.

6. DOMESTIC ECONOMY.

Manual instruction is to the boys what domestic economy is to the girls, a necessary part of daily life instruction. Opinions differ as to the age in which such instruction should commence. I am of opinion that, until the work is organised, a medium course is advisable, and that girls of Standards V. and VI. should receive instruction in the domestic sciences, whilst the boys of the same standards would be engaged in manual exercises. A writer to *Education* thus defines the sections of instruction: (1.) Laundry-work taught practically and thoroughly. (2.) Cookery: all kinds of plain cookery, with simple lessons on the choice and food-value and money-value of articles used. (3.) Housewifery: simple definite rules for general housework and cleaning, the pupils being guided to think out for themselves proper methods of spending, using, and saving. (4.) Simple lessons in health, care of infants and children, and sanitation. (5.) Dress-cutting from any size measurement, with sufficient practice. (6.) Simple dressmaking and fitting. (7.) Undergarment-pattern cutting from any size measurement. (8.) Plain needle-work. (9.) Mending.

The above would be an excellent course of work; the question is how much can be done in connection with our primary-school system. In connection with the last five sections we already have sewing in our schools. Girls unfortunately are often taught to sew, but not to cut out, or make use of material to the best advantage. The London School Board in this respect requires that cutting-out, both in paper and material, shall form an important part of the children's training. The method usually adopted is that of a simple system of measurement on paper, the elder girls in many cases cutting out for the younger ones. Mending is also encouraged, particularly in country schools, children bringing work from home for that purpose. Pupil-teachers during their training are taught needlework and cutting-out, and are required to give a lesson in the presence of Her Majesty's Inspectress. The lesson is not considered satisfactory unless sketches and measurements are freely and fully given upon the blackboard. In this particular way I think the lessons in sewing might be made considerably more practical.

Cookery.—Lady Warwick, in an excellent article upon the training of girls, states that the following principles should be followed in connection with such classes: (1.) To teach the value of economy and cleanliness. (2.) To teach principles rather than to give recipes. (3.) To teach the nutritive value of different foods. (4.) To show that, with the exercise of thought, diet can be varied without extra cost, and that all instruction given should be of a character adapted to the homes of working-men.

As showing the rapid progress made in England during the past few years, I quote the following figures: Girls taught cookery in 1886, 12,438 from 643 schools. In London alone in 1897 about 33,000 girls from the Board schools were instructed.

Under the London School Board there are 170 cookery centres. These schools are usually built in connection with existing primary schools; manual instruction for boys and laundry-work for girls being also provided for at the majority of the centres. Children from outside schools may attend the Board's classes upon payment of a fee of 4s. for the course of twenty-two lessons. Prizes are awarded for regular and punctual attendance. By resolution of the Board, 7th May, 1896, all girls in Standard IV. are required to attend twenty-two lessons in the first course of instruction in cookery at one of the Board's centres. All girls in Standard V. are required to attend twenty-two lessons in the second course, each course extending over a period of six months. The morning classes at the cookery centres commence at 9 o'clock; demonstration is continued until 10; first practice, 10 to 11; second practice, 11 to 12. The last practice to include dishing-up, cleansing utensils, and clearing away. Afternoon classes commence at 2 o'clock; demonstration until 3; practice of all girls to 4.30, as in the morning course.

Girls who attend cookery and laundry centres are required to go direct from their homes to the centre, and the instructress is responsible for properly marking the attendances of each girl. Duplicate registers are kept, as in the case of manual instructors, C or L being marked in the circle opposite each girl's name, one register being forwarded to the head teacher of the school.

One of the Education Department requirements is that the equipment of the kitchens shall be appropriate, and that the stoves and other appliances shall be such as are usually found in the homes of the working-people of the neighbourhood. Large fireplaces are discouraged. Cookery by gas is allowed to be taught, but only as an additional means of cooking. Although gas-stoves are now freely used, they are never likely to entirely supersede the colonial oven or range.

The following is the method of instruction under the London School Board, several centres of which I visited: (1.) Each lesson opens with questions upon plain cookery. (2.) The demonstration then follows for one hour, during which there is no dictation. (3.) The class is again questioned upon the day's lesson. (4.) The class is then divided into two detachments, the first practising one hour; the second are for the first half-hour copying the day's work into a note-book, and the second half-hour in dishing up such dishes as are ready, making sauces, &c., washing-up, cleaning knives, scrubbing, &c. The order of this work is reversed each week for the same class.

Receipt-books, strongly bound, are provided for each class. The food cooked is usually sold at cost price, cheap dinners are provided for the school-children, and in many cases the teaching staff of the school remain for meals. The text-book used by the London School Board is "Instruction in Cookery," by Miss Briggs, the Board's superintendent of cookery, published by Charles Straker and Sons, Bishopsgate Avenue, E.C.

London School Board.

Syllabus for First Cookery Course.

Lesson 1.—First rules for cookery, vegetable-soup, egg-snow for invalids, eggs cooked in two ways.
Lesson 2.—Boiled and steamed potatoes, baked bread-pudding.
Lesson 3.—Shepherd's pie, baking-powder, boiled suet-pudding.
Lesson 4.—Roast meat, and rules for dry-roasting; Yorkshire pudding; to clarify dripping.
Lesson 5.—Boiled fish and sauce, fish-cakes.
Lesson 6.—Pea-soup, seed- or currant-cake.
Lesson 7.—Minced meat with mashed potatoes, coffee.
Lesson 8.—Boiled meat, caper- or onion-sauce, rice-pudding.
Lesson 9.—Leg-of-beef stew, rock-cakes.
Lesson 10.—Meat-pie and patties, short pastry, Hunter pudding, fruit-pie for practice.
Lesson 11.—Fish fried in batter, scones.
Lesson 12.—Potato-soup, bread with yeast.
Lesson 13.—Meat-pudding, brown bread or baking-powder bread.
Lesson 14.—Baked haddock, beef-tea, porridge.
Lesson 15.—Toad-in-the-hole, pancakes, gruel, fruit baked in batter for practice.
Lesson 16.—Haricot beans (either way), baked potatoes, roly-poly pudding.
Lesson 17.—Irish stew, boiled greens, poached eggs.
Lesson 18.—Lentil-soup, sausage-rolls (flaky pastry), fried sausage.
Lesson 19.—Liver and bacon or tripe and onions, tapioca- or sago-pudding, bacon and eggs for practice.
Lesson 20.—Broiled chops or steak, baked dumplings or turnovers, cocoa.
Reserve Dishes.—Stewed beef and rice, Cornish pasties, boiled cauliflower, barley-water, lemonade.
Season Dishes.—Plum-pudding, mince-pies, orange-marmalade, pickled cabbage, salads, jam.

Second Course.

Lesson 1 (Invalid Cookery).—Steamed fish, invalid's jelly, cup of arrowroot or rice-water.
Lesson 2.—Stewed rabbit, gingerbread.
Lesson 3.—Savoury cod, bread-and-butter pudding.
Lesson 4.—Stewed lentils, cornflour cake.
Lesson 5.—Meat-cake, rice-snowballs, orange- or lemon-sauce.
Lesson 6.—Haricot mutton, fried potatoes (cooked or uncooked).
Lesson 7.—Veal-pie (flaky pastry), gingerbread-pudding.
Lesson 8.—Stuffed mackerel or herrings, fig- or sultana-pudding.

Lesson 9.—Good vegetable-soup, macaroni-pudding.
Lesson 10 (Potato Lesson).—Sausage-potatoes, supper-potatoes, potato-pastry.
Lesson 11.—School-of-cookery hash, Yorkshire tea-cakes.
Lesson 12.—Haricot soup, treacle-tart, salad.
Lesson 13.—Curried meat, boiled rice, oatmeal-buns.
Lesson 14.—Savoury batter, hominy or semolina blancmange, stewed fruit.
Lesson 15.—Savoury hominy or macaroni soda-buns.
Lesson 16.—Exeter stew, Swiss pudding.
Lesson 17.—Fried chops or steaks, apple-sauce, steamed semolina-pudding, jam- or marmalade-sauce.
Lesson 18.—Fish-pie, Dr. Johnson's pudding, cornflour-custard.
Lesson 19.—Roast veal, bread-sauce, rice-buns.
Lesson 20 (Invalid Cookery).—Invalids' pudding, teacup-pudding, invalids' cake or diet-bread, hominy- or semolina-porridge.

When a fowl or a rabbit can be disposed of to any person, either may be substituted for veal, the trussing in either case being a useful lesson.

Reserve Dishes.—Savoury-pudding, vegetable-marrow or carrot soup, beef-olives, stewed steak, fruit-cake, bran-tea, toast-water.

Season Dishes.—Steamed vegetable-marrow, stuffed and baked marrow, stewed tomatoes, pickled onions, preserves, plum-pudding.

Various methods are shown of using up cold meat, cold vegetables, odd scraps of bread, &c. Some of the teachers take their girls to the market to purchase greengrocery, meat, &c., and are taught how to spend a given sum to the best advantage.

Certificates.—The Board authorise the award of a certificate to all girls who make twenty-two attendances, of which eighteen must be red-mark (punctual) attendances, and have received not less than twenty hours' practice in cooking, and a further certificate and a copy of the Board's Cookery Receipt Book to all girls who make twenty-two attendances, of which eighteen are red-mark attendances, during the second course.

Country Centres.—The only method I see of success in the case of country schools in New Zealand is by the training of teachers in our Saturday classes and the appointment of a peripatetic teacher to visit and assist such classes as are in operation. The larger towns will find little difficulty in the matter. In England a very large number of teachers are attending classes provided by the County Councils in order to qualify themselves to give instruction in their own schools.

Building and Appliances.—The class-rooms for cookery are usually about 21 ft. by 18 ft. for single centres, to accommodate eighteen scholars, or about 46 ft. by 25 ft. for a double centre. The London Board are providing their schools generally at centres with cookery, laundry, and housewifery rooms in one special building. A plan is here given of the new rooms of the Goodrich Road School, which will, no doubt, be of considerable service. I would suggest the Education Department should provide half the cost of buildings erected for special instruction of primary scholars, also half the cost of fittings and appliances, a list of which is given in detail, with the probable cost attached. It would be necessary that the department should approve of the plans and specifications of all buildings towards which funds were contributed.

List of Utensils required for a Class of Twenty.—Scales and weights, ten scrubbing-brushes, one large brush, one pot-brush, one knife-board, one knife-box, one string-box, six enamel plates, twelve kitchen plates, six white dishes, six enamel pie-dishes, three cups and saucers, six pudding-basins, nine enamel basins, six brown basins, one crock for flour, three enamel jugs, fifteen knives, four onion-knives, six iron spoons, six tin spoons, one pepper-pot, one enamel saucepan, two black saucepans, one fish-kettle, one fish-slice, one baking-tin (12 in.), six small ditto, three flour-dredgers, one set of skewers, four baking-sheets, one kettle, two colanders, six rolling-pins, one steel, two forks, one tin-opener, one corkscrew, sixteen wooden spoons (14 in.), one towel-roller, three saucepans ($\frac{1}{6}$, $\frac{1}{7}$), one bucket, one spice-box, one meat-chopper, one pair scissors, four pot-stands, one broom (hair-broom), dust-pan and broom, twelve pastry-boards, one wire sieve (brass), one strainer, one and a half sets of measures, saucepans, cutlery, &c.

Cost of above utensils, £10; cost of tables, cupboards, &c., £8; cost of food for week, about 18s.

The accompanying illustrations (see Plates XVII. and XVIII.) will be serviceable as showing the arrangements of the stoves, table, and appliances.

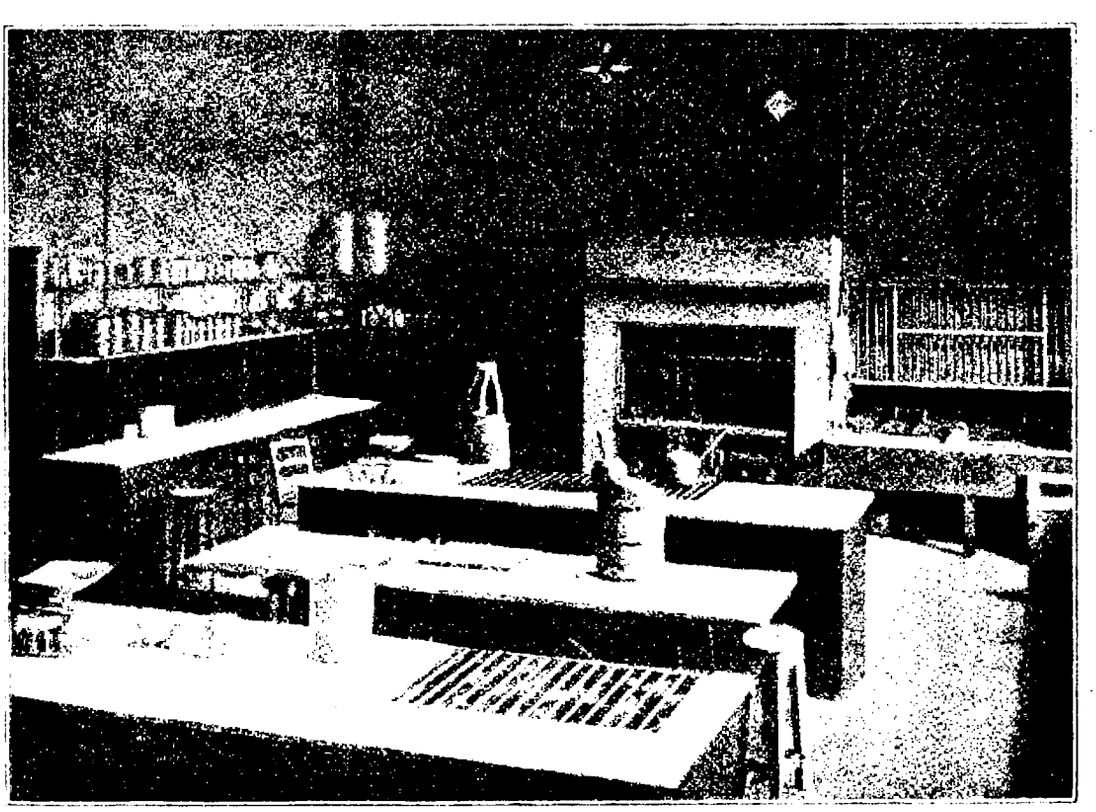
Laundry-work.

The London School Board arrange for Standard VI. girls to undergo a course of laundry-work at the various centres, of which there are now 139 sanctioned. The centres are open from 9 to 12, and 2 to 4.30. Not more than fourteen scholars may be instructed at any one time; the number of lessons is twelve, and full attendances are required. No grant is paid by the Education Department upon scholars receiving less than twenty hours' instruction. Scholars unconnected with any Board school may attend the course providing accommodation can be found for them without displacing the Board scholars, the fee being 2s. for the course. The regulations require that the appliances should be such as are possible in the houses of workmen. The objects of teaching laundry-work are described as not only to teach girls how to wash, dry, starch, and iron clothes, but to train them particularly in habits of neatness and cleanliness.

Miss Pearson, in an article in the *Record*, states that "The method of washing linen, flannel, &c., can be taught equally well on small articles, which can be finished off in the time allowed; therefore large basins can take the place of washing-tubs, and a clothes-horse in front of an open range or fireplace, together with a clothes-line on which the proper method of hanging out clothes



XVII.—DOMESTIC ECONOMY SCHOOL: THE KITCHEN.



XVIII.—THE BATTERSEA POLYTECHNIC: COOKERY SCHOOL.

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to dry can be shown, is quite sufficient drying apparatus. All that is wanted is a fairly large room with a stove on which water can be boiled, irons heated, and a large saucepan, which takes the place of a copper, can stand. There must be a constant supply of water at hand, and tables firm enough to iron upon."

The teaching is given in demonstration lessons, in which the practical work is done by the teacher only, alternating with practice lessons, in which the pupils themselves do the work. The following is described as a suitable syllabus for the course:—

1. Demonstration Lesson.—Rules for sorting and arranging the clothes in piles for washing; steeping soiled linen, &c.; washing and drying flannels and stockings; the use of water, soaps, and ammonia, and their different properties; washing and ironing muslin and lace; making boiled starch; arrangement of the ironing-table; folding and finishing stockings and flannels.

2 and 3. Practice Lessons.—Repetition of Lesson 1 by the class.

4. Demonstration Lesson.—Disinfecting clothes; removing stains from table-linen; washing table- and body-linen; rules for drying, ironing, and folding handkerchiefs; starching and ironing table-linen; paraffin washing.

5 and 6. Practice Lessons.—Repetition of Lesson 4 by the class.

7. Demonstration Lesson.—Folding and ironing body-linen; making cold starch; starching, ironing, and polishing collars and cuffs; washing silk and coloured muslins; use of gum and hot starch for silk.

8 and 9. Practice Lessons.—Repetition of Lesson 7 by the class.

10. Demonstration Lesson.—Folding, ironing, and polishing a shirt; getting-up neckties; goffering; washing real lace, chiffon, &c.

11 and 12. Practice Lessons.—Repetition of Lesson 10 by the class.

At each lesson the teacher should have the syllabus clearly written upon the blackboard; and at the demonstration lessons, while doing practical work, she would explain the various points, giving full and clear reasons for each process, and asking the class to take notes. As an instance, in a lesson on the washing of white clothing or linen, the blackboard might contain the following:—

Process of Washing Linen.—(1) Steeping in cold water, (2) rubbing in the steeping-water, (3) washing in hot water, (4) rinsing in warm water, (5) boiling, (6) rinsing in cold water, (7) blueing, (8) wringing, (9) drying, wrong side out.

These points the teacher would thoroughly explain. Thus the different processes would be taught, much useful information being given about the best soaps to be used, &c., the various ways of softening hard water, the arrangement of work so as to save time, labour, and fuel. Wherever it is possible girls should be asked to bring small articles of their own to wash at the practice-lessons, but no bed- or body-linen, and nothing from a house where infectious disease has existed until after the expiration of not less than six months.

Certificates.—The London Board authorise the award of a certificate and a copy of a laundry receipt-book to all girls who make twelve attendances, of which ten are red-mark (punctual) attendances, during a course of instruction in laundry-work.

Class-room and Appliances.—"Centres" consist of a stepped class-room about 46 ft. by 22 ft., containing accommodation for the children seated at desks; fourteen washtubs, four ironing-tables, an ironing-stove, a sand-box, sink, gas-copper, and an open fire-range with hood over to carry off the steam; and a cloak-room forming an entrance-lobby. A plan of the Goodrich Road Laundry Centre, London, is given, showing in full detail the arrangements. I would suggest a similar departmental contribution to the laundry-work as to the cookery centres. The following list of utensils is suggested by Miss Pearson for laundry centres:—

List of Utensils for Laundry Class (the English cost of which would be about £3).—Clothes-line (8 yards), clothes-horse, one kettle, one pair of goffering-tongs, three soap-trays, three iron table-spoons, one knife, four cups, one water-can, one shirt-board, two towels, two dusters, six iron-holders, large saucepan in lieu of copper, small saucepan (2 pints), fourteen irons, three polishing-irons, six iron-stands, three teaspoons, seven large (unbreakable) basins or seven iron tubs, seven small basins, box for small things with partitions, 8 yards felt, 8 yards thin white calico, one clothes-bag, one boiler-stick, and clothes-pegs.

Housewifery.

Several centres have now been established under the London School Board in this important subject, and at the Friern Street School I found the girls actively engaged in various household occupations in a special set of rooms arranged to meet the requirements of the subject. At Alma Road a two-roomed cottage at the school entrance is utilised for this purpose. At both these centres cookery, laundry-work, and housewifery are in complete working order. In no instance may housewifery be taken as a school subject unless practical teaching in cookery and laundry-work has been taken or is being taken by the girls. Not more than fourteen girls may receive instruction at one time. The classes are held at the centres continuously, as in the case of cookery and laundry, the course being twenty-two lessons, covering a period of six months. Examinations are held at the completion of each course, and certificates awarded.

From inquiries made at the times of my visits, and from observations of class and other work in progress, I should certainly strongly recommend housewifery classes being established in conjunction with cookery and laundry-work at the various centres established for primary schools. General satisfaction has been expressed with the success of the London centres. Several others are about to be established. For general information the syllabus is attached:—

First Stage.—Every Day's Work.

Lesson I.—(1) Guiding principles to insure health and happiness; (2) selection of a house—drainage, sanitation; (3) hints on the furnishing of the home.

Lesson II.—(1) Chief items of a week's household work; practical work; lighting a fire and tidying the hearth and living-room.

Lesson III.—(1) An ordinary day's work in a working-man's home; (2) rules for setting a breakfast-table; (3) practical work; laying breakfast-table; revision.

Lesson IV.—(1) The composition of the air we breathe; (2) different impurities; (3) simple methods of ventilation for home illustrated and explained.

Lesson V.—(1) The importance of airing a bed, directions for the same; (2) rules for bed-making; (3) practical work, making a bed.

Lesson VI.—(1) The principles involved in the variety and selection of foods, their preparation and arrangement for meals; importance of regularity in meals; rules for eating, and behaviour at table; (2) directions and practice in setting the dinner-table.

Lesson VII.—(1) Tidying the kitchen; (2) rules for the tea-table; (3) making the tea; (4) washing dishes, glass, pots and pans.

Lesson VIII.—(1) Cleaning windows and sills, various methods; (2) cleaning entrance, door-steps, and passage; (3) written examination.

Lesson IX.—Revision of the whole of first stage, and questions on the same; recapitulation of the practical work.

Second Stage—Special Work for Regular Days.

Lesson X.—(1) Directions for cleaning a bedroom; (2) sweeping an uncarpeted room; (3) practical work on the same.

Lesson XI.—(1) Dust, its several kinds, the harm it may do; (2) directions for dusting; (3) practical work.

Lesson XII.—(1) Cleaning water-bottles, hair-brushes, and marble; (2) practical work on the same.

Lesson XIII.—(2) Blackleading a grate; (2) cleaning fender and fire-irons, both steel and brass; revision of Lesson II., first stage; (3) practical work.

Lesson XIV.—(1) Cleaning a sitting-room; (2) sweeping a carpeted floor; (3) directions for cleaning linoleum and oilcloth; (4) practical work.

Lesson XV.—(1) Brushing of furniture; (2) how to make furniture-polish; (3) directions for the polishing of furniture.

Lesson XVI.—(1) Cleaning lamps; (2) precautions in using lamps and oil; (3) suitable lamps; (4) how to put out a fire from a lamp being upset.

Lesson XVII.—(1) Kitchen-work, such as boot-cleaning, cleaning of knives and silver; (2) practical work.

Lesson XVIII.—Continuation of kitchen-work, including the scrubbing of tables, the cleaning of steps, the removal of kitchen refuse, &c.

Third Stage—Some Practical Rules for promoting Health and Happiness in the Home.

Lesson XIX.—(1) Thrift; the necessity for saving; (2) some safe ways of investing money, such as are offered through the Post Office.

Lesson XX.—(1) Personal cleanliness and home tidiness, necessity of, aids to, and advantages from; (2) revision of second stage.

Lesson XXI.—(1) Recreation, its various forms; the best forms of exercise, and their effect upon the body; (2) recreation of the mind, its necessity and effects.

Lesson XXII.—Oral examination and revision of theoretical and practical work of the three stages.

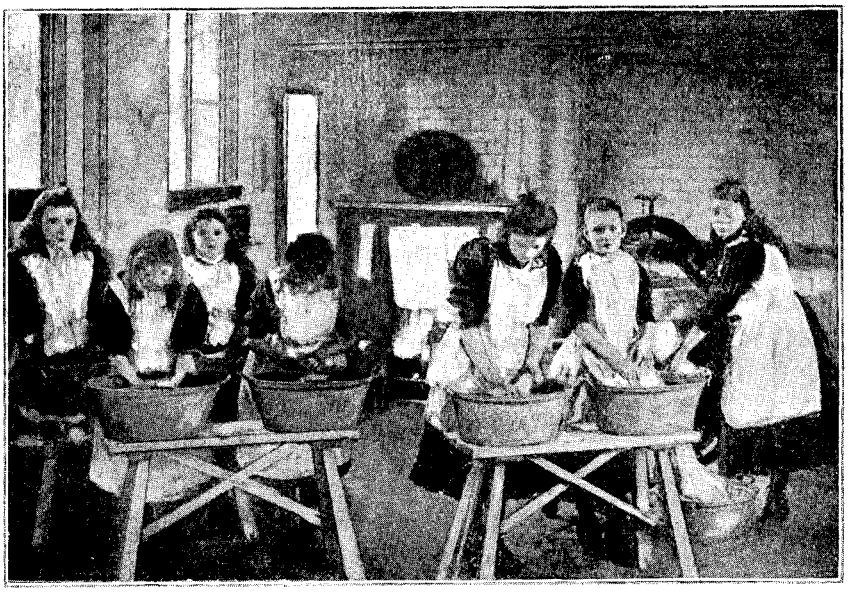
Additional information will be found in connection with this subject under the heading of "Intermediate or Continuation Schools."

The illustrations XIX. and XX. are from Mrs. Lord's "Laundry-work for Scholars," the photographs being taken from London School Board classes. The text-book will be found invaluable to laundry teachers in the colony: it is published by Nelson and Sons. The text-books upon laundry and cookery and the plan of rooms for these classes were very kindly provided by the London School Board.

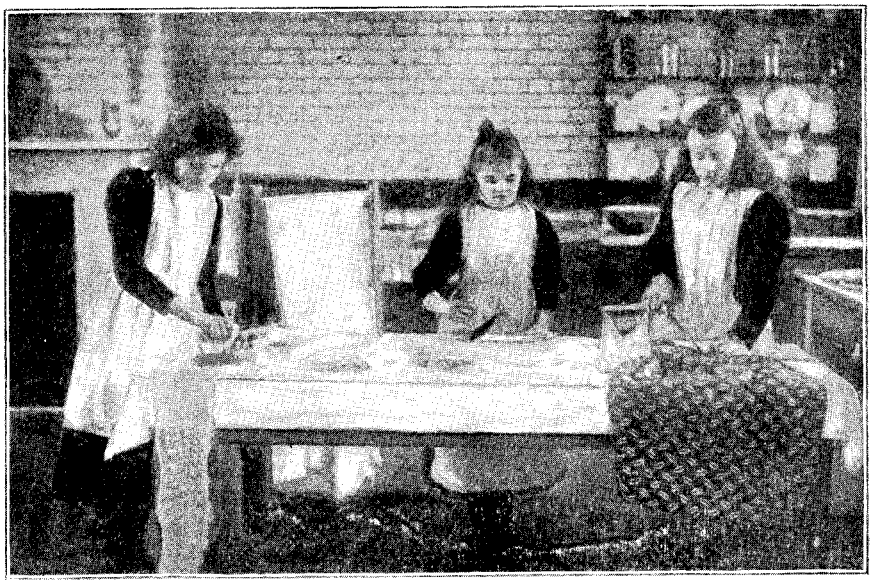
Scholarships. — The London County Council awards no less than over 550 domestic-economy scholarships. They provide free education in all branches of domestic economy, extending over a period of half a year; and, in place of a money-payment, two meals a day, and the dress material necessary for the dress-making classes are given to each scholar. These scholarships are awarded to girls who are not less than thirteen years of age who have passed the Fifth Standard, and have left school not more than one year or are about leaving. No candidate whose parents are in receipt of £100 a year are eligible for a scholarship.

I suggest that a limited number—say, fifty—such scholarships in each district be offered to candidates from primary schools upon similar conditions except that no dress-material be provided. The scholarships to be tenable at the central technical schools, in cookery, domestic economy, and dressmaking; the period of scholarships to be six months; special classes being held at the central school in the above subjects during each week. The examinations to be held for the colony by the Education Department. The London County Council scholarship regulations will be found in Appendix C.

Training of Teachers.—Success in domestic subjects, again, largely depends upon the training of primary-school teachers, more especially in connection with the country schools. I therefore urge the advisability of each district appointing organizing instructors, as in the case of manual training; I recommend a subsidy being contributed by the department towards the salary of such specialists appointed; the first and most important duty of such instructors being the training of teachers by Saturday and other classes, and the establishment of central school classes for primary



XIX.—A WASHING LESSON.

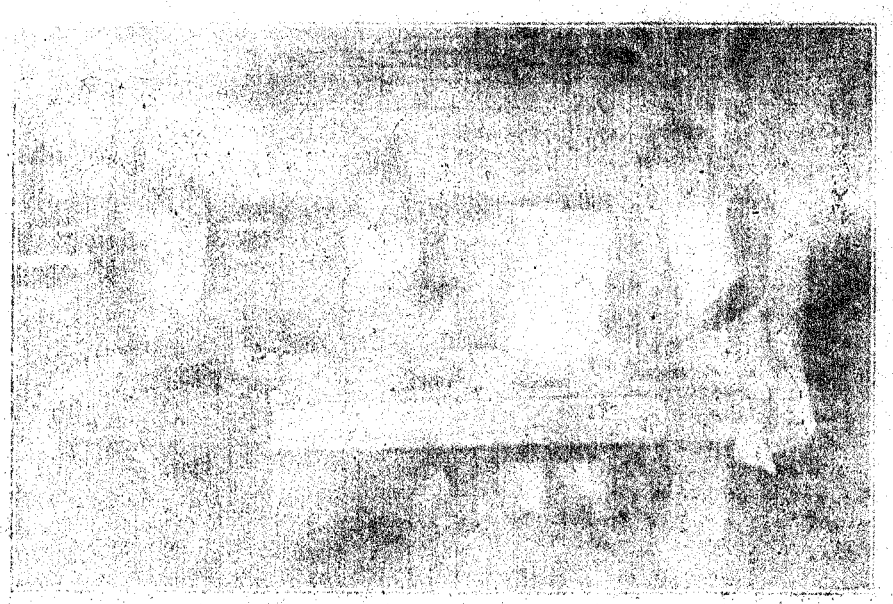


XX.

IRONING LACE. POLISHING A COLLAR. GOFFERING AN APRON.

(To face p. 28.





scholars, afterwards undertaking the general supervision and advising teachers as to the course of work and the methods of instruction. As everything depends upon the efficiency of the teachers, every possible facility should be given to enable them to attend the necessary classes. I further recommend a bonus of £2 to every teacher qualifying to give instruction in domestic economy, including cookery and laundry-work.

Departmental Assistance.—Capitation upon all classes held in accordance with the Technical Instruction Act. I further recommend a grant of one-half the cost of buildings erected as special centres of instruction; a grant of one-half the cost of appliances and fittings; a subsidy of £50 towards the salaries of special instructors for special centres; and a bonus of £2 to each teacher completing the course of instruction in domestic work and obtaining a certificate.

In concluding this primary section I would express a hope that my suggestions may not be considered extravagant in the direction of grants and subsidies. Let me ask if, say, £10,000 is much in comparison with the benefits to be derived, for, assuredly, this work is the basis of the whole scheme of technical work. Failure here is failure throughout, and that is not to be thought of for one moment. My inspection has convinced me how greatly we are behindhand in the matters I have alluded to. We must compulsorily follow other nations in matters shown to be necessary. Why delay? Every year lost will make the work harder to accomplish.

SECTION II.—INTERMEDIATE INSTRUCTION.

(1.) Evening continuation schools.
(2.) Higher-grade day schools.
(3.) Farm schools.
(4.) Secondary schools.

1. EVENING CONTINUATION SCHOOLS.

Evening continuation schools should aim at direct continuity with the work of the primary day-school, in reality taking up the work where the standards left off, and continuing the study in order that scholars may be in a position to profit by the higher classes held in the technical schools and university colleges.

The report of the Royal Commission on Technical Instruction states: "These evening schools help to sustain a boy's interest in study at a time when he is likely to forget what he has acquired in the ordinary primary school. For the want of them, apprentices or young workmen frequently find themselves too ignorant to avail themselves of the special technical instruction which they have the opportunity of obtaining, and on this account, and also because they serve to give a youth a taste for study at the time when he begins to appreciate the value of instruction. These schools have proved to be most serviceable to German and Swiss artisans in quickening their intelligence, and in affording them useful information bearing upon their trades."

There can be no doubt in the mind of any person who has read the report of this Commission that this question of continuation-work was very forcibly brought to the front, and proved the necessity of such classes (day and evening) being established if England was to be equal with other nations. Thus it is that an enormous advance has been made, and the recent regulations as to greater freedom of subject, non-compulsory examination, and that students may be over twenty-one years of age, has tended to strengthen these classes to a very considerable extent; and I find generally a carefully graded system leading from the elementary work of the primary school to the highest grades of technical work.

With reference to the establishment of these schools or classes in New Zealand, as I have remarked previously, our centres are comparatively small. Concentration of effort is therefore very necessary in the larger towns. I suggest the school or classes should be attached to the technical schools; in the suburbs and country districts the classes might be attached to the local schools. In the latter case, where no technical school is available, there should be a wide range of subject, capitation being paid so long as such classes satisfied the department's Inspectors. Preference should naturally be given to subjects suitable to the requirements of the district. The advantage of having the continuation school or classes attached to the technical schools in large centres would be considerable, inasmuch as the various workshops and rooms used in manual and domestic instruction would be available for students desirous of following such a course of study.

One would almost feel tempted, after reading the evidence of various commissions and special reports upon educational subjects, to adopt the Saxony method of making such attendance at a continuation class compulsory. German writers frankly state that in no sphere of life is compulsion more necessary than in education. Thus it is that in Saxony "All boys leaving the elementary schools are hereby required to attend a continuation school for three years, unless their further instruction is provided for by some other approved means. The masters in any branch of industry are bound, in the case of their workers under the age of eighteen, to allow them the necessary time to attend the continuation school, under a penalty provided." And further, "It is the duty of the board of management in each school to see that no scholar withdraws from the instruction." Business at home or trade employment of any kind is never to be accepted as an urgent ground. The time required to be devoted to these classes is fixed by law as not less than two hours per week; it may, by the local authority, be raised to six. In Leipzig the local authority has altered the course to six hours per week for two years.

In Saxony the law recognises a claim to exercise authority over the pupils after school hours; thus, "the discipline of the continuation school extends to the behaviour of the scholar outside the school, so far as supervision aids the purpose of the schools. Visits to public dancing-halls and to all such exhibitions as are dangerous to uprightness and purity of character are strictly forbidden

to scholars of a continuation school." All regulations of this kind are published, and dangerous resorts specified, and penalties for infringement of regulations thereof are enforced by the police.

Director Pache, in addressing a teachers' conference in Leipzig, said: "We can, in short, maintain and prove that our continuation schools actually exercise a most valuable influence on the moral education of their scholars; that they have given firm ground to many tottering waverers, tamed many a wild young fellow, strengthened the reverence due to authority, and therewith afforded the growing youths a surer standing-ground for the struggle of life, and a higher morality."

The success of continuation schools has, as I have previously remarked, been very great in Britain during the past ten years. In London alone over fifty thousand entries were made, and in Manchester over forty thousand. Every possible facility is given in all centres for the continuation of primary instruction.

There is no reason why these classes should not be established in New Zealand, since the new Technical Instruction Act provides grants on their behalf. I question, however, if the capitation suggested of 1s. per hour will be sufficient to cover the ordinary expenditure, and would suggest an increase to 1s. 6d. per hour. I would further suggest that scholars should not be pressed to present themselves for examination in any subject, inspection by the department's officers being a sufficient guarantee of the nature and value of the instruction given. Classes might therefore be formed in any local school in the following subjects: General subjects—Reading or recitation, writing and composition, reading and writing combined, arithmetic. English—English, geography, history, life and duties of the citizen. Mathematics—Euclid, algebra, mensuration.

In country centres or places where no technical school exists instruction might also be given in some of the following subjects, grants for which should be paid as if taught in a technical school proper, subject, of course, to the departmental Inspector's satisfaction: Drawing—freehand, model, light and shade, &c.; plane and solid geometry; *elementary physics and chemistry (where appliances are available); botany; *domestic economy, cookery and laundry-work; *dressmaking and cutting; shorthand, &c.; *manual instruction. Fees would be charged in all cases, but I would suggest that not more than 5s. be the fee for ordinary subjects, a special fee being required for classes marked thus*. The classes should be well advertised by means of leaflets, and posters for workshops and public boards, &c. Departmental assistance would be rendered by means of capitation in accordance with the provisions of the Technical Instruction Act.

2. HIGHER-GRADE SCHOOLS.

There are a very large number of scholars who leave the primary schools after passing Standard VI. who do not attend the secondary schools or colleges. These scholars have no provision made for the continuance of their studies in New Zealand, whilst in England a very large number of higher-grade schools are now separately established or attached to existing Board schools. I visited these schools in both London and Manchester, and find them very much appreciated, and meeting a long-felt want. In suggesting the establishment of higher-grade schools I have no desire to interfere with existing secondary schools, nor do I think such would be the case, but I am anxious to see schools established which will carry scholars over the most important and critical period intervening between the primary school and the workshop, giving an efficient course of instruction, including elementary science, physics and chemistry, drawing and manual training for boys, and domestic economy for girls, as a basis for industrial or other careers. The establishment of higher-grade schools would practically raise the school age, and would also tend towards relieving the congested state of a large number of schools, inasmuch as the children who have passed the highest standard would enter the higher-grade department. These schools should either be free or the lowest possible fee should be charged.

The subjects taught are generally as follows: Science—Mathematics; chemistry, theory and practice; practical plane and solid geometry; physics, theoretical and practical; theoretical mechanics. Physical training—Military drill; manual instruction. Domestic instruction for girls. Art—Freehand drawing; model-drawing; light and shade. Literary and commercial—French; book-keeping; shorthand; geography; English.

One instance of this work in London is the very successful mixed school established at the Battersea Polytechnic. The school aims at meeting the requirements I have mentioned—that is, it is intended for boys and girls who have left the elementary school, and desire to continue their education or to train themselves in preparation for the workshop, science, or domestic work. The course extends over a period of three years, but the elementary course is suitable for boys and girls desirous of continuing their general education beyond the elementary schools. The training in no way replaces ordinary apprenticeship. The Polytechnic workshop and class-rooms are available for teaching purposes. The subjects of study are as follows:—

Boys.—Elementary Course.—Mathematics, five hours; mensuration and physics, three hours; chemistry, two hours and a half; practical geometry, three hours; freehand and model drawing, two hours; workshop instruction (wood-work), three hours; English, history, and geography, five hours; French, three hours; gymnastics, one hour. Advanced Course.—(Mechanical Division): Mathematics, five hours; mechanics, three hours and a half; heat, three hours and a half; practical geometry, two hours; machine or building construction and drawing, two hours; workshop instruction (wood- and metal-work), four hours and a half; English, history, and geography, four hours; French, two hours; gymnastics one hour. (Science Division): Mathematics, five hours; mechanics, two hours and a half; chemistry, three hours and a half; electricity and magnetism, three hours and a half; practical geometry, three hours; workshop instruction, two hours; English, history, and geography, four hours; French, two hours; model-drawing, one hour; gymnastics, one hour.

Girls.—The course of study in the elementary course for girls is the same as for boys, with the substitution of domestic-economy subjects for workshop instruction. In the advanced course hygiene and physiology and art subjects may be substituted for mechanics and physics.

After passing through the elementary and advanced courses, students are allowed to confine their studies to science or technical subjects.

School Rules.—Admission to the school is limited to boys and girls who have obtained entrance scholarships from a public elementary school, or who have passed, or are able to pass, the Sixth Standard of the Educational Code or its equivalent, or who shall exhibit such exceptional knowledge as shall warrant the governing body in assuming that they will be able to profit by the advanced education offered. All applicants for admission to the school, except those holding scholarships, are required to pass an entrance examination. The Governors are very anxious that the discipline and moral tone of the school shall be of the highest possible character, and every student must render obedience to all the school rules. The principal is empowered by the Governors to expel any boy or girl whose continuance in the school shall be deemed by him to be detrimental to its welfare. Every student is required to do from one to one and a half hours' home-work each evening. Books and materials will be provided for that purpose, subject to parents being responsible for their proper treatment and return. The Polytechnic provides all necessary books and other materials free of cost, except for needlework and dressmaking, but everything must remain the property of the Polytechnic. Parents are required to give a guarantee to pay for any damage or loss to buildings, apparatus, or materials caused by the carelessness of the student, and they will be informed when materials are issued to the students. Students are supplied with sufficient books for the work of the term, and if these are used wastefully they will be required to provide others. Every student must be provided with aprons for use in the workshops, cookery school, and chemical laboratory, and with proper shoes for use in the gymnasia. Girls must bring their own materials for needlework and dressmaking, which must be selected in accordance with directions given by the teacher. Boys are allowed to take away, at the end of each term, certain of the work done by them in the workshops upon payment of the cost of the materials used. No student may join evening classes without the permission of the principal. Every boy must wear the school cap, which may be obtained at the office, price 1s.

The charge for each student is £1 per term, or 10s. per half-term, payable to the secretary in advance. This fee includes all books and materials, except for needlework and dressmaking.

Battersea Polytechnic Technical Day School.

This school is another form of continuation school, and is intended for boys who have passed through an elementary school and desire to receive special instruction in technical subjects required for work in the building, electrical, and mechanical trades. The work of the school is not intended to replace apprenticeship or workshop training, but as a useful preparation for future work. Another useful provision is that any of the classes are open to apprentices and lads engaged in the industries named whose employers grant leave of absence to attend the school upon certain half-days.

The course of work is as follows (per week): Applied mechanics, steam- and heat-engines, with laboratory-work, four hours; technical arithmetic, mensuration, and mathematics, four hours; practical geometry, and machine construction and drawing, six hours; physics, including heat, and electricity and magnetism, with laboratory-work, three to six hours; electrical engineering, with laboratory-work, three to six hours; building construction and drawing, three to six hours; workshop practice, wood or metal, nine to twelve hours. Hours of attendance are 9.30 to 12.30 and 2 to 5. Fee for full course, £1 per term of about thirteen weeks. Fees for occasional students (per term): Subjects with laboratory-work, three hours per week, 5s.; mensuration, mathematics, and drawing classes, three to four hours per week, 4s.; workshop practice, half-day weekly, 4s.; one day, 6s.; one and a half days, 9s.; two days, 12s. These fees entitle the student to the use of drawing-boards and tee-squares, and of tools and apparatus, and the provision of materials for laboratory and workshop classes. Students provide their own instruments, paper, text-books, &c. At the end of the term students are permitted to take away work done by them in the workshops upon payment of the cost of materials. Leaving-certificates are granted to students at the end of their course, which will record the character of the work done, and the progress made, and the examinations passed, if any.

Manchester Boys' Commercial and Manual Training School.

This school is also an excellent example of the work done in the direction of intermediate study. The main purposes of the school are described as the harmonious development of a boy's whole faculties by means of a systematic and progressive course of intellectual and manual training, which has for its express object the cultivation of the powers of observation and the formation of habits of accuracy and painstaking effort. The school has no narrow aims; languages and literature, mathematics, elementary science, drawing, and business training receive due and proportionate attention, and the pupil acquires by the daily use of tools a real knowledge and experience of processes and materials which cannot but be of the greatest value to him. The course of study adopted is found to create a higher sense in the boys of the value and dignity of labour, and the worth of clever workmen. At any rate, it supplies during school years the stimulus of a healthy occupation, and cultivates, through the constant practice of working to drawings and exact measurements, habits of precision, method, and careful work.

The course of instruction is as follows: First year—language and literature, geography and history, five hours per week; higher rules of arithmetic and mathematics, four hours per week; writing, shorthand, and drawing, nine hours per week; elementary science, six hours per week; manual instruction, six hours per week. The fees are £2 2s. per term, or £6 per year. Other conditions are similar to those of the schools of London, Liverpool, and Birmingham.

Referring to these higher-grade schools, Mr. W. Mather, of Birmingham, stated that, as an employer, he would prefer not to take any boy to learn his trade in his works who had not passed from the elementary school into a graded school, and spent two years, from about fourteen to sixteen, in systematic study, combined with tool practice and laboratory experiments, however elementary the subjects might be. He would say that any one hundred lads so prepared, and entering on employment to learn a trade, would at the age of twenty-one years be in all respects as artisans superior men to one hundred others who had passed at fourteen straight into the workshop from the elementary school. Another advantage gained by these schools was that it was much easier to see in what direction boys showed the most capacity.

Manual High School, Denver, U.S.A.

As an instance of what America is doing in this respect, I insert the syllabus of the Manual Training High School, Denver, which is taken from the work published by Education Bureau of the United States. The syllabus is for 1896:—

Course of Study.

[Note.—The figures after the studies indicate the number of school-hours per week devoted to that subject.]

First Year.—Mathematics (5): Algebra and plane geometry. Science (4): Physical geography until January; botany. History and English (3): American literature and rhetoric until January; Greek history. Language (4): Latin or German. Drawing (4): Freehand (2); mechanical (2). Manual work (10): For boys—Joinery, sixteen weeks; wood-turning, twelve weeks; wood-carving, ten weeks. For girls—Plain sewing; joinery on alternate days from January to June. Music (1): Chorus-singing. Physical culture.

Second Year.—Mathematics (4): Algebra; plane and solid geometry. Science (5): Physics, with laboratory practice. History and English (3): Roman history until January; rhetoric; English and American literature. Language (4): English or German. Drawing (4): Freehand (2); mechanical (2). Manual work (10): For boys—Pattern-making and moulding, twenty weeks; forging, eighteen weeks; lessons in brazing and soldering. For girls—Drafting patterns; cutting and fitting undergarments; machine-sewing; wood-carving on alternate days from January to June. Music (1): Chorus-singing. Physical culture.

Third Year.—Mathematics (4): Algebra; plane trigonometery; book-keeping. Science (7): Chemistry, with laboratory practice (5); steam-electricity and magnetism* (2). History and English (5†): English history; English literature; civil government. Language (4): English or German; French.‡ Drawing (4): Freehand (2); mechanical (2). Manual work for boys: Vice-work; machine-tool work; construction. For girls: Cooking; household science. The manual work of this year occupies eight hours per week for sixteen weeks, and six hours per week for twenty-two weeks. Music (1): Chorus-singing. Physical culture.

Fourth Year.—Mathematics (4): Spherical trigonometry; surveying; book-keeping. Science (5): Advanced chemistry (5), or advanced physics (5). Manual work (8): For boys—Machine-tool work and construction. For girls—Cooking; household science. Or the pupil may elect advanced work in any of the lines of shop-work already pursued. History (4): One half-year. Study of some period of American history; political economy. Psychology (4): One half-year. Language (5): French, or German, or English. Drawing (2 to 10): Freehand; mechanical; modelling. Music (1): Chorus-singing. Physical culture.

From the above, with the approval of the principal, the student chooses thirty hours' work per week, at least thirteen of which must be chosen from the following lines of work: Mathematics, science, history, language. The manual work is required of all students.

Drawing.

The drawing-work of the school may be classified under three heads: Constructive, representative, and decorative work. The time is divided equally between freehand and mechanical work, the two being carried along side by side throughout the entire course. The equipment of the drawing-rooms includes a good assortment of models, casts, and studies.

Constructive drawing: Includes all drawings relating to the facts of form, such as freehand and mechanical working drawings, geometric problems, surface developments, projections, intersection of solids, and drawings relating to machine and building construction.

Representative drawing: Drawings dealing with the appearance of form, such as drawing from cast and object with charcoal, pencil, and pen and ink. Perspective problems.

Decorative drawing: Includes work relating to the decoration of form—viz., elementary design, historic ornament, decorative design in colour.

First Year.—Freehand: Working drawings of solids; elementary perspective in outline; water-colouring in flat washes; charcoal and pencil drawings from object and cast; historic ornament and design.

Mechanical: Instruction in use of drawing-tools; working drawings to a scale; sections, elevations, and details of machines and parts of machinery; geometric construction; problems in orthographic projection; development of surfaces; isometric projection; lettering and borders.

Second Year.—Freehand: Elementary perspective in light and shade from object with charcoal, pencil, pen and ink; water-colour shading; sketches of machinery; historic ornament and design, conventional forms, designs for ornamental ironwork.

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* With the approval of the principal, shop-work may be substituted for this work. † Three for the first four months. One of the five periods is for unprepared work. ‡ French may be substituted for mathematics in the third year.

Mechanical: Isometric projection; intersection of solids and development of surfaces; architectural working drawings; elementary perspective; projection of shadows; machine drawing; lettering and borders.

Third Year.—Freehand: Drawing from cast in charcoal and pencil; decorative art work; pen sketching and shading; perspective; designing.

Mechanical: Machine design and construction; perspective; shades and shadows; geometric problems. A finished drawing with full details, embodying all that the pupil has learned in drawing.

Clay-modelling.

This work is done the first half of the second year, and consists of modelling from casts, plant-forms, carvings, and designs. It is intended to give the pupils along with this work a knowledge of the modelling of the various styles of relief-decoration, such as the Greek, Roman, Romanesque, and Renaissance. Also, in modelling from plant-forms, to teach the pupil to see broadly, and, while getting the character of the leaf or flower, to eliminate the non-essentials and those features impossible of reproduction in plastic form.

Manual Work.

In disciplinary value the manual work rises to the dignity of laboratory-work, and holds equal rank with the regular academic studies. It embodies a training in habits of careful, patient, systematic, intelligent labour. The pupil is made to feel from the beginning the necessity for planning his work with the utmost care and exactness in order to secure accurate results. All exercises made in the shop must agree precisely in form and dimensions with the drawing; usually in the form of a blue print, with which each pupil is provided. Each exercise is carefully planned to embody some definite mechanical principle, and to bring into use, one after another, the various shop tools. The shop teacher explains the construction and use of each tool as it is needed and gives directions for its care. Then in the presence of the class he shows exactly how to perform the work, and also occasionally, by way of a caution, "How not to do it." Economy of time, labour, and material is taught and enforced by careful supervision. Special attention is given to the formation of habits of neatness and order, and to the employment of workmanlike methods.

For boys the work is as follows:—

First Year.—Joinery, turning, carving: In the joinery course only hand-tools are employed, the object of the course being to give practice in the use of the principal wood-working tools, and teach the elementary principles of construction. The course in wood-carving affords instruction in the use of the principal wood-carving tools, and a further training in appreciation of beauty of form in design. After the work at the bench, wood-turning is taught. No kind of shop-work is more fascinating to the student, or presents a greater opportunity for developing an appreciation for grace, symmetry, and beauty in form. Throughout the year frequent talks are given by the instructor upon such topics as these: Distribution of forests; processes of lumbering; the principal varieties of wood and their leading uses; physical properties of wood; its behaviour under various conditions; its proper distribution in construction; preservation of timber, &c.

Second Year.—Pattern-making, moulding, forging: Some foundry-work precedes the pattern-making in order that the student may better understand the construction of patterns. The course in pattern-making will consist in plain work; pulley-, pipe-, gear-, and core-work. In the foundry the students are taught to make moulds and cores, each student pouring for himself into the moulds that he has made.

Forging: Exercises in drawing, upsetting, shaping, bending, welding, punching, and cutting, hardening, and tempering of steel. During the course each student forges and tempers a set of steel-lathe tools, to be used in the shop-work of the following year.

A short course in ornamental ironwork closes the year's work.

Third Year.—Vice-work and machine-tool work: The vice-work includes chipping, surface-filing, straight, angular, and round fitting, scraping, and finishing. The machine-tool work is designed to teach the uses of the most common machine-tools and the elementary principles of machine construction. It consists of a series of graded exercises involving the uses of the lathe, drill, planer, shaper, milling- and grinding-machines, and will include work in cast- and wrought-iron, steel, and brass. The ground covered may be summarised as follows: Lathe-work, consisting of centring, drilling, and countersinking, straight and taper turning, chuck-work and screw-cutting, also hand-turning, filing, and polishing. Planing and shaping, including the production of both plane and curved surfaces, and key-seating. Straight and spiral milling, includes key-seating, gear-cutting, and the fluting of taps, drills, and reamers. Grinding and fitting, including the sharpening of milling cutters and reamers, and the grinding of hardened steel arbors and gauges. During the year some project such as a small motor, dynamo, steam-engine, or machine-tool is constructed.

Manual Work for Girls.

First Year.—Sewing, joinery: Instruction and practice is given in all the important varieties of plain sewing by hand, including mending and darning, also drafting and cutting patterns of undergarments. Lectures are given by the teacher upon the nature and manufacture of the materials used in the work. Local mills and factories are visited by the classes. From January to June joinery alternates with the sewing. This work is intended to familiarise the girls with the principal wood-working tools and elementary constructive principles, and thus serve as a basis for their work in wood-carving in the following year.

Second Year.—Sewing, wood-carving: Cutting and fitting garments, care and use of the sewing-machine, instruction in selecting and purchasing materials. From January to June wood-carving alternates with sewing. Instruction is given in correct methods of handling wood-carving

tools, and in the principles of applied design for relief ornament. A variety of woods, from soft to hard, are employed.

Third Year.—Cooking, domestic economy: The instruction in cookery is both theoretical and practical, and is intended to furnish many illustrations of applied chemistry. Laboratory methods are employed, and habits of neatness, order, economy, and systematic work encouraged and cultivated. The course in domestic economy is designed to give instruction upon the subjects of foods, their constituents, comparative values, and proper methods of cooking. Instruction is also given in plain and fancy cooking, invalid cookery, chemistry of foods, adulterants, dietetics, and the care of the house. The work of the kitchen is done by three housekeepers appointed from the class each day; instruction is given in the use of sapolio and scouring agents, the care of silver, and sweeping and dusting. Foods are treated in relation to the demands of the body, with attention to physiological subjects. Milk is taken as a type of a perfect food, and its analysis forms the basis of all analytical work. Special study is given to economics and the food questions in household economy, such as the production of the most nutritious foods from the cheapest materials, the best methods of cooking, and the advantageous use of food-remnants. The equipment of the cooking-room includes a coal-range, a gas-range, and an Aladdin oven. The room-fittings are designed to accommodate class sections of twenty-four at one time.

The arrangement of the subject-matter of the course for the year is as follows:—

Fall Term.—Fruit-cookery, water, starch, milk, eggs, fish, meats, soup-stock, and simple deserts. Special attention is given to the housework, and only the simplest methods of cooking are employed.

Winter Term.—Marketing, baking-powder, yeast, batters, doughs, bread, and the more elaborate desserts. Work in physiology and dietetics.

Spring Term.—Fancy cooking, invalid cookery, preparation of economical menus, dietetics, questions of ventilation and sanitation, practice in laying the table and serving.

Equipment of the Shops, &c.

The joinery shop is 32 ft. by 51 ft. It has thirteen double cabinetmakers' benches, with sets of tools for each bench; each bench has six locked drawers, in which are kept the individual sets of edge-tools of the pupils working at the bench.

The pattern-shop is 32 ft. by 60 ft. It is furnished with twelve double cabinetmakers' benches, with set of tools for each bench. The same provisions for individual edge-tools are made here as in the joinery-shop, with the addition of a set of turning gouges and chisels. The equipment also includes twenty-five wood-lathes, a band-saw, and two grindstones.

The foundry has accommodations for class sections of twenty-four. For the present lead is the only metal used in casting.

The forge-shop is 35 ft. by 58 ft. It is located on the ground-floor, and is equipped with twenty-five Buffalo Forge Company's improved down-draft forges. The blast is furnished by a fan driven from the motor in the engine-room. The equipment also includes twenty-five anvils and sets of hand-tools, a tool-rack containing a complete assortment of special tools, a post-drill, a powerful hand punching and shearing machine, and five vices mounted on the benches which surround the room. In the benches are locked drawers, which contain the pupils' work-aprons and unfinished work.

The machine-shop is 32 ft. by 60 ft. It is equipped with the following machine-tools: Six Reed engine-lathes, 14 in. swing, 5 ft. bed; eight Putnam engine-lathes, 14 in. swing, 5 ft. bed; one Pratt and Whitney engine-lathe, 16 in. swing, 7 ft. bed; one Putnam engine-lathe, 20 in. swing, 7 ft. bed; two Pratt and Whitney hand-lathes, 9 in. swing, 30 in. bed; one Brown and Sharpe 9 in. universal hand-lathe; one Pratt and Whitney hand-lathe, 14 in. swing, 5 ft. bed; one 13 in. Slate sensitive upright drill; one 22½ in. Barnes upright drill; one grindstone; one Diamond Machine Company wet emery-grinder; one Cincinnati Milling Machine Company universal cutter and reamer grinder; one Cincinnati Milling Machine Company No. 1 universal milling-machine; one Gould and Eberhardt 12 in. shaper; one Gray planer, 22 in. by 6 ft. bed; one gas blow-pipe for hardening, tempering, and brazing. Two sides of the room are lined with benches, on which are mounted eighteen Prentiss vices, for work in chipping and filing. Underneath each vice is a drawer containing steel scale, try-square, hand-vice, dividers, chipping-hammer, &c. In addition to these, each student has a separate drawer in which to keep his assortment of files, chisels, and lathe-tools, as well as his unfinished work.

The tool-room, which occupies a space of 9 ft. by 16 ft. in one corner of the shop, contains a complete assortment of necessary appliances, such as chucks, drills, reamers, taps, dies, gauges, surface-plates, micrometer calipers, &c.

The engine-room is situated directly under the machine-shop, and contains a 60-horse-power Reynolds Corliss engine, "1890" frame. It is fitted with indicator-pipe and reducing motion, so that by means of the Crosby indicator and Amsler polar planimeter students are taught how to properly adjust the valves, calculate the horse-power, &c. This engine furnishes the power for the shops, while a 15-horse-power slide-valve engine is used to drive the two large ventilating-fans which furnish a constant supply of fresh air of a uniform temperature to all parts of the building.

A 12-kilowatt 500-volt Edison motor is used to drive the blower which supplies the blast to the forge-shop. The current is supplied from one of the city power plants.

Tools and materials required in the shops are furnished by the school. When the exercise made in the school is something which the pupil is to carry away and retain, then he is required to furnish the material.

The principal of the school, Mr. C. A. Baldwin, says: "Cost value of plant is about $135,000. The annual expense of maintenance is difficult to tell. Our school is a new one, and this is the first year that all of the departments are in working order. So far as materials for the shops and

laboratories are concerned, I think that the cost per pupil will average about $6 for the year. In other directions the cost of maintenance will not differ from that of any other first-class high school. So far as my experience goes, it seems that the effect of manual training upon other studies is to stimulate them—or, rather, to make it possible—to do more and better work in the same time. The effect in the laboratory-work is quite marked; pupils who have had manual-training work are much superior to those who have not had it."

It will be seen from the above syllabus that the girls are taught in their first year's course joinery for six months, and in the second year's course wood-carving.

I have given two instances of higher-grade schools being established for boys and girls together, and would suggest that as the best form of school for New Zealand, where the towns are small in comparison, and concentration of work desirable. Schools so established, if at all central, would be enabled to utilise the central technical workshops and domestic-economy rooms, which would be a considerable saving of expense and salaries. The whole scheme might, in fact, be worked as in the case of the Battersea Polytechnic—that is, in connection with the central technical schools; or as in many cases in Manchester and London, where Standards I., II., and III., and sometimes IV., are accommodated at other schools, and the space thus left available is utilised for higher-grade work.

Should it be deemed advisable, however, to establish the boys' school separately, provision could be made for day continuation classes in domestic economy to cover a given course of study, such as those established by the London Technical Education Board, or the housewifery schools of Belgium.

In the latter case the course is a six-months one, and must include cooking, washing, ironing, cleansing of garments, cleaning, and sewing, &c.; and in country districts gardening, dairy-work, and poultry-keeping. Cookery includes the preparation of a dinner for six persons, at a given cost. The dishes must include soup, meat, vegetables, &c. The girls are to lay the table, sit down, and eat the meal, taking turns at the carving and serving. Bread-making is particularly mentioned. The purchases and general marketing are done by the girls under supervision, and accounts are regularly kept of all expenditure. Lessons are given during the week upon domestic economy and hygiene, and must include the following: Arrangement and cost of household furniture; house-cleaning, daily, weekly, yearly; arrangement of house-work for a day; making a bed, with practical demonstration; lighting and cleaning a petroleum-lamp; household remedies for cuts, burns, bruises; changing the sheets of a bedridden person, &c.

The London Technical Education Board opened a School of Domestic Economy at Battersea with twenty-four girls, and so successful did this prove that eight additional schools have now been opened. At these schools systematic training is given in cookery, laundry-work, dress cutting and making, needlework, patching and darning, housewifery, and general health laws. The whole work is treated, not as a lesson, but as a part of every-day life, and this is one of the greatest advantages claimed on behalf of the system. The meals are cooked and eaten by the girls. The syllabus includes dishes well within a working-man's earnings. The using-up of scraps, bread, cold vegetables and meats receives special attention, and care is taken in providing such stores and appliances as are likely to be found in the majority of homes. The scholars are taught to measure, fit, and make their own dresses. Laundry-work also receives careful direction. Here, again, little special aid beyond a wringer and a mangle is given. The syllabus provides for steeping, washing, boiling, rinsing, bluing, wringing, drying, folding and mangling, starching and ironing. The washing of flannels is made one of importance. The girls are taught the market-value of foods, and at the school visited (Battersea) they are taken out to purchase food, &c; they compare prices, judge the freshness and quality of commodities, and learn how to expend a given sum to the best advantage, &c. The Board offer no less than 250 scholarships every half-year in domestic economy, or over five hundred annually.

In Yorkshire the method of providing instruction for the rural districts is by taking two small houses for three months at a time in towns or villages easily reached by road or rail. Each house is simply furnished upon the plan of an artisan's home. Six girls are instructed in each school for three days weekly, one instructor having charge of both schools. The food is provided by the girls themselves, as also are clothes for washing, &c. They receive instruction in home-work generally. The hours of instruction are the same as those of the primary school. I am informed that this practice has led to very excellent results.

Examinations.—In this matter I suggest perfect freedom of classification, and no compulsory examinations. Scholars desirous of obtaining special certificates might do so by presenting themselves at the various examinations held by the technical schools or other institutions. My desire is to minimise as much as possible the great evil of examination as at present applied to public schools, so that the whole time of the scholars may be utilised for the purpose of gaining sound and useful information, and not cramming for special points of examination. I suggest a leaving-certificate, as adopted by the English and other high-grade schools.

Scholarships.—Scholars holding primary scholarships might have the choice of a higher-grade school or a secondary school. A proportionate number of scholarships should be available for higher-grade schools (in accordance with the numbers in the various schools), tenable at technical classes in special subjects, or for university courses; such scholarships having a higher monetary value in proportion to primary scholarships.

Departmental Assistance.—Should schools of this kind be established it would be necessary to place them upon a similar basis to the primary schools so far as payment for ordinary subjects is concerned, other subjects, such as manual and domestic, science and art sections, being paid for in accordance with the Technical Instruction Act. The majority of the scholars would be those above the Sixth Standard now in the primary schools. Thus only a slight increase in capitation would be required.

3. INTERMEDIATE SCHOOL FARMS.

The question of agricultural education is one of the utmost importance to such a colony as New Zealand. Information and suggestions with reference to intermediate agricultural instruction will be found under "Agriculture," Section V., page 56.

4. SECONDARY SCHOOLS.

In connection with the secondary schools I recognise many difficulties, inasmuch as our population is small and the curriculum is necessarily a very general one. I should, however, urge that wherever drawing, practical science, manual instruction, or domestic economy (in connection with girls' schools) are efficiently taught a capitation grant be made to such schools, such grants, however, to be paid only upon the recommendation of the Education Board of the district in which such school is situated. Grants so paid should mainly be used for the equipment of science laboratories, art-rooms, manual training, or domestic-economy class-rooms. Such assistance would, I am sure, lead to the encouragement of those subjects, and considerably strengthen the cause of technical education.

Drawing.—From inquiries made during my recent visit to England, I find that drawing is, in the majority of secondary schools, taught throughout the school, and in many schools special provision, in the shape of an art-room, is provided and well equipped with casts, models, and other necessary appliances. The course of work in drawing should be practically what is known as the second-grade course in freehand, model, plane and solid geometry, perspective, light and shade from the cast, modelling or elementary design. These subjects being taught throughout the school, assuming a three-years course of work, geometry and perspective would occupy the first year, freehand and model the second, and the remaining subjects the third year; it would be possible then to include machine drawing and building construction (drawing only).

Manual Instruction.—The secondary schools, in this respect, have made little progress in comparison with primary schools, nor is the work generally so efficiently carried out. The schools are, however, becoming alive to the requirements of manual training as an ordinary part of their syllabus, and rapid progress may be looked for in the next few years. The course of work would, if manual work is included in primary schools, be a second or third year's course, adapted from one of the series suggested in the section of this report dealing with the subject.

Science Instruction.—A large number of schools are well equipped in this respect, but there has been much difference of opinion upon the nature of the instruction given. Mr. H. Llewellyn Smith states that in the majority of schools practical chemistry merely means qualitative analysis. The text-books in use were mainly Jago's Elementary or Advanced Chemistry, or Roscoe's.

The London County Council Technical Education Board, considering the importance of teaching chemistry in secondary schools, appointed a special committee to inquire into the system adopted. This committee, after consideration, adopted the following recommendations, which have met with strong approval from educational authorities: (1.) That chemistry is a valuable subject for school-teaching, but that it should not exclude training in mathematics and languages, but should with these form part of a general education. (2.) That it should be preceded by an elementary course of physics, to be treated as much as possible as exercises in measurements and practical arithmetic. (3.) That the work should be always largely practical. (4.) That attention should be paid to the style of the daily record of work, so that it may serve as an education in handwriting, grammar, and English composition. (5.) That no attempt should be made to impart in schools any knowledge of the application of chemistry for commercial purposes, except in so far as the products of such operations concern the common phenomena of every-day life. (6.) That in selecting candidates for the higher science training a written examination is insufficient and inadvisable, but the selection should rather be determined by the recommendation of the headmaster of the school from which a pupil may proceed, based on the work of the candidate throughout his whole school career.

Girls' Secondary Schools.—Drawing as a rule is taught throughout. Modelling is very generally taught, in some cases throughout the school. Needlework and dress-cutting are also generally taught throughout. Botany is the most usual subject. Cooking is not generally taught, but strong efforts are being made to introduce this subject.

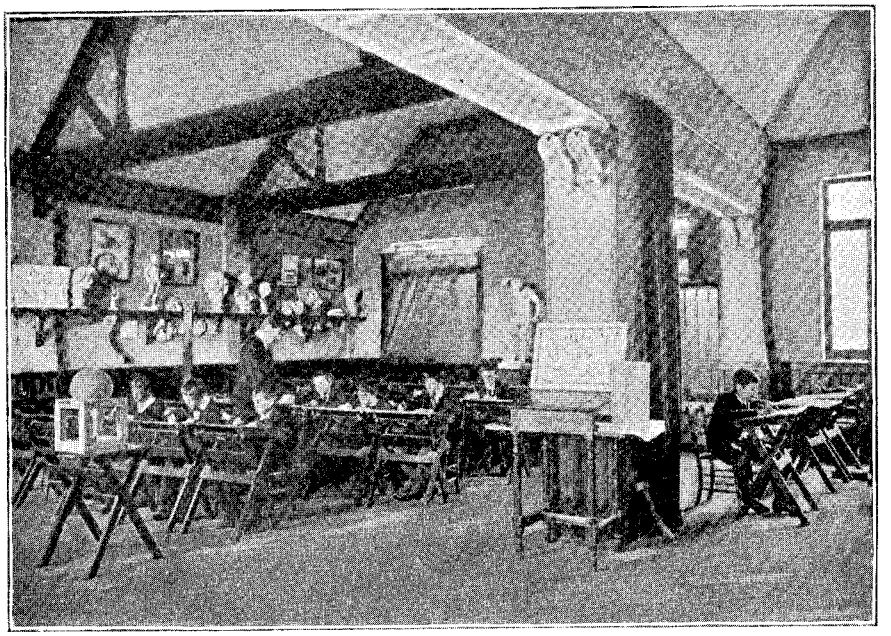
The two illustrations (XXI. and XXII.) will give some idea of the importance attached to the subjects mentioned. I may say that in a large number of secondary schools this provision is very complete. The illustrations are reproduced by kind permission of the *Record*, the journal of the National Association for the Promotion of Technical Education.

SECTION III.—SCHOOLS OF ART AND CRAFTS.

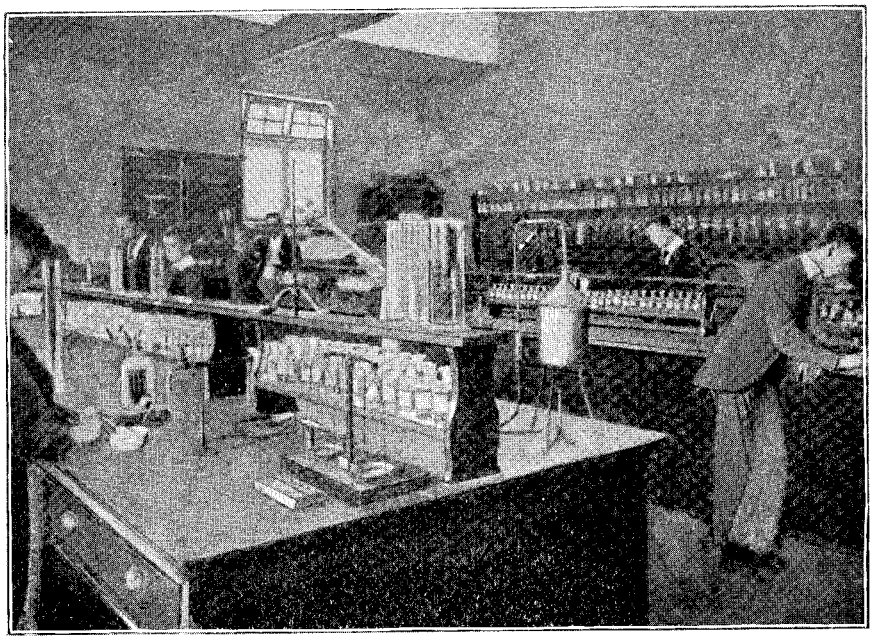
(1.) Drawing, painting, modelling, and design. (2.) Art crafts. (3.) Miscellaneous.

1. DRAWING, PAINTING, MODELLING, AND DESIGN.

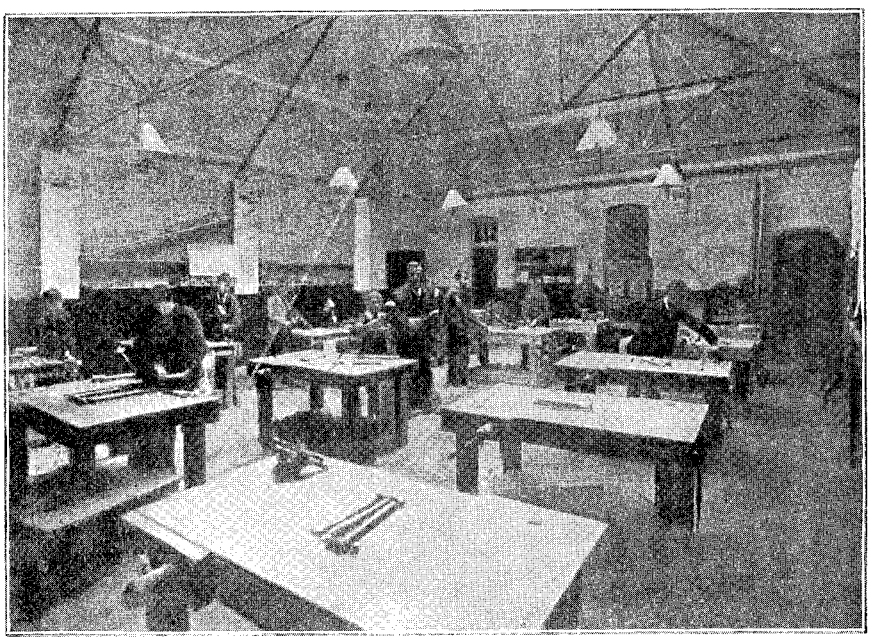
If our system of education is to be successful, art schools must play a very prominent part in that success. Drawing is the basis of all technical teaching, and is now regarded as a universal language open to all. There has been much discussion upon the question of whether an art school should undertake what is called "pure art" or "applied art," the former alluding to the pictorial, and the latter to the working or application of art to clay, metals, wood, or stone. France, Germany, and latterly England, have found it useless to make any distinction between the two, and now great pains are being taken to spread pure art knowledge as the best method of instruction,



XXI.—THE MATHEMATICAL SCHOOL, ROCHESTER—ART ROOM.



XXI*a*.—THE MATHEMATICAL SCHOOL, ROCHESTER CHEMICAL LABORATORY

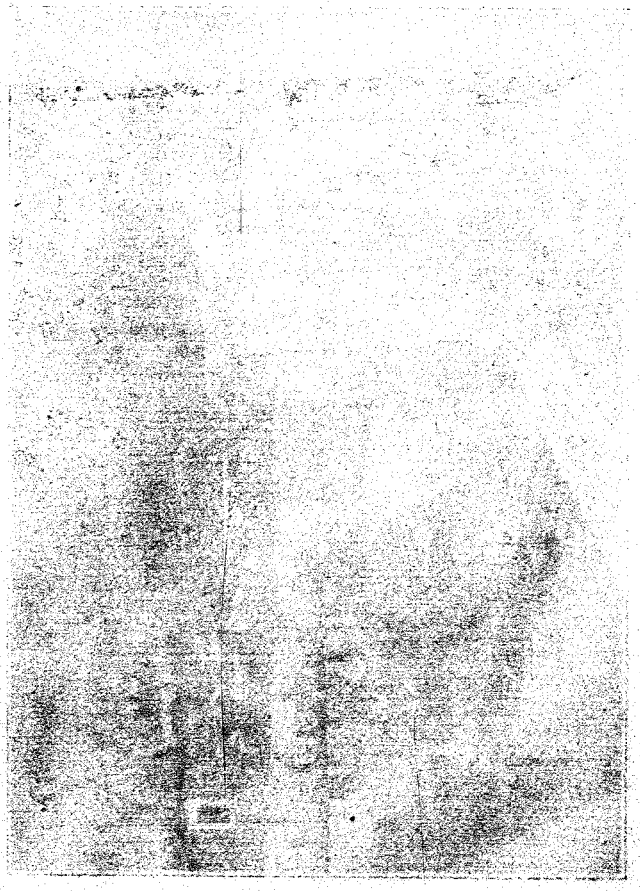


XXII. THE MATHEMATICAL SCHOOL, ROCHESTER CARPENTERS' WORKSHOP.

[To face p. 3⁶.







for the higher the value of the work done the more successful must industrial or applied art become. In our colonial art schools it behoves us to strain every possible point to improve the general standard of art education, from the simplest elements in the primary schools to the highest possible point of success. We are, unfortunately, placed at a great disadvantage in having few good art examples, no art museums, or anything capable of raising the standard to a high state of efficiency by comparison, or by a knowledge of the capabilities of our materials. Such collections are, however, a question of time, and I can only hope that efforts will gradually be made to obtain collections of art objects and pictures on behalf of our art students, as suggested in a later stage of this report under the head of "Museums and Libraries."

The art schools already established are available for both day and evening classes, and naturally form an important part of our technical system. To be useful such schools must work hand-in-hand with the technical classes—there should be no distinction or separation one from the other. One of the greatest difficulties schools of art contend against is the student's want of elementary knowledge as a basis on which to continue his studies. An instructor's time is often spent in giving instruction in such work as ought to have been done in our primary schools. It is therefore essential that the drawing in primary schools should be under the control of or directed by the head of the art schools, who should have the training of all primary-school teachers carefully attended to, and should by personal visits advise and assist teachers giving class instruction in our schools. There can be no question of the necessity of this point, for it is the foundation, and without it success cannot possibly be generally obtained. The want of this primary knowledge often discourages an artisan attending a drawing class, and after, say, a year's course of work he finds he has not learnt what he considers necessary for his trade purposes, but which it is impossible to give him without the groundwork. Thus many are discouraged. I cannot too strongly impress the necessity of great thoroughness in primary drawing. There is, unfortunately, much misapprehension with regard to the objects of art schools. It is sometimes supposed that boys attending such schools are or will be made architects, designers, or carvers in a twelve-months course, and that the school is to furnish the student with all that long experience which an intimate acquaintance with the conditions of art and art-manufacture alone can teach, in less time than it is necessary to master the elements of drawing. Time alone will, of course, remedy this evil. With reference to the course of study adopted in schools of art, care should be exercised to see that every student's course of study is arranged so as to bear upon his or her occupation. Direction and care in this matter are essential if success is to be looked for. Too often Committees provide a school fitted with appliances and masters, but students are left to their own choice of class or classes—such, for instance, as machine and building construction, students entering these sections at once without the necessary grounding in geometrical and other drawing. There is a further danger in connection with our art schools that there may be too much teaching, particularly in the case of promising students. In such cases what is really wanted is not so much teaching as direction, so that there may be no stifling of a student's originality. Particularly is this so in such a subject as design, where originality, even if unfortunate in composition or treatment, should be encouraged.

To many persons the teaching of design is considered unnecessary, and the application of simple design to clay, metal, or other substances by the students is considered as "dilettante" and useless occupation. Such, however, is very far from being the case; every endeavour should be made to strengthen the position of our schools by applying the knowledge obtained to practical purposes. The mere fact of such work being done will tend to foster an improved taste in household decoration and in daily life and surroundings, and provide occupation for our students. Everywhere during my visits have I found this fact strongly insisted upon, and in the majority of art schools some branches of work may be found in progress, whilst in the larger centres special schools have been established and are doing excellent work, one of which will be found described under Section 2 of this subject.

Schools of art receiving aid under the London County Council must comply with the requirements of the Science and Art Department, or satisfy the Board that they provide facilities for the systematic study of art. They must also (1) teach design as a part of the regular school course; (2) teach modelling; (3) teach the application of design to at least one manufacturing process, such as wood-carving, inlaying, repoussé and other metal-work, gold- and silver-work, niello-work, lithography, picture-frame making, gesso-work, wrought-iron work, chasing and jewellers' work, medals and die-sinking, etching, engraving, illumination, leather-work, embroidery or lace-work, paper-staining, fresco-work, sgraffito, book-illustrating, bookbinding, pottery- enamel- or glass-work, tapestry weaving and painting, house painting and decorating, stencil-work, modelled plaster, &c.

In connection with the South-west London Polytechnic Art School the methods of teaching and the principles governing the teaching are thus set forth: (1.) Adapting the teaching as much as possible to the individuality of the pupil, in order to foster this quality, and not to crush it by a hard-and-fast system. (2.) Impressing upon all craftsmen the unity of the arts and crafts, and the absolute necessity of a knowledge of drawing in the craftsman. (3.) Making the craftsman the designer of his work. (4.) Pointing out to each artisan-student the artistic possibilities of the trade he is following. (5.) Making use of all mechanical and scientific means for saving unnecessary labour, and so keeping in touch with modern effort, and making the utmost artistic use of the circumstances of the time, in place of attempting to revive the methods of bygone ages. (6.) While providing as many specimens of the best works of each period as possible for the students to see, not insisting on elaborate copies being made of them, but directing the thoughts of the students to the study of nature through direct casts from flowers, fruit, &c., through casts of heads and torsos, and to the study from the living model. (7.) Giving each student the opportunity of posing the model in the life class, in order that the studies may be utilised for actual

design in course of progress. (8.) Taking advantage of the teaching in the science section, where it has a bearing upon the arts—*e.g.*, conducting an electro-depositing class for designers and modellers as a combined science and art class. There is much excellent advice to be gained by a careful study of the foregoing suggestions and an adherence to the principles inculcated.

It will no doubt be an advantage to teachers and students that I should give a brief summary of the facts and details obtained in regard to sections of work in connection with art schools.

Outline Drawing, Freehand and Model.—Too much outline drawing is inadvisable. Elementary exercises from the copy should mainly be done from the blackboard upon a large scale, the scholar's work being as large as possible in order to enable proportion, blocking-in, and freedom of the hand to be readily learnt. These exercises should be flat-tinted in order to obtain exercises in simple washes and contrasts of colour. At the Finsbury Technical School drawing from small diagrams of L'Art Practique is encouraged. These are enlarged and the repeat traced, the whole is then coloured in two, or possibly three, shades to the student's taste, thus drawing out and correcting his ideas of colour. Drawings from Albert Dürer in pencil and ink are also encouraged. The cast, model, or simple foliage may next be drawn in pencil, pen, charcoal, or brush upon any material. In evening-class instruction it is advisable to apply the construction of figures used in model-drawing to as many practical trade purposes as possible, in order to give confidence to the student, and enable him to see the use of work often considered by an artisan as useless to him. In all cases, day or evening classes, plenty of blackboard demonstration should be given. In more advanced outline, such as the Louis XII. pilaster, exercises are occasionally drawn in white body upon a tinted paper, giving excellent practice. In outline for the Kensington examination the student is not expected to remedy apparent defects in the cast, or make both sides strictly symmetrical. In all cases, freehand or model, variety of exercise and method should be constant. Memory drawing should be encouraged by every possible means.

Perspective.—The text-books generally in use were Dennis's Second and Third Grade, Cartlidge's, and Yules's.

Plane and Solid Geometry is placed under the science section, for geometrical drawing only; Morris's "Geometry" is freely used.

Light and Shade, and Monochrome.—In these subjects charcoal upon white, or black or white chalk upon brown paper, is the general method in use. No effort should be made to obtain finished drawings in the earlier stages. Care should be taken to give frequent demonstration to the class upon light, half-tone, shade, shadow, and reflected light. When these have been fully demonstrated, and fair practice obtained, the student might then proceed to work with the brush in oil- or water-colour, using varied tones as a background; the ornament to be painted in what is known as "Grisaille," in agreeable relation with the colour of the ground. No hard-and-fast rule should be made as to the nature of the material used. Freedom and variety should be the constant thought of the instructor. Memory-work should again play a conspicuous part in this section.

Antique- and Life-work.—It is important that after a certain amount of work has been done from the antique, life-work and antique should be combined. The antique establishes mainly ideas of proportion, which are not usually found in the life figures; the difficulty, especially in New Zealand, of obtaining suitable life-models is a very serious drawback to our work. Worked together, a true appreciation of both sections of work is engendered, the one assisting the other to a very great extent. Life-work should be carried on to the fullest possible extent in every art school, for to industrial art students it is invaluable. Outline from the antique is not considered advisable. Charcoal studies in point without stippling upon white, brown, or tinted papers are encouraged, the paper being used sometimes as a half-tone, with black and white chalk. Too much stress cannot be laid upon the necessity of studies of the extremities, not elaborately shaded, but correct in drawing and proportion; therefore frequent exercises in this direction in chalk or colour should be insisted upon. It is all very well to paint the whole figure continuously as students are desirous of doing, but the want of accurate knowledge of detail will be a constant trouble, unless considerable attention is given to the same. Drawings laboriously worked or highly finished as studies are to be discouraged; rapid and effective sketches should be encouraged in every possible way, the life-model occasionally being posed in turn by the students for hour-sketches in pen, pencil, chalk, &c. Special time should be set aside for memory-work. Drapery drawn or painted from the antique should form part of the study in this section of work; the method should be simple in its treatment; much time spent on elaborate accessories is wasted. The various styles in painting it is impossible to describe; the general feeling, however, tends in the direction of direct and solid painting. Drawing and painting from the antique and life should be undoubtedly carried on to its utmost limit.

Anatomy forms a part of the life and antique instruction. Between the lectures the students are required in some schools to prepare a series of drawings, life-size, of the various bones in three views, and to submit them upon the evening of the lecture. As the lecture proceeds notes are taken, and during the week the muscles, showing origin and insertion, are added to the previous drawing of the bones. Full-sized studies are everywhere encouraged, together with sketches from the life and antique suitable to the section of the body under consideration.

The text-books generally in use were Marshall's "Anatomy for Artists," Fou's "Anatomical Plates," Knox's "Manual of Artistic Anatomy," Flaxman's "Anatomical Studies," Thompson's "Anatomy," Duval's "Anatomy."

Painting Still-life and Plant-form.—Painting still-life is generally carried to a high pitch of perfection in detail. The method usually adopted is to commence with groups without strong colour (the students being allowed to arrange the group subject to the instructor's approval), and gradually proceeding to objects of stronger colour and contrasts. Drawings and paintings of interiors and plant-form receive every attention. Here, again, variety of work and method are to be encouraged. In the study of plant-form and foliage the use of colour, and the habit of

working directly upon paper with the brush, would give great facility and precision of touch, a directness of execution very desirable in all work. In painting without background, native foliage should receive particular attention. Drawings from memory and in black and white should be frequently given, the latter enabling the student to study the values of colour to black and white, a style of work particularly useful for illustrative purposes.

General Instruction.—An excellent method of general instruction is to set aside one day weekly in which a special study is given. The instructor is required to execute the example in the presence of the class upon a fairly large scale in order to show the best method of proceeding. The students have each, of course, a different view of the object, and proceed with their work upon the lines suggested by the instructor. One day the subject may be a cabbage, executed in water-colour; the next a monochrome study from the antique, or portion of the same, a model in clay of a cast, a lobster, group of ice and fish, piece of drapery, the living model, plant-form, &c.: these studies, after completion, being placed together and criticized for the information of the class.

Modelling.—This subject should undoubtedly be taught in every art school. The London Technical Education Board require that half an hour's demonstration shall be given not less than twice weekly; not more than twenty students may be taught by any one instructor. Considerable attention is given to this important work in all the schools visited. The inspector's general complaint is the too free use of the modelling-tool in elementary work, and the striving after smoothness in more advanced work. The work from the cast is usually considerably larger than the example. Work is also often done from memory by students from the drawing classes with very beneficial results.

The following is the syllabus of the Manchester School: (1) Manipulation of clay and exercises in simple form; (2) modelling simple, radiating, and repeating forms from casts; (3) and (4) modelling from simple bi-symmetrical forms, vases, fruits, and from casts; (5) modelling from imbricated forms; (6) modelling from simple Gothic foliage in high relief; (7) modelling Italian ornament, delicate relief, and small details necessitating the use of tools; (8) treatment of large planes in ornamental foliage from Roman casts; (10) modelling from natural objects; (11) antique and drapery, held in connection with the life classes; (12) modelling from the life, held in connection with the life classes.

Modelling is undoubtedly one of the best means of obtaining a thorough knowledge of form. Exercises in modelling plant-form and foliage will be found a great relief to students whilst working at ornamental forms from the cast drawing or photographs. Both the latter are good exercises, but should not be attempted until fair practice has been obtained. In the human figure nothing will assist students better in obtaining a thorough knowledge of form than to model portions of the figure, particularly the features and hands and feet. These should in the first case be taken from the antique, but may afterwards be worked from the life. Drapery should also be modelled freely, as well as being drawn and painted.

Evening Branch Classes.—In country districts where continuation schools or other classes are likely to be held, provision is made in the Technical Instruction Act for the establishment of drawing classes or kindred subjects where it is possible to obtain suitable teachers, and there is no doubt considerable advantage will be taken of this important provision. Even if the subjects taken up are only elementary, if they are taught upon right lines, it will materially strengthen the efforts of the Education Department in obtaining good results. There are in a large number of schools teachers who are able to form such classes with great advantage to the district and themselves.

Design.—The place of design in our art schools should be one of considerable importance; as it is, it is often relegated to a late stage of school-work, after a considerable course of general training.

I have already indicated the practical subjects which may be taught. Even in our New Zealand schools it is quite possible to work out designs in wood, stone, metal, bookbinding, stencilling, lithography, lace, embroidery, or other materials; and I suggest that, no matter how simple the design, an effort should be made to carry the same out in a practical manner. In every art school visited I found particular attention paid to this subject. In Birmingham design-work extends from the higher-grade school classes right through the whole system in a most admirable manner, and gives conclusive proof of the capabilities of this subject as a general medium of education.

Many persons conclude that design is not capable of being generally taught—that only gifted students are eligible for such instruction. Design, however, may be and should be taught from the earliest stages. It is quite possible to inculcate ideas of form, symmetry, and repetition, as applied to the simplest elements, in our primary drawing course, as is done in Birmingham, and to a certain extent this is already done in the Wellington District. Design should undoubtedly form a part of ordinary education in our art schools. It has occasionally been remarked that it is useless to teach a subject having no application to the industries of New Zealand. Surely some of the following trades would receive considerable benefit from their workers having a knowledge of ornament and its application: Wood-carvers, stone-carvers, metal and wrought-iron workers, picture-frame makers, jewellers, engravers, lithographers, bookbinders, book-illustrators, house-decorators, architects, modellers, pottery-workers, printers, &c. In the various branches of these trades and professions alone design is a most important factor, and there is no reason to suppose that other industries will not spring into existence.

As a rule, our schools do not present a sufficiently large number of students to enable two distinct classes to be formed in principles of ornament and design. The only remedy is therefore to work the two classes together, and, if possible, to make it a general school subject.

The following syllabus of the Manchester School of Art may help teachers to block out their work systematically:—

Principles of Ornament.—(1.) Ornament: various periods and style; importance of analysis and method study. (2.) Principles derived from the observation of natural laws. (3.) Elementary forms: geometric arrangements and construction; lines of pattern. (8.) Ornamentation of flat surfaces and solids. (9.) Elementary forms, abstracted from foliage, flowers, &c. (10.) Elementary forms, abstracted from animals. (11.) Elementary forms, abstracted from architecture, and objects of decorative value. (12.) Coloured ornaments in flat-surface decorations, such as walls, ceilings, tiles, textiles, &c. (13.) Coloured ornament: stained glass; mosaics; inlays. (14.) Relief-ornament in terra-cotta, stone, wood, &c. (15.) Iron; bronze; silver; gold; pottery; glass.

Text-book: J. Ward's "Elementary Principles of Ornament." Reference works: Owen Jones's "Grammar of Ornament"; Mayeux's "Decorative Composition"; Meyer's "Handbook of Ornament"; Wornum's "Analysis of Ornament."

Design in its Application.—(1.) Decoration of flat surfaces in single colours; brush-work stencilling; pattern construction; varied treatments. (2.) Decoration of flat surfaces, with motives derived from simple natural forms; beauty of mass-line. (3.) Repeating patterns for colour processes and adaptation. (4.) Repeating patterns, with motives derived from foliage forms. (5.) Design for given spaces: motives derived from foliage and animal forms. (6.) Ornament to fill a given space. (7.) Borders in two or more colours. (8.) Relief-ornament in panels and pilasters. (9.) Metal-work; pottery; glass.

Text-books: "The Anatomy of Pattern," Lewis F. Day; Frank Jackson's "Lessons on Design." Reference works: Owen Jones's "Grammar of Ornament"; Racinet's "Polychromatic Ornament"; Lewis F. Day's "The Application of Ornament" and "The Planning of Ornament"; T. R. Colling's "Gothic Ornament"; Owen Jones's "Chinese Ornament"; F. Meyer's "Handbook of Ornament"; G. Birdwood's "The Industrial Arts of India"; F. W. Moody's "Lectures and Lessons on Art"; "Arts and Crafts Essays"; Walter Crane's "Claims of Decorative Art"; Spitzer collection.

Plants in their relation to design is an additional course: (1.) Character and growth of plants: their artistic value. (2.) Stems; branches; arrangement of leaves. (3.) Leaf-buds and their development; stipules; bracts. (4.) Simple leaves; aquatic plants; lobes; serrature; veins; surface markings; compound leaves. (5.) Drawing and colouring and memory exercises. (6.) Flowers: the calyx; corolla; stamens, &c. (7.) Some typical forms of flowers: their variations and groupings. (8.) Fruits; ovaries; pods, &c. (9.) Roots, bulbs, &c. (10.) Adaptations in art. Additional text-books are John Gerard's "Herbal," Pratt's "Flowering Plants of Great Britain," Curtis's "Flora Londinensis," and Lindley's "School Botany."

The following text- and reference-books are recommended for the study of historical ornament, in addition to several mentioned in the above lists: "The Industrial Arts"; Jane Harrison's "Greek Vase Paintings"; Perrot and Chipiez's "Egypt, and Assyria, and Chaldea"; Murray's "Handbook of Greek Archæology"; Birch's "History of Ancient Pottery"; M. Solon's "Art of Old English Pottery"; Digby Wyatt's "Metal-work"; John H. Pollen's "Furniture and Woodwork"; Wm. Maskell's "Ivories, Ancient and Mediæval"; G. Redford's "Ancient Sculpture," &c.

Whilst it would be impossible under present conditions for our schools of art to embrace such a course of work as that indicated above, the suggestions will be of general service, and the list of text-books valuable. It behoves every school to have in its possession as many of the works mentioned as possible, more especially as a lending as well as a reference library. Having no museums to refer to for examples, such works are indispensable to a school.

In all cases in more advanced work students should make themselves acquainted with the various processes of workmanship, such as stencilling, colour-printing, inlaying, wood-carving, modelling, casting, &c., so that their designs may be practically adapted to execution in a given material. Instructors should accompany their students to the various establishments where such processes may be seen, and should recollect that there is more to be learnt from making a simple design well suited to its purpose than from elaborating the most ambitious drawing adapted to no purpose or process of execution.

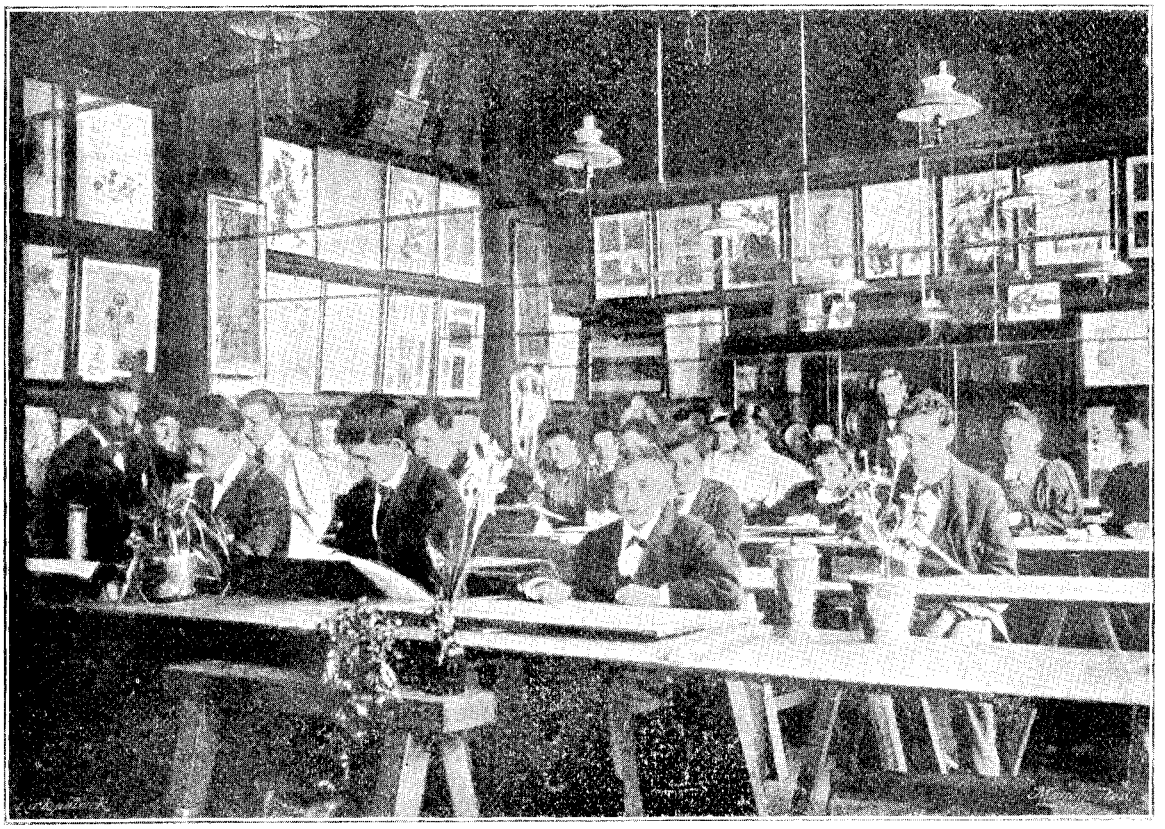
Clay is one of the best materials in which to produce designs in relief, and should be freely used. As an example, designs for wood-work, carving, decorative schemes for wall-panels, terra-cotta, metal wall-plates, repoussé-work, &c., might all be modelled in clay, and cast, giving students an excellent idea of the real value of their productions from a decorative standpoint. The nature of the material used lends itself wonderfully to suggestion as the work progresses, and enables the student to judge of his masses and light-and-shade values far better than by line productions upon paper. I cannot too strongly urge the application of all designs to practical purposes, and by this means make the subject a real live one, and a very valuable one to our rising industrial artists.

It is useless attempting to obtain great originality without first giving students some ideas of what really good work is. Let the schools, therefore, by every possible means, obtain possession of the best illustrations and actual objects for the guidance of designers. One of the reasons of the great success of the Home schools in this subject is the very valuable collections of objects and illustrations in their possession, and the loan collections from the South Kensington Museum. If we are to succeed we must follow in their footsteps without delay. I sincerely trust my recommendations relating to this matter will be accepted, for without such assistance we cannot hope to succeed.

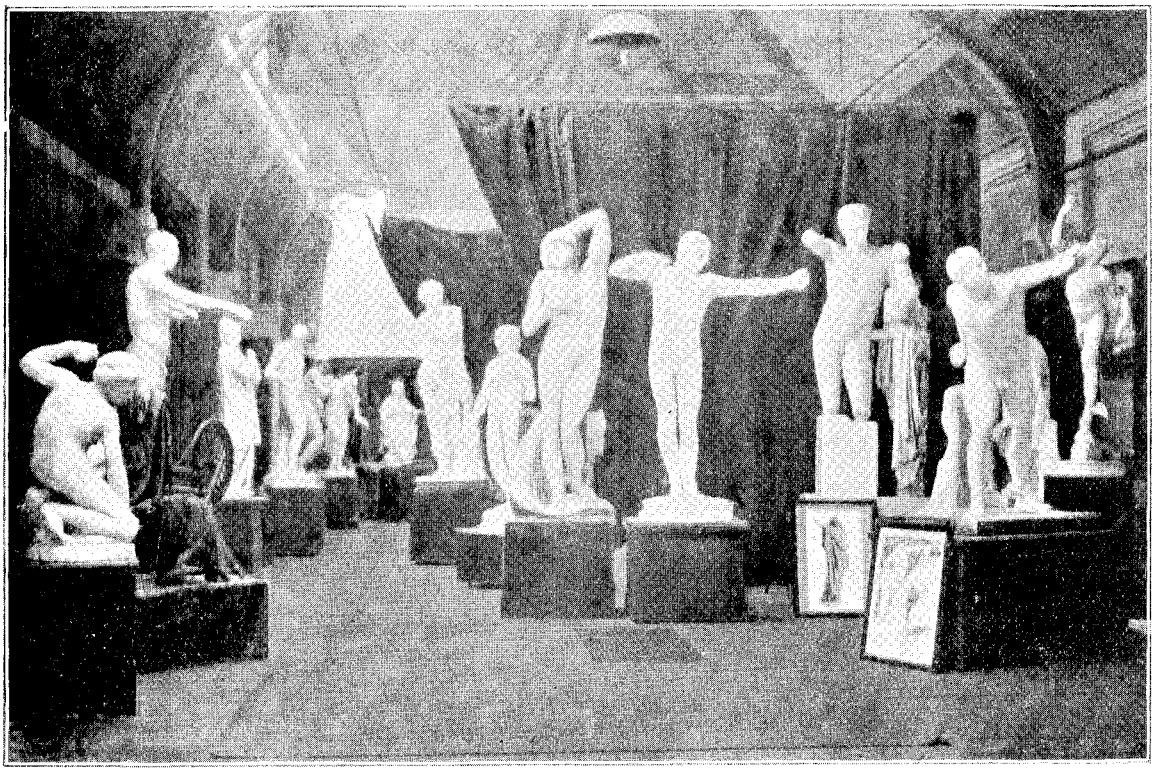
Illustrations XXIII. and XXIV. are of the Manchester School of Art.

2. ART CRAFTS.

The practice of the various arts as a craft is by every possible means to be encouraged in connection with our local art schools. The London County Council wisely requires that not less than one handicraft shall be taught in connection with each school of art receiving aid from the



XXIII.—DESIGN ROOM, MUNICIPAL SCHOOL OF ART, MANCHESTER.



XXIV.—THE GALLERY OF ANTIQUE CASTS, MUNICIPAL SCHOOL OF ART, MANCHESTER.

[To face p. 40.

Board. In England the Home Arts and Industries Association have many thousands of students at work. But there can be no doubt that this work, to be really successful, should be closely associated with our schools.

Work in the following branches may be readily undertaken with advantage and profitable results to a large number of students: Furniture-decoration, repoussé-work in metal, wood-carving, art needlework, pottery-decoration, house-decoration, sgraffito-work, embossed leather, gesso-work, &c. In all these cases it is essential that drawing, painting, modelling, and design shall be continued while pursuing the actual practice of their work. Students will thereby have an opportunity of making and working from their own original designs — the best of educational training, and one that will strengthen and raise the value of industrial art. To design upon paper is one thing, but to carry out such a design practically is a totally different matter, and one of the greatest importance if our teaching of design is to be effective.

In attempting this work in New Zealand one is met by the suggestion that such work is only fitted for young ladies as a dilettante study. Such, however, is far from the case, at any rate in the United Kingdom, for the great majority of workers are of the poorer or middle class. A great work can be done in our colony in this direction, with advantage to the schools, the students, and the public generally; and I trust every effort will be made to make our schools of art thoroughly practical in their methods of work.

London Schools of Art and Crafts.—In order to meet the requirements of artisans and craftsmen who are engaged in industries, the London Technical Education Board has established two special schools—one at 316, Regent Street, and the other in Camberwell. In these schools art is taught entirely in relation to special crafts, and the fees are fixed at a sufficiently low figure to enable working-men to attend the classes. Both these institutions have met with remarkable success, and are to be followed by others.

The following branches of work were in progress upon the two evenings I spent at the Regent Street Institution: Architecture, drawing, colour and decoration, wall-paper and textile design, heraldic drawing, designs for cabinetmakers and metal-workers, modelling and ornament as applied to architecture and the allied crafts, drawing from the life, woodcuts in colour, enamelling, silversmiths' and goldsmiths' work, chasing, engraving, carving, lead-casting and ornamental lead-work, stained-glass work, stone-working, boookbinding, embroidery.

The school-fee is 2s. 6d. a month, and this admits the student (subject to the approval of the directors) to all or any of the classes of the school except the life-class, for which an additional fee of 2s. 6d. a month is charged. The classes in silver-working are strictly limited to the trades. Journeymen working at a trade or craft, and in receipt of wages not exceeding £1 10s. a week, may join the school for a fee of 1s. a month. Any apprentice, learner, or improver under the age of twenty-one is admitted to all the privileges of the school, except the life-class, free of charge, upon the production of a letter from his master to the effect that he has been regularly indentured, and is still under apprenticeship. There is no intention of supplanting apprenticeship, but simply to give thorough tuition in technical details, and to encourage expression of individuality in original work.

The *Stone-working for Architects* treats of various kinds of stone and the methods of working them, such as reducing blocks to working-size, squaring-up, working from templates, circular work, development of mouldings, and other branches of stone-work.

In *Lead-work for Architects and Plumbers* the various ways of using lead are described, and the ornamentation of lead is shown in detail—such, for instance, as casting ornamental lead-work in sand, lead patterns, pierced, stamping, punching, and inlaying of lead. Plumbers practise designs in the various sections, and work them out under the guidance of their teachers.

Stained-glass Work includes the general composition and setting-out of windows; the principles of cutting and use of the lead-line in plain glazing, ornament, and the figure; the principles of ornament as applied to glass; the treatment of glass in colour; design; painting of glass from cartoons, &c. All students must complete the whole processes of cutting, leading, drawing, and painting.

Silversmithing, Goldsmithing, and Jewellers' Work. — Students are required to study in design, drawing, and modelling, as well as in casting in metal, enamelling, or other sections of their craft. The workshops are provided with every convenience for engravers, chasers, repoussé-workers, and carvers, and are lighted by both electricity and incandescent gas-light.

Enamelling by the Champlévé, Cloisonné, Limoges, Bassetville, and painted-enamels methods are taught, and the preparation of metals for enamelling, preparation of enamels, laying-in enamels, firing and polishing.

Bookbinding.—There are two classes in this subject, every facility being given for the forwarding and finishing. Students are encouraged to carry out, from first to last, the binding and decoration of books, and also to design and work out their own patterns.

Embroidery.—A class in this work, including design, is established, and has the advantage of a considerable collection of fine examples of needlework. Each lesson comprises about half an hour's demonstration on the blackboard, the remainder of the time being occupied with tracing and transferring designs, and the practical application of the various kinds of stitches in hand-work and frame-work.

Woodcuts in Colour.—A special class is formed in this subject. Design, engraving, and printing of colour prints from wood blocks are done on a method based upon Japanese practice.

Altogether the work of this school forms one of the most interesting and instructive features of modern methods of education. I was pleased to find in the bookbinding class an old Wellington Technical School student, making good progress in his work, with the intention of returning to New Zealand. It may not be possible to approach in completeness any such school as the Arts and Crafts of London, but something may be done by combining design and practice together as previously indicated in our New Zealand art schools.

Wood-carving Art School.—This school is established at South Kensington, in rooms connected with the City and Guilds of London Institute. Both day and evening classes are held. Some remarkably fine work is produced by this school, which undertakes commissions for various firms or private persons. Twelve free studentships are granted, six in the day and six in the evening classes. Students who have been twelve months in the school may receive payment for their work upon the committee's recommendation. Amongst the many excellent works published by Miss Rowe, the directress, may be mentioned the "Portfolios of Carvings of the South Kensington Museum."

I suggest that double the ordinary grant be allowed by the Education Department to schools of art for craft instruction.

Home Arts and Industries.—This association is doing a valuable work, the object being to teach the minor arts to the working-classes, thus spreading a knowledge of artistic handiwork among the people. The intention is that the instruction should be given in such a manner as will develop the perceptive faculties and manual skill of the pupils, preparing them for possible entrance into trades, as well as increasing their resources and enjoyment.

The methods employed are: (1.) The organization of classes in Great Britain and Ireland, in which attendance is entirely and teaching almost entirely voluntary. (2.) The distribution to these classes of selected designs and models, and leaflets of information. (3.) The maintenance of a central office and studio in London, where both voluntary and paid teachers can be trained. (4.) The publication of the report, in which class experiments are fully described. (5.) The holding of a yearly exhibition and sale, when the year's work is compared and criticized, and certificates awarded.

The objects of the association are purely educational, and aim particularly at assisting isolated workers in very remote and poor districts. The following sections of work are aided: Drawing and design, geometry, modelling, joinery, carving in wood, carpentry, repoussé-work in brass and copper, bent iron, hand spinning and weaving, toy-making, embroidery, ring-making, pottery, embossed and cut leather, bookbinding, basketmaking, &c. The members' subscription is £1 1s. or upwards per annum, and for class-holders (persons who organize the classes and act as mediums with the association), 10s. per annum.

The suggestion given *re* classes is that one or two amateur workers join and get together a few pupils or scholars recommended by the schoolmaster of the district or other persons interested. Application is made by the class-holders for assistance from the association in the nature of advice as to materials, tools, &c., and for designs, thus enabling work to be commenced upon right lines.

From experience in the matter of persons who are desirous of obtaining information, I am of opinion that such an association in New Zealand would meet with very considerable support, and enable much useful and good work to be done in remote districts or even in country towns where no art classes exist. It would, no doubt, be possible to affiliate with the Home institution, which would, I have reason to believe, give every possible advice and assistance. A small sum granted by the Education Department annually—say, £1 for £1 upon subscriptions—would, I think, enable this useful work to be commenced.

Two illustrations (XXV. and XXVI.) are given of work under the Home Arts and Industries.

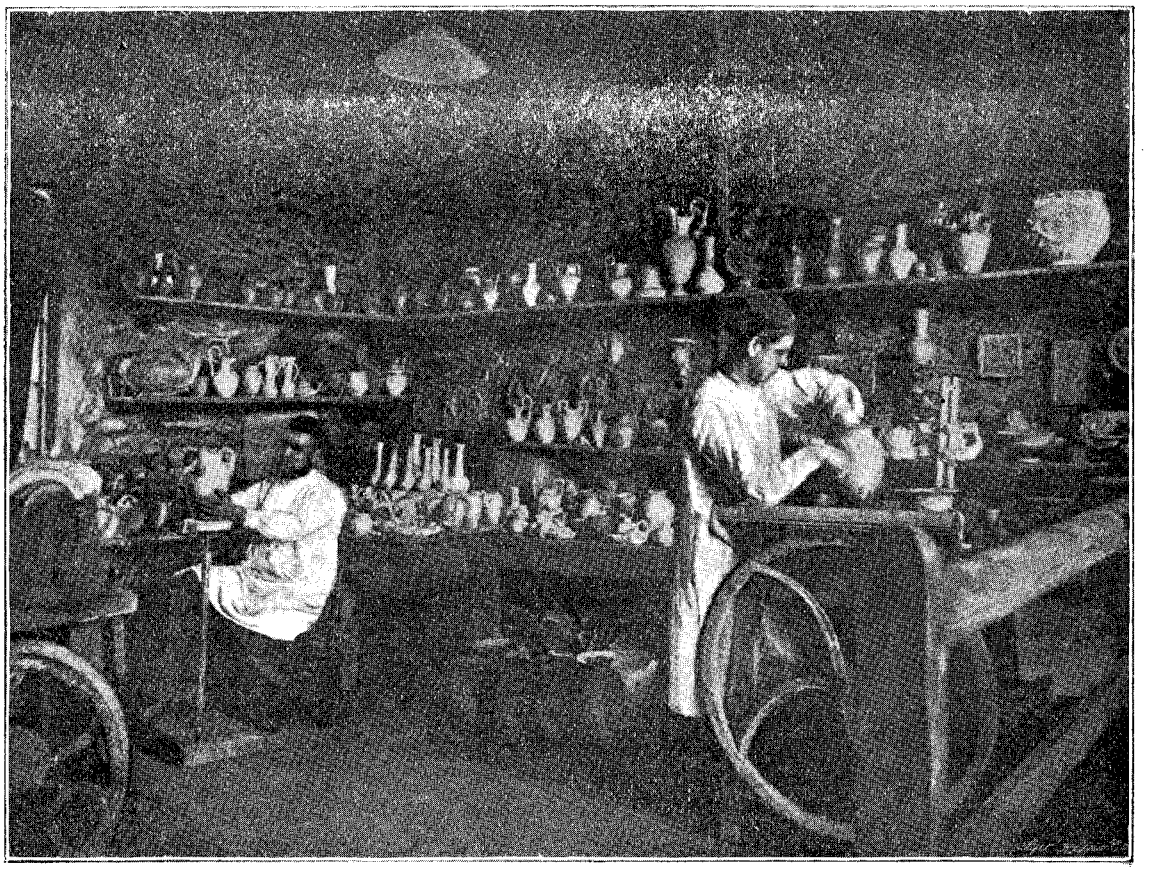
3. MISCELLANEOUS.

Buildings and Appliances.—The Technical Instruction Act contemplates assistance towards this most important part of the work. Without suitable rooms and particular attention to the lighting of the same much difficulty will be encountered, and for this reason I think it a very wise provision that the department should give no assistance unless the plans of new arrangements or new buildings are satisfactory to them. In England this matter is very strictly dealt with by the Science and Art Department, and rightly so. At my request the latter department placed at my disposal plans of two buildings of approved dimensions suitable for New Zealand towns, and one of these buildings—at Accrington—I visited.

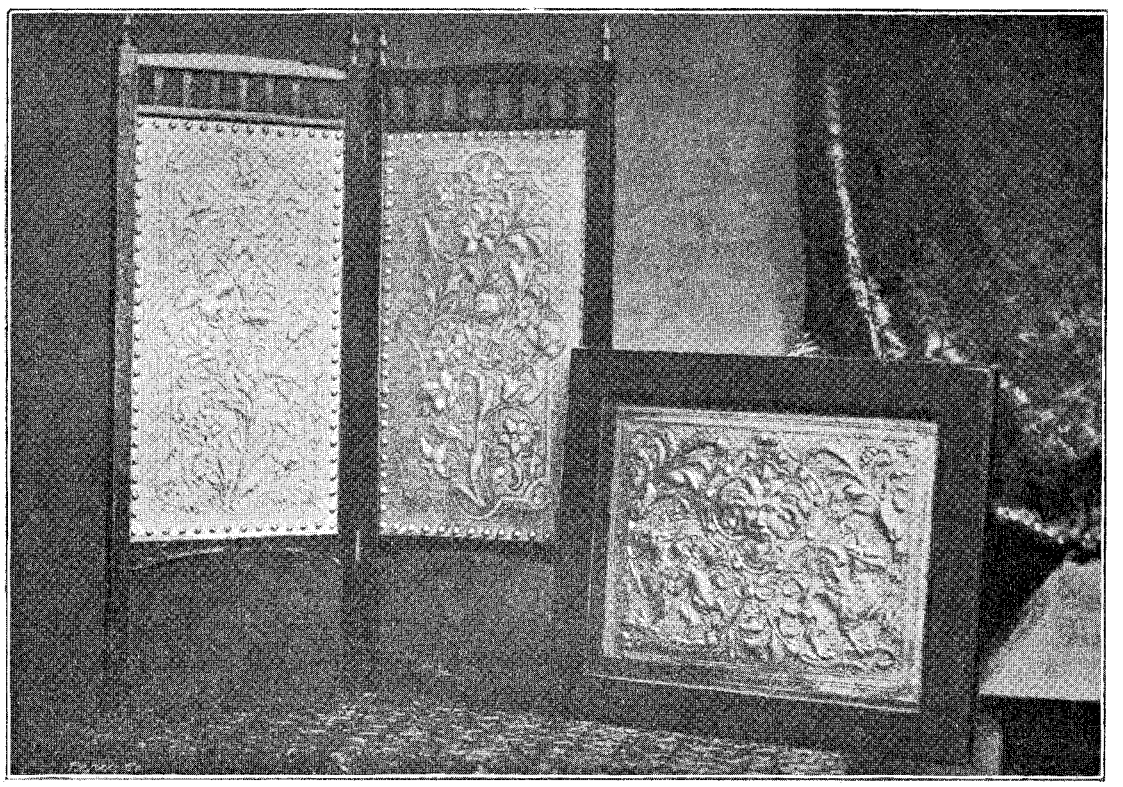
In the matter of appliances I noted particularly the models, casts, and other requirements of the more important institutions visited. I also paid visits to such firms as Brucciani's, of Covent Garden, where the best of antiques approved by the Science and Art Department may be obtained; Messrs. Chapman and Hall, also of Covent Garden, for casts of ornaments, artistic publications, and models of building and machine-work; Messrs. Batsford, of Holborn, for art and science publications; Messrs. Elkington, of Birmingham, for reproductions of metal-work; Messrs. Bacon and Co., Strand, for drawing and other charts; Messrs. Doulton and Co., Lambeth, for pottery, tiles, &c.; as well as many other important firms. Those I have mentioned, however, may serve as a guide to schools desirous of purchasing such appliances, and in some instances I received special terms for supplies for New Zealand schools. I further visited the circulating branch of the South Kensington Museum, and hope that satisfactory results will follow my efforts on behalf of New Zealand schools, particulars of which will be found under the heading of "Museums and Libraries."

I would urge very liberal assistance being rendered to all art schools and classes in the matter of appliances, and particularly in illustrations of industrial arts and designs, and in suitable works for the school libraries, for such assistance is urgently required. The wealth of illustration to be found in English schools of art is one of the features of art education in the Home-country, and one which we in New Zealand must pay immediate attention to, if we desire reasonable success. I would recommend the department to give every possible assistance and advice as to the nature and selection of such appliances, particularly if grants are made in aid of the same.

Examinations.—These are necessary on behalf of teachers and industrial workers, but I would suggest in future that ordinary students should cease to present themselves for examinations, additional time sketching being introduced in class-work in lieu of such examination. It is unfortunate that the examinations of the Science and Art Department and the City and Guilds of



XXV.—HOME ARTS AND INDUSTRIES—THE POTTERS' WORKSHOP, KIRKBY LONSDALE.



XXVI.—HOME ARTS AND INDUSTRIES—EMBOSSED LEATHER WORK EXECUTED BY A STUDENT OF KIRKBY LONSDALE.

[To face p. 42.

London Institute come in the middle of our year's work, as these are of the utmost importance to us. I suggest that efforts be made to arrange with the departments named to hold special examinations on behalf of the colony at the end of the year's work—say, November—even though the whole cost is met by the New Zealand department; this would enable nearly all local examinations to be dispensed with, and would in every way be more satisfactory.

Whilst our local examinations serve an excellent purpose, for large numbers of candidates present themselves who do not attempt the English ones, yet such successes, locally obtained, cannot be recognised by the Home departments as equivalent to their own, or accepted towards the completion of trade, science or art full certificates. Naturally the English certificates are recognised throughout English-speaking communities, and in that sense are doubly valuable to our students, particularly trade students.

Examinations are necessary in the allocation of all scholarship awards, but otherwise I shall be glad to see a considerable reduction in the number held. I am not in favour of examination as a guide to the nature of, or the value of, a school's work, but suggest the adoption of a very thorough inspection of work in progress and class-teaching as the best means of judging the qualifications of any school or class entitled to earn capitation from the department.

Scholarships and Free Studentships.—The following recommendations are made: (1.) Five free studentships, available for all evening classes, for two years, tenable at the central schools; five scholarships available for all evening classes of the value of £5 per annum for two years. (2.) Two free studentships available for all day classes for two years; two scholarships available for all day classes of the value of £10 per annum for two years. (3.) Three scholarships available for day and evening classes of the value of £50 per annum, open to the whole colony, and tenable at any art school approved by the department, for two years. (4.) One travelling scholarship of the total value of £250 for two years, to enable students to obtain instruction at the best English or Continental schools. To be open to all New Zealand students registered in schools of art or art classes. The examinations for these scholarships should be held by the Education Department.

In sections 1 and 2 I suggest that the scholarships and free studentships to the number stated should be allotted to each educational district where provision is made for such instruction, and that the subjects of examination be freehand, model, geometrical, and light and shade. Sections 3 and 4 to be colonial scholarships, open to all New Zealand art students; the subjects of examination in section 3 being advanced light and shade, model, antique, modelling and design or still-life, together with the school-works executed during the past twelve months. Section 4: The subjects of examination to be drawing from the antique, painting from the life, design, modelling one original piece of applied art, and the works executed during the previous year.

I suggest that the department meet the expense of one-half of sections 1 and 2, and the whole of section 3, and the travelling scholarship. I hope to see the Trades Councils and large employers of labour assisting liberally in the scholarship schemes, as without doubt a strong scholarship system will be of considerable value to the colony generally. Great importance is now attached to such schemes in Britain, and in each school visited by me liberal scholarships and free studentships are offered, and very freely taken advantage of. My suggestions are only brief in detail, and are merely suggestions for future elaboration if approved of, or for general guidance.

Departmental Assistance.—Capitation for all these classes is paid in accordance with the Technical Instruction Act; an increase of double capitation per head for craft classes. I further suggest grants towards the alteration of buildings already erected, or new buildings, to the extent of one-half the cost of building and furnishing, providing in all cases the plans are submitted and approved by the department. Grants of one-half the cost of appliances, and of works purchased for technical-school libraries, subject to the list of works or appliances meeting with the department's approval, a lien being kept by the department for not less than six years upon material, &c., so purchased. A grant of £150 per annum towards the appointment of directors of technical instruction, whose sole duty is the control of such education throughout the district. Grants in aid of scholarships to the extent of one-half the amount in sections 1 and 2, and the whole of sections 3 and 4 (travelling scholarship).

SECTION IV.—SCIENCE AND TECHNOLOGY.

(1.) Introductory and apprenticeship.
(2.) Science subjects, chemistry, mathematics, physics, applied mechanics, and electricity.
(3.) Building trades and architecture.
(4.) Metal trades.
(5.) General trades.
(6.) Domestic economy and women's department.
(7.) Miscellaneous.

1. INTRODUCTORY AND APPRENTICESHIP.

Introductory.—Science and technology are closely allied in our system of technical education, but time alone can impress the necessity of their joint study upon our rising youth and mechanics. One of the principal difficulties in making our technical schools effective is (as I remarked in the section devoted to "Intermediate Education") the break in school-life between the primary and the technical work; and, secondly, a great desire upon the part of young students to specialise their work immediately upon entering a technical school.

In endeavouring to fulfil my duty as Director for Technical Instruction in the Wellington District, I have found the utmost difficulty in persuading students to undertake a preliminary course of work. This, when our schools are firmly established, may be remedied by making a course of work adapted to special requirements compulsory. The former case, however, can only be remedied by the establishment of continuation schools and classes. Another difficulty in

connection with our technical classes arises from the want of preparedness in the elementary work, and valuable time of instruction is wasted in giving information which ought to have been well grounded in elementary work.

There is one other point of great importance, and that is the necessity of our manufacturers and master tradesmen identifying themselves closely with our technical-education system. It is by the means of this education that they reap considerable benefits. There can be no question of the value of this work to them, neither can there be any question of the value to education if an interest is shown by those so intimately concerned. French and German employers largely recognise this fact, and in the latter country it is common in some industries to find employers giving their apprentices one and in some cases two afternoons per week to enable them to take advantage of technical classes. Some such arrangement, even if only half a day per week, would be of great advantage to apprentices. In Birmingham some two hundred and fifty apprentices leave work an hour earlier upon class evenings twice weekly to attend the well-equipped jewellery classes connected with the art school.

I suggest that conferences of the trades and technical authorities should be held, with a view to eliciting useful information as to the nature of the instruction required, the needs and requirements of the various trades, and the best means of encouraging young journeymen and apprentices. Such conferences will strengthen the position considerably, as it is only with the sympathy and help of the workmen and employers that technical education will be successful.

Germany attaches the utmost importance to science instruction in all branches of work. From various reports it is made apparent that the prosperous condition of manufactures in that country is due to the excellent schools provided at an enormous cost. In 1882 the British Technical Education Commission expressed an opinion that Germany had too many polytechnics. The reply to this has been a large increase of schools, upon the most modern lines, with every possible equipment for technical instruction—one of these institutions alone costing no less than £100,000.

Apprenticeship.—The apprenticeship system is now a thing of the past. Boys are now sent to a trade as improvers, and from improvers develop into journeymen as fast as they possibly can, in order to obtain the increased wage. No consideration, as a rule, is given to their fitness or knowledge. Apparently it is nobody's business to teach the boy—he must look after himself. Technical instruction is therefore a necessity if our industries are to flourish, and we are to keep pace with the world. The youth, then, must be taught the principles underlying his trade, and the best way of applying those principles. Industry and integrity are not the only capital now needed—there must be a certain amount of skill and knowledge displayed in connection with his daily work, and this may best be provided by our technical institutions.

Professor Silvanus Thompson thus describes the modern English apprentice: "He (the apprentice) is placed in the manufacturing workshop under a journeyman carpenter, who is supposed to look after him, but who, having his own work also, and not being paid to teach apprentices, nor, indeed, qualified to do so, loses no opportunity of neglecting him. The boy must do some work, so the first odd job that may be supposed easy enough is set before him; he has the very vaguest instructions given him, and nobody troubles to explain to him the difficulties he will encounter, or tell him how to overcome them. He spoils two or three pieces of wood before he has produced anything, and is simply sworn at or threatened with blows at each failure. Of instruction there is none, for the workman who ought to have instructed him could not do so if he would, and would not if he could, as he has no mind to be displaced by a clever young workman, who could do his work for less wages. So the lad learns, with weary months of aimless and unsystematic labour, to ape the tricks of the elder workmen, falling irrevocably into their worst methods, and acquiring their slang talk. He is, of course, a perfect slave to the inaccurate 'rules of thumb' handed down in the traditions of the shop. At first, before his hands have acquired any rude kind of skill, he is the common drudge—must run for one man's coat and for another's tobacco. From the moment when he has obtained some skill with his fingers he must be continually producing paying work, and so, without regard to that which would be best fitting for him for doing further work, he must drudge on, planing, moulding, or shaping legs of stools by the year together. He does not know how to describe his work; could not read his instructions aright if given him, as they ought to be, in the form of a working drawing, much less could he himself set out a working drawing for another to work by. So he grows up an uninstructed, uneducated, bad workman, and, having served his seven years of apprenticeship duly, cannot well be forbidden entrance to that haven of bliss, the union of his trade, where, having entered, he can claim to be paid at least as well as his fellow-workman. And this is apprenticeship."

Upon another occasion Professor Thompson, speaking of technical education, remarked, "A most important reform is that of utilising the faculties for instruction to develop breadth of view and capacity in those who are trained. This is all the more vital to the future of technical education because of the extreme degree to which the subdivision of labour has been pushed in many handicrafts. Formerly the apprentice learned a whole trade, nowadays the apprentice learned but a part of his trade. In many industries the result is deplorable. Men grow up capable of doing but one thing, and are dependent upon a wholly different set of men to finish what they have begun. The all-round hand is rare; trade suffers, workmen suffer. Technical education may do much to remedy this. Every effort should be made to give the student a broader view and practice of the craft in which he is engaged."

I feel strongly that it would be a great gain if the system of apprenticeship could to a certain extent be revived, a wider recognition of modern conditions of work being taken into consideration, together with the opportunities of instruction in technical schools. Possibly the most serious objection comes from the employers, who find many difficulties in regard to discipline and conduct of apprentices, and the responsibility of providing the instruction to the satisfaction of all persons concerned. I suggest, however, a trial of the apprenticeship system, say, in connection with the

mechanical engineers, plumbers, painters and decorators, and carpenters and joiners, in centres where technical instruction is given in those subjects, attendance at the school and satisfactory progress being required as part condition of the apprenticeship.

I have already alluded to the fact that the continuation school should, as a part of our system, supply or keep up that very necessary portion of work, mental training. Unfortunately, a boy, having left school and gone to a trade, usually considers his mental work past and done with, conceiving that it is only necessary now to learn his work. It is not until later years that he usually finds out his mistake. I have often found—nay, constantly find—young men ignorant of the simplest calculation or arithmetical knowledge really necessary to their trade; in the plumbing classes particularly has this been so. One of the first duties of an artisan in most trades is to make himself proficient in arithmetic, geometrical, freehand, and scale drawing, in order that he may readily understand working drawings, and, if necessary, express himself by means of rough freehand sketches; and every effort should be made to induce the student to follow such a course of work previous to entering upon his special instruction.

Next comes the question of theoretical instruction, combined, in many cases, with workshop practice. In the majority of trades there can be no doubt that the practice of the same can be best acquired in the workshop or factory, and that the instruction given in the technical school should be supplementary to such daily practice. There are, however, many trades where the practice thereof is necessarily combined with theoretical instruction, such, for instance, as plumbing, bookbinding, mechanical and building trades, weaving, &c.; in the latter case the excellent textile classes of Manchester are an example. In these cases machines and tools are fully employed as in the course of trade practice. The question has been raised, is not this teaching the practice of a trade as expressly forbidden by the Technical Instruction Act? Such, however, is not the case. The machines, &c., are used for the purpose of illustrating how certain processes are performed.

As Sir Philip Magnus puts it, "The difference between the use of such machinery and tools in the shop and in the school is that in the shop the apprentice or young artisan acquires slowly, under considerable difficulty, and frequently without any explanation of the why or the wherefore, the knowledge of how to use the particular machine or appliances; and, once having learnt it, he is kept working at it so as to gain skill and rapidity of execution in its use. In the school, on the other hand, he learns leisurely how the tool is used, the principles of its construction, the errors to avoid, and the means of rectifying them when they occur, the nature of the material wrought, and the means of distinguishing different qualities of such material; and having learnt all this, and having acquired a certain degree of manipulative skill, he is not expected by constant repetition of the same process to aim at that rapidity of execution which is indispensable for trade purposes, but is allowed to pass on to the explanation of the use of some other machine, and to the learning of some other process. It will be seen, therefore, that, although a technical school may be equipped almost as completely as a trade-shop, the equipment serves a very different purpose. Its object is the production of intelligent workpeople, and not the production of saleable goods.

"That goods may be produced is an incident only in the production of intelligent artisans. The practice a student obtains in a technical school is not intended to give him a complete mastery and rapidity of execution—the result of constant practice—which can be acquired only in the shop or factory, where work is done on commercial lines, but rather it enables him to understand the appliances of his trade, and to use them with care and judgment. Nor, indeed, can the technical school, howsoever completely it may be equipped, afford that special training in adapting means to ends, in economic working, and in the appreciation of the commercial importance of detail, and of the true value of time, which is acquired in the shop."

The theoretical work, therefore, is doubly valuable where continued conjointly with workshop practice. It is not, however, possible in towns such as those of New Zealand to form special classes for all trades; the best that can be done is to establish classes in any special industry in the district. In other cases there must be a certain amount of general collective teaching, particularly in relation to science-work.

In all classes affecting particular industries it is very necessary that the instructor should be a man acquainted with the practice and theory of his work; not a theorist, but a man in whom the students will have confidence as having a thorough knowledge of his business; anything else will be a failure. Take mechanical drawing and building construction as an example; both classes require men who have constant practice in the every-day work of those branches; the mere mechanical or architectual draughtsman is not the man required; he must, if possible, be an experienced man in his particular profession. Only under such conditions will our classes succeed. There can be no doubt that instructors of technical classes should be practical craftsmen.

From my personal knowledge I should say the trades organizations of New Zealand will gladly assist the Education Boards in the formation of classes for the apprentices and younger men, and I am hopeful that the trades will interest themselves in this direction. Co-operation will lead to excellent results, and the employed as well as the employers should awake to the necessity of aiding the great cause of education. Much might be done by the unions in the direction of encouragement to their younger members to qualify themselves for their work, in classifying the workmen first, second, or third class in accordance with their ability, and thus avoid the present pernicious practice of paying the bad workman a wage equal to the more experienced man, simply because he is a journeyman. Surely if the unions have the interests of their trade at heart there should be no difficulty in arranging some such scheme in conjunction with the employers. At present there seems little inducement for a man to perfect or improve himself once he reaches the ordinary level of workmanship.

Further, I suggest the advisability of the unions issuing a certificate to members of their trade who have served a proper apprenticeship, and qualified as tradesmen by examination, in addition to.

technical school certificates, time spent in the technical school for special instruction being taken into consideration; also giving assistance towards special scholarships in connection with their trade, and generally taking an interest in the educational movements of the day, which tend so much to raise their status, morally and financially.

There may be a few instances where firms having a very large number of hands might establish classes in connection with their works, such, for instance, as may be found at the works of Messrs. Howard and Bullough, machinists, Accrington, or at Messrs. Mather and Platt's, Salford. In the former case the firm employ considerably over two thousand workpeople; about 20 per cent. of these are from thirteen to twenty-one years of age. All apprentices are required to attend the school until they are twenty-one years of age. The fee is 2s. 6d. per session for each subject, or 6s. for three, one compulsory subject being mathematics. A considerable number of free studentships are awarded. The first room is fitted with machinery manufactured by the firm; the second is the lecture-room, with accommodation for two hundred students; and the third the physical and mechanical laboratory. The subjects taught are mathematics, magnetism, and electricity, applied mechanics, machine construction and drawing, and cotton-spinning. Mathematics is divided into three classes—A, B, and C. The student must show proficiency before passing from A to B, which deals with higher rules of arithmetic, and arithmetic as applied to geometry; it also includes plane geometry. Class C deals with higher divisions of the same subject. In magnetism the general properties of magnets are explained, as also magnetic induction, the permanent magnetism of hard steel, and terrestrial magnetism. Frictional and voltaic electricity are exhaustively dealt with, and the practical application of electricity to cotton machinery. The students make records of all experiments made, and the references they deduce from them are inspected. Applied mechanics is exhaustively dealt with from its most rudimentary principles and forms up to its most complex application shown in machines constructed by the firm. In cotton-spinning the City and Guilds of London programme is followed. The work is supplemented by practical work upon the machines immediately after the lecture. There is in addition a practical machine-fitting class. Efficiency as an apprentice in the work of any department in the shop entitles the student to a remission of fees for classes, and to successive advances of 1s. per week, besides other privileges. Athletics and swimming form part of the school's curriculum.

Both the firms mentioned above send workmen abroad constantly, and have found that the system of instruction adopted has placed at their disposal men who are not simply mechanics in the ordinary sense of the word, but men who are able to turn their attention to the various branches of work required. One of the managers remarked that, instead of his being required to look after each separate job, the young fellows can now make their own drawings, work to them, and fit the work together and erect it, where it used to require a separate man for each department.

The admission of amateurs to trade classes has been a keenly discussed point. The question arises, has a public institution supported by public funds any right to refuse a student admission to any particular class, or the opportunity of learning any trade? Or, again, would it be just to prevent an architect or sanitary engineer from attending a plumbing class? In many schools I found the classes limited to trade students. I would suggest that a student be entitled to enter any class applicable in any sense to his employment.

2. SCIENCE.

I have previously referred to the fact that care must be exercised to see that there is no overlapping of classes and instruction. In the case of science subjects, in three of our centres there are university colleges, with apparatus and appliances to hand for the teaching of these subjects. Where such is the case I would urge efforts being made to establish evening classes for ordinary and artisan students, such classes to be worked in conjunction with our technical schools under arrangement with the university authorities. In no case are our centres large enough to support two sets of classes, or to engage more than one specialist in each department. By concentrating all efforts in this direction the best possible system of instruction might be organized without any undue strain upon our finances. Should such an arrangement be fortunately come to I would recommend capitation being paid upon such classes as if they were held in a technical school. It would, of course, be necessary to form a small joint-committee of the technical school and university college for the management and development of such classes.

Mathematics and Mechanics.—In the larger towns classes in this subject are already in operation. In country centres where no technical school exists these classes would fall under the continuation-class section. It cannot be too strongly urged upon students connected with mechanical and electrical engineering trades that their success largely depends upon their ready solution of mathematical problems.

The following text-books were in use in the Manchester and Birmingham Technical Schools:—Mathematics: Layng's "Euclid"; Brook Smith's "Arithmetic"; Todhunter's "Spherical Trigonometry"; Loney's "Co-ordinate Geometry"; Edwards's "Differential Calculus" and "Integral Calculus." Works of reference: Hall and Knight's "Higher Algebra"; Smith's "Treatise on Algebra"; Hall and Knight's "Elementary Trigonometry"; Casey's "Sequel to Euclid"; Lovett and Davidson's "Trigonometry."

Theoretical Mechanics, Solids, and Fluids.—The principles of mechanics are explained by means of experiments, and the aid of the lantern, which, I may here state, is very widely used throughout technical schools for illustrative purposes.

Solids: Books of reference are: Worthington's "Dynamics of Rotation"; Parkinson's "Elementary Mechanics"; Ganot's "Natural Philosophy"; Wormell's "Mechanics"; Twisden's "Mechanics"; Deschanel's "Natural Philosophy"; Garnett's "Dynamics"; Taylor's "Mechanics"; for honours stage the text-books are: Todhunter's "Analytical Statics"; Williamson's and Tarleton's "Dynamics."

Fluids: Reference works: Ganot's "Natural Philosophy"; Deschanel's "Natural Philosophy"; Phear's "Hydrostatics"; Sanderson's "Hydrostatics." For honours stage: Text-book: Minchin's "Hydrostatics and Hydrokinetics" or Besant's and Taylor's "Mechanics," Thornton's "Mechanics."

Pure and Applied Chemistry.—With the exception of a limited number of persons who require a long course of special training connected with a particular industry, and teachers connected with our educational institutions, the majority of students will be young men engaged in industry in which a knowledge of chemistry will prove useful, or persons desirous of cultivating their powers of observation, and who are interested in chemical pursuits. The majority of workers will therefore be evening-class students. It might be possible to establish special science sections in connection with a trade such as plumbing, but at present, unfortunately, there is little appreciation or demand for science instruction as applied to industry.

The London County Council obtained a special report upon the subject of chemical teaching. The summary of the report is as follows: "(1.) That to young apprentices chemistry should be taught in close association with mechanics and physics as a mental training, and for the cultivation of powers of observation and accuracy; but such teaching should be illustrated, as far as possible, from the every-day work of the students. (2.) That for a certain class of adults, both employers and employed, there is a need of instruction in special branches of chemistry, an understanding of which is of direct use to them in their occupations, and that the teaching of chemistry in its application to any localised industry should be concentrated, as far as possible, in a small number of institutions, which should be thoroughly equipped for the purpose and placed under the direction of technical experts. (3.) That there is a limited demand for university instruction in chemistry of the highest order by persons who are prevented from attending university classes in the day-time. (4.) That chemistry may be taught for purely educational purposes in the evenings on the same lines as in secondary schools. (5.) That normal classes for teachers, under competent instructors, should be held on the lines indicated, in accessible institutions, at times convenient to teachers. (6.) That pioneer lectures are occasionally useful for pioneer purposes—*i.e.*, in order to attract students to more systematic instruction."

Clause 4 is of the highest importance to us in the present stage of science instruction. It is a necessity, if real good is to be done, that the science teaching of our primary and secondary, or intermediate, schools should receive attention. The training of teachers by experienced men is of the greatest importance, for if the basis of the work is indifferent it is almost useless establishing higher establishments at considerable cost.

Regarding the instruction of evening students, the report states "that the time which an elementary student attending an evening class can give to the study of chemistry can be most advantageously spent in the study of what may be termed 'educational chemistry,' and that this should, if possible, be preceded by a course of simple physical measurements; in fact, by such a course as the one in 'elementary experimental science.'" Strong opinions are expressed that by such a course of instruction students would be far better fitted for entering a chemical manufactory or for specialised instruction.

The report goes on to state that the teaching of chemistry should be largely carried out by means of practical work, the students being induced to form their own deductions, and to solve problems by actual experiment; that attention should be paid to the writing, spelling, and clearness of expression in all notes and descriptions of experiments, and that the teaching of these subjects may be to a considerable extent interwoven with the chemical teaching. That great good may be done by enabling scholars who have shown special aptitude for the study of elementary science to continue their studies, but that such selection should not be made by ordinary examination, but by recommendation of headmasters or others who have a personal knowledge of the fitness of a student. The committee were impressed by the evils arising from the too frequent examination of young students.

Passing from the teaching of chemistry simply as an element of education to the teaching of it with the special object of fitting a student for taking an important position in chemical work, the committee are convinced that the course of study must extend over several years, and be of university standard. They desire to emphasize most strongly the need of the highest chemical instruction for the technological chemist, and believe that the employment of men thus educated would prove of great advantage not only to the manufacturer, but to the country in general.

As to the question of or advisability of teaching chemistry with the object of its being useful to those engaged in certain trades and manufactures, there is a general impression that considerable advantage arises from the students engaged in any chemical trade attending lectures on their particular subject. As a general expression the committee do not think that much permanent good does arise from this kind of teaching, for the reason that the majority of students who attend such lectures are not sufficiently acquainted with the groundwork on which the explanations and applications given rest; thus their learning becomes empirical, and is of but little practical use, and is likely to give them an undue sense of the importance of what they have learned. Dr. Armstrong, in his evidence regarding evening classes, was of opinion that it was best to endeavour to develop their powers of observation from the commencement; yet, while training them with a purely educational object, you could, he thought, to a large extent make use of their technical experience, and teach them principles and methods by means of examples met with in their work. It was not, however, advisable to give "tips," but the men should be led to think and observe for themselves. Regarding plumbers, it was essential that they should know something about air and water, and the action of air and water upon metals and other materials; but, as a rule, on entering a class plumbers had no knowledge of the simplest chemistry, and the course of instruction most useful to them would be a course of twenty lessons in a chemical laboratory. These lessons should not be

preceded by lectures—all the work should be practical, the instruction consisting of problems bearing on the trade, which would lead them to understand the changes undergone by metals exposed to air, the action of water on metals, &c. The object of the course, however, should be to make them observe and think. In teaching this class of men lectures were of no value.

The text-books generally in use in the London technical schools were—for lectures, Jago's, Newth's, and Thorpe's "Chemistry"; and for practice, Clowes and Coleman's, Valentine's, Jago's, and Cohen's "Chemistry."

In Manchester and Birmingham the following text-books and works of reference are suggested: Inorganic chemistry—elementary text-book: Roscoe and Hunt's, or Taylor's, "Chemistry for Beginners"; Furneaux's "Elementary Chemistry." Reference works—Roscoe and Schorlemmer's "Inorganic Chemistry." Advanced stage—text-book: Taylor's "Student's Chemistry," or Von Richter's "Inorganic Chemistry," or Newth's or Emerson Reynolds's "Experimental Chemistry." Reference works—Roscoe and Schorlemmer, Vols. I. and II.; Thorpe's "Dictionary of Applied Chemistry," Vols. I., II., and III. Honours stage—text-books: Tilden's "Chemical Philosophy," Remsen's "Principles of Chemistry," Newth's or Thorpe's "Inorganic Chemistry," Clowes and Coleman's "Quantitative Analysis." Organic chemistry—text-book: Perkin's "Organic Chemistry" is generally used in all stages. In honours Richter's is also used. The works of reference in the honours stage are Roscoe and Schorlemmer's "Treatise on Chemistry," Parts 1 to 6; Watt's "Organic Chemistry," edited by Tilden; and the various chemical journals. Practical inorganic chemistry—text-books: Grant's "Laboratory Guide and Analytical Tables," Valentine and Hodgkinson's "Qualitative Analysis," Thorpe's "Quantitative Analysis," and Taylor's "Analysis Tables." Reference works—Fresenius's "Quantitative Analysis" and Sutton's "Volumetric Analysis." Practical organic chemistry—text-book: Gatterman's "Organic Analysis"; Cohen's, Chapman Jones's, and Streatfield's "Practical Organic Chemistry."

There is a generally expressed opinion that much of the science teaching is regulated by the requirements of the Science and Art Department examinations, and with a view to obtaining the necessary grants. The London County Council is endeavouring to relieve this pressure by additional funds, in order that more original work may be encouraged amongst the classes, and less of examination facts and definition of terms.

Electrical Work.—In all the more important institutions visited provision is made for electrical teaching. In evening classes the most important work is apparently conducted at the Finsbury and South-west London Technical Colleges. The main objects of instruction are to train students in the application of the laws of physics to industry, and to lead them to see how by such application industrial operations can be improved and cheapened. The instruction is given partly by lectures, but mainly through the laboratory-work of the students themselves. Their knowledge thus takes practical form, and is no mere book-knowledge.

The first year's course on electrical technology is as follows: On simple applications of electricity and magnetism: Electrical instruments making, galvanometers, electro-magnets, electric bells, primary batteries, thermopiles, lightning-conductors. Second year's course: On the more advanced applications of the laws of electricity and magnetism (students must have passed the first year's course): Dynamo electric machines, electric lighting, electric transmission of power, transformers, arc-lamps, glow-lamps, and advanced methods of electric testing.

At the South-west London Polytechnic a special feature is made of the practical work which follows the lectures. This is divided into four sections, through which the students pass in rotation. Section A—Electrical testing: Includes the calibration of instruments, measurement of resistance, &c. Section B: Includes practical instruction in electrical jointing and connecting, starting and running dynamos, repairing faults, &c. Section C: Specifying and estimating and taking out quantities. Section D: Engine, dynamo, and motor tests. All these sections have been remarkably successful, so much so that it has been impossible to accommodate the students, and duplicate classes have perforce been established.

The practical physics course is attended by first-year students of all the college departments. In this course the fundamental laws of physics are taught in relation to, and as explanatory of, the various industrial processes in which they are exemplified. Special attention is paid to heat and the laws of thermo-dynamics as being of primary importance.

The remainder of the course is devoted to optical instruments. The electrical laboratory contains many arrangements of apparatus for an organized series of quantitative experiments, each set being complete in itself. Students find ready to hand apparatus necessary for carrying out a large number of experiments. Printed instructions are supplied to students of each experiment. The advanced students, in groups of three, take charge of the electric lighting of the college for a week at a time, attending to the whole of the lighting plant, keeping a record of the life and running of the lamps. They also make measurements on the transmission of power, take indicator diagrams of the steam-engine and gas-engine, measure the electrical power, and send in to the senior demonstrator a report every week of the efficiency of and general working of the installation. Students also assist in running leads in the college, and receive practical instruction in jointing, &c., testing insulation of leads, calculating proper size of wires to avoid fire risks, and working out estimates for lighting generally.

In Manchester and Birmingham the following text-books are in use: Jamieson's "Electricity and Magnetism," Poyser's "Advanced Magnetism and Electricity," Gunn's "Numerical Examples." Honours: Youbert's "Electricity and Magnetism," translated by Foster and Atkinson; Henderson's "Laboratory Manual," Vols. I. and II.; Sylvanus Thompson's "Electricity and Magnetism"; Ayrton's "Practical Electricity." For electrical engineering: "Electric Lighting, and Power-distribution," by Perren Maycock; Slingo and Brooker's "Electrical Engineering"; Joyce's Examples in Electrical Engineering"; S. V. Thompson's "Dynamo Electric Machinery." For telegraphy: Preece and Sivewright's "Handbook of Telegraphy"; Herbert's "Electricity in its Appli-

cation to Telegraphy"; Lynd's "Practical Telegraphist." For telephony: Poole's "Practical Telephone Handbook"; Allsop's "Telephones."

3. BUILDING TRADES.

Through the kindness of Dr. Garnett I am enabled to briefly mention suggestions by the employers in connection with some of the London trades as to technical instruction, and I have in addition given the text-books used in some of the institutions visited, as a guide to classes established or likely to be so, or for use in the reference libraries. Provision is made in all important centres for instruction in the various trades, of which full advantage is taken by the workmen and apprentices. Considerable difficulty has been found in obtaining fully qualified teachers to meet the demands made.

Masonry and Brick-work.—Classes are engaged in the following work: Treatment of the various kinds of stone and methods of working them, such as reducing block to working sizes, squaring-up, hammer and point, mallet and tools, axed work, working from templets, circular work, simple development of mouldings and capitals, working and polishing of marble. The recommendations of the employers as to the line of study were as follows, taking as a sample lesson the stone dressing round a window-opening: (1) Drawing elevation and sections of the object to small scale; (2) enlarging drawings to the scale at which the object is to be worked out practically; (3) drawing full-sized details of sill, jambs and lead separately; (4) cutting moulds in zinc from full-size details; (5) applying these moulds to the stone and working up same, as in workshop; (6) fitting together and setting up in position the finished stones worked by the various students. A further suggestion is made to the effect that the instructor should have a knowledge of practical plane and solid geometry, freehand drawing, elementary building construction, quality of stone, its nature and adaptabilities, the setting-out of work, &c. The Battersea Polytechnic has been particularly successful in this work.

Text-books and works of reference: E. Dobson's "Masonry and Stone-cutting," also "Foundations and Concrete Works"; Baker's "Strength of Arches"; Rivington's "Notes on Building Construction"; "Building Construction," by G. C. F. Mitchell.

Brick-work.—The application of geometry to brick-work: Methods of obtaining and applying moulds, templets, and levels, by setting out in detail elliptical and oblique arches, domes, niches, groins, raking mouldings, tunnel and sewer construction; the nature and properties of bonding; foundations; walls; moulded cornice; chimneys; shafts; the nature and properties of limes, cement, and bricks, and the use for which each kind is specially adapted; terra-cotta, and its application to buildings.

Practical work done by the students themselves occupies most of the time, the lecture instruction being devoted to explaining principles and clearing up difficulties. Students are encouraged to attend classes in drawing, building construction, workshop arithmetic, &c., which in many cases are open without extra fee. These classes are largely attended by young bricklayers, something like two hundred passing through in London alone every year.

Reference works: Dobson's "Manufacture of Bricks"; "Drawing for Bricklayers," Cassells and Co.; Rivington's or Mitchell's "Building Construction"; Pasley's "Limes and Cements"; Baker's "Strength of Arches."

Carpentry and Joinery.—Large classes are held in these subjects in most centres. The work includes scale and geometrical drawing as applied to wood-work; correct use of tools; setting out full-sized sectional or working drawings, and principles of construction. Practical work is everywhere the rule, supplemented in some cases, where there are large numbers of students, by systematic lectures. The course of work includes the whole range of carpentry and joinery, special attention being given to advanced students: as, for instance, at the Battersea Polytechnic there were examples of students' work in hand-railing, oriel-window framing, and examples of "double curvature." In several of the polytechnics the drawing classes are free to members of the carpentry and joinery classes. Special classes are also held in staircasing, hand-railing, &c.

The following are some of the text-books used: Trainor's "Drawing and Bench-work," and "Advanced Practical Carpentry and Joinery"; Wilson's "Carpentry and Joinery." Reference works: Goss's "Bench-work in Wood"; Lickel's "Exercises in Wood-work"; Professor Smith's "Cutting-tools"; Holtzapfel's "Turning and Mechanical Manipulation," Part II.; Wilson's "Carpentry and Joinery"; Newland's "Carpentry and Joinery"; Nicholson's "Carpentry and Joinery"; Scott Burn's "New Guide to Carpentry."

Painters' and Decorators' Work.—Useful work is being done under the above heading, and there is no reason why similar classes should not be successfully conducted in this colony in the four larger centres. The subjects generally dealt with are the mixing and matching of tints and colours, graining and marbling, sign and ornamental writing, staining, gilding, distempering, paperhanging &c., brush-work, stencilling, and more advanced decorative treatments.

An employer's suggestions are as follows: "The object of the classes should be to teach learners how to become good decorators, and they should be taught, besides the workshop practice, freehand, model, and geometrical drawing. In the workshop they should be instructed in practical methods of executing work from given designs, and (1) the names and uses for the various tools, brushes, &c.; (2) how to use these tools; (3) names of the various colours, their principal properties, the art of mixing colours together to match any given colour, and how to apply the same; (4) use of chalk-line, straight-edge, and stencil-plate; (5) the use of gold-leaf. A plain plastered wall to be prepared and painted with the requisite number of coats, and afterwards decorated with design previously prepared, the stencils being cut by the students. After the above grounding the student should proceed with the study of drawing and designing in its higher branches.

The Manchester Technical School formulates a very complete course of study in this section. Under the heading of "Decoration" are the following: (1) Plain gilding; (2) lining and outlining; (3) preparation of cutting of stencil; (4) advanced stencilling; (5) painting of flat ornament in colours and gold; (6) painting ornament in light and shade; (7) preparation of working drawings, pounces, &c.; (8) enlarging, reducing, and adapting ornament to technical requirements; (9) the use of gold and other metals, and the mode of application; (10) the decoration of relief-ornament in colours and metals.

Under "Drawing" come: Freehand drawing of ornament, elementary freehand brush-work, elementary plane and solid geometry, elementary principles of design, distinguishing features of style in ornament, drawing to scale from actual measurement.

Under "Measurement" come: Measuring for preparation of drawings, measurements for estimating and quantities, preparation of a specification.

The following text-books will be found useful: "Painting and Decorating," W. T. Pearce; "Manual of Home Painting," Ellis Davidson. Reference works are: "Colour," A. H. Church; "Chemistry of Paints and Painting," Church; "Painters' Colours, Oils, and Varnishes," C. H. Hurst; "Grammar of Ornament," Owen Jones; "Art of Graining," Sutherland; Lewis F. Day's "Text-books on Ornament and Design"; Frank Jackson's "Lessons on Design"; "The Journal of Decorative Art"; "Building World"; "Plumber and Decorator."

Each student in the Manchester School takes up and carries through a definite piece of practical work from start to finish. Prizes are offered in many centres by the painters' societies and unions, and by private firms.

Plumbing.—Large classes are in operation in every centre visited, one class of the Regent Street Polytechnic having as many as 150 students. In some institutions students are admitted free to drawing classes, and to classes in physics and chemistry of plumbing.

In all cases models and diagrams of the latest and best appliances are available for the use of the students. The course of instruction generally embraces the following sections: Workshop arithmetic; geometry and drawing; elementary physics for plumbers; workshop appliances, and the principles of their action; the methods of obtaining measurements from plans; simple examples of estimating the cost of work; simple examples of obtaining plans and sections.

In practical work: The various tools required, and the method of using them; straightening sheet-lead and tin, lead pipes, &c.; preparation of seams for soldering sheet-lead and tin; methods of soldering sheet-lead with fine tinman's and plumbing solder; preparation of solder, soil, &c.; preparation of joints for soldering with iron, blowpipe, and metal; joint-making; calking joints with lead and rust cement; joints of earthenware, &c.; hot- and cold-water arrangements; bending, bossing, and lead-working in various forms.

The text-books generally in use were: T. W. Clarke's "Plumbing Practice"; S. S. Hellyer's "Lectures on Sanitary Plumbing"; Dr. Willoughby's "Hygiene"; Davies's "Plumbing." Reference works: T. Wright Clarke's "Plumbing Practice"; Rivington's "Building Construction"; Hood's "Warming and Ventilation of Buildings"; Latham's "Sanitary Engineering"; "Domestic Sanitary Drainage," by Maguire; Parry's "Water: its Collection and Distribution," &c.

In Manchester sanitary lectures are arranged for women, and for women sanitary workshop inspectors.

In London the course of lead-work for plumbers is amplified at the Arts and Crafts Institution in Regent Street by what is usually described as "external plumbing," including sheet-lead casting, simple casting in sand with open moulds, and generally the art of moulding in sand, samples of which were turned out by the students during my presence; pattern-making, especially the use of lead for patterns; pierced-lead work; incising, stamping, punching, and inlaying lead; tinning used ornamentally on lead, &c. Some of the objects to which the above processes are applicable, and in the design and making of which practice is given, are: Ridges and finials; gutters, pipe-leads, and cisterns; crestings, valances, tablets for inscriptions, flower-boxes, &c.

Considerable discussion is at present going on in England in relation to the certificating of plumbers. From inquiries made I strongly advise the City and Guilds of London Institute's examinations as being the best for our plumbers.

Regarding the examination in honours, there has been no practical examination up to the present, but Sir Philip Magnus informs me that such an examination will probably be held in 1899.

I would urge the adoption of a recognised certificate in the theory and practice of plumbing, the same to be required from all plumbers before a license shall be granted to carry on the trade of a plumber.

The recommendations of master plumbers in relation to subjects of instruction are fully covered by the various syllabuses of instruction. A suggestion is made under the heading of "Departmental assistance," to the effect that capitation upon practical classes should be increased to such an extent as to require no fee for the use of materials being charged, as has in some cases been done.

Building Construction and Drawing is one of the most important of all subjects connected with the building trades. The importance of a knowledge of drawing cannot be overestimated, for, although it is not always necessary for the workman to make a drawing, it is absolutely necessary that he should be able to read one. Large classes are held in every centre in Britain, and in every case ample illustration is provided by models and diagrams, and by specimens of all the different kinds of timber. Brick-work is illustrated by models, and in almost every school visited the lantern is freely used for the illustration of lectures continuously given.

The course of work generally includes the execution of working drawings such as are required by builders or architects, the setting-out of masons', carpenters', plumbers' iron- and brick-work.

In centres such as those of New Zealand architecture is necessarily included with building construction.

In connection with these classes I strongly advocate students presenting themselves for an elementary course of practical plane and solid geometry, and model and freehand drawing, previous to their entering the building-construction section. There is a tendency to avoid doing so if possible, students being under the impression that they should enter the special class at once; much valuable time, however, is wasted by this proceeding, for the instructors spend a considerable portion of their time in explaining elementary facts of construction which ought to have been learnt previous to their entering the building classes. I would recommend these classes being well provided with models and appliances showing constructive details, and ample illustration by means of diagrams and the lantern.

The text-books and works of reference generally in use were: Mitchell's "Building Construction," Longmans and Wilson's "Advanced Building Construction," Rivington's "Building Construction," Gray and Lawson's "Graphic Statics," Rosengarten's "Architecture," Gwilt's "Encyclopædia of Architecture," "The Builder," "The Architect," "The Building News."

Builders' Quantities.—Classes are held in many centres in quantity surveying, instruction being given in the usual methods of taking off, abstracting, and putting into estimating form the various materials employed in excavating and draining, brick-work, masonry, carpentry and joinery, plumbing and glazing, painting and plastering, &c. The method of instruction is by means of large scale and detail drawings, together with small scale drawings and descriptive details for home-work. Students are generally expected to have passed the advanced stage of building construction and drawing before taking up this subject. The works of reference are generally Leaning's "Quantity Surveying," or Banister Fletcher's "Quantities."

Architecture and Architectural Design.—In the larger centres in Britain there are sufficient students to form special classes in the above subjects; but in New Zealand, even in our larger towns, a sufficient number will hardly be found to form special classes in these sections. The work will therefore generally be given in connection with the building-construction classes, through which it is necessary that students should proceed previous to entering upon architectural studies, the Canterbury College architectural section being utilised for the purpose of providing the higher instruction.

The course of study is based mainly upon the following sections: The orders of architecture, Grecian temples, Roman temples and amphitheatres, domestic architecture, Byzantine churches, Saracenic architecture of Cairo and Damascus, Norman architecture, Gothic styles, English and French cathedrals; Renaissance architecture of Rome, France, and England; colour in relation to architecture; mouldings and their enrichments. The text-books are Roger Smith's "Classic Architecture," and "Gothic and Renaissance Architecture"; reference works:—Classic architecture: Stuart and Revett's "Antiquity of Athens"; Spiers's "Orders of Architecture"; Fergusson's "History of Architecture"; Chambers's "Civil Architecture"; Gwilt's "Encyclopædia"; Rosengarten's "Handbook." Gothic architecture: Parker's "Glossary"; Sharpe's "Seven Periods of English Architecture"; Collins's "Gothic Architecture"; Street's "Brick and Marble in the Middle Ages," &c.

In Manchester the following is the order of the advanced course of work: (1) Plans, elevations, sections, and details of domestic, civil, and ecclesiastical architecture; (2) style and individuality in design; (3) the application of ornament to architectural style; (4) the application of colour to architectural style; (5) architectural perspective drawing; (6) architectural drawings from casts of different periods. Lessons are given in actual measurement, and sketching of buildings in pencil, ink, and colour.

In Birmingham the students are required to design in the first section: (1) A row of three cottages; (2) a cricket pavilion; (3) a stone lych-gate and flight of steps; (4) one of a street of houses to let at 6s. per week; (5) a cabmen's rest. In the advanced section: (1) The treatment of a site to be selected; (2) a town house; (3) a college chapel, with organ-screen; (4) stable-court, with clock-turret, for a country house; (5) dining-room fireplace.

4. METAL TRADES.

Save in the direction of mechanical drawing, little is being done in connection with the metal industries in our technical schools. It is unfortunate that the engineering school of the Canterbury College is not more utilised by the young men connected with the engineering trades, but I trust that a system of scholarships, tenable at this institution, will be made available for students attending ordinary technical classes. It seems to me that the best method of advancing our system of education is by strengthening individual sections of work in particular centres, and enabling students of special ability to take advantage of the same from the various centres. It is quite impossible to establish highly equipped institutions in each of the four centres in each branch of work. The technical schools, however, should carry on instruction in mechanical drawing and machine construction, pattern-making, turning, and fitting, with a certain amount of workshop practice, leaving the higher branches to the Canterbury Engineering College.

The Northampton Institute, the newest and latest London Polytechnic, has divided the mechanical section into a series of lectures, as follows (admission, 2d. per lecture): Engineering materials, eight lectures; transmission of power, five lectures; machine-tools, seven lectures; hydraulic machinery, four lectures; machines in the foundry and smithy, three lectures; lifting machinery, four lectures; steam-engines and boilers, eighteen lectures; gas- and oil-engines, eight lectures; water-motors and turbines, four lectures; the cycle, construction and machinery used, eight lectures.

The mechanical laboratory and the workshops are furnished with every possible appliance for the conduct of the work.

The work of the mechanical laboratory is arranged in the following groups of experiments for those engaged in engineering, building, and metal-working trades: (1) To determine the nature and strength of the various materials used in construction; (2) to investigate the different methods of manipulating and working the said materials; (3) to investigate the principles and laws which underlie construction. The experiments are made upon boilers, engines, motors, and machines which form part of the Institution plant. The workshops are furnished with several first-class lathes of various makers; a standard drilling-machine; a universal milling-machine; a special universal cutter-grinding machine; twist drill and tool-grinding machines; a blower and three electro-motors. The work includes exercises in screw cutting and turning; every kind of drilling, boring, planing, slotting, &c., and the making and fitting of engines. There are special classes also in connection with pattern-making, practical smith's work, ornamental ironwork, die-sinking, brass-finishing, and metal-plate working.

In practical smith's work the shop is open every evening, and is equipped with the most modern appliances for the heating and forging of iron, brazing, and welding. Gas-furnaces and brazing-tables having recently come into use for work of this description, they have been introduced into the smithy that the students may not only carry out ordinary smith's work, but also be taught the management of a new type of heating appliances, particularly so in relation to the cycle trade. In Birmingham special attention is paid to small arms and ammunition.

In mechanical drawing students are generally instructed in the principles underlying the arrangement, proportions, and strengths of simple machine details, and in making complete working drawings from actual measurement of machines. The schools being plentifully supplied with models and parts of machinery, are also making use of the machinery and engines connected with the various workshops.

In all schools visited the strongest pressure is brought to bear upon students with reference to the course of practical plane and solid geometry and applied mechanics, and I suggest the compulsory attendance of engineering students in the first subject previous to or conjointly with their machine-construction drawing. I would urge a plentiful supply of machine models and details for use in other classes in conjunction with the diagrams and plates now so generally used.

The text-books in use are: Cryer and Jordan's "Machine Construction and Drawing"; Low's "Drawing-scales"; Unwin's "Elements of Machine Design"; Low and Bevis's "Manual of Machine Drawing and Design"; the weekly engineering papers; Marks's "Hydraulic Machinery"; Marks's "Mechanical Engineering Materials"; Hasluck's "Metal-turner's Handbook"; Northcott's "Lathes and Turning"; "The Steam-engine," Cotterill's, Ripper's, Northcott's, or Professor Ewing's; Adams's "Handbook for Mechanical Engineers," &c.

Applied Mechanics.—Excellent courses of instruction are provided in all the institutions visited. In Manchester a special selection of Schröder's and other models, and photographs of Anderson's diagrams, are used to illustrate the course in applied mechanics and steam. Students generally are required to make freehand sketches of models and diagrams used, to which great importance is attached; a portion of class time is devoted to this work in particular. The course of work is much the same in all institutions, as follows: Definition of force and mechanical power, transmission of power, simple examples of mechanism, hydrostatics, strength of materials, friction, forms of mechanism, centrifugal force, pneumatics, hydraulics, &c. Text-books: Cryer and Jordan's, Jamieson's, or Professor Cotterill's "Applied Mechanics"; Goodeve's "Elements of Mechanism"; Lineham's "Mechanical Engineering."

Practical Plane and Solid Geometry.—Considerable attention is given to this subject by every school; in many instances there are special classes applicable to the various trades in the more advanced work, but all are required to go through an elementary course previous to the special one. There are, however, insufficient students in our New Zealand classes to permit special courses of geometry for the trades. Care should be taken to see that in such work as plumber's and metal-plate workers, &c., a certain amount of class instruction in geometry, combined with their ordinary class-work, is given.

The text-books were various. Morris's "Geometry" is freely used in the arts section; Gill's "New Geometry," Harrison and Baxondall's, Low's and Angel's "Plane Geometry and Projection," Low's "Drawing-scales," and Gray and Lowson's "Graphic Statics" were the other text-books I found in use.

Metal-plate Work.—These classes are mainly attended by tin, iron-plate, and zinc workers, coppersmiths and boilermakers. Special attention is paid in class instruction to the improvements in workshop methods, which are often wasteful in time and material. The text-books are Millis's "Metal-plate Work" and "The Sheet-metal Workers' Guide," E. and F. Spon. Particular attention is given to geometrical construction in these classes.

Gold- and Silver-smiths' Work, and Decorative Metal-work.—Classes in these subjects are held at the Northampton Institute and the Central School of Arts and Crafts in London and at Birmingham. The general course of work is the adaptation of designs to articles of jewellery and artistic craftsmanship, special importance being given to electric-light and gas fittings, lamp standards, ecclesiastical and domestic metal-work, repoussé, chasing, etching and engraving on metal, and enamelling. The work in all classes is adapted to the capacity of the students. In the silversmith's classes, devoted to "large" and "small" workers, students are assisted in the design and execution of such work as does not form part of the ordinary day's labour in the workshop. The same may be said of chasers, carvers, and engravers; indeed, every effort seems to be made to give students a broad view and practice of the craft. Classes in elementary metal- and repoussé-work may very well be established in connection with the arts branch of all technical schools.

5. GENERAL TRADES.

Book and Printing Trades.—The London Technical Education Board has given great attention to these trades, with remarkably successful results. The Bolt Court Technical School, Fleet Street, and the St. Bride's Foundation Institute are the two principal centres of instruction. The Board finding strong feeling upon the part of the lithographic and printing trades against technical education as conducted by the Board, co-operated with the workmen themselves in the management of their own trade school. The school is managed by a committee elected by and from the National Society of Lithographic Artists and representatives of the Technical Education Board. Only those who are engaged in the printing and photographic trades are admitted to the school. Instruction is given to boys who are going to be apprenticed, but the committee decide what time shall elapse before apprenticeship commences. This policy has been very successful, the attendance at the school being about one-fifth of the entire London trade of lithographic-drawing, designing, and photo-engraving.

The subjects taught comprise the various branches of negative-making, collotype, photo-lithography, zinc line and tone etching, and tone-etching on copper and brass. The school is well equipped, with good studios containing cameras, fitted with a pair of Brockie-Pell twenty-five ampère alternating current arc lamps, arranged for copying; a large sensitising-room for wet collodion photography, a developing-room to accommodate eight students, a room for the preparation of the metal for printing, a general work-room with benches and electric lamp for printing, drying-cupboards, &c., and a space covered in with glass for intensifying and finishing negatives. Then there is a press-room with lithographic and copper-plate printing-press, a room for collotype and photo-lithography with all appliances, and two etching-rooms.

The school also includes drawing from the cast and antique, drawing and painting from the nude and draped model, quick sketching, drawing as applied to process and the practice of design. The technical side includes the study and practice of lithography, chromotype blocks, and tricolour negative making.

Particular attention is paid to the lighting, the life-room being most effectively lighted with Sunbeam lamps of one-hundred-candle power. The tricolour negative class works in the photographic studio and dark rooms. This class, which produces negatives for the trichromatic-printing process, is well attended. There is in addition a class for the production of aquatint colour blocks, a process capable of producing blocks giving beautiful results in the letterpress-printing machine.

Some of the reference works mentioned are as follows: "Zincography as practised in Connection with Letterpress Printing," J. Bœk (translation, Wyman and Sons); "Instruction in Lithography," C. Straker; "Grammar of Lithography," W. D. Richmond; "Photo-engraving" and "Photo-mechanical Processes," W. T. Wilkinson; "Collotype and Photo-lithography," T. Schnauss; and "The Printer's Handbook," C. T. Jacobi.

Typography and Letterpress.—At the St. Bride's Foundation Institute every branch of instruction needed by the compositor is given, the classes being attended by over two hundred students. There are also other large centres of instruction. The St. Bride's and the Bolt Court Schools work conjointly. The former school is also managed by a joint committee of the Society of Printers and the Technical Education Board of the London County Council. The St. Bride's School is essentially a printing school, in which the whole work centres in the press.

Reference works mentioned in this section are: "Practical Printing," by J. Southward; "Printing-machines and Machine-printing," F. J. Wilson; "Electrotyping," S. W. Urquhart; "Manual of Typography," A. Oldfield; "Printing: a Practical Treatise on the Art of Typography," C. T. Jacobi; "Modern Printing," J. Southward; and "Technical Queries," C. Blakshaw.

Bookbinding.—The classes in this subject are well attended, the instruction being in forwarding and finishing. At the Central School of Arts and Crafts, Regent Street, special classes have been formed, and the subject is treated as an artistic craft, two rooms being fitted with all the necessary appliances. There is, I think, room for classes of the above character in our four large centres, and there is no doubt much good work would result if these classes were established.

Cabinetmaking.—Large classes are held in connection with the furniture and cabinetmaking trades; considerable difficulty is, however, experienced in the matter of attendance, owing to the men and boys working overtime. The special course of work at the Finsbury Technical College, one of the centres for this work, covers a period of three years. The first year's course consists of technical drawing (setting out), enlarging and diminishing of mouldings and ornament, geometry and perspective; freehand drawing, ornament and models; modelling in clay for wood-carvers, and workshop instruction for apprentices only in the nature and properties of wood, correct use of tools, dovetailing, mortising, dowelling, rule-joints, panelling and veneering, inlaying and working mouldings. Second year's course: Drawing full-size working drawings, and to scale; principles of construction, carcass- and table-work, including cabinets, book-cases, sideboards, tables, desks, &c.; workshop practice in the above; modelling in clay and freehand drawing; and a course of lectures upon art furniture, including domestic furniture, inlaid, carved, gilt and painted, English and French. Third year's course: Designs of original furniture, various styles, and preparation of complete drawings and details; styles and ornament, technology of woods, estimating, inlaying; modelling in clay, including the figure from the cast and from the life, design in relief of figure subjects, and floral ornaments; technical painting for panels, decorations, and wood-staining with permanent dyes.

The work throughout these classes was of a high order, and from my conversation with the students I found a very keen appreciation of the efforts made on behalf of the furniture- and cabinet-workers to improve the trade. Every effort is made in the course of work to induce originality of thought and treatment of various forms of decorations.

There is no reason why the whole of the above course of work may not be carried out in our New Zealand art schools. Although special classes may not be formed, the various sections are, with

few exceptions, already upon the syllabus of some of the schools. The attention of the furniture- and cabinet-makers might with advantage be called to the opportunities available and the advantages of such a course of work in the larger centres.

The following are some of the reference works in use: "Specimens of Ancient Furniture," Shaw; "Cabinetmaker's Drawing-book," Sheraton; "Cabinetmaker's Assistant," Blackie and Sons; "History of Furniture," Litchfield; "Ancient and Modern Furniture," Hungeford; "Furniture and Decoration," Heaton; "Cabinetmaker and Art Furnisher," William Benn, &c.

Workshop Drawing.—In each of the large centres I suggest the establishment of workshop drawing classes. In all branches of constructive work it is very necessary that skilled artisans should thoroughly understand how to interpret, use, and make working drawings; the ability to read and make the same renders a man more valuable, and able to earn higher wages than otherwise. Each student should work from models, copies, rough sketches, and to specifications. Apprentices of the following trades might well take advantage of such a class: Engineers, fitters and turners, pattern-makers, smiths, watch- and clock-makers, metal-plate workers, builders, carpenters and joiners, cabinetmakers, stonemasons, plumbers, bricklayers, coach- and carriage-builders, plasterers, painters and decorators, and wood- and metal-workers generally.

Pottery-, Brick-, and Tile-work.—In centres where works of this description are established encouragement might well be given to students in the study of form, throwing, pressing, casting, and the simple treatment of decorative forms in pottery and for architectural use. The effect of the Lambeth School of Art work upon Messrs. Doulton and Co.'s productions is an indication of the value of such instruction, and should give every encouragement to students and the producers to carry out a similar alliance, even if only upon the smallest possible scale. The work of the Home Industries Association, as shown by the illustration, is in itself ample evidence of what may be done in a small way for the development of such industries. In connection with the Doulton Company, every girl gets additional pay for each examination she passes after her admission to the factory. All girls so admitted must have passed an examination in second-grade art subjects. Surely it is possible to strengthen the work of the New Zealand factories by similar methods if reasonable means are adopted and efforts made to utilise the advantages of our art schools in a legitimate sense.

Textile Industries.—In Lancashire and Yorkshire ample provision is made for instruction in these important industries. Weaving mechanism and design are fully treated. Every form of appliance and machinery is available as in an ordinary spinning- or weaving-shed. The students are taught to thoroughly understand the machines and their action, and may be seen at work taking to pieces or refitting the machines connected with their occupations. The manufacturers of machines usually provide examples of the latest improvements for use in the technical schools, so that every possible advantage is within reach of the students. Special courses of lectures are given upon design as applied to textiles, the students preparing designs, stamping them, and working out the same upon the looms.

The equipment of the Manchester School comprises a complete range of spinning and preparation machinery, appliances for yarn-testing, and hand- and power-looms of the best type for the manufacture of all classes of fabrics. There is also a rare collection of models, fabrics without number framed and displayed upon the walls, all appliances and materials connected in any way with the trade, and a fine library of English and foreign books and periodicals relating to the spinning and weaving industries. The scheme of study extends over two years, and is designed to give a satisfactory training in the principles and processes of spinning and weaving as applied to cotton, silk, and mixed fabrics, and, in addition, includes mathematical calculations, the use of the slide-rule, freehand and engineering drawing, elementary mechanics, steam and the steam-engine, and chemistry in its application to the technology of fibres and materials, and to dyeing, bleaching, and finishing processes.

6. DOMESTIC ECONOMY AND WOMEN'S DEPARTMENTS.

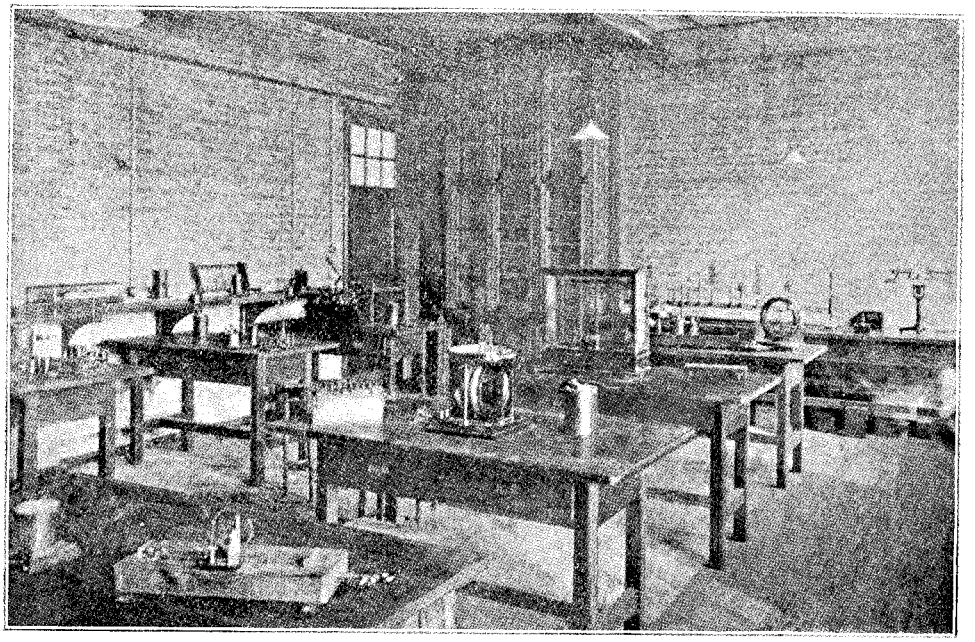
In every technical institution of importance I found provision made for domestic classes, and as an illustration may mention the classes formed at the newest London Polytechnic, the Northampton Institute, which are as follows: * Cookery and chemistry of food, * housewifery and hygiene, * laundry-work, * dress cutting and making and household sewing, home millinery, ambulance-work, including nursing, artificial-flower making. Day classes are also held in subjects marked *, a fee of 10s. per session covering the subjects. Girls must be not less than thirteen years of age, and have passed Standard V., be in good health, and able to attend regularly.

Cookery, laundry-work, and domestic economy are worked upon the lines already laid down in the chapter upon these subjects in the earlier stages of this report, except that in cookery an advanced course is provided for.

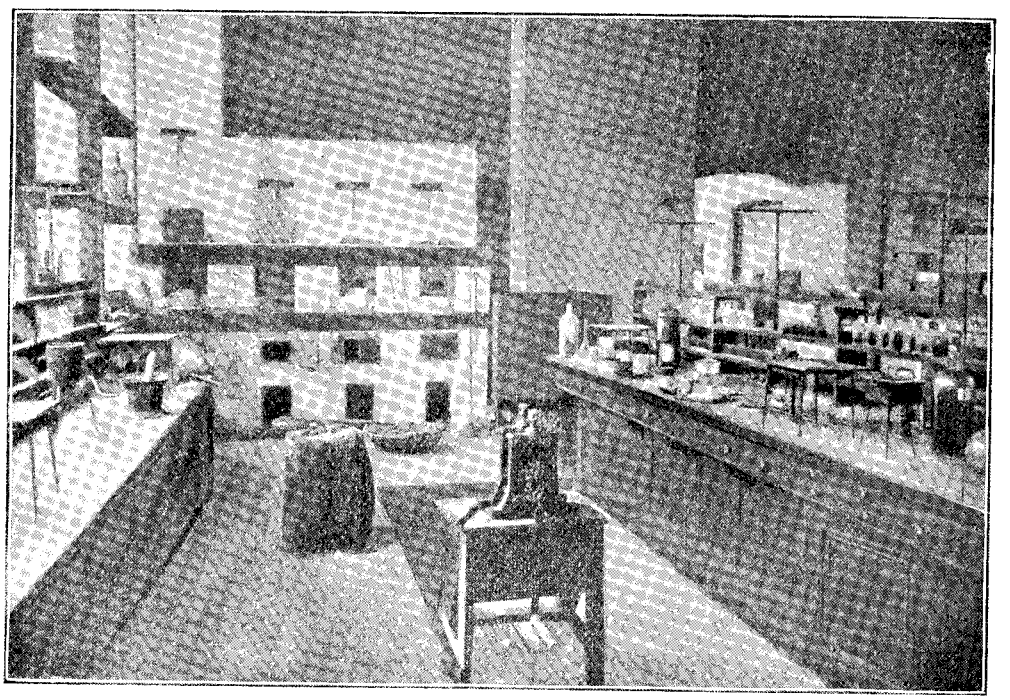
Dress Cutting and Making.—In this section there are two distinct classes—one for home dress-cutting, &c., and the other for apprentices only who are actually engaged in the trade. The syllabus includes a course of twelve lessons on the cutting-out of bodice patterns from measurements and making a blouse bodice, twelve lessons on skirt drafting and making, and the making of a shaped and boxed belt. The trades class includes, in addition, cutting out and making sleeves, pockets for coats, collars, adapting patterns, lessons in fitting, &c.

Millinery.—In the same way two classes are held—one a trade course, the other a home course. The trade courses are open to apprentices at half-fee, 2s. 6d. The home course includes bow-making, buckram shapes, plain covering, head-lining, trimming, children's millinery, altering and remodelling, bonnets and toques. The trades course includes, in addition, wiring and building, velvet folds and rolls.

Artificial-flower Making.—This class is only open to those engaged in the trade. The syllabus includes flowers copied from natural forms, chrysanthemums, lilies, lilacs, marguerites, hyacinths,

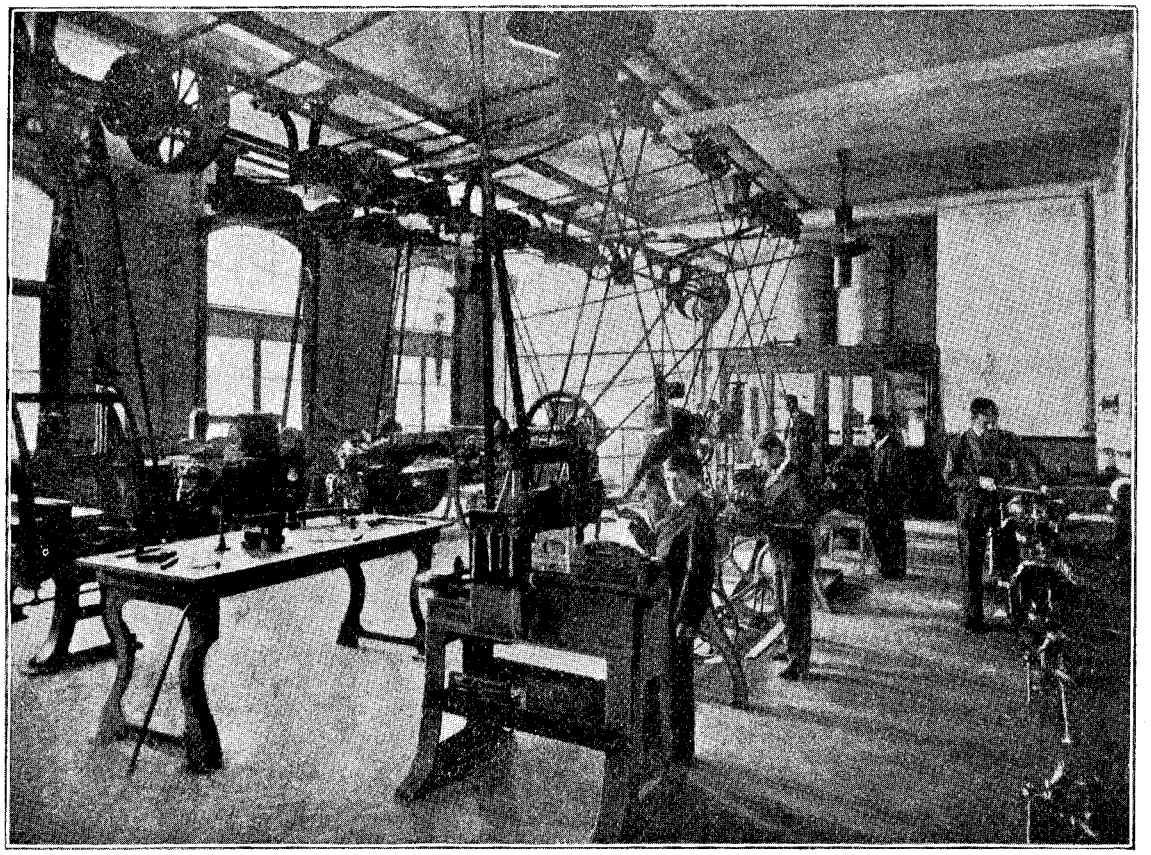


XXVII.—SENIOR PHYSICAL LABORATORY, NORTHAMPTON INSTITUTE.

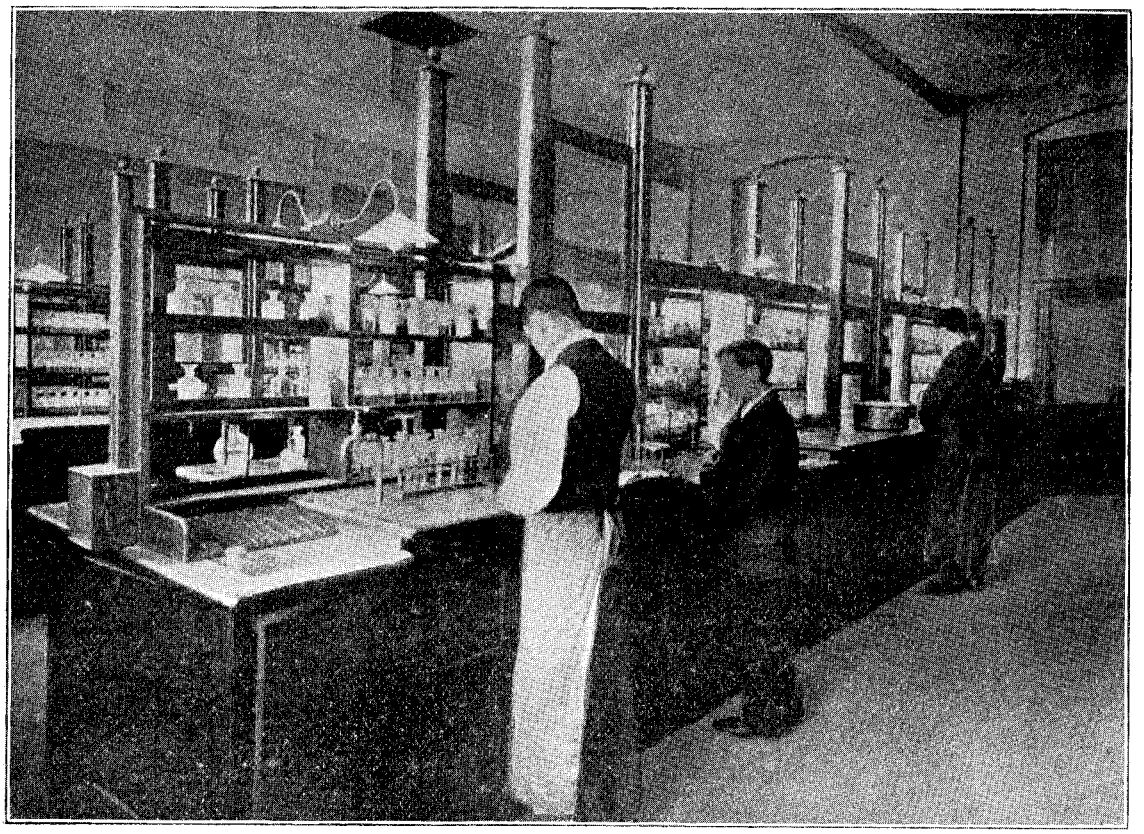


XXVIII. THE SHEFFIELD TECHNICAL SCHOOL—METALLURGICAL LABORATORY.

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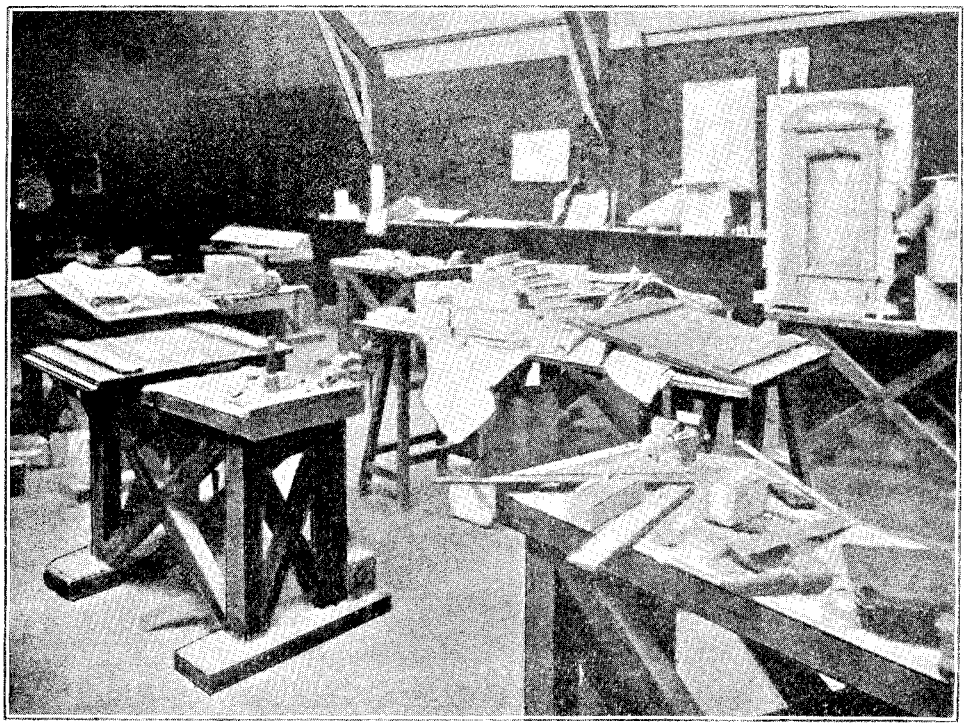


XXIX.—THE MUNICIPAL SCHOOL OF SCIENCE AND TECHNOLOGY, BRIGHTON—MECHANICAL ENGINEERING WORKSHOP.

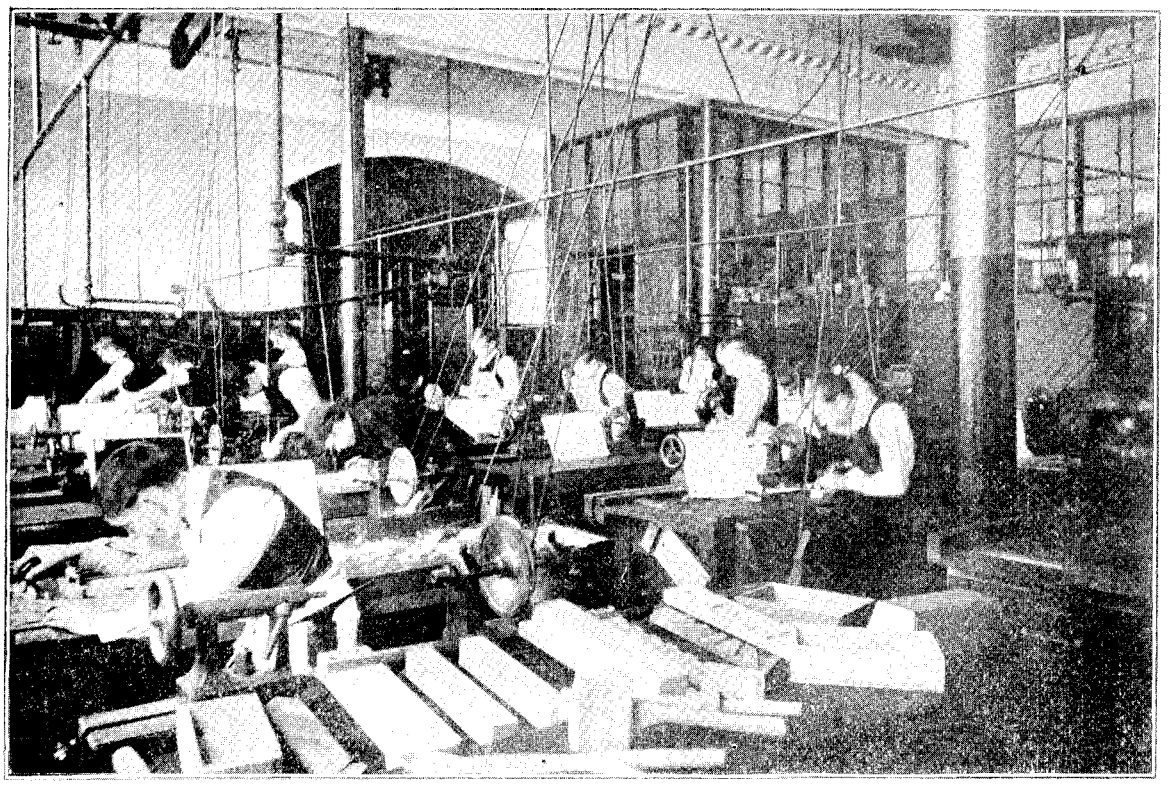


XXX.—THE MUNICIPAL SCHOOL OF SCIENCE AND TECHNOLOGY, BRIGHTON—CHEMICAL LABORATORY.

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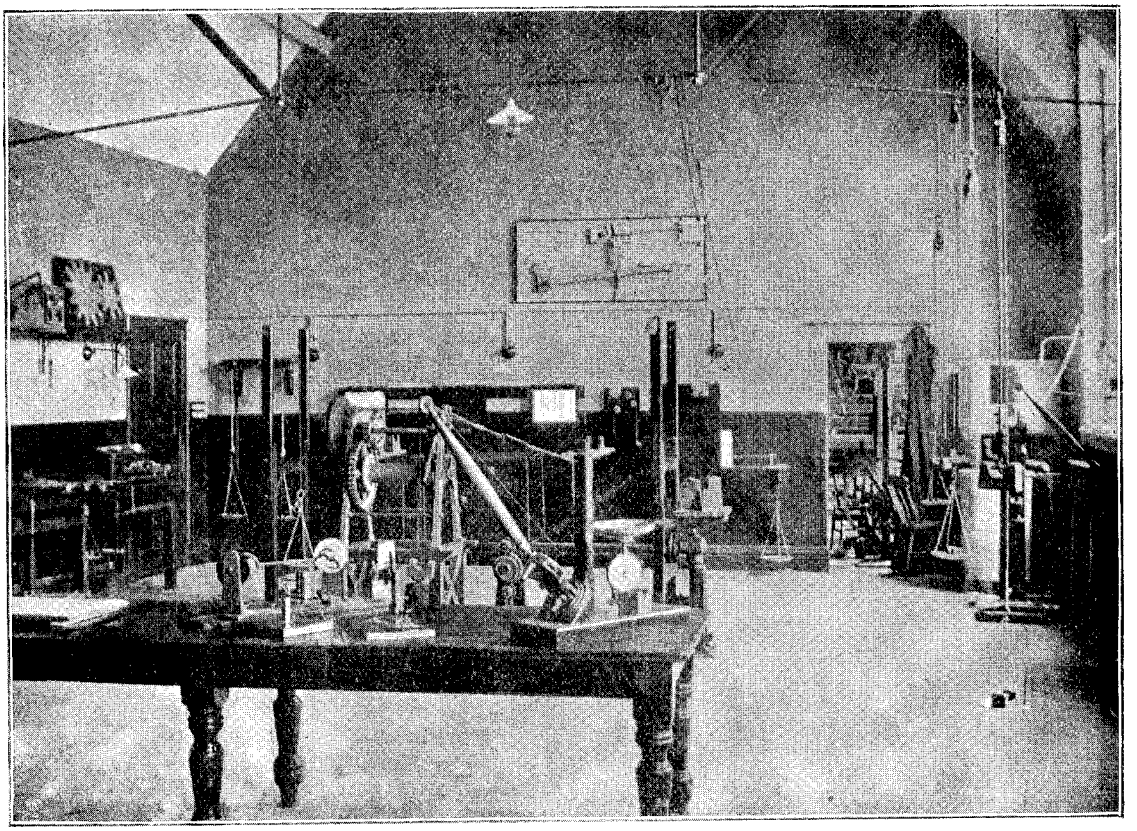


XXXI.—THE CARPENTERS' COMPANY'S TRADE SCHOOL—MASONS' SHOP.



XXXII.—INTERIOR OF WOODWORKING SHOP, MUNICIPAL TECHNICAL SCHOOL, MANCHESTER.

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XXXIII.—THE BATTERSEA POLYTECHNIC—MECHANICAL LABORATORY.

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elder-flowers, laburnums, wisterias, wild roses, guilder-roses, nasturtiums, carnations, roses. All flowers are made from white materials (silk, velvet, muslin, &c.), and are coloured, made, and mounted. Each student provides her own cushion, rubber-pad, and scissors.

Ambulance Course.—Two courses of twelve lectures are given, and are based upon the St. John's ambulance-work in first aid to the injured, and lectures on nursing and hygiene.

7. MISCELLANEOUS.

Every department visited I found provided with every convenience and appliance for the satisfactory conduct of its work, and, as the arrangement of rooms is of considerable importance, I give at the end of this section illustrations (XXVII. to XXXIII.), taken mainly from the *Record*, the publication of the National Association for the Advancement of Technical Education, by whose permission they are reproduced.

Scholarships.—I would suggest,—(1.) In each educational district where technical schools are established, ten free studentships in connection with the evening classes, tenable for two years, five to be available each year; ten scholarships, of the value of £5 per annum and free instruction for two years in the evening classes. The Education Department to bear half the cost, assistance being invited from the various trade societies. The scholarships and free studentships to be divided amongst the various subjects of instruction under the heading of "Science and Technology." (2.) Open to the colony: Four scholarships of the annual value of £50, tenable for two years at the special institutions providing complete courses of study in engineering, architecture, chemistry, and electricity; such, for instance, as the university colleges. (3.) One travelling scholarship, tenable for two years, of a total value of £250, to be available at any recognised British or continental institution, conditionally upon the holder returning to New Zealand upon the completion of his term of scholarship; any section of study being chosen. The cost of sections 2 and 3 to be borne by the Government. The examinations should be conducted by the Department of Education, which should be solely responsible.

Departmental Assistance.—Capitation for all classes is paid in accordance with the Technical Instruction Act. I suggest that the capitation for workshop classes should be increased by not less than one-half where the instruction is reported as satisfactory, and the condition regarding appliances and accommodation is effectively complied with. A grant of one-half the cost of appliances and of works purchased for the school library in technological or science subjects, subject to a similar condition to that contained in the arts section. Grants in aid of buildings or alterations to same, as set forth in the arts section. Grants in aid of scholarships to the extent of one-half of section 1, and the whole of sections 2 and 3, under the heading of "Science and Technology."

SECTION V.

(1.) Agricultural instruction. (2.) Mining.

1. AGRICULTURE.

This subject is one belonging entirely to the Agricultural Department, which has already taken steps in the matter of education applicable to agriculturalists. I have, however, obtained information as to what is being done in Lancashire and Cheshire, and place the information at the department's disposal, that it may be utilised if found desirable. There can be no possible doubt that the County Councils of Great Britain are doing valuable work in the institution of school-farms, experimental stations, and dairy-schools. The great value of agricultural experimental stations has already been clearly proved by France and America, and the dairying industry is now of such importance to the colony as to make it a matter of necessity that instruction should be given in such subjects as the improvement of the breed of our dairy cattle, the manufacture of dairy produce, treatment of milk at the farms and at the factories, pasteurising, and the growing of fodder-crops, &c.

In the majority of English counties instruction is given to primary-school teachers (free) upon the principles of agriculture, and every encouragement is given to country schools to take up this course of work.

The New Zealand syllabus provides that elementary agriculture may be taken as an alternative subject. I would suggest that for use in the country schools the Agricultural Department should compile a 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 main features and qualities of the land in the various provincial districts, and its appropriate uses, 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, coupled with the illustrated leaflets of the department upon fruit pests, &c., would be of the greatest value and service to our country teachers and scholars.

The cultivation of small garden or vegetable plots in the school grounds would give encouragement to scholars, and form a useful occupation in country centres in lieu of some of the occupations mentioned in the earlier chapters of this report.

A number of school-farms have been established in England, and lectures upon agriculture have been extensively given amongst the farmers. Dairy instruction has been most practically given by migratory schools, and also at a considerable number of fixed centres. Agricultural experiments have been carried out in many counties, with useful and successful results, at a com-

paratively small cost; and agricultural colleges have been established by various County Councils at very large expense, scholarships being freely granted in all departments of the work.

If agriculture and dairying are ever to be brought to that comparative state of perfection to which other arts have already attained, it will only be by making use, as others have done, of the many aids which science offers; and if the practical man is ever to realise upon his farm all the advantages which science is capable of putting within his reach, it will only be when he has become so far acquainted with the art by which he lives, and the sciences, especially that of chemistry, as to be prepared to listen to the suggestions these are ready to make to him, and to attach the proper value to the explanations of his various processes which they are capable of affording. The advantages of the study of science in relation to agriculture are now becoming more fully appreciated, thanks to the system of technical instruction which is available in most centres, and it behoves this colony to offer every possible information and assistance in the science of agriculture to the farmers.

Farm or Intermediate Agricultural Schools.

The Canterbury Agricultural College already attends to the higher branches of instruction—is, in fact, our Agricultural University; but to the bulk of our youths such a course as is there given is financially beyond them. An intermediate course would, I venture to say, be of great advantage. The results obtained by the farm-schools of Preston, Crewe, Bedford, and Leeds lead me to suggest the adoption of similar schools in New Zealand.

These schools would, if established, form a connecting link from the primary schools to the Agricultural College, where scholarships obtained at the farm-schools might be tenable. As an instance, I might suggest the Wairarapa as one suitable district in the North Island. The Town Lands Trust of Masterton is in an excellent position to carry out such a scheme. Surely it would be possible to obtain from the large landowners of the district a sufficient area of land either as a loan for the benefit of education or at a nominal rental. I cannot do better than briefly describe the farm-schools of France, so ably reported on by the late Mr. Jenkins on behalf of the Royal Commission on Technical Education, and the schools at Preston, Bedford, and Holmes Chapel.

Mr. Jenkins's report states that these schools have in France been established for over thirty years—this was in 1884. There were at that time twenty-three schools in operation. They are of special interest on account of their being the means whereby a certain number of young men, sons of labourers and small farmers, receive a fair amount of scientific and general instruction, and a good practical training in farm-work, free of cost to their parents. The pupils are really apprentices, and are bound to serve with the director for two or three years as the case may be. The number of apprentices varies according to the extent of the farm and the nature of the agriculture of the district. Thus in a pastoral district there must not be more than one apprentice to from 12 to 15 acres, but where the growth of cereals is the principal object as many as thirty apprentices may be received on a farm of 250 acres, and in small farm districts a relatively large number may be allotted to a certain acreage. The number of apprentices must, however, never be less than twenty-four. Besides these agricultural apprentices, each farm-school may receive three garden-apprentices, who must be attached exclusively to the garden and the nursery-ground.

It is most essential that the number of apprentices shall never be too great for the area of the farm, so that there shall be sufficient farm-work for them to do; it is also considered desirable that the apprentices shall be sufficiently numerous to avoid the necessity of employing any resident labour. In any case, the apprentices are bound to work exactly like paid labourers, according to their strength and knowledge.

Apprentices are received at the age of sixteen. The following is the staff: One inspector-accountant, one farm-bailiff, one garden-nurseryman, one veterinary surgeon.

The State makes an allowance of £10 16s. per annum towards the keep of each apprentice. At the termination of the apprenticeship the young men who have acquitted themselves in a satisfactory manner receive a certificate of apprenticeship, with a present of £12 or £24, according to the length of their apprenticeship, this amount being supposed to represent what they might have saved out of their wages during that time if they had been paid as ordinary indoor farm-servants. The director is absolute master of the establishment, and can discharge and appoint the members of his staff. His farm must give the apprentices the best professional education, and must be a model to the whole district as a profitable example of cultivation. In his school he must explain in the most simple manner the most important operations, both practically and theoretically, while avoiding the discussion of ideas that are speculative or recondite. He is, in fact, enjoined to confine himself to explanations of occurrences and processes that take place before the eyes of the apprentices, and always to bear in mind that the object of the farm-school is to make good cultivators, not men of science.

The director is further bound as follows: (1.) To keep a regular set of books, as far as possible by double-entry, and constantly posted up to date. (2.) To submit his books in their entirety to the examination of the persons appointed by the Government for that purpose. (3.) To send to the Minister for Agriculture in the first two months of each year a statement of the results of his farming operations during the preceding twelve months, accompanied by the annual inventory. (4.) To send within the first ten days of each month a bulletin of the proceedings on the farm and in the school. Further, if the Government should be of opinion that, taking a sufficient lapse of time into consideration, the profit of the farming is less, on the whole, than that of other farms in the neighbourhood, it reserves to itself the right to withdraw its authorisation of the holding being termed a farm-school.

The duties of the staff are: (1.) The inspector-accountant must teach the apprentices as simple a form of book-keeping as is possible, having due regard to efficiency; and he must complete their elementary education as regards land-surveying, cubic measure, levelling, &c. He must

also superintend their dormitory, refectory, and other arrangements. (2.) The garden-nurseryman must give the apprentices general notions of kitchen- and market-gardening, particularly in pruning and grafting. He must also instruct the garden-apprentices in the principal branches of horticulture, both by practice and precept. (3.) The farm-bailiff must teach the apprentices how to handle and keep in working order the several implements and machines of the farm, and generally must direct their work both in the field and the farm-buildings. These three members of the staff are resident on the farm, and the director has them under his immediate orders, both as regards the work of the farm and the instruction in the school. (4.) The veterinary surgeon has under his care the animals of the farm, and by explaining facts and demonstrating simple operations he shows the apprentices how to give them in sickness the most necessary relief whilst waiting the arrival of a skilled practitioner.

The whole establishment is under the control of a committee of supervision, who determine what candidates are eligible for admission. They especially insist upon the candidate's possessing a good elementary education, and sufficient strength to perform the manual work of the farm. The Inspector-General of Agriculture is also charged to keep a watchful eye upon the general conduct of the farm, and report to the Minister his views upon the subject.

The description of one of the farm-schools known as "La Pilletière" is as follows: "The country is very picturesque; wooded hills and dales, with either vineyards or pasture land on the slopes, meadows in the valleys, and arable land between, afford ample means of instruction in a wide range of agricultural subjects. Owing to the slope of the ground the farm-buildings and the school have a character of their own. The sheep-stables occupy the ground-floor of the lowest aspect, and are succeeded at a higher level by the cow-stalls and horse-stables, which are flush with the surface of the ground at the doorway, looking in the opposite direction. Above these again come the school-buildings, the dormitories, and other offices, which can alone be said to lie 'upstairs.' All the appointments are of the most approved character. The farm consists of 280 acres, a large proportion of which is in pasture, clover, and lucerne, and a certain acreage in vines. Four Charolais oxen and four horses are kept for farm-work. The cattle-stock consists of forty more or less pure shorthorn cows, all the calves of which are reared, the best females being kept to replace the cast cows, and the rest fattened for the butcher. The sheep-stock consists of 150 head of all ages and sexes, the breeding flock being sixty crossed Leicester-merino ewes. The pigs have long flap ears, and are chiefly of the native blood, with a certain, or, rather, uncertain, infusion of the large Yorkshire breed. The course of instruction extends over three years, and the ordinary apprentices are the sons of small proprietors and tenants in the neighbourhood. They have to undertake the different departments of farm-work in rotation—for instance, three are employed in the cattle-sheds for a month, and one in preparing the cattle-food; and the next month these are replaced by the apprentices next in rotation for these duties. The school is designed for thirty-six pupils, twelve of whom are expected to go out and come in every year."

Having described the farm-school of "La Pilletière," I may mention the practical work done at Preston, Cheshire, and Bedfordshire. At Preston the Harris Institute undertakes the theoretical portion of the agricultural work, whilst the practical work is carried on at Hutton, about four miles from Preston. The farm consists of about 200 acres, with model buildings, which have recently been added to in the form of a dairy-school. A fine herd of cattle is available for this work. At the time of my visit the operations for the morning had just been completed, the students, eight in number (boys), being engaged in washing and cleaning the dairy appliances. Steam-power is attached for dairy purposes, but hand-churning is also practised. The course of instruction lasts eight weeks, boys and girls being received alternately. During this period the students are boarded and lodged free of expense, receiving instruction in butter- and cheese-making on the most approved principles, and lectures on the chemistry of milk and the science of dairy-work. Experimental plots are provided for the testing of seeds and manures, something like fifty plots being available, in addition to ordinary crops. There is also a special department for poultry, where feeding, breeding, incubation, cramming, and every other form of instruction is given. Students from the Harris Institute attend the farm from time to time in order that they may see the practical operations carried on upon the land.

The Bedfordshire School Farm consists of 274 acres, placed at the disposal of the County Council by the Duke of Bedford, to which have been added school-rooms, dormitories, and living-rooms. About twenty boys who have passed the Fifth Standard or have attended evening classes are received. The age is usually about fifteen or sixteen years. The time required to be spent at the farm is two years, board, residence, and instruction being free. A small wage is paid to each student, but this is subject to certain fines imposed in case of breach of school rules, &c. There is a farm-master, who manages the work, a dairy-mistress, a home-master, and a matron. The home-master instructs the boys in school every alternate day in agricultural subjects, and in arithmetic, mensuration, surveying and land-measuring, botany, animal physiology, geology of the district, and other subjects likely to be of practical use to them. The boys perform all dairy operations: milk, weigh the milk, and keep a register of each cow, make the butter and cheese, and cleanse the dairy and appliances. The management of poultry, bee-keeping, and market-gardening are also part of the ordinary course of study. Everything, in fact, connected with this farm of 274 acres is done by the twenty boys, assisted by one or two labourers.

Cheshire County Council.

Agricultural, Horticultural, and Dairy Schools.

The Agricultural and Horticultural School at Holmes Chapel is a commodious building. The farm consists of about 100 acres, of a rich loam, upon a subsoil of sand and clay, and has accommodation for about sixty students. Adjoining the school are extensive gardens, with greenhouses, frames, &c., and a considerable portion specially devoted to fruit culture.

The syllabus of work is such as to—(1.) Supply thorough and systematic instruction in all subjects necessary to produce an intelligent agriculturist, special attention being given to the scientific and technical subjects underlying the practice of agriculture or horticulture. (2.) Provide practical work in all operations of the farm or of the garden. (3.) Give instruction in woodwork, farriery, and valuing; also in gathering, marketing, and storing of fruit and flowers. (4.) Supply instruction and practical training in poultry-keeping. (5.) Carry out experimental work, and keep careful records relating to farm-work and agricultural tests.

A report of the progress and conduct of each student is sent to parents or guardians at the close of each term. Cricket and football teams and a debating society are established in connection with the school. Each day is divided as follows: 5.45 a.m., first bell; 6 a.m., practical work; 7 a.m., lectures; 8 a.m., prayers and breakfast; 9 a.m. to 12 a.m., lectures; 12.30 p.m., dinner; 1.30 p.m. to 4 p.m., practical work; 5.30 p.m., tea; 7 p.m., preparation; 8.30 p.m., prayers and supper; 9.30 p.m., lights out.

Theoretical Training and Work.—With the exception of Wednesday, the whole of the mornings are given up to theoretical work, and the evenings to preparation. On Saturday there is no work after 11 a.m. Students are divided into three classes, according to ability. Class A consists of final-year students; Class B consists of second-year students; Class C consists of first-year students. The course of study will be best seen from the following time-table:—

Time-table.—Autumn and Spring Terms.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
7 to 8 a.m.						
Class A	Book-keeping	Agricultural engineering	Agricultural engineering	Chemistry	Surveying	Agricultural chemistry.
„ B	Algebra	Algebra	Agriculture	Agriculture	Agriculture	Book-keeping.
„ C	Agriculture	Agriculture	Arithmetic	Arithmetic	Book-keeping	Arithmetic.
9 to 10 a.m.						
Class A	Zoology	Zoology	Chemistry	Zoology	..	Examination.
„ B	Zoology	Zoology	Practical work, farm or garden	Zoology	Agri. engineering	„
„ C	Euclid	Euclid		Surveying	Algebra	„
10 to 11 a.m.						
Class A	Botany	Geology	Practical chemistry	Botany	Geology	Veterinary, or
„ B	Chemistry	Chemistry	Practical work, farm or garden	Chemistry	Chemistry	Horticulture.
„ C	Mensuration	Algebra		Agriculture	Drawing (geometrical)	„
11 to 12 noon						
Class A	Practical science	Practical science	Practical chemistry	Practical science	Practical science	..
„ B	Surveying	Euclid	Practical work, farm or garden	Plotting	Drawing (geometrical)	..
„ C	Chemistry	Chemistry		Chemistry	Chemistry	..

Horticulture: Wednesday, 11 a.m. to 12 noon; Friday, 9 a.m. to 10 a.m.; Saturday, 10 a.m. to 11 a.m.

PRACTICAL WORK: Afternoons from 1.30 to 4 p.m.

Class.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.
Class A	Chemistry	Woodwork, or farm or garden	Surveying	Farm or garden	Machine drawing, 1.30 to 2.30 p.m. Chemistry, 2.30 to 4 p.m.
„ B	Farm or garden	Woodwork, or farm or garden	Chemistry	Surveying	Farm or garden.
„ C	Surveying	Chemistry	Farm or garden	Woodwork	Farm or garden.

Practical Work.—All the pupils are required to take up the practical work in the chemical laboratory and workshop, and to engage in the operations on the farm or in the garden, under proper superintendence. Each student is required to take part in every operation and kind of work presenting itself in the course of the year's farming. He will thus become thoroughly acquainted with the same, and be better able to undertake such work himself. Each student keeps a diary of his daily work, and of the operations on the farm and garden. Careful provision is made for instruction in dairy-work. Experiments on the merits and effects of manures, feeding-stuffs, various kinds of crops, roots, seeds, clovers, and grasses are carried out, the results of which are published and circulated.

Gardening and Horticulture.—Pupils desirous of following the occupation of horticulture obtain their practical training mainly in the garden instead of the farm. Instruction and practice are provided in the planting and cultivation of the various kinds of fruit-trees—budding, grafting, pruning, storing, marketing, &c. Careful attention is given to the management of the greenhouse, growth of grapes, tomatoes, peaches, strawberries, mushrooms, cucumbers, flowers, bulbs, ferns, &c., and the making-up of flowers for the market. In order to place the school in immediate contact with the elementary schools, pupils are admitted at the age of thirteen years and upwards, thus allowing no break to occur in their education. An entrance examination is provided.

Syllabus.—Agriculture and Agricultural Chemistry.—Plant life. Soils: Formation, composition, and properties; methods of cultivation; implements; draining, liming, &c. Manures. Crops: Systems of rotation; harvesting, storing, marketing; clovers and grasses. Stock: Animal

nutrition, feeding-stuffs; breeding, rearing, and management. Disease and pests of plants and animals.

Book-keeping and Correspondence, with special reference to farm accounts.

Botany.—Structure, growth, development, and classification of plants.

Chemistry.—The chief elements and their compounds; the laws of combination; chemistry of life; analysis of foods and manures, &c. An excellent laboratory for practical work is provided.

Drawing.—Geometrical, freehand, and model; plan- and machine-drawing.

Geology.—Formation, composition, and distribution of rocks; the formation of soils therefrom.

Horticulture.—Soils, management of various kinds; trenching, manuring; fruits and flowers, hardy and exotic. Vegetables, culture and rotation; improvement of plants; diseases and pests.

Mathematics.—Good knowledge of arithmetic and elementary mathematics.

Mechanics, especially as applied to agricultural work.

Mensuration, Land-surveying, Levelling.—To ascertain the acreage of fields, contents of stacks, heaps, timber, &c.; to draw plans of farms, estates, &c.

Veterinary Hygiene.—Structure and functions of the various organs of the different farm animals, their diseases, the symptoms, causes and treatment, especially the horse, cow, sheep, and pig. Practical demonstration is provided.

Wood-work or Carpentry.—Splicing, mortising; the alteration and repair of farm requisites, doors, gates, &c.

Zoology.—Vertebrate and invertebrate; characters of animals; sub-kingdoms; parasites on animals and plants; British mammals.

The school year is divided into three terms: From the New Year to middle of April; middle of April to middle of July; middle of August to end of November.

The fees are as follows: Day pupil only, £6 6s. per annum; students under sixteen, £30 per annum; students over sixteen, £36 per annum; students outside the County of Cheshire under sixteen, £40 per annum; students outside the County of Cheshire over sixteen, £48 per annum. Day pupils may dine at the school at a daily charge of 8d. Students boarding outside or attending for special courses of work are charged ten guineas per annum.

Diplomas and Certificates.—On the completion of the school course, students who satisfy the examiners in the science and practice of agriculture, or horticulture, chemistry (general and agricultural), botany, zoology, geology, veterinary hygiene, land-surveying and levelling, mechanics, and book-keeping, will be awarded a diploma, while those who obtain 75 per cent. in either agriculture or horticulture alone will obtain a certificate.

Scholarships are awarded to candidates, who must be not less than thirteen years of age or more than sixteen. Scholarships are granted for one year, but are renewable for a second and third if the reports as to conduct and progress are satisfactory; they are of £30 value each, and £1 for medical fee. After the scholarship-holder attains the age of sixteen £6 per annum for board must be paid. A scholarship is not awarded to any candidate who fails to gain an aggregate number of marks equal to 70 per cent. of the total number obtainable.

Grammar-school Lectures.—A weekly lecture upon the principles of agriculture is given at eight of the grammar-schools in Cheshire. During the summer months instruction was given to these pupils on grasses and pastures, and they are taught to distinguish the various kinds, and make collections of the same. The pupils are taken for practical demonstrations on neighbouring farms. Most of these schools will shortly be in possession of good laboratories, when systematic instruction will be given.

The following extract from a report by Mr. T. W. Kirk, F.L.S., of the Agricultural Department, in relation to South Australia is interesting: "Although I do not propose to give here any detailed account of the agricultural institutions, there is one matter which must be mentioned. Dr. Cockburn, the Minister for Agriculture in South Australia, has instituted primary schools of agriculture, where, for the small fee of 1s. per week, boys are instructed in elementary farm botany, land-surveying, objects to be obtained by tillage, application of manure, rotation of crops, &c. Several acres of land surround the school I visited, and portions of the ground have been laid off in plots, where various varieties of grain and vegetables were growing, having been planted by the boys under the direction of the master, in order to demonstrate the relative results of different systems of planting, the difference between manured and unmanured lines, &c. The pupils take great pains with these cultivations, and the interest exhibited was certainly very encouraging to those responsible for the conduct of the school. Should these schools achieve the success which it is anticipated they will attain, Dr. Cockburn intends to start others. Institutions of this kind in the country districts here would no doubt prove beneficial."

Other instances might be freely quoted, but sufficient information has been given to illustrate the nature of the school-farm suggested, and I am inclined to think that the establishment of such schools would meet with very considerable success, especially if dairy-schools are made an important feature of instruction, available for boys and girls. It would be an advantage also to have the sympathy and financial assistance of the various agricultural societies of the colony.

Scholarships.—Scholarships should be available from primary schools, higher-grade schools, or continuation classes to the farm-schools, and higher scholarships from the farm-schools to the Canterbury Agricultural College.

Departmental assistance would require to be in the form of a grant per head for each scholar instructed, as well as in grants towards buildings and farm stock and appliances.

The classes, lectures, and advantages offered by the various County Councils of Britain are widely advertised, the poster of the Lancashire Council reproduced herewith being a fair example :—

[*POSTER, 30" X 20".*]

LANCASHIRE COUNTY COUNCIL.

Technical Instruction Committee:

AGRICULTURAL DEPARTMENT.

FREE AND ASSISTED

EDUCATION IN AGRICULTURE.

The Lancashire County Council offers FREE EDUCATION to

FARMERS' SONS AND DAUGHTERS,

And others engaged or likely to be engaged in agricultural pursuits, who are residents of the Administrative County of Lancashire, and, in addition, allows the sum not exceeding

TEN SHILLINGS PER WEEK

Either for Board and Lodgings in Preston or for Travelling-expenses thereto.

The Classes are held at the HARRIS INSTITUTE, PRESTON, and the Session lasts from the first week in October to the end of April in each year.

FREE EDUCATION, with Board and Lodging, is given to Students attending the DAIRY-SCHOOL at the County Council Farm, Hutton, near Preston.

The Dairies, Shippons, Poultry-runs, Experimental and Educational Plots at the County Council Farm are open for inspection to visitors on Tuesdays and Fridays, by ticket, to be procured at the County Offices, Preston.

Poultry Cramming and Trussing Demonstrations are given on Friday afternoons during the Season.

Instruction in BUTTER-MAKING and CHEESE-MAKING given FREE of COST at Farmhouses.

BUTTER-MAKING CLASSES arranged where required.

Assistance given in aid of Instruction and Advice in AGRICULTURE, HORTICULTURE, ORCHARD-MANAGEMENT, MARKET-GARDENING, BEE-KEEPING, POULTRY-KEEPING, and POULTRY-TRUSSING.

Grants are also given in aid of Experiments with MANURES or SEEDS on GRASS or ARABLE LAND.

ANALYSES of Manures, Feeding-stuffs, Soils, &c., at Low Fees.

Valuable Scholarships and Exhibitions are offered Annually.

Further particulars may be obtained from

The Director of Technical Instruction, Agricultural Department, County Offices, Preston.

I cannot do better than add the circular sheets issued by the Lancashire County Council in relation to their agricultural work, showing the classes and arrangements made:—

THE COUNTY COUNCIL FOR THE COUNTY PALATINE OF LANCASTER.—TECHNICAL INSTRUCTION COMMITTEE.

SCHEME of AGRICULTURAL EDUCATION, to be carried out at the County Council Farm, Hutton, the Harris Institute, Preston, and in Various Parts of the County, during 1897–98.

THE COUNTY COUNCIL FARM, HUTTON, NEAR PRESTON.

Resident Staff.—Directress and matron, Miss Macqueen; head teacher of dairying, Miss Macqueen; assistant teacher of dairying, Miss M. Knowles; bailiff, Mr. J. Winder.

Visiting Staff.—Lecturer on agricultural chemistry, A. J. Cooper, B.A., B.Sc., F.C.S., principal of the School of Agriculture, Harris Institute, Preston; lecturer on agriculture, J. R. Campbell, B.Sc., agricultural lecturer at the School of Agriculture, Harris Institute, Preston.

Dairy-school.—Residents of the Administrative County of Lancaster, over fifteen years of age, and approved by the Committee, can receive a thorough training in the theory and practice of butter- and cheese-making (also in bread-making and poultry-keeping), and be boarded and lodged free of cost, at the County Council Farm, provided they remain for a period of not less than eight weeks, and comply with the conditions laid down by the committee. Pupils will also be received for a shorter term, if vacancies occur, on payment of 7s. 6d. per week, and subject to the same conditions.

Experiments.—A variety of manurial, feeding, and other experiments are conducted at the farm, under the direction of the lecturer on agriculture at the Harris Institute, Preston, and demonstrations are occasionally held, of which notice is given through the press and by handbills.

Poultry.—Several kinds of poultry are kept, both pure and first cross, for egg-production and for table purposes; demonstrations in poultry fattening and trussing are given on Friday afternoons during the season.

Milk-testing.—Samples of milk can be tested for butter-fat at low fees; apply direct to the head teacher of dairying, at the farm.

Visiting-days.—The public are invited to visit the farm on Thursdays and Fridays, between 8 a.m. and 4 p.m.; admission by ticket, to be procured at the County Offices, Preston.

HARRIS INSTITUTE, PRESTON.

School of Agriculture.

Principal, A. J. Cooper, B.A., B.Sc., F.C.S.; agricultural chemistry, A. J. Cooper and J. R. Campbell; assistants, J. B. Coppock and D. E. Bostock; agriculture, J. R. Campbell, B.Sc.; veterinary science, C. Blackhurst, M.R.C.V.S.; agricultural book-keeping, J. C. Forrester, C.A.; mechanics and steam, R. Pendlebury; land-surveying, F. E. Dixon, A.M.I.C.E.; preparatory work, J. H. Brittain (Lond. Univ.).

A systematic course of instruction in agricultural chemistry, the principles and practice of agriculture, veterinary surgery, book-keeping, steam and mechanics, and land-surveying will be given at the School of Agriculture, at the Harris Institute, Preston, during the session commencing on the 4th October, 1897, and ending on the 29th April, 1898. The object of this school is to prepare youths for the practical work of a farmer's life, by instructing them in the principles which underlie farming operations, and demonstrating, in the lecture-room and on the farm, modern and scientific methods of agriculture. The full course of instruction extends over three winters, the students being divided into three classes:—

1. *Preparatory Class.*—This is intended for boys who are a little backward in general education, and who, in addition to attending the more important lectures of the junior course, will receive instruction in arithmetic and English composition.

2. *Junior Class.*—These students take the first year's course, which includes lectures on practical agriculture, but is for the most part devoted to teaching the elements of chemistry, physiology, and mechanics. This will enable them to take full advantage of the more practical work of the senior course.

3. *Senior Class.*—These students have either taken the first year's course, or otherwise possess a knowledge of elementary science. Their time is devoted to learning how the science which they have acquired as junior students may be applied to general farm-work.

The instruction is free, and in addition the County Council allows a sum not exceeding 10s. per week, either for board, lodging, or for travelling-expenses, to each student in full attendance, not being a holder of a senior or junior agricultural scholarship, who fulfils the conditions laid down. Students must be over fourteen years of age, and be residents of the Administrative County of Lancaster, or of the County Borough of Wigan. Arrangements will be made for students to visit the County Council and other approved farms, accompanied by Mr. J. R. Campbell. Students will be at liberty to attend appropriate evening classes at the Institute, without fee, conditionally on their making the required attendances and sitting for examination under the Science and Art Department. External students are also admitted to any one or more classes at special fees.

Miscellaneous Work in the County.

Migratory Staff.—Agricultural lecturer, J. R. Campbell, B.Sc.; teachers of butter-making, Miss M. Brown and Miss M. E. Sheedy; teacher of cheese-making, Mr. J. Gornall; poultry lecturers, Mr. E. Brown, F.L.S., and Mr. Thomas Carr.

Agricultural Lectures.—The Joint Committee will consider applications from local committees, agricultural societies, or farmers' associations, for a course of lectures by Mr. J. R. Campbell (not

exceeding four in number), which will be given on Mondays and Fridays, between October, 1897, and the beginning of March, 1898. Admission to these lectures must be free. Local committees are expected to provide a room suitable for the lecture, to advertise the course in their own district, and to furnish the Agricultural Sub-Committee with a full report on the lectures at the close of the course. The County Council pays the lecturer's expenses. As only a limited number of lectures can be given, early application should be made.

Practical Agriculture.—The Joint Committee is prepared to receive applications from local committees, agricultural societies, or farmers' associations, for grants in aid of practical instruction in agriculture, horticulture, and bee-keeping, on condition that full reports of the work done and a statement of accounts are furnished to the Committee. This includes (*a*) experiments with manures or seeds on grass or arable land, and (*b*) instruction and advice in agriculture, horticulture, orchard management, market-gardening, and bee-keeping.

Migratory Butter Classes.—The Joint Committee is prepared to provide a teacher of butter-making free of cost, and supply the necessary utensils to carry on classes in farm-houses or other suitable places. The number of pupils allowed to attend such classes is not less than six nor more than eight. The teacher will also be prepared to visit, on invitation, any farms within reasonable distance of the place where the classes are being held, to advise on dairy management.

Migratory Cheese Instruction.—The Joint Committee is prepared to send the instructor in cheese-making to farm-houses during the season free of cost, who will remain at each farm for the period of one week, on the condition that he receives free board and lodging.

Instruction in Poultry-keeping.—The Joint Committee is prepared to consider applications for the services of a lecturer and make grants in aid: the applications should state (*a*) the names of the places at which it is proposed to have the lectures; (*b*) the number of lectures required in each place; and (*c*) that admission to the lectures will be free.

Analytical Department.—Analyses of feeding-stuffs, manures, soils, and water will be made at especially low rates for farmers living in the Administrative County of Lancashire, provided that such analyses be required for *bonâ fide* agricultural purposes. For scale of fees apply Mr. A. J. Cooper, Harris Institute, Preston.

Agricultural Scholarships and Exhibitions.—The Technical Instruction Committee offers each year a number of senior agricultural scholarships of the annual value of £60, and of junior agricultural scholarships of the annual value of £30, which are tenable for a term not exceeding three years; a number of agricultural exhibitions of the value of £10 each, tenable for one year, are also offered for competition annually.

Further particulars, and the conditions on which all the above-mentioned privileges may be obtained, can be had on application to the Director of Technical Instruction, Agricultural Department, County Offices, Preston.

Free Classes in Agricultural Subjects.

The Technical Instruction Committee of the Lancashire County Council is prepared to allow a sum not exceeding 10s. a week to each student, approved by the Committee, who attends a full course of agricultural instruction, sanctioned by the Technical Instruction Committee, at the Harris Institute, Preston (and other classes as may be required by the principal of the Agricultural School), during the session commencing the 4th October, 1897, and ending the 29th April, 1898. The student must make at least two-thirds of the possible attendances, and also sit for the examination at the end of the session. There will be an interval of about three weeks at Christmas and two weeks at Easter during which no classes will be held. The sum allowed may be spent on board and lodgings in Preston, or on travelling-expenses from home to and from Preston, and, where possible, railway contract tickets must be obtained.

The council of the Harris Institute is prepared to recommend lodgings, and, in addition, to allow each approved student to attend the School of Agriculture, as well as appropriate evening classes, free of all charge, provided the students make the required number of attendances and sit at the examinations. Students must be over fourteen years of age, and must be resident in the Administrative County of Lancaster, which includes all places within the area of Lancashire, except Stalybridge and Todmorden, and the County Boroughs of Barrow-in-Furness, Blackburn, Bolton, Bootle, Burnley, Bury, Liverpool, Manchester, Oldham, Preston, Rochdale, St. Helens, Salford, Stockport, and Wigan. But, by special arrangement, the County Borough of Wigan has been merged in the administrative county for technical-instruction purposes only.

Students must in all cases make application to enter the classes on the proper form, and no claim for allowance will be entertained which has not been approved by the Technical Instruction Committee. Where travelling-expenses only are claimed, a statement of the cost of the contract ticket must be sent in with the application form, and such expenditure must be approved by the Technical Instruction Committee.*

The payment of the allowance will be made after the close of the session in May, 1898, on a claim in writing, accompanied by a satisfactory report from the principal of the Harris Institute, being submitted to and approved by the Technical Instruction Committee. Holders of Lancashire County Council agricultural scholarships of the annual value of £30 and upwards are not eligible to receive any allowance. Application to attend these classes must be made to the Director of Technical Instruction, Agricultural Department, County Offices, Preston.

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* The principal railway companies have agreed to issue contract tickets to the students for seven months at proportionate rates.

Time-table.

Junior Class.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.
a.m. a.m. 9.15 to 10.15	..	English.	Agriculture.	Arithmetic.	Agriculture.
a.m. a.m. 10.15 to 11.15	Arithmetic.	Agriculture.	Chemistry.	Algebra.	Laboratory.
a.m. p.m. 11.30 to 12·30	Geometrical drawing.	Chemistry.	Preparation.	Chemistry.	Laboratory.
p.m. p.m. 2·30 to 4	Botany.	Freehand drawing.	Preparation or excursion.	..	Geometrical drawing.
Evening.	Euclid, 4 to 5.	English, 7.30 to 8.30.	Arithmetic, 7 to 8.	Chemistry, 7 to 8.	..

Intermediate Class.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.
a.m. a.m. 9.15 to 10.15	..	Agriculture.	Book-keeping.	Chemistry.	..
a.m. a.m. 10.15 to 11.15	Mechanics.	Laboratory.	Book-keeping.	Agriculture.	Veterinary science.
a.m. p.m. 11.30 to 12.30	Botany.	Laboratory.	Agricultural chemistry.	Veterinary science.	Botany.
p.m. p.m. 2.30 to 4	Preparation.	Preparation or surveying.	Preparation or excursion.	Freehand and model drawing.	Laboratory.
Evening.	Geology, 7.15 to 8.15.	Mathematics, 7.30 to 8.30.	..	Chemistry.	..

Senior Class.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.
a.m. a.m. 9.15 to 10.15	Mechanics.	..	Veterinary science.	Chemistry.	Book-keeping.
a.m. a.m. 10.15 to 11.15	Mechanics.	Laboratory.	Agricultural chemistry.	Veterinary science.	Book-keeping.
a.m. p.m. 11.30 to 12.30	Agriculture.	Laboratory.	Agricultural chemistry.	Agriculture.	Agricultural chemistry.
p.m. p.m. 2.30 to 4	Preparation.	Preparation or surveying.	Preparation or excursion.	..	Laboratory.
Evening.	Theoretical mechanics, 8 to 9.	Hygiene, 8.30 to 9.30.	..	Chemistry.	..

The session will consist of three terms, viz.: First term, from the 4th October to the 17th December, 1897, eleven weeks; second term, from the 3rd January to the 13th March, 1898, ten weeks; third term, from the 28th March to the 29th April, 1898, five weeks: total duration of session, twenty-six weeks.

Agricultural Lectures.

The Joint Committee will consider applications from local committees, agricultural societies, or farmers' associations for a course of lectures by Mr. J. R. Campbell, B.Sc. (not exceeding four in number), which will be given on Mondays and Fridays, between October, 1897, and the beginning of March, 1898, and which may be selected from the following:—

I. Use and purchase of manures (four lectures): (1) Principles underlying profitable manuring, (2) principles guiding the selection of manures, (3) principles on which manures should be purchased, (4) principles on which manures should be mixed. (One or more may be selected.)

II. Effects of manures on farm-crops at the County Council Farm, Hutton, and elsewhere (four lectures): (1) Recent trials in the manuring of oats, (2) recent trials in the manuring of hay, (3) recent trials in the manuring of roots, (4) recent trials in the manuring of potatoes. (One or more may be selected.)

III. Management of grass land (two lectures): (1) Grass- and clover-seeds, (2) laying down land to temporary and permanent pastures. (One or both may be selected.)

IV. Feeding-stuffs.

V. Management and feeding of calves.
VI. Farmyard manure.
VII. Liming land.
VIII. Finger-and-toe or club root.

Admission to these lectures must be free. Local committees are expected to provide a room suitable for the lecture, to advertise the course in their own district, and to furnish the Agricultural Sub-Committee with a full report on the lectures at the close of the course. The County Council pays the lecturer's expenses. As only a limited number of lectures can be given during the winter session, the Sub-Committee may not be able to arrange more than two lectures in any one district. Early application should be made to the Director of Technical Instruction, Agricultural Department, County Offices, Preston.

Lectures on Poultry-keeping.

The Agricultural Sub-Committee has again engaged Mr. Thomas Carr, of Heatherlea, Anfield, Liverpool, to deliver lectures on poultry-keeping, and to visit farms and cottages, on invitation, for the purpose of giving advice on poultry-management, but will allow local committees to engage Mr. Edward Brown, of Velmead, Caversham, Reading, if his lectures are preferred.

The Sub-Committee is prepared to consider applications for the services of a poultry lecturer from rural district committees, agricultural and poultry societies, or farmers' associations; the applications should give (*a*) the names of the places at which it is proposed to have the lectures; (*b*) the number of lectures to be given in each place; and should state (*c*) that the local committee is prepared to pay the cost of the lecturer's visit out of the special grant mentioned below, and out of the ordinary technical grant, or from other sources; and (*d*) that admission to the lectures will be free.

Mr. Carr's fee is fixed at £1 10s. per day, for which sum he is prepared to deliver a lecture and to visit a reasonable number of poultry-runs. This fee will include all his expenses for board, lodging, travelling, and trap-hire. Local committees desirous of having lectures from Mr. Edward Brown must make their own terms with him.

The Agricultural Sub-Committee is prepared to print all the necessary bills for announcing the lectures, and, in addition, to make a special grant in aid of the cost of the lectures of 18s. per day for every day Mr. Carr is engaged in a district, or £1 per day if Mr. E. Brown is engaged, on condition that the local committee provides a suitable room and advertises the lectures in the district.

As far as possible, applications for Mr. Carr's services will be considered in order of date, and it is requested that the local committee will arrange for the lectures and visits to be held on consecutive days of the week (Saturday excepted), but not necessarily at the same place. All the arrangements for visiting the poultry-runs in a district should be made by the local committee direct with Mr. Carr, or with Mr. E. Brown.

As soon as a course of lectures is completed, the local committee should forward a report to the Director of Technical Instruction, Agricultural Department, County Offices, Preston, stating (*a*) the number of lectures given, with the attendance at each; (*b*) the poultry-runs visited; and giving (*c*) a detailed statement of the total cost of the course. After the accounts are approved, the Sub-Committee will pay the special grant to the treasurer of the local committee, who will then be responsible for the whole cost of the lectures.

Analyses of Feeding-stuffs, Manures, &c., for the Benefit of Farmers resident in the Administrative County of Lancaster.

The Agricultural Joint Committee has made arrangements with the Council of the Harris Institute, Preston, to analyse feeding-stuffs, manures, soils, waters, &c., at the following rates. Since these fees only represent a small proportion of the actual cost of analysis, it is hoped that farmers will avail themselves of the opportunity thus offered:—

List of Fees.	£	s.	d.
1. Determination of the percentage of nitrogen in a sample of sulphate of ammonia, shoddy, horn-dust, dried blood, or other nitrogenous manure	0	2	6
2. An analysis of a sample of nitrate of soda	0	2	6
3. Determination of the percentage of soluble phosphates in a sample of mineral superphosphates or in any other manure	0	2	6
4. Determination of the percentage of insoluble phosphates in a sample of basic slag (Thomas's phosphate-powder) or in any other manure	0	2	6
5. Determination of the percentage of nitrogen, together with the insoluble phosphates, in any manure (such as bone-meal, &c.)	0	3	6
6. Determination of the percentage of nitrogen, together with the soluble and insoluble phosphates, in any manure (such as dissolved bones, compound manures, &c.) ...	0	5	0
7. Determination of the percentage of potash in sulphate or muriate of potash, &c. ...	0	3	6
8. Determination of the percentage of lime in a limestone or marl	0	2	6
9. Determination of the percentage of lime and phosphoric acid in a limestone or marl...	0	5	0
10. Determination of the percentage of fat and albuminoids in a feeding-stuff (oilcakes, meal, &c.)	0	5	0
11. A complete analysis of any manure or feeding-stuff ... ... 10s. to	1	0	0
12. A partial analysis of a sample of soil	0	10	0
13 A complete analysis of a sample of soil	1	10	0
14. Determination of the hardness of a sample of water	0	3	6
15. An analysis of a sample of water to determine its suitability for domestic purposes ...	0	10	6

Fees for other determinations will be given on application.

Instructions for selecting and sending Samples for Analysis.

Artificial Manures.—Take a large handful from each dozen bags, break down any lumps with the hand, and mix the whole well together on a large sheet of paper. From the heap select six small portions of about 4 oz. each, and, after mixing these thoroughly together, divide the whole into three equal parts, and put each into a clean, dry, wide-necked bottle, with a well-fitting cork or stopper, or into a well-fitting, clean tin box. All these samples should then be labelled, dated, and sealed. One of them is to be retained by the purchaser, the other by the vendor, and the third sent to the analyst. Samples for analysis should on no account be merely put up in paper. [N.B.—Samples, both of manure and feeding-stuffs, should always be taken by the purchaser or his agent, in the presence of the seller or his agent, or in the presence of two independent witnesses, to whom due notice of the time of sampling should be given.]

Soils.—Dig a little trench about 2 ft. deep, exposing the soil and subsoil. Cut from the side of this trench horizontal scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner about 1 lb. weight of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist that he may examine them individually before mixing in the laboratory.

Waters.—The water should be sent in a perfectly clean Winchester quart bottle, made of clear glass, and with a well-fitting glass stopper, which is readily obtained at any chemist's shop, or the same will be supplied, ready for use, on application to Mr. Cooper, the carriage to be paid by the sender of the water. The sample-bottle should be rinsed out twice with the water to be analysed before being filled. Well-water should be allowed to run for some time before the sample is drawn. Standing water from cisterns, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, about 4 in. below the surface. Spring- or stream-water should be sampled in dry weather, by immersion, if possible; but, if not deep enough for that, a perfectly clean cup or glass should be used for transferring the water to the bottle. When the bottle has been filled the stopper should be rinsed in the water before being replaced, after which it is to be securely tied down and sealed. For the determination of the degree of hardness, only one quart wine-bottle of the water is required. This bottle must also, of course, be perfectly clean. [N.B.—Samples should be dated and despatched to the laboratory immediately after being taken. It ought to be unnecessary to add that the water-supply of every farm should be above suspicion.]

Limestones, Marls, Ironstones, and other Minerals.—Whole pieces, weighing from 4 oz. to 8 oz., should be sent. These may be enclosed in small linen bags, or wrapped in paper if there is no tin at hand.

Oilcakes.—Take three strips (of the entire breadth of the cake) from the middle of three whole cakes, breaking the latter into two halves for the purpose. The three strips should then be packed in a tin, and the latter dated, labelled, and sealed down as above. Three duplicate pieces, similarly dated, labelled, and sealed, should be retained by the purchaser.

Feeding Meals.—Samples of these should be taken in the same manner as samples of manure, and put into tins. About 4 oz. to 6 oz. are sufficient for an analysis.

All communications referring to analyses must be made to Mr. A. J. Cooper, the Principal of the Harris Institute, Preston, and on forwarding samples separate letters should be sent, specifying the nature of the information required, and, if possible, the object in view.

EXPERIMENT ON THE MANURING OF CLOVER HAY (1898). Under supervision of Mr. J. R. Campbell, B.Sc., Harris Institute, Preston.

Thirteen plots are required for each experiment, two of which are to be unmanured. Each plot is to consist of one-twentieth part of an acre, or 2,178 square feet, and may be 80 ft. 8 in. long and 27 ft. wide, or other dimensions found more suitable, but containing the same area. The land selected for the experiment should be of uniform character. It is desirable that it should be in somewhat poor condition. The previous cropping and treatment of the land all over the area set apart for experiment should have been the same. The plots are better to be all at some distance from fences or ditches, and no part of a head-land ought to be included in them. They should be arranged to run across the ridges to avoid any inequality caused by ridges and furrows. The lines of division between the plots are to be distinctly marked, so that no overlapping may occur either in the application of the manures or in the mowing of the crop. It is essential to the success of the experiment that the utmost care be taken in the application of the manures to the plots. All the artificial manures should be applied on a calm day. The best method is to empty the bags of manure on a sheet set down in the field close to the plots, and any lumps must be carefully broken down. It will be advantageous to mix each manure with such a quantity of earth or sand (not lime or ashes) as will make the whole quantity equal for each plot, and such as will enable the sower to broadcast the manure at least twice uniformly over each. The phosphatic and potassic manures and farmyard manures are to be applied as early as possible. The farmyard manure for plots 10, 11, and 12 (10 cwt. for each) should be carefully weighed. The sulphate of ammonia is to be applied in the last week in March, and the nitrate of soda as soon as growth sets in. The hay is to be weighed when it is dry enough to be put into large stacks or to be sent to market. If the green forage of the second crop is cut, it may be weighed as soon as possible after cutting, or after it is made into hay, provided the crop on all the plots is weighed under the same conditions. The artificial manures will be sent free of charge to the farmer making the experiment; he, however, will supply the farmyard manure from his own farm free of charge. The farmer will be remunerated for time lost in weighing the farmyard manure, and in cutting and weighing the crop. The empty bags are to be returned as soon as convenient, unwashed and

unpaid, addressed to Superintendent of Experiments, County Council Farm, Longton-bridge Station (L. and Y. R.). It would be advisable that the secretary or one or more members of the committee, society, or association applying for grants in aid of this experiment should be in attendance to assist the farmer in seeing that the measuring of the land, the sowing of the manures, and cutting and weighing of the crop be done accurately. All particulars should be entered on this sheet in the space provided, and, when the experiment is finished, sent to the Director of Technical Instruction, Agricultural Department, County Office, Preston, to whom applications for grants in aid of this and other experiments should be made.

Kinds and Quantities of Manures to be applied.

No. of Plot.	Kind of Manure.	Quantity of Manure per Acre.
1	Nothing.	
2	Sulphate of ammonia	*
3	Nitrate of soda	1 cwt.
4	Basic slag	6 cwt.
5	Bone flour	†
6	Muriate of potash	½ cwt.
	Basic slag	2 cwt.
	Nitrate of soda	1 cwt.
7	Muriate of potash	1 cwt.
	Basic slag	2 cwt.
	Nitrate of soda	1 cwt.
8	Muriate of potash	2 cwt.
	Basic slag	2 cwt.
	Nitrate of soda	1 cwt.
9	Muriate of potash	2 cwt.
	Basic slag	2 cwt.
	Sulphate of ammonia	*
10	Farmyard manure...	10 tons.
11	Farmyard manure...	10 tons.
	Nitrate of soda	1 cwt.
12	Farmyard manure...	10 tons.
	Sulphate of ammonia	*
13	Nothing.	

* A quantity containing nitrogen equal to that applied on Plot 3.

† A quantity containing phosphate equal to that applied on Plot 4.

THE COUNTY COUNCIL FOR THE COUNTY PALATINE OF LANCASTER.

Experiment on the Manuring of Clover Hay.

Name of Experimenter: .
Postal Address: .
Nearest Railway-station: .
Distance of Farm from same: .
Character of Soil on Plots: .
Character of Crop: .

No. of Plot.	Weight of Dried Hay (First Cutting).		Weight of Green Forage (Second Cutting).		Remarks.
	Per Plot.	Per Acre.	Per Plot.	Per Acre.	
	Cwt. qr. lb.	Tons cwt. qr.	Tons cwt. qr.	Tons cwt. qr.	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

Additional Information.—Notes on the following points may be entered in the space below: (1) Date of sowing manure, (2) any peculiarity in appearance of the plots during summer, (3) character of the hay, (4) any peculiarities in the "making" of the hay on each plot, (5) any other information that may lead to a correct interpretation of the results.

EXPERIMENTS ON TURNIPS AND SWEDES (1898).—Under Supervision of Mr. J. R. CAMPBELL, B.Sc., Harris Institute, Preston.

Twelve plots are required for each experiment. Each plot is to consist of one-tenth part of an acre. If the drills be made 27 in. apart, the area required will be contained in twelve drills 161 ft. 4 in. long, eight drills of a length 242 ft., or six drills 322 ft. 8 in. long. Each plot must be divided into two—one-half to be dressed with dung of even quality at the rate of 12 tons per acre or 12 cwt. per half-plot. Special care must be taken to secure that the dunged plots receive exactly the same quantity and quality of dung. The land selected for the experiment should be of uniform character. It ought to be free from weeds, and it is desirable that it should be in somewhat poor condition. The previous cropping and treatment of the land all over the area set apart for experiment should have been the same. The plots are better to be all at some distance from fences or ditches, and no part of a head-land ought to be included in them. The drills should be made, if possible, to run directly across previously existing ridges to avoid any inequality caused by the previous ridging and furrowing. It is essential to the success of the experiment that the utmost care be taken in the application of the manures to the plots. All the artificial manures should be applied on a calm day. The best method is to empty the bags of manure on a sheet set down in the field close to the plots, and any lumps should then be carefully broken down. After the drills are opened and the dung applied to half of each plot, the artificial manures are to be sown broadcast over the whole plot, dunged and undunged alike, and the drills immediately covered. It will be advantageous to mix the manures, before sowing, with such a quantity of earth or sand (not lime or ashes) as will make the whole quantity equal for each plot, and such as will enable the sower to broadcast the manure at least twice uniformly over each. The artificial manures will be sent free of charge to the farmer making the experiment; he, however, will supply the farmyard manure from his own farm, free of charge. The farmer will be remunerated for time lost in weighing the farmyard manure and the crops. The empty bags are to be returned as soon as convenient, unwashed and unpaid, addressed to Superintendent of Experiments, County Council Farm, Longton Bridge Station (L. & Y.R.).

It would be advisable that the secretary or one or more members of the committee, society, or association applying for grants in aid of this experiment should be in attendance to assist the farmer in seeing that the measuring of the land, the sowing of the manures, and cutting and weighing of the crop be done accurately. All particulars of the experiment must be entered on this sheet in the space provided, and, when the experiment is completed, sent to the Director of Technical Instruction, Agricultural Department, County Offices, Preston, to whom applications for grants in aid of this and other experiments should be made.

Kinds and Quantities of Bagged Manures Supplied.

No. of Plot.	Kind of Manure.	Quantity per Acre.
1	No artificial manure.	
2	Superphosphate	5 cwt.
3	Bone flour	*
4	Basic slag	*
5	Superphosphate	5 cwt.
	Nitrate of soda	1 cwt.
6	Superphosphate	5 cwt.
	Sulphate of ammonia	†
7	Superphosphate	5 cwt.
	Nitrate of soda	1 cwt.
	Sulphate of potash	1 cwt.
8	Superphosphate	5 cwt.
	Sulphate of ammonia	†
	Sulphate of potash	1 cwt.
9	General mixture	5 cwt.
10	"	7 cwt.
11	"	9 cwt.
12	No artificial manure.	

* A quantity containing phosphate equal to that applied on Plot 2.
† A quantity containing nitrogen equal to that applied on Plot 5.

THE COUNTY COUNCIL FOR THE COUNTY PALATINE OF LANCASTER.

Experiment with Manures on Turnips and Swedes (1898).

Name of Experimenter;
Postal Address;

Nearest Railway-station:
Distance of Farm from same:
Character of Soil:
Manuring and Crops grown previous Season:
Variety of Turnip or Swede Sown:

No. of Plot.	Weight of Dressed Roots on Undunged Half.		Weight of Dressed Roots on Dunged Half.		Total Weight of Roots on Plot.	
	Per Half-plot.	Per Acre.	Per Half-plot.	Per Acre.	Per Plot.	Per Acre.
	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Additional Information.—Notes on the following subjects may be entered in the space below: (1) Date of sowing seed, (2) any peculiarity in appearance of the plots during summer, (3) any peculiarities noticed in the roots on each plot, (4) any other information that may lead to a correct interpretation of the results.

Dairy Institute, Worleston.

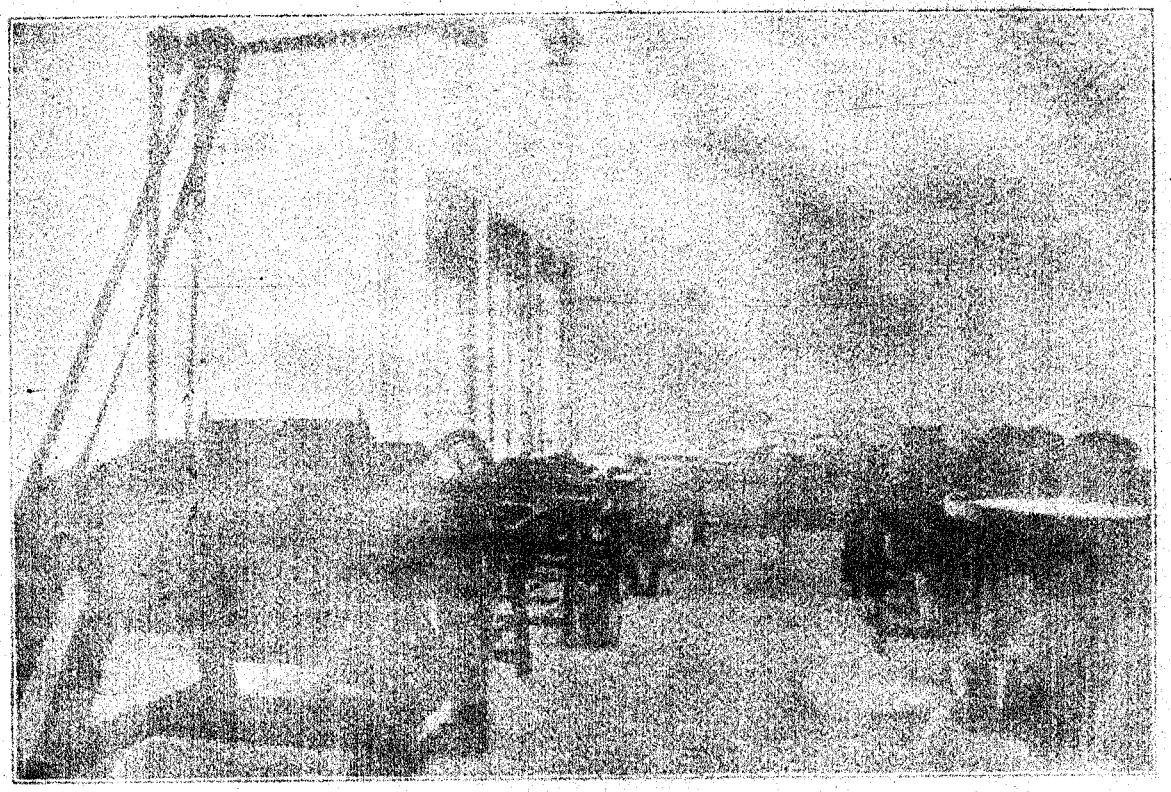
The institute is situated at Worleston, between Crewe and Chester, amidst some of the best dairy-land in the county. The farm is 165 acres in extent, entirely grass land on heavy clay. A herd of fifty milking-cows is maintained, and the whole produce of these is dealt with in the dairy, in addition to which a considerable quantity of milk is purchased. Butter is made daily throughout the year, and cheese except for a few weeks about the new year. Accommodation is provided for the boarding and lodging of sixteen pupils. There are special rooms for cheese- and butter-making; and a commodious press-house, and rooms for ripening cheese have been built, and equipped with all the necessary and most modern appliances for dairy-work; the whole of the work in connection with both cheese-making and butter-making, including the separating of the milk by the hand-separator, being performed by the students.

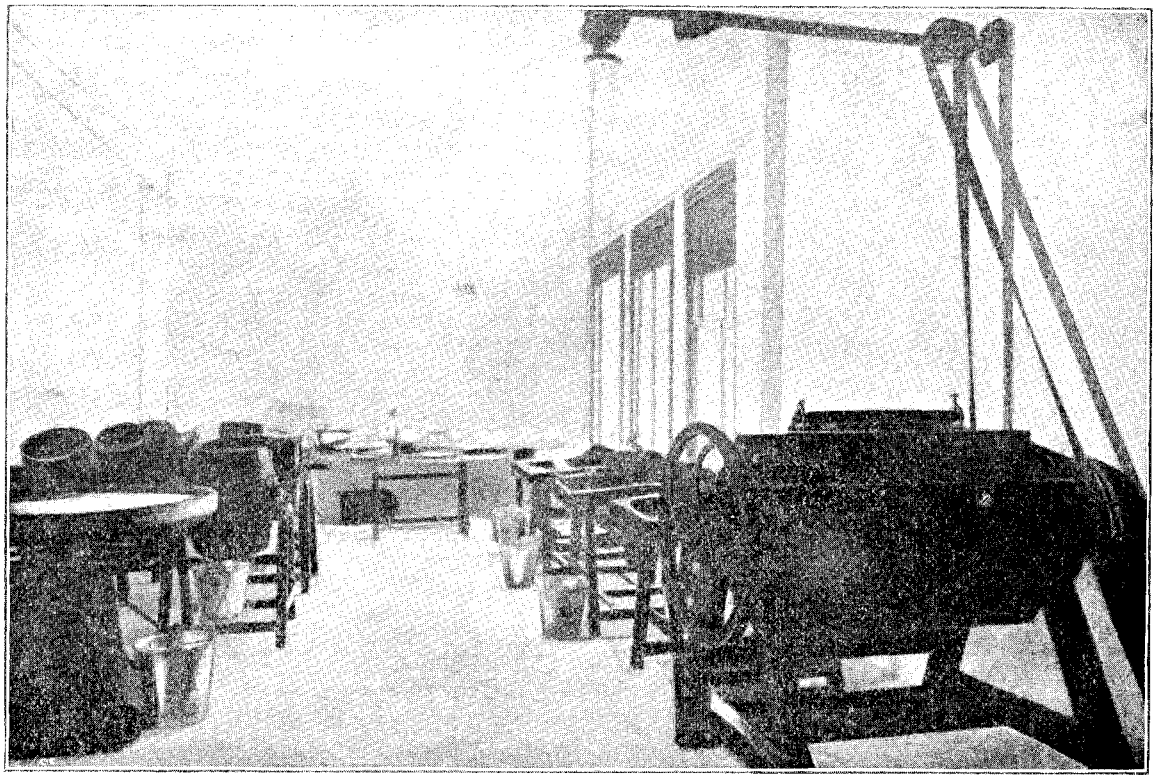
The Cheshire County Council formed this institution to provide a thoroughly practical course of instruction in dairying, combined with such scientific instruction as is found necessary to explain and illustrate the principles on which the practice depends. The breeding of dairy cattle, milking, the treatment of milk, methods of creaming, separating, ripening, and butter-making, with the best methods of packing and marketing, are taught. In cheese-making the attention is mainly given to the manufacture of Cheshire cheese; the early ripening and medium ripening kinds being chiefly made. Occasional instruction is given in making such varieties as Wensleydale and Stilton, and soft cheese. Provision is made for the students getting a very large amount of actual practice both in butter- and cheese-making. Each student is thoroughly taught and practised in testing milk for butter-fat by means of the Gerber and Babcock tester. A laboratory has been equipped for instruction in the chemistry of dairying, and apparatus provided for analytical and test work with advanced students.

There are two courses of work: (1) For those desirous of having such a training as shall enable them to undertake the management of a dairy at home or elsewhere; (2) for those desirous of taking an advanced course, such as to fit them for becoming, if need be, instructors in dairy-work.

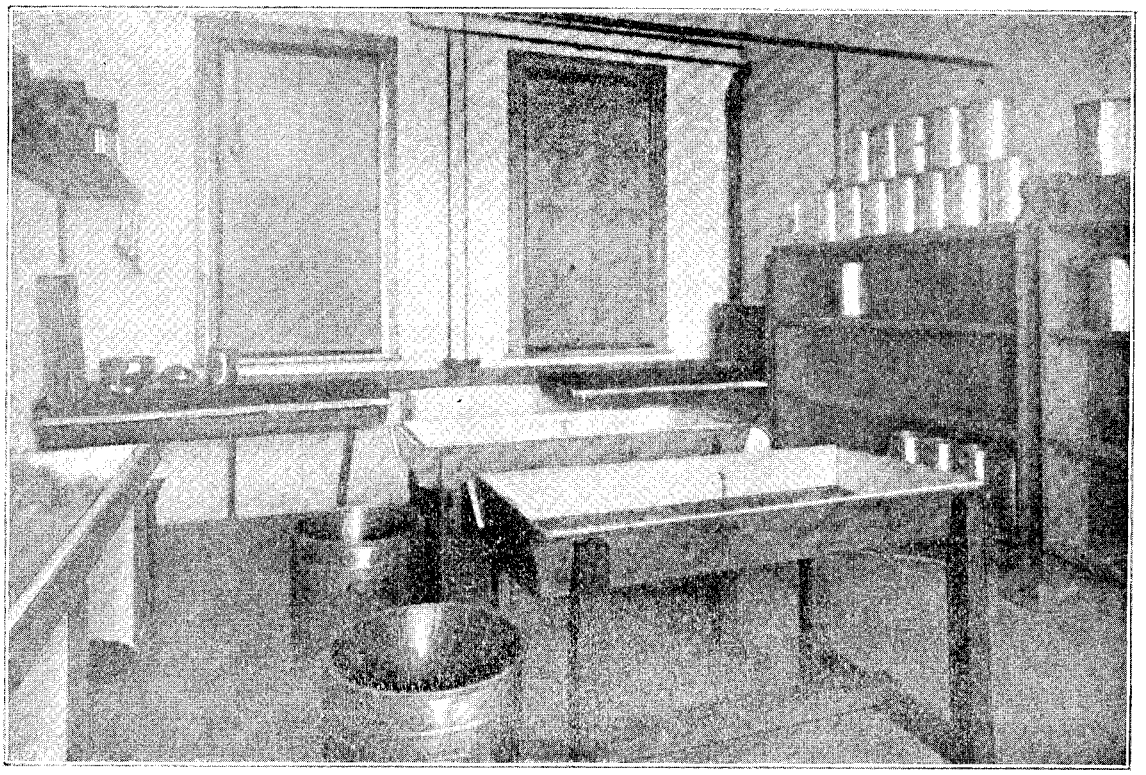
For the first course at least ten weeks is considered necessary. At the end of this a searching examination is held, on the results of which certificates are granted; but no one is allowed to compete for the certificate unless attendance has been made at the Institute for at least seven weeks. The examination embraces the making of cheese throughout, making of butter, and an oral and written examination on the questions involved in dairying. The cheese made is examined and tested when ripe by a skilled cheese-factor, and marks awarded according to its value. Students in this course may enter for a shorter period than the ten weeks. Persons who have met with difficulties in their own practice may attend for a shorter period for the purpose of obtaining information upon the points required. All are, however, urged to remain the full ten weeks, and more if possible.

For the advanced course twenty weeks or more are required, and the work, both practical and theoretical, is such as to cover the syllabus drawn up by the Royal Agricultural Society for its examination for the diploma for dairy-work. Hence regular instruction is given in chemistry and bacteriology, on dairy cattle, pasture and crops, and foods used in dairy-feeding, as well as the thorough practical management of the dairy. Students in this class are also trained to impart instruction to others. Persons are not encouraged to enter for the advanced course unless they have already taken the earlier course, or have a very good knowledge of dairying and dairy-work.





XXXIV.—THE MIDLAND DAIRY INDUSTRY. CHURN ROOM.



XXXV.—THE MIDLAND DAIRY INSTITUTE. STILTON AND SOFT CHEESE MAKING-ROOM.

[To face p. 64.

The boarding-accommodation, unlike that at Preston, is entirely for females, male students entering for either course are required to lodge in the immediate neighbourhood. At Preston male students are received for one term, and female the next.

Careful instruction is given to students in poultry-keeping. A number of houses and runs have been built, and birds of special breeds are kept. This branch is under the lecturer on poultry-keeping employed by the County Council. Sittings of eggs from the special breeds are supplied at a moderate charge to people applying for them.

Farmers and dairymen residing within the county may consult with the chief dairy teacher in regard to any difficulty that has occurred to them in their dairies, and arrangements can be made for a visit by her or some other responsible person to the farm or dairy.

The general arrangement of work is as follows:—During the mornings to 1 p.m.: Practical work in either cheese- or butter-making. During the afternoons: Theoretical instruction, lectures, &c. During the evenings: Private study, reading-up of notes, and preparation for the following day's instruction. Each student is required to keep a record of the dairy-work.

A list is kept of those students who desire to go out as dairymaids, and whose work, ability, and conduct warrant the manageress in recommending them. Persons desiring such dairymaids are invited to make application.

In 1895 the Council commenced domestic-economy classes at Worleston in conjunction with the dairy farm, and these have been continued with great success. The course of work extends over a period of nine weeks, the subjects being cookery, dress-cutting and -making, laundry-work, bread-baking, housework, and sick-nursing. Special teachers have been sent out to the school to undertake this work. A fair percentage of the domestic-economy students afterwards enter as dairy students, and thus become, in addition, accomplished dairymaids.

The fees are as follows: Students from the Administrative County of Cheshire, 10s. per week; for others, £1 per week. Persons attending for a single day, 2s. 6d.; any other portion of a week is charged as a full week.

Scholarships.—Ten scholarships are granted, tenable at the Institute for ten weeks. These cover the whole cost at the school. They are widely advertised in the county papers. No student under the age of fifteen is admitted.

During 1896–97 127,959 lb. of milk produced 5,082 lb. of butter, and 224,894 lb. of milk produced 466 cheese.

The income of the school for 1896–97 was £2,104 2s. 8d., made up as follows: Sales effected, £1,388 16s. 8d.; fees received, £345 6s.; County Council grant, £370. The expenditure was £1,969 4s. 8d. The school has been so successfully worked that there is a balance in hand of £427 from this and previous years.

The Cheshire County Council have set aside £1,000 for peripatetic lectures. The county is divided into four districts, a qualified lecturer being engaged for each district. The syllabus of the course includes: (Winter term), soils and subsoils, improvement of soils, manures, feeding-stuffs, management of land; (spring term), crops and crop-culture, pastures, live-stock, sheep; (summer term), pigs, cattle, milk, cream, butter, cheese, &c. This, it is estimated, will take up £800. The remaining £200 is to be spent on a series of special lectures to farmers at market towns, to be followed by discussions: (1.) Breeding of farm-horses—lecture at five centres. (2.) Market-gardening in a wholesale manner—lecture at five centres. (3.) Veterinary, horses and cattle—lecture at five centres. (4.) Potato-cultivation—lecture at five centres. (5.) Manures, management of—lecture at five centres. (6.) Feeding and management of dairy stock—lecture at ten centres. (7.) Scientific and practical management of arable land—lecture at five centres. (8.) The management of milk, &c.—lecture at five centres. (9.) Summer feeding and management of cattle for milk-selling—lecture at five centres. (10.) Clover and root-crop cultivation—lecture at five centres.

Berkshire Agricultural Scholarships.

The following conditions are laid down: (1.) Candidates must be between the ages of fourteen and sixteen years of age, and be the sons of persons who have been for the last three years resident or occupiers of land in the County of Berkshire. (2.) The scholarships are of the annual value of £50, tenable for three years. The first year must be passed at the Agricultural College, Aspatria, which undertakes to receive Berkshire County Council scholars for £50 per annum. The second year may be passed at the same or a similar institution, or with a farmer or practical agriculturist approved by the Committee. The third year must be passed with a farmer or practical agriculturist, also approved. (3.) No payment will be made on account of a scholarship without the production of a certificate each term, satisfactory to the Committee, testifying to the scholar's good conduct, progress, and attendance.

Each candidate must pass in all four compulsory subjects, and in two (or not more than four) optional subjects, one from each group. The compulsory subjects are elementary agriculture, English history and geography, arithmetic (up to and including vulgar and decimal fractions and the unitary method), simple English composition, and writing from dictation. The optional subjects are algebra, elementary Latin, French or German, drawing, elementary chemistry, elementary mechanics, and mensuration and land-surveying; manual instruction.

Two illustrations are given (XXXIV. and XXXV.) of the Midland Dairy School, situated at Kingston Fields. The views are from the *Record*, the publication of the National Association for the Promotion of Technical Education.

Dairy-work in Denmark and Sweden.

The following article will be found interesting: it is from *Education*, March, 1898:—

At the last annual general meeting of the Association of Directors and Organizing Secretaries, Mr. George St. John (Warwickshire), who accompanied a deputation of the British Dairy Farmers'

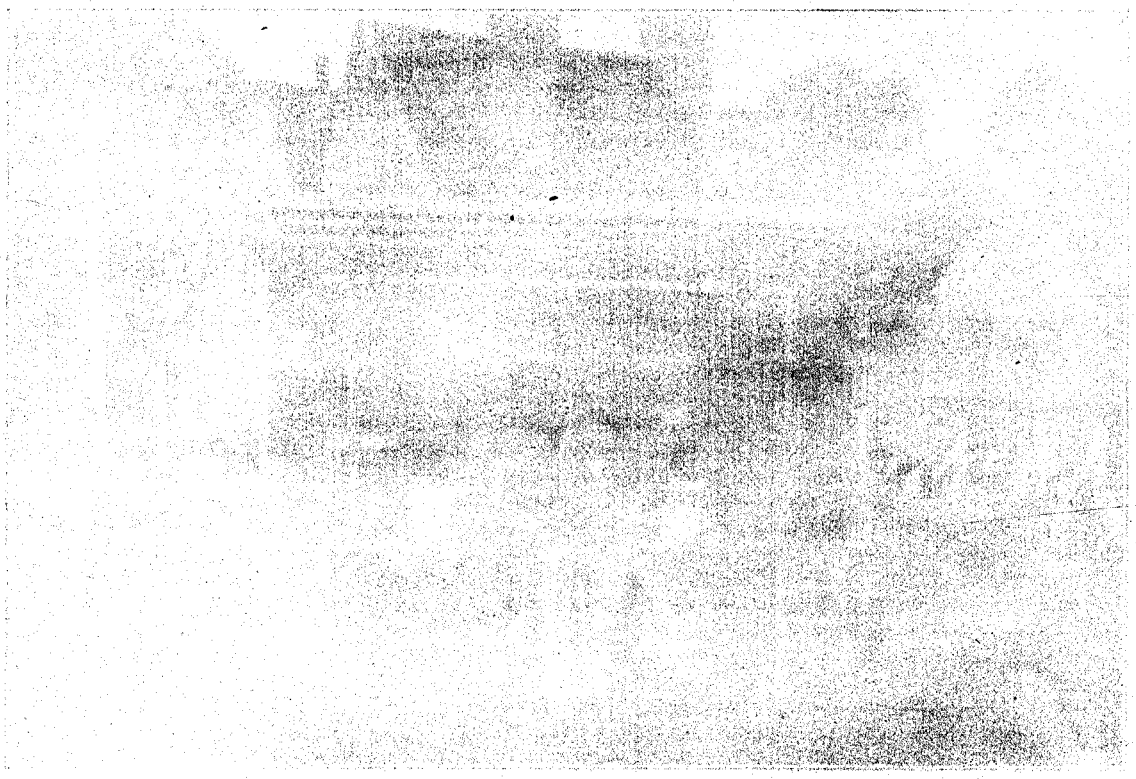
Association to the above-named countries, read a paper embodying the information he had collected and the views he had formed as to the bearing of technical education upon the dairy industry.

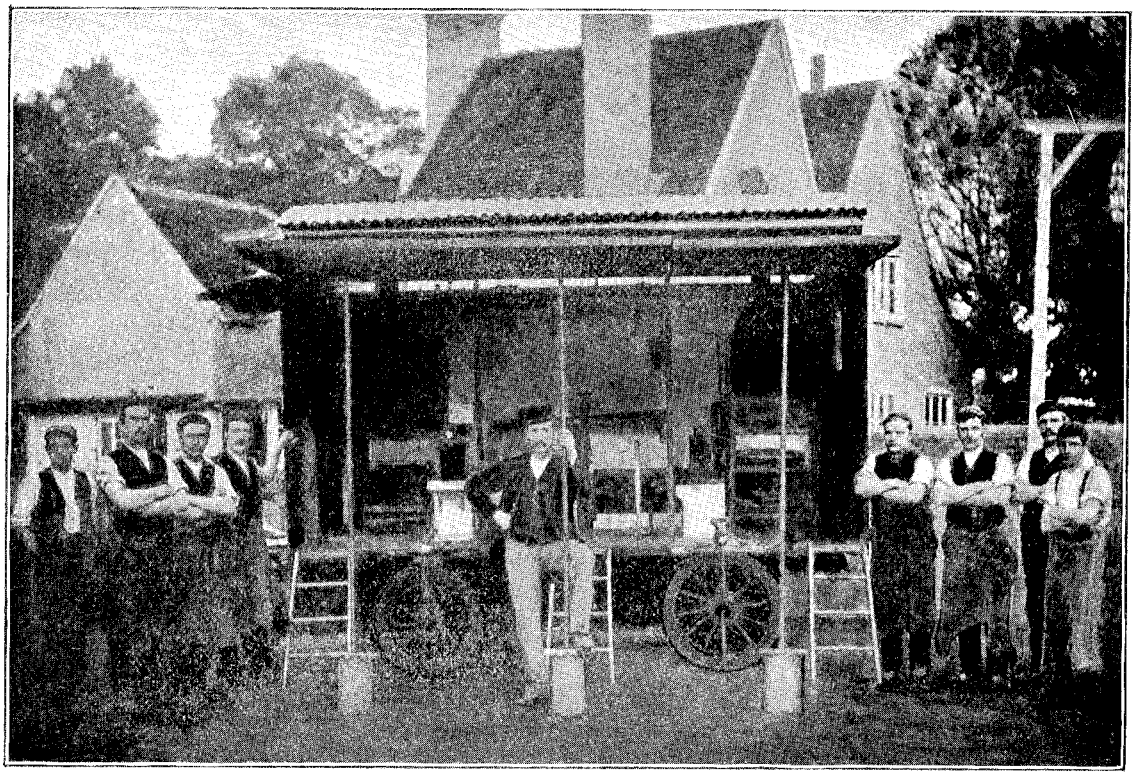
It appears that in the ten years 1886–96 our imports of Danish butter increased threefold, and those of bacon and ham sevenfold. This remarkable growth in the Danish export trade is attributed to the fostering care of the Danish Government, whose influence was exerted, in the first instance, through the Royal Agricultural Society of Denmark. The society began its work sixty years ago by organizing a system of education in dairying for peasants' daughters. The subsequent establishment at the Royal Agricultural College of a professorship in dairying resulted in the training in the science of dairying of a number of young men, who diffused among the farmers, by farm-to-farm visits, the expert knowledge they had thus acquired in the feeding of cattle and in dairy-work generally. An additional professor, with State endowments, was appointed to conduct experiments in practical dairying, such as the economic use of ice, separators, and the system of shallow setting, the best methods of conveying butter, feeding, systems of butter-yields, &c. The State also provided four consulting dairy experts, whose assistance may be had by the payment of their travelling-expenses only. The advice of an engineer as to the use of machinery in dairies and the economic use of coal may be obtained in a similar manner. The further action of the State include (1) annual grants to agricultural societies, farmers' clubs, &c., to encourage the breeding of improved dairy cattle and pigs; (2) annual grants of nearly £6,000 for experiments in the stamping-out of tuberculosis; (3) the development of the railways; (4) the provision of special refrigerator-vans; (5) a stringent Margarine Act—a fraudulent infringement of which is punishable by imprisonment; (6) the holding of butter-shows—the exhibits to be despatched immediately upon the receipt of a telegram asking for same, so as to insure that the ordinary produce only shall be judged. There are about eighty dairy-schools—called "popular," "high," and "agricultural" schools—and all of them were initiated by private enterprise. The teachers are generally students or graduates from the Royal Agricultural College. About ten of these schools take agriculture as a special study.

Mr. St. John thus describes a school visited by him: "The school has accommodation for one hundred pupils of both sexes, all of whom are boarders from eighteen to twenty-five years of age, and they attend the school for a six-months course. The pupils are drawn from all classes of society, though mostly from the peasant class. The aim of the school is, first, to develop the personal character of the pupils; and, secondly, to give systematic instruction in agriculture and the sciences on which it is based, such as chemistry, physics, natural history, anatomy, physiology, &c. A farm of 170 acres is attached to the school, and an experimental plot of about 20 acres supported by the State; but the whole of the instruction is theoretical, the pupils being supposed to have gained practical knowledge by work on the farm and in the dairies of their homes. The fees are from 30 to 36 kronas per month—that is, from £1 13s. 4d. to £2. The State supports these schools by a yearly grant of £10,000, but makes it a condition that a certain proportion of the sum allotted to each school shall be devoted to partly paying the fees of deserving students. I was informed by the principal that only a small sum is granted to the pupils to assist in paying their fees, and that the schools are nearly always full, a vacancy seldom occurring. . . . In addition to the above-mentioned grant, the State annually votes about £700 for higher instruction to dairymen and dairymaids. This sum is chiefly spent among the more experienced men and women, to enable them to visit the best-managed dairies at home or neighbouring countries, especially for the purpose of studying cheese-making."

In Sweden the dairy exports are rapidly increasing year by year. The State is working on similar lines to those of Denmark. In addition to the agricultural colleges of Alnarp and Ultuna, dairy instruction is provided by the following means: One higher dairy-school for experts; one lower dairy-school for men; seven lower dairy-schools for women; twenty-four stations for women. There is a chief dairy inspector appointed by the Government, and twenty-three experts appointed by the agricultural societies of the different counties, who also pay the greater part of the cost of the schools. The total expense borne by the Government is £7,530 (schools £2,700, the two colleges £4,830). Alnarp Agricultural College includes the following divisions: (1) Higher agricultural college, (2) lower agricultural college, (3) higher dairy college, (4) lower dairy-school for men, (5) lower dairy-school for women, (6) a gardening college, (7) a farriery school. The higher dairy-school is open only to experts and teachers who have passed through the agricultural college and afterwards had one year's practice in dairy-work; instruction is given in milk-testing, chemistry of milk, bacteriology, breeds of cattle, diseases, engineering, butter-judging, analysis of milk (chemistry and bacteriology), design and estimate of dairy-buildings, book-keeping. There are six pupils, who pay a fee of £33 6s. 8d. per annum. The lower dairy-school is for foremen of larger dairies, who must have a good knowledge of arithmetic and writing, and have had at least one year's practical work in a dairy. The course is for one year: six pupils; fees, £22 5s. per annum. The lower dairy-school for women is maintained by one of the county agricultural societies. The course is for two years, the greater part of which is spent in practical work in large dairies, and the remainder in theoretical instruction in the composition of milk, correct management of milk, milk-testing, butter and cheese production, butter-judging, book-keeping. The instruction is free, and an allowance is made for work-dresses.

Mr. St. John observes: "A visit to these countries and a study of this question fills one with admiration for the people, who by their energy and persistence, and by their willingness and ability in availing themselves of the help offered, have raised this trade to its present importance. . . . The rent of the land is about the same as with us, and the mode of cultivation as costly, while the average return for the milk produced is 3½d. per gallon. How, then, is the farmer enabled not only to live, but to save money? I think the explanation lies in the facts that (1) the farmer, his wife and family, all work; (2) they live more frugally; (3) their co-operative methods of manufacture effect great economies; (4) their agricultural technical instruction is more thorough; (5) the people are more ready to avail themselves of that instruction. . . . In England about





XXXVI. THE FARRIERY VAN, BERKSHIRE

[To face p. 71

£86,000 is spent annually by the Board of Agriculture and the County Councils on agricultural instruction, and when we compare the results obtained from this expenditure with the results obtained in Denmark and Sweden there is room for doubt as to whether we get enough value for our money. Certainly there is not the eagerness on the part of our agriculturists to avail themselves of the instruction offered. This may be because the social conditions of the countries are very different. In this country there is a large trade in milk, and it is not probable that the English farmer who can realise 6d. or 7d. per gallon by sending his milk to market is likely to attempt to compete with the foreigner in butter-making, who is satisfied with little more than half that amount. Add to this the fact that in 1894 there were only sufficient cows in this country to produce about 32 gallons of milk per head of the population, and it will be seen that any serious competition with Denmark for the bulk of the butter trade is out of the question. These facts also make it very doubtful whether the co-operative butter-factories are adaptable to this country. Professor Long states that the best butter is not made in factories, and this is borne out by experience, as good fresh farm-house butter still fetches a price considerably in advance of that obtained by Danish butter. And it is in this direction that the English farmer can successfully compete with the Dane, but only by the manufacture of butter of the highest quality and of uniform excellence. In districts remote from railway-stations, butter- and cheese-making form the only way of disposing of the milk, and the aim of the County Councils should be to provide thorough instruction in the best methods of butter- and cheese-making, so that products of the very highest quality only should be put on the market. I am of opinion that such instruction cannot well be provided by travelling dairy-schools. These have, no doubt, been of great service in the past in arousing interest in dairy-work, but to obtain the end we have in view the instruction must be much more complete and thorough, and a course of from three to six months at a dairy-school is desirable. County Councils are, no doubt, beginning to realise this, as is evidenced by the establishment during the last few years of schools or institutions, with farms attached, for instruction in dairy-work. The reports from such schools show that in districts which have felt the influence of the dairy-school there has been a marked rise in the price obtained for the butter made. The cost of carrying on such schools is, no doubt, great; but by the amalgamation of three or four counties the cost becomes less than that of a travelling school, while the work done will be more thorough, and greater care may be exercised in selecting for such instruction only those directly connected with the work of dairying."

Farriery.

Farriery being of considerable importance, and the subject having already been considered by the Wellington Education Board with a view to instruction being given, I give an illustration (Plate XXXVI.), reproduced from the *Record*, of the Berkshire School of Farriery.

The Council of the Berkshire School instituted lectures during two winters at suitable centres on the principles of horse-shoeing. The difficulty arose, however, of providing the necessary practical instruction combined with the theoretical work. A sub-committee appointed to deal with the matter suggested a travelling forge, accompanied by a competent instructor, with the result that the van as shown in this illustration was constructed. It was designed by Mr. Fathers, the instructor. It contains two forges, with vices, fittings, and tools to enable four men to work at one time, who take alternately the duty of acting as striker.

The *Record* gives the following method of conducting the school: "A convenient centre is selected, and suitable handbills are circulated in the district by way of advertisement. In adddition to this the instructor, as far as time permits, calls upon the smiths at their homes and forges, and he has seldom much difficulty in persuading them to join the school. As the men have to do their ordinary work in the daytime, it is necessary to carry on the classes in the evening; consequently they usually commence at 6 p.m. or 6.30 p.m., and continue as late as desired. A course of instruction comprises ten evenings—no work, however, being done on Saturday nights. Since a class can only conveniently be composed of four men, and as these cannot always attend night after night, it is sometimes found desirable to conduct two classes, upon alternate evenings. The men are shown the correct method of shoeing all kinds of horses likely to be met with in their business. Not only are different classes dealt with—from cart-horses to hunters—but proper modes are taught of adapting shoes to abnormal conditions of the foot, and subjects are provided for practice where obtainable. An interesting typical collection of shoes is always on exhibition where the van is stationed, and is much appreciated.

This practical work has hitherto been followed up by an instructive course of lectures, delivered at convenient centres by Mr. Wheatley, on the structure of the horse's foot, illustrated by models. At the conclusion of a certain number of courses in a district a prize competition is held, open exclusively to pupils from these classes; and to encourage regularity of attendance only smiths who have attended upon eight evenings are allowed to compete. Prizes are given, and commendation certificates; also, if a man reaches a certain standard of excellence he is entitled to registration upon the books of the Worshipful Company of Farriers. The course of instruction has been confined strictly to men already in the trade, a policy which has probably been the main reason of the movement having been unimpeded by jealousy or ill-feeling.

The following statement of expenses will show the cost of conducting the school of farriery for twelve months: First cost of van, £50, subsequent alterations, £10, £60; tools, lamps, &c., £20; salary of instructor and assistant, £140; iron for making shoes, nails, rasps, &c., £45; removals by horse from place to place, £15; rent of premises occupied at each centre, £15; inspection journeys, £10; printing, £5; incidental (as coals, &c.), £25: total, £335.

2. MINING.

As in the case of agriculture, this section is controlled by a special department (under the Minister of Mines). The syllabus of the Science and Art Department in this matter is already well

known to the mining schools of New Zealand, and in the institutions visited that syllabus was generally in force.

The text-book in use at Manchester in mineralogy was Rutley's "Mineralogy." Reference works: Bauermann's "Mineralogy," Dana's Manual, and Fletcher's "Optical Indicatrix." For metallurgy: Rhead's or Roberts-Austen's reference works; Eissler's "Gold, Silver, and Lead"; Peter's "Copper-smelting"; Egleston's "Metallurgy of Gold, Silver, and Mercury"; Phillips's "Metallurgy"; Mills's "Fuel"; and current journals. For the laboratory: Rhead's "Exercises in Practical Metallurgy"; Sexton's "Quantitative Analysis." Reference works: Beringer's "Manual of Assaying"; Kerl's "Assayer's Manual"; Mitchell's "Assaying."

In Glasgow, in addition to some of the above works in metallurgy, Sexton's "Fuel and Refractory Materials"; Greenwood's "Metallurgy," also "Steel and Iron"; Rose's "Metallurgy of Gold"; and Macmillan's "Electro-Metallurgy" were in use. For the laboratory, in addition to the Manchester works, Brown's "Assaying of Gold, Silver, &c.," and Arnold's "Steel-works Analysis" were in use.

In Glasgow a course of eighty lectures is given upon mining—the first year's course dealing with the methods of mining as now practised in this and other countries, and the principles which underlie such methods—students being recommended to spend the summer vacations of their first and second years in underground work, so as to have a general knowledge of the subject previous to their third-year course. Notes and sketches made by students during these periods are required to be handed in for examination, accompanied by statements of their experiences signed by the mine-managers. Each student is required to qualify in ambulance-work. The mining text-books are Hughes's "Coal-mining," and Le Neve Foster's "Ore and Stone Mining."

In the mining and geological laboratory and drawing-office, the second year's course instruction is given in the methods of identifying minerals and rocks, both in hand specimens and under the microscope; preparation of the specimens for the microscope; examination of fossils; use of simple surveying instruments for land-surveying and geological work; levelling and plotting; geological mapping and section-drawing. A few easy examples of mine-surveying are plotted with the protractor, tc give students an idea of the dispositions of mine-workings on veins and beds. Full-day excursions are made, in addition to Saturday afternoon excursions, to examine the phenomena presented by aqueous, igneous, and metamorphic rock-masses.

In the third year's course three months is occupied in machine drawing and structural design, laboratory-work, field-work, and excursions to mines; four months in drawing-office work in mine-surveying; and the summer months in mine-surveying, with whole-day excursions. Text-book: Brough's "Mine-surveying."

The geology and mineralogy section embraces fifty lectures, divided into two portions—the first on the general principles of stratigraphical geology; in the second attention is devoted more particularly to the mineralogical portion, and to the practical application of geology to mining and engineering. Works recommended are as follows: Geikie's "Class-book of Geology"; Cole's "Aids to Practical Geology"; Judd's "Volcanoes"; Jukes-Browne's handbooks of geology.

In all cases suitable specimens are required to be provided for class instruction in geology and mineralogy.

Coal-mining.—Special classes are arranged by the Lancashire and Derbyshire and other County Councils in coal-mining, and considerable advantage of the opportunities offered is taken by the miners of the districts.

The Derbyshire scheme was an experimental one, designed to interest as large a body of miners as possible, and to endeavour to arouse a desire for more systematic study. The lectures first given were of a popular nature, illustrated by experiments on lantern-slides, followed by a class, the members of which worked papers during the week, which were sent by post to the lecturer, and then discussed at the class itself. Although in some districts the lectures and classes were only moderately attended, in others the numbers were far beyond expectations; the men walking long distances to attend, and doing this regularly through the worst part of the winter. Examinations were held at the end of the course, and certificates granted to a large number of miners.

SECTION VI.—COMMERCIAL EDUCATION.

At the present time the importance of commercial education is being widely recognised by Great Britain, and every effort is now being made to provide instruction such as will compare favourably with the commercial schools of France and Germany.

Mr. Sidney Webb (who has recently visited this colony), in his Society of Arts speech upon commercial education, said that "It was the ingrained belief of the English business-man that there is not, and never can be, any commercial education comparable with that which a man picks up in the actual business of a daily life. The most intelligent merchant never dreams of seeking for his son any special commercial education: he either sends him to Oxford or pitches him straight into his office. During the last ten years in particular this lack of commercial education in England, and the failure of business-men to appreciate the need for it, had been a matter of serious concern to those interested in technical education." Mr. Webb divides commercial education into three sections: "First, the education of the youth before he enters business-life; second, the provision of opportunities of evening instruction for the young clerk; and third, but perhaps most important of all, there is what may be called higher commercial education, required by the officer of the commercial army, if not by every ambitious member of the rank and file."

With reference to the first section, would it not be possible to make a distinction in our secondary schools of scholars in the upper forms, say, over the age of fourteen—the one section

for trades or agriculture, and the other for commerce; the former entering more into science, mathematics, manual instruction, and drawing, the latter languages, commercial arithmetic, and book-keeping?

With reference to the second section, it is possible to form a moderately complete course of instruction in connection with evening continuation schools by the establishment of special classes in commercial arithmetic; commercial geography and history; languages—French, German, &c.; book-keeping; shorthand; typewriting; commercial correspondence; and economics of commerce. In the four principal centres of New Zealand there should be sufficient students to enable such classes to be formed.

In connection with the third section, that of higher commercial education, I suggest that the Victoria University College should make this section a special feature of its curriculum by courses of lectures and special classes. The lectures might embrace such subjects as the life and duties of the citizen; commercial geography and history; commercial and industrial history; mercantile law; insurance—life, fire, and marine; economics of commerce, &c.

The Manchester Central Commercial Evening School provides a complete and connected course of instruction in the branches of knowledge requisite for those desirous of obtaining positions of trust and responsibility in the counting-house, warehouse, bank, or office, either as clerks, cashiers, book-keepers, or as general and foreign correspondents. The course of instruction is also suitable for candidates for the Civil Service, for the accountants' and actuaries' examinations, and for the degree examinations (Arts) of the London University.

The subjects taught are as follows: Accountancy, arithmetic, book-keeping, business training, commercial English, commercial law, elocution, English literature, commercial geography and history, handwriting, shorthand, typewriting, French, German, and Italian, Latin, Portuguese, and Spanish, political and social economy, London University degree (Arts).

Book-keeping includes the most approved modern method of practical book-keeping, departmental accounts, preparation of reports on profit and loss accounts and balance-sheets by single and double entry, banking, bills of exchange. The summer term includes the application of double entry to agencies, banking, insurance, manufacturing and shipping companies, solicitors', trustees', and executors' accounts.

Business Training and Handwriting comprises copying, indexing, and filing correspondence; letters, business forms and accounts; ways of sending parcels; petty-cash accounts; telegraph codes; postal arrangements.

Intermediate course: Preparation of account-sales, invoices; uses of warehouse and office books; cheques, crossing and indorsement of same; banker's pass-book; commercial expressions; discount and interest calculations; markets, and methods of buying and selling; shipment of goods, including use and method of preparing bills of lading, manifests of cargo; dock and Customhouse work, import and export; entry of goods at Customhouse; principles of marine insurance; general and particular averages, &c.

Advanced course: Forms of banking accounts; use and value of cheques; practice and law as to drawing, accepting, and negotiating bills of exchange, promissory notes; regulations and customs of bankers regarding discount-loans, securities, overdrafts; foreign exchanges, and standards of monetary value; systematic way of keeping accounts of acceptances in order to protect credit of employers; joint-stock enterprise, shares, debentures, forms, books, and returns for directors; review of the duties of junior, ordinary, shipping, and booking clerks; mercantile correspondence in its most advanced stages.

Shorthand.—Attention is given to correct spelling, punctuation, neat transcription of home-work. The work comprises, in the advanced class, an extensive variety of correspondence, market reports, prospectuses, &c.; and commercial matter is given on the blackboard, and various technicalities explained. Text-books: Beginners—"Phonetic Teacher"; intermediate—last part of "Teacher" and first part of "Manual"; advanced—"Manual." Reporting: "The Instructor," or Primers I., II., and III.

Typewriting—Copying of agreements, articles of association, accounts, authors' MSS., actors' parts, briefs, bills of costs, bills of sale, bills of quantities, deeds, estimates, inventories, indentures, letters, plays, sermons, specifications, testimonials, bills, &c. Twenty Remington machines are provided, and practice is from 6 to 10 each evening.

Commercial Arithmetic.—This subject is taken in three stages, special attention being given to short methods of work, and the practical application of arithmetic, as in the measurement of builders' and decorators' work, and of land, timber, carpentry, &c.; in addition to ordinary rules, tots, percentages, profit and loss, commission, stocks, bank interest and discount, dividends, coinage and exchange, and the metric system.

Commercial English comprises the elements of grammar and composition, the writing of business letters and forms, and essays on commercial subjects, drafting of advertisements, circulars, prospectuses, *précis*-writing, commercial terms, and abbreviations.

Elocution and Literature.—The course comprises the study, in theory and practice, of the elemental sounds, articulation, pronunciation, tone, emphasis, expression, gesticulation, &c. The text-book is Professor Greenbank's "The British Orator."

Commercial Geography and History.—This subject treats (1) of the geographical distribution of commercial commodities—food products, raw products, and manufactured products; the localities where and the geographical and local conditions under which these are produced; quantities available for export; capacities of new countries, as Africa and Australasia, for commercial development. (2.) Various facilities for and hindrances to trade, as tariffs, currencies, weights and measures, transport, telegraphs, postal arrangements, the distances, trade routes, and ordinary modes of conveyance to important markets, ports, harbours, coaling-stations, &c.

Commercial Law.—Principles of joint-stock-company law, including the rights and duties of liquidators and receivers; on mercantile law and bankruptcy law, including the rights and duties of

trustees, and on the law of arbitration and awards; the law of partnership, and the principles of the law relating to executors and administrators.

Languages.—In all the classes in modern languages the students are taught from the first to speak the language they are studying, and in conducting advanced classes English is spoken as little as possible. Attention is paid to correct pronunciation, and the application of the language to business requirements is considered of the first importance. *Vivâ voce* classes are held for advanced students to acquire a knowledge of the technicalities, customs, and formalities of shipping-houses, and to become conversant with the equivalents in French, German, Italian, Portuguese, and Spanish of colloquial phrases and terms, and of the names of the great variety of goods shipped to and from Manchester.

Much has been said at the recent conferences in London and Paris upon the subject of the superior instruction given in French and German schools in relation to commercial education.

The *Record*, in discussing this subject, gives the following account of "A French Practical Commercial School": "The school is established on the principle of practical and individual tuition, and is an exact reproduction of a French merchant's office, with desks, counters, drawers, files, copying-press, telephones, and various other counting-house requirements, together with a model bank, post-office, railway parcel-office, &c. There are almost complete collections of specimens of the work of old and of new and actually existing firms. The Municipal Council of Paris, finding the teaching so thorough, gives a subsidy of £100 per annum to this particular school, and the Minister of Commerce pays for the education of twelve pupils annually. An idea of the value set upon the students of this school may be gathered from the fact that on an average ten applications are received for the services of every pupil. The aim of the school is to prepare students rapidly, and at little cost, for commercial, industrial, banking, and financial careers; and most of the students of this school are the sons of business-men, paying, according to the character of the course taken up, from £2 to £6 per quarter.

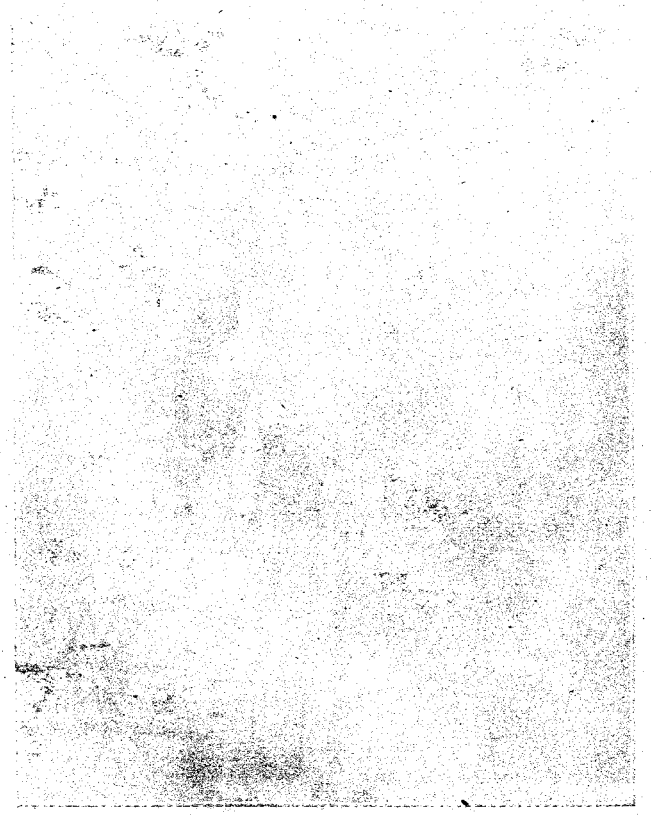
"The courses of study are so organized and arranged that students may join at any time. There is no entrance examination. The ordinary course of study comprises four distinct sections, each being complete in itself, and the period devoted to each may range from three months to a year. The fee for any one section is £2; for any two sections, £3 10s.; and for the full course, covering four sections, £6. First section: Preparatory section for young students having no notion of commercial matters. Introductory commercial knowledge; the study of commercial documents; arrangement of correspondence; copies of letters; postal and telegraphic service; mental arithmetic, &c. Second section: Elementary course for adults, including students from the commercial schools who already possess some theoretical knowledge, and office employés. This course takes up the ordinary correspondence and communications required in an office, with a study of the different methods of book-keeping, commercial arithmetic, and correspondence. Third section: Higher section practical work for book-keepers desirous of completing their business knowledge; the regulations governing business-houses, entries and closing-up of accounts, bankruptcies, balance-sheet, schedules, inventories. Fourth section: Practical work for students who have passed through the previous courses, and others, such as heads of business-houses; the study and practice of special information applicable to certain professions and industries."

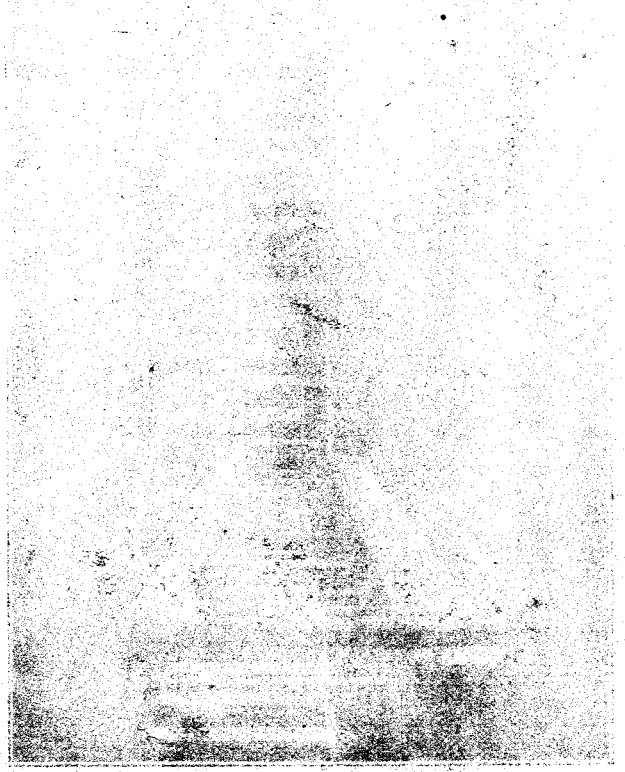
In addition to the above, there are special courses in foreign languages, banking, accountancy, exchange, commercial law, commercial geography, history, arithmetic, shorthand, and typewriting. The school is provided with a library of reference-books on commercial subjects, with a small commercial museum, and also with a collection of packing-cases, showing the various types in general use both for home and export trade. The school receives foreign students, and was last year attended by about five hundred students. There is a separate ladies' department organized on similar lines, but having lady teachers.

School Museums.—The French merchants attach considerable importance to these museums, which show, in the clearest possible manner, by means of samples and specimens, all kinds of products in their natural or raw state, and the various phases through which they pass from the raw to the manufactured state. Museums are attached to all schools of commerce as an essential, and are looked upon as a means of education, and of enlarging the ideas of the students. They are very general throughout France, and the samples and specimens have been presented to the schools by merchants and manufacturers; it is the exception for a school to have to purchase a set.

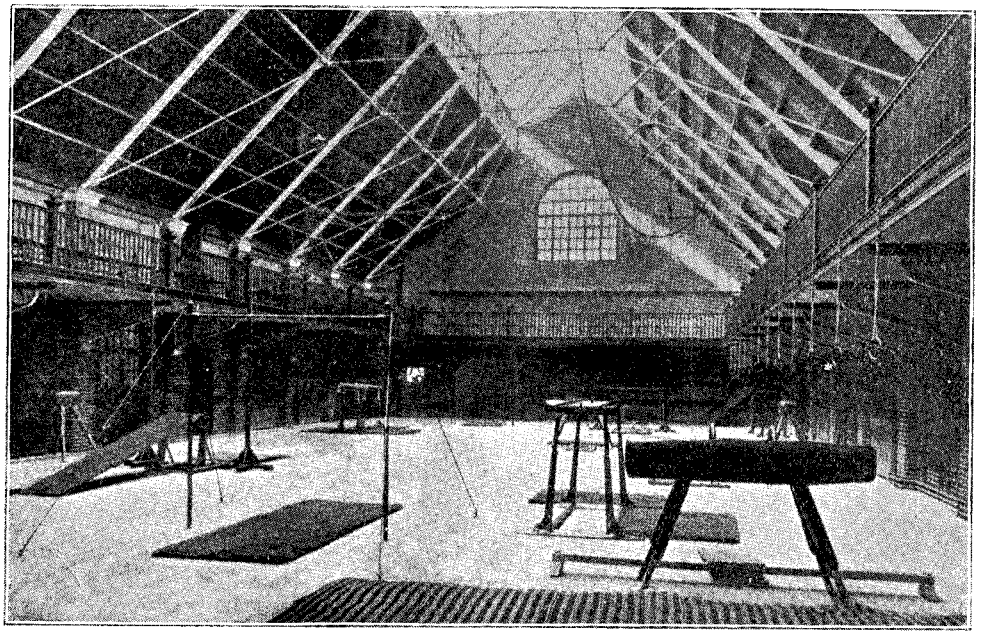
"The professor largely utilises these specimens in giving his lessons. Supposing, for instance, that cotton is the subject of study, the different varieties of this textile are submitted to the students for examination; they are asked to notice the length, colour, and strength, &c. Then the professor shows the vegetable which produces it; the countries that cultivate it. Afterwards he makes known the different trade classifications of the product, its use, and the principal markets, adding some statistical data as to its production and commercial importance. In addition to this, the students are taught how to submit products and samples to chemical and mechanical tests, and how to observe them under the microscope to detect fraud, &c. In this way, by means of object-lessons on all kinds of merchandise, illustrated by actual specimens obtained from the school museum, the business-man of the future is equipped to give an accurate description of any article, and qualified to find out for himself the reason why his own goods are being supplanted at home and abroad by goods of home or foreign manufacture."

My suggestions are that an effort be made to give additional training in languages, mathematics, and shorthand in our secondary schools; that special commercial sections be formed in connection with evening continuation classes in the larger centres; that the Victoria University College give a special course of work in the higher branches of commercial education; and that the chambers of commerce take this question into serious consideration, and assist the technical committees in the formation and support of commercial classes, and provide scholarships for each district.

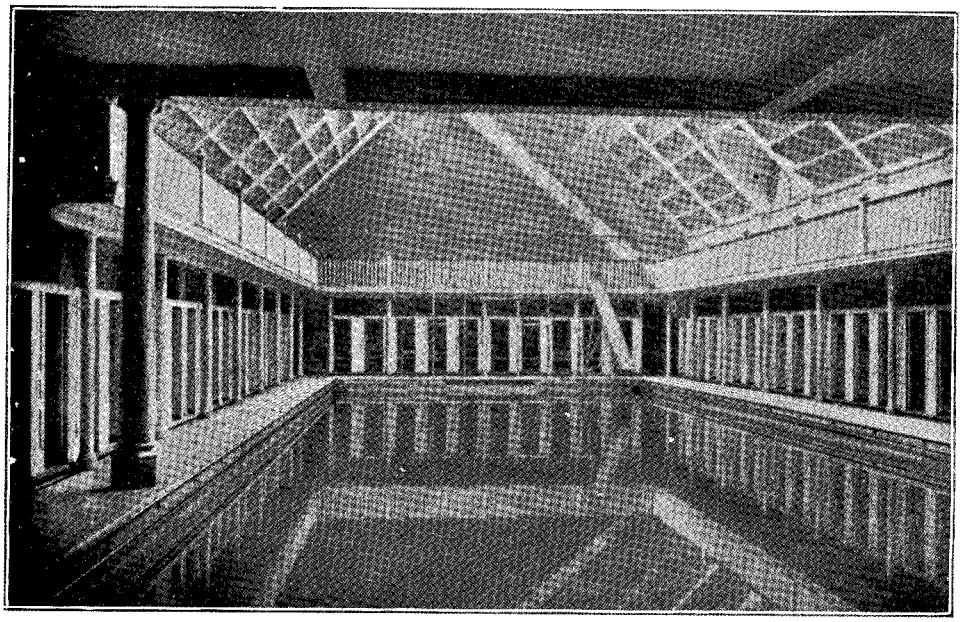








XXXVII.—THE GYMNASIUM.



XXXVIII.—THE SWIMMING-BATH.



XXXIX.—THE LIBRARY.

[To face p. 75.

SECTION VII.—GENERAL.

(1.) Physical, recreative and social.
(2.) Scholarships.
(3.) Examinations and inspections.
(4.) Training teachers.
(5.) Buildings and appliances.
(6.) Museums and libraries.
(7.) Administration.

1. PHYSICAL, RECREATIVE AND SOCIAL.

In many of the institutions visited provision is made for physical training, musical instruction, and swimming, and full provision is made of a social and recreative character in the form of social and club rooms, reading-rooms, and library, &c. There can be no question that such provision adds greatly to the success of the educational work of the institution, and from the evidence obtained of the general success of such arrangements I have no hesitation in recommending the adoption of similar lines in connection with our larger technical schools, such as Auckland, Wellington, Christchurch, and Dunedin, where it would be possible to have from one thousand to fifteen hundred students. I cannot do better than briefly describe the arrangements made at the Northampton Technical Institute, one of the latest London schools, where provision is made for instruction in all branches of work upon the best possible lines.

Gymnasium.—A fine room 120 ft. long by 50 ft. wide, with a spectators' gallery. The arrangements and completeness are said to be the finest in London (See Plate XXXVII.). Underneath one end of the room are commodious dressing-rooms, baths, and lavatories. The gymnasium is open four nights to men and two nights to women, from 6.30 until 10 p.m. A reduced fee is charged to students joining other classes. Day classes, from 3.30 to 5 p.m., are open to men and women. An efficient instructor is provided.

Capitation paid upon actual classes held under the Boards in New Zealand should enable excellent work to be done in this direction, with very beneficial results to the community and young people.

Swimming-bath.—This is large and commodious, and well fitted with the usual modern accessories (see Plate XXXVIII.). The basin is lined with white marble, and is 100 ft. long by 35 ft. wide, and surrounded with convenient dressing-boxes. Good diving-boards, a water-chute 19 ft. long, and other appliances are provided. Members of the Institute are admitted at 2d. each. Non-members: Men, 5d.; women, 4d.: the former, twenty block tickets, 7s. 6d.; the latter, twenty for 6s. Instruction given before 5 p.m.: Members, 6d. per lesson; non-members, 1s. per lesson. Instruction given after 6 p.m.: Members, 3d. per lesson; non-members, 6d. per lesson. Three instructors are provided—two male and one female.

Social and Club Rooms.—Separate and exceedingly comfortable social rooms are provided for males and females, and also a room for the meeting of clubs and societies formed by students or members, such as chess, cricket, cycling, swimming, Saturday recreation, &c. Special facilities are afforded for the formation and working of clubs for approved objects. All accounts in connection with each club must be submitted for audit every year. Concerts and entertainments are held in the winter session on Saturday evening in the large hall, which will comfortably seat thirteen hundred persons, and is provided with a fine organ. Excellent programmes are arranged by the various committees and clubs, and by the musical classes of the Institute, students from which, if they are sufficiently proficient, are made members of the Institute choir and the Institute orchestra. In the former a fee of 2s. per quarter is charged, the latter is free. Definite works are put in rehearsal for the Saturday concerts, and regular practices held. The musical classes are conducted by specially appointed instructors. The Saturday Recreation Club is formed with the object of arranging pleasant Saturday afternoons in the country at a small cost. Outings had been fixed for every Saturday afternoon for the season, and special trips on Whit Monday to Maidenhead and Taplow, and on Bank Holiday to Windsor.

Library and Reading-rooms.—In the former only about twelve hundred volumes are at present available, this being a matter of growth in a new institution. The reading-room, however, is provided with all the leading papers, magazines, &c., both literary and technical, and is very comfortably furnished and decorated (see Plate XXXIX.). In fact, every provision is made for the comfort and convenience of students, and one cannot help being considerably impressed with the perfection of all detail in the management, and the encouragement given to students in all directions.

2. SCHOLARSHIPS.

The scholarship schemes of Great Britain form one of the most striking features of modern education, and are of the highest importance to the success of education generally. There are at present various kinds and systems of scholarships in force in New Zealand, and I now suggest that every effort should be made to bring about a universal system of scholarships on behalf of the colony, controlled, if necessary, by a Joint Scholarship Board having representatives from the various sections of educational work throughout the colony. There can be no question that much good would result from a systematic distribution of scholarships in the various departments of educational work, and from a recognised system of selection or examination by an independent Board acting on behalf of the whole colony simultaneously.

The question of whether private schools should have the right to compete for scholarships is one of considerable discussion. A recent bill for secondary education in England contains the following clause:—"Aid to private schools: No grant shall be made to a private school, but nothing in this Act shall prevent pupils of such schools from competing for scholarships and exhibitions provided by local authority under this Act. Scholarships may be tenable at efficient secondary schools conducted for private profit under such conditions as the local authority may prescribe."

Having considered the question of scholarships, I make the following suggestions for consideration:—

(1.) That a Joint Scholarship Board be established for the purpose of preparing a complete scheme of scholarships on behalf of the colony in primary, secondary, technical, and university education. The Board to consist of members nominated by the Education Department, University Colleges, Education Boards, technical schools, secondary schools, and primary schools. The Board to organize and conduct all examinations for the award of scholarships, selecting examiners, and making all such regulations as are necessary for the conduct of the work; the expenditure to be met by annual grant from the Education Department, contributions from educational authorities, and candidates' fees.

(2.) Suggested scholarship scheme: (*a*) Primary scholarships for primary-school scholars, tenable at higher-grade schools, secondary schools, or continuation classes; (*b*) secondary scholarships for scholars of higher-grade and secondary schools and continuation classes, tenable at technical schools, art, science, farming schools, or commercial classes; (*c*) university or higher technical scholarships, tenable at special institutions, or for travelling scholarships.

Section A.—Primary scholarships are now awarded by the various Boards of Education, tenable mostly at high schools and colleges. I suggest that these scholarships should, in addition, be tenable at evening continuation classes and higher-grade schools where established. That, in addition, in each district in which art schools are established drawing scholarships should be awarded—say, fifty, available for one year, of the value of 10s. and free instruction for half a day in the art school; twenty of the fifty to be available for a second year under similar conditions, and to be of the value of £1. In each district where domestic-economy classes are established fifty domestic scholarships to be offered—the expenses of country scholarship-holders being paid to the nearest centre. Limit of age to be fifteen.

Section B.—Secondary scholarships: I would suggest an increase of the number of scholarships now awarded by secondary schools, the additional scholarships to be available among the higher-grade schools or continuation classes—the value ranging from £20 to £35 per annum; the scholarships to be tenable at the university colleges, mining schools, farm schools, commercial school, or technical schools; a limited number—say, ten free studentships—also to be granted in each district. Limit of age to be twenty.

Section C.—Technical and art scholarships: In connection with the technical and art schools I suggest, where such schools are established,—

Art Section.—Each district: Five free studentships in evening classes, tenable for two years; five scholarships in evening classes, tenable for two years, of the annual value of £5; two free studentships in the day classes, tenable for two years; two scholarships in the day classes, tenable for two years, of the annual value of £10. Open to the whole colony: Three scholarships, tenable at any art school in the colony approved by the Board, day and evening classes, for two years, of the annual value of £50; one travelling scholarship, of the value of £125 per annum, tenable for two years in any English or continental school approved by the Education Department, the holder to return to the colony upon the completion of the scholarship. The free studentships and scholarships to be offered alternate years.

Science and Technology.—Each district where technical schools are fully established: Ten free studentships, tenable for two years in the evening classes, to be divided amongst students in the plumbing, engineering, building, electrical, chemical, and mining classes; ten scholarships, of the annual value of £5, tenable for two years in the evening classes, to be divided in a similar manner. Open to the colony: Five scholarships, of the annual value of £50, tenable for two years at special institutions, providing complete courses of instruction, one in each of the following sections: Engineering, architecture, chemistry, electricity, and mining. One travelling scholarship, of the value of £125 per annum, tenable at any British or continental school approved by the Education Department for two years, the holder to return to the colony upon completion of his scholarship.

Agricultural Scholarships.—Eight scholarships, of the annual value of £50, to be tenable at the Canterbury Agricultural College for two years, with a possible extension of one year. Six of these scholarships to be available to lads of the school farms, if established.

Commercial Scholarships to be arranged for when provision is made for appropriate instruction. I would suggest that the limit of age for all the above sections should be twenty-five years.

I do not suggest that the whole of the scholarship funds should be provided by the Government; a sum of about £2,000 should be so provided. That amount is exceedingly small in comparison with the benefits likely to be generally derived. Assistance would be rendered by the Education Boards of the colony from ordinary and technical capitation, and efforts should be made to interest the employers, trades-unions, agricultural societies, and chambers of commerce in such a scheme. It would be greatly to the advantage of such societies, as well as to the cause of education, that such should be the case. I have no hesitation in recommending the suggestions I have made for consideration, for I am assured by the highest educational authorities of the value of scholarships and the beneficial effects of co-operation in the matter of a system of education having such widespread results and advantages.

Scholarship schemes to be successful must cover a wide area. The conditions should be as simple as possible, and the examinations uniform, full information being circulated by every possible means. It is for this reason that I suggest that a Scholarship Board be established.

In Appendix C will be found the regulations of the London County Council referring to their scholarship scheme, which will, no doubt, be of considerable value in assisting those intrusted with the formation of any particular scheme of scholarships devised on the colony's behalf or by individual districts or schools. I would advocate the selection of candidates (especially in agricultural, science, building, and other sections) more by special recommendation, and less by examination, where it is possible to do so; and in the art section, particularly, by the merit of works done by students.

3. EXAMINATION AND INSPECTION.

Primary Examination and Inspection.—In visiting the primary schools of Britain I made careful inquiries regarding the new system of inspection adopted by the Education Department in lieu of examination. The generally expressed opinion is that it is proved to be a more real guarantee of a proper distribution of public funds than the annual examination. The question is one of the highest importance to technical education, for by means of the change to freedom of classification manual instruction, domestic economy, and an extension of the kindergarten methods to the standards have become possible, and I am glad to say have been freely adopted by the teachers with very excellent results.

The "new education," as it is called in England, has been forced upon her by continental example, and, as the teachers themselves inform me, the system has proved itself immeasurably superior to the old one. Such being the case, we must, if we are to keep in touch with education, adopt similar lines. I suggest, therefore, a trial of the system in, say, the Wellington Education District, taking the large schools, inspection being substituted for examination, and the syllabus being so relieved as to permit the introduction of manual and domestic instruction upon the lines of the English schools. My remarks with reference to the nature of this instruction are amplified in the earlier chapters of this report.

Regarding the question of inspection, I quote the report of the Committee of Council on Education, as follows: "We regard the changes which we have made in the rules of inspection as being of the utmost importance from the point of view of the efficiency of those schools which are deemed to have reached a high standard of excellence. In the general reports of your Majesty's Chief Inspectors for the past year will be found valuable summaries of the educational effects which can already be traced to these changes recently made in the code. We note with satisfaction that the teachers are proving themselves worthy of the trust which is placed in them; that the relations between them and the Inspectors have become more cordial; that the mechanical forms of teaching, induced by a more mechanical method of examination, are tending to disappear; that the teachers, relieved from the nervous anxiety inseparable from the formal test of an official examination of the scholars, with its inevitable tendency to assign less importance to the daily process of patient teaching than to the carefully prepared display of possibly superficial results, are more at liberty to improve their methods of instruction, and to think rather of the development of the intelligence of their scholars than merely of the effective reproduction of a certain amount of knowledge on a given day."

Drawing Examination.—The first-grade drawing examination has produced such beneficial results in the development of industrial work that I suggest the examination be held by the Education Department throughout the colony until such time as superintendents of drawing are appointed to each district, when the work may be then examined at the visit of such superintendents.

Secondary and Technical Schools.—There is an unfortunate tendency to judge the value of a school's work by the number of passes obtained at examinations, and the efforts of the school are therefore naturally aimed in that direction. Such statistics, however, give no idea of the real value of school work, but only of a small percentage of the higher-grade students. Professor Armstrong, speaking of certain English schools, remarked, "The execrable system of examination we have allowed to grow up has engendered an altogether false conception of what a boy is and can do; we are fast coming to regard the pupil as a kind of animated set of pigeon-holes into which every sort of fact can be crammed and taken out again when required. Experience shows, however, that the boy behaves much as the pigeon-holes would, taking in and giving out information more or less rapidly, but without digesting it—without ever learning to properly apply it."

The worst effects I have noticed in connection with theoretical examination work is the tendency to stereotyped teaching, following a particular text-book, possibly compiled by the known examiner, or working up previous test-papers by the same examiner, who, possessing a particular "fad," may be sure his "fad" will receive special attention, to the detriment of the rest of the work.

That this is so is unfortunate; and I am of opinion that, wherever possible, examination-work should be dispensed with, more reliance being placed upon the teacher to give sound and systematic instruction of the best kind, with a view to the real educational development of his students. There are, of course, cases where examination is a help and a necessity—such, for instance, as teachers and trade students; but otherwise I would not urge students to present themselves for examination in general work.

Examinations for technical schools should, in my opinion, be held solely by the Education Department. The teachers' examinations are now so held, but the local technical examinations, being conducted by the various Boards, are wanting in uniformity. I suggest that the Education Department should undertake all technical-school examinations throughout the colony, and that regular trade certificates be issued by the department, which should be recognised by the various trades, and considered as a part of apprenticeship by those holding the same under certain ages.

Persons desirous of holding special certificates under British institutions would at the same time have the privilege of presenting themselves for examination under the following institutions: The City and Guilds of London Institute; the Science and Art Department, London; the Society of Arts, London.

It is hardly possible to restrict examinations to these three institutions. Local examinations are a necessity in trade subjects, for there are many cases in which candidates would attend only the local one in order to qualify for their trades. There are, again, great advantages in doing so, inasmuch as local interest is aroused, and the masters and men are induced to interest themselves, greatly to the benefit of the trade concerned.

Inspection.—It is satisfactory to note that the Education Department have adopted the plan of payment upon attendance, instead of the English method of partial payment on results, the evils of which are undoubtedly great. The inspection of technical schools is a necessity, and if efficiently done will tend greatly to strengthen the system, for in many cases advice is urgently needed. It is to be hoped the Technical Education Bill will be passed this session, in order that relief may be afforded to many very deserving institutions.

4. THE TRAINING OF TEACHERS.

The training of teachers is of the highest importance to education, and is a subject which receives every attention from the education authorities and County Councils of Great Britain. Almost every County Council provides instruction, generally free, with a refund of railway expenses, to teachers in such subjects as the following: Manual instruction, wood or metal; domestic economy and hygiene; elementary agriculture; drawing and brush-work; elementary science. Regular and systematic courses of instruction are given in these subjects, and, although many years ago these subjects were not taken into consideration, an enormous development has now taken place, and these classes are fully taken advantage of.

I suggest that classes similar to the above should be established throughout the colony, and that kindergarten schools be established in each Island for the training of teachers in the Froebel system. Kindergarten training is undoubtedly the foundation of technical training, and if success is to be obtained it is necessary that our primary system should be made as efficient as possible, every possible assistance being given to teachers to enable them to obtain a very thorough grounding in the best and latest methods of education. Unless this is done little progress can be expected in technical work, and it is for this reason that I have paid particular attention to the work of the primary schools visited.

In such subjects as manual instruction and domestic economy it would be wise to obtain a number of efficient instructors having experience of their special work in England; these instructors to organize systems of work, and particularly to undertake the training of teachers, in order that the work may be effectively dealt with throughout the various districts.

I have, in the various sections dealt with under the heading of "Primary instruction," suggested a small bonus being given to teachers who complete special courses of work in elementary science, drawing, domestic economy, and manual instruction. The amount suggested is more in the direction of covering sundry expenses which teachers may be put to than as a direct bonus. It would, I think, help to encourage the work, the cost to the State being very trifling in comparison with the benefits to be derived.

Technical Teachers.—In the matter of teachers for science and art we are fortunate in having many capable instructors in various parts of the colony, but in the teaching of trades classes we are not so fortunate. Great difficulties are met with in procuring men of experience, for, whilst they may have a practical knowledge acquired in the workshops, they do not, as a rule, understand the theory or principles of the science and arts applicable to their work; nor have they the teaching capabilities, except in rare instances. The difficulties of this work can only be overcome by time and patience, and by a judicious selection of likely men from amongst the student workers in any particular branch of work, and the careful training of such men as far as circumstances will permit. It is out of the question to establish a training college for the colony for such requirements. I hope, however, that the travelling scholarships may be awarded, for such scholarship-holders would be invaluable to the colony upon their return. In this sense the scholarships generally should prove of considerable value in enabling likely persons to undergo such training as will be serviceable alike to themselves and the State. Care should be exercised in appointing technical teachers to see that they are not simply prepared to coach up classes for examination to obtain certificates, but are genuine, capable, and enthusiastic teachers, prepared to give useful information, and having a thorough knowledge of their work.

5. BUILDINGS AND APPARATUS.

Particular attention is paid in Britain to the construction of buildings, and to the nature of the appliances used in connection with technical classes. I would suggest to the department that, as it is proposed that funds to the extent of £1 for £1 shall be provided by the department towards the erection of buildings, or the alteration of existing buildings, for the purposes of technical work, no grant should be made unless the department is satisfied that the school is required and likely to be maintained, and that the site, plans, title, &c., are satisfactory to the department. This condition is insisted upon by the Science and Art Department, particular attention being given to the size, arrangement, and lighting of the various rooms. The Science and Art Department very kindly, at my request, provided me with the plans of two new institutions of a character and size useful to our New Zealand towns. These plans of Accrington and Swindon technical schools I have had photographed, as likely to be of service to this colony. The former institution I visited at the suggestion of the department, and noted particularly the general arrangements.

I may say that enormous sums are now being spent in the building of technical institutions, as, for instance, Manchester; the estimated cost of the building alone, exclusive of equipment and land, being upwards of £130,000. The new technical school of Birmingham, and the Northampton Institute, are also examples of the care and thought bestowed upon the arrangements for successful working. I forward with this report, for the department's information, views of the three buildings mentioned.

Aid for Appliances is also necessary to enable the schools to efficiently provide apparatus, diagrams, and examples, without which it is impossible for schools to satisfy the requirements of the Education Department and earn capitation. In each case a complete list of the apparatus, &c.,

required should be furnished to the department, and in all cases where assistance is rendered a lien should be held upon such objects for not less than five years. I would further suggest that catalogues of the best forms of appliances, apparatus, casts, diagrams, models, furniture, &c., should be obtained by the Education Department with a view to advising educational authorities in such matters as are needful.

6. MUSEUMS AND LIBRARIES.

Museums.—In connection with industrial art it is a necessity that illustrated examples be freely provided, for the express purpose of cultivating a knowledge of what is possible and what has been accomplished in colour, design, and workmanship. The industrial art schools of New Zealand are unfortunate in having no collection of art objects and illustrations, such as are especially provided by the Science and Art Department of Great Britain, and continental departments, on behalf of their schools, by which means they are enabled to treble the value of their work.

Whilst in England I took the opportunity of discussing this question with the director for art, Mr. Armstrong, who is fully alive to the importance of the matter, and who at once very kindly offered to assist the colony in every possible way. Mr. Armstrong accompanied me to the circulating branch of the South Kensington Museum, which contains an extensive collection of framed illustrations, diagrams, and art objects of every industry. These are continually distributed amongst the art schools, together with rare and valuable published works upon the decorative arts. The loans are available for three months. The following branches of art are represented: Sculpture in marble and stone; carvings in ivory, bone, &c.; leather-work, including bookbinding; pottery and porcelain, mosaics, wood-work, metal-work, coins and medals, arms and armour, jewellery, glass vessels, textile fabrics, musical instruments, silversmiths' work, enamels on metal, stained glass, lace, decorative paintings.

Loans are made upon the following conditions: That adequate provision is made for exhibiting them. That their security and safe return are guaranteed. That the exhibition is open to the public, both during the daytime and the evening. That students of the school are admitted free; that arrangements are made for the admission of artisans who are not students in the school at a reduced rate on certain evenings; and that, in the event of the exhibition remaining open more than three months, it be free at least one day and one evening each week.

Seeing that it is impossible for the industrial arts to be taught in connection with our schools without such illustrations as I have described, I make the following suggestions, and would strongly urge that effect be given to the same: (1.) That the Education Department establish a circulating branch of industrial art, a sum of £250 a year being voted for this purpose for the next five years. (2.) That the Science and Art Department of South Kensington be asked to grant a loan of sixty frames of examples annually, containing illustrations or reproductions for circulation amongst the schools of New Zealand; the cost of such loan to be defrayed by the colony. (3.) That publications such as "Grigg's Portfolios of Decorative Arts" be provided in the same manner. (4.) That the sum of £30 be spent annually for the next five years in the purchase of prize national competition works; the Science and Art Department undertaking the selection and purchase on behalf of the colony. (5.) That the authorities of the British Museum be asked to provide drawings, photographs, or reproductions of prints on behalf of the colony, such as are provided for the British schools of art, and at similar cost, or at such reductions in price as can be obtained. The whole of the cost of sections 2 to 5 to be charged to the sum of £250 suggested in section 1.

With reference to sections 2 to 4, Mr. Armstrong, the director for art, Mr. Skinner, assistant director for the Kensington Museum, and Mr. Watts, superintendent of the circulating branch, have very kindly offered to give every possible assistance in the selection of such works as the department will lend, the purchase of reproductions of objects such as can be obtained at Messrs. Elkington's and of other firms, and in the purchase of national-competition works each year—the bare cost to the Science and Art Department only to be paid by the colony.

With reference to section 4, as the works of the national competition were about to be exhibited, I arranged with Mr. Armstrong (subject to the approval of the Minister of Education) to purchase works to the value of £30 on behalf of the colony, as had I not done so the opportunity would have been lost, the works being returned to the various schools within a few months.

The thanks of the colony are due to the gentlemen I have named for the sympathy shown with our difficulties and the keen interest taken in our future welfare.

Referring to section 5 of my suggestion, I called upon the curator of the British Museum and discussed the possibility of obtaining examples such as I have named. I have no doubt that representations made by the Education Department of the colony would meet with considerable success, and that the result would be invaluable to our schools. Visits were also paid to Messrs. Elkington's (Birmingham), Doulton (Lambeth), and the various important publishing firms, with a view to obtaining important concessions should purchases be made on behalf of the colony or individual schools of art.

I am satisfied that if the suggestions made can be carried into effect the schools will be enabled to compete on a very much more satisfactory footing in the national competitions, which are of the highest importance, and will also be very materially strengthened in their efforts and productions, which are now seriously handicapped for the want of suitable aims and examples.

Technical-school Libraries.—This section is also of the greatest importance to school work. Each central institution, at least, should possess a library and reading-room, available for the use of the students, where the best possible works and periodicals might be consulted and text-books lent to registered students.

Every effort should be made to make this branch of work a success, and with this object in view I have mentioned throughout the report the various text- and reference-works found in use at

the schools visited. I also noted the following periodicals available in the reading-rooms attached to the libraries: Plumber and Decorator, Watchmaker and Jeweller, The Builders' Journal, Education, Nature, Architect, The Engineer, Building World, Mechanical Engineer, Journal of Education, Electrical Review, Building News, Mechanical World, The Studio, The Artist, Work, The Art Journal, The Idler, Engineering, English Illustrated Magazine, Magazine of Art, Decorator, Scribner's Magazine, The Century, The Strand, The Windsor, as well as the illustrated weekly papers. These in all cases are bound at the year's end and added to the library.

I would urge assistance being given towards the purchase of technical works. Finally, I would suggest that an officer of the Education Department should be appointed to carefully watch the progress of educational and industrial work in Britain and other countries, and, where possible, obtain copies of lectures and papers read before the various societies, have the same printed and circulated throughout such centres as are affected by the subject, at the same time obtaining such models, illustrations, or lantern-slides as may give due effect to the same.

7. ADMINISTRATION.

The grants proposed in this report would for the first year not exceed £6,000. The details given below make allowance for the fullest possible expenditure, which is not by any means likely to be reached.

1899.	£
Capitation upon classes	2,200
Bonus to teachers for full certificates	250
Scholarships	2,000
Grants towards salaries of specialists	2,000
	£6,450
Grants for buildings and appliances from the special vote—say ...	£10,000

Careful administration and organization are of great importance if success is to be obtained. It is very necessary that the general direction and supervision should emanate from the technical branch of the Education Department, and that thorough inspection should be maintained, in order that surety may be given that energy is not wasted and that funds are wisely expended. Careful direction at the present stage of technical work in the colony will mean a considerable saving, and place this important branch of education upon a sound footing. Money thus expended will save its value many times over.

There are two important points which may repay consideration. Firstly, our City and County Councils are undoubtedly interested in the educational developments within their own area. The main burden of providing the necessary funds falls upon the State. The City and County Councils do not at present possess the power to vote funds for the purpose of education. I suggest, therefore, that provision be made to enable the Councils to render assistance towards the development of industrial classes within their own district by means of grants of land for building purposes, or money-grants (the latter being doubled by the Government); and, further, that the Mayor or chairman of such contributing Council should be a member of the governing body to which contributions are made, providing that the sum exceeds £100 per annum. Secondly: If education in this colony is to be successful the whole system of primary, secondary, technical, and university work should be one of continuity; all schools should bear relation one to another, without such overlapping as is at present the case in England. It is only by assigning each section its definite course, and by true continuity of working, that high success will follow. Our educational districts and centres are comparatively small; it is therefore all the more advisable that our efforts should be concentrated. Let us see, then, that all institutions aided or subsidised by the State are maintained by the various controlling bodies in accordance with the lines to be defined or suggested. Divided authority cannot, and never will, be satisfactory; let each educational section agree upon the best methods of co-ordination and procedure, and so bring the whole system into line. I am led to make the above suggestion by the force of such examples as I have met with in England, by centres having divided authority, and by centres controlled by various bodies having a joint board of advice composed of members appointed by each educational body, where complete co-ordination exists.

If the Manual and Technical Instruction Act is passed by Parliament it will afford considerable relief to the existing institutions and do much to help the promotion of new schools. I would suggest, however, that the Education Boards of the colony, as the Boards having control of technical education in each district, should have the power to extend their number upon special committees, in order that persons having special knowledge of the various branches of technical work may act as co-operative members, as is the case upon the English Boards and Councils. Dr. Garnett, of the London County Council Technical Branch, informed me that very beneficial results had been brought about by this means.

SECTION VIII.—RECOMMENDATIONS.

CONCLUSION.

As a summary of this report, I respectfully make the following recommendations:—

I. That kindergarten schools be established as a part of the primary system of education, with central schools for the training of teachers.

II. That the following subjects be considered as a part of the ordinary standard instruction, the introduction to be gradual, the choice of section being left to the teacher's discretion: Clay-modelling, paper folding and cutting, bricklaying, wire-work, cardboard-work, brush-work.

III. That first-grade drawing examinations for primary schools be held throughout the colony.

IV. That second-grade drawing be taken as the standard of examination for pupil-teachers and teachers of the primary schools, and that drawing and elementary science be separate and distinct from the teacher's classification certificate, a pass in one section only being required in each subject at each examination; a special certificate being issued for such success; the classification certificate being withheld until such passes are obtained; present head-teachers, and teachers over forty years of age, to be exempt.

V. That a bonus of, say, £2 be paid to teachers completing certificates in the following subjects: Subjects specified in recommendation II., drawing, elementary science, manual instruction, domestic economy.

VI. That a grant of £50 per annum be paid the Education Boards towards the salaries of specialists appointed to supervise instruction and train teachers in the following subjects: Drawing, elementary science, manual instruction, domestic economy.

VII. That manual instruction and domestic economy, including practical cookery, be considered a part of the ordinary standard instruction.

VIII. That the present syllabus be modified to such an extent as to permit of the introduction of the above subjects, and that a trial in one educational district be made of such modified syllabus and of inspection in lieu of examination.

IX. That schools known as higher-grade schools be established in continuation of the primary system.

X. That a trial be made of farm-schools as a means of intermediate agricultural education.

XI. That provision be made for evening continuation classes, coupled with higher commercial education.

XII. That applied design be taught in connection with the art schools of the colony.

XIII. That every effort be made to associate the employers' associations and the trades-unions with the system of technical education, and that such education, given in a recognised technical school, should be accepted (subject to conditions to be defined) as a part of apprenticeship.

XIV.—That attention be given in each district where technical schools are established to the training of such persons as are likely to prove efficient instructors in the various trades and technical subjects.

XV. That a complete scholarship scheme be organized, from the primary schools to the university, including travelling scholarships, and that a Joint Scholarship Board be established.

XVI. That special assistance be given in the direction of building-grants and appliances for manual and technical instruction.

XVII. That an industrial art museum be established, and the works and objects circulated amongst the schools of art and technical schools throughout the colony, and that arrangements be made with the Science and Art Department and the British Museum authorities, as suggested on page .

XVIII. That the Education Department establish a sub-department for the control of all technical matters, and undertake all technical examinations in connection with the schools of the colony.

XIX. That a code of regulations be issued by the department, containing the fullest possible information in relation to manual and technical instruction, the same to be widely circulated throughout the colony.

In conclusion, I may be permitted to say that I do not consider this report by any means complete. I have dealt particularly with the primary system, considering that to be the basis of technical work. I hope, at no distant date, to continue my inquiries in America and upon the Continent, where much valuable information is to be obtained.

I have endeavoured to place my information in as practical a form as possible, in the hope that it may be of considerable assistance to workers in educational matters. I shall have accomplished something if I succeed in impressing the fact that great advances have been and are still being made in educational work. There is no evidence of standing still, or being satisfied with past progress. We also in the colony cannot afford to remain satisfied. If we are to keep even ordinary pace with the world's progress, our educational system must be modernised. We cannot afford to treat with contempt what other countries have found a necessity. With regard to industrial progress, it must be generally recognised that such progress is based on the skilfulness of the workman, and upon the excellence and cheapness of his methods of work; and it concerns this colony that her people should be skilful, as well as economical in their time, labour, and material.

Finally, I beg to express my thanks to those authorities whom I have consulted, and who have given valuable information and have afforded me every possible assistance in the course of my inquiries. Amongst these are Sir Philip Magnus, of the City and Guilds of London Institute; Dr. Garnet, of the London County Council Technical Board; Mr. Armstrong, director for art; Mr. Cole, examiner in the Science and Art Department; Messrs. Skinner and Watts, of the Museum Department; Dr. Walmsley, Northampton Institute; Messrs. Reynolds (Manchester); Hewitt (Liverpool); Rhodes (Accrington), Lloyd-Evans (Preston), Young (Glasgow), Hiller (Birmingham), connected with technical instruction; Messrs. Croad, Wyatt, and Hance, secretaries of the London, Manchester, Liverpool, and Birmingham School Boards; Mr. Oldman, secretary of the National Association for the Promotion of Technical Education; the secretary of the Arts and Crafts Institution, London; Miss Jones, Mr. Barter, and Mr. Ortner, officers of the London School Board; the headmasters of the various schools visited; and the Agent-General and officers of his department, for their kindness and courtesy during my stay in England.

29th September, 1898. ARTHUR D. RILEY.

The Hon. Mr. W. C. Walker, Minister of Education.

APPENDIX A.

(Time-table referred to in page 2 in relation to hand-and-eye work, wire- and cardboard-work, Standards I. to IV.)

REA STREET SOUTH BOARD SCHOOL.

BIRMINGHAM SCHOOL BOARD.—CLASS TIME-TABLE.

STANDARDS I., II., AND III. BOYS' DEPARTMENT.

MORNING.

	9 to 9.15.	9.15 to 9.40.	9.40 to 10.15.	10.50 to 11.5.	10.15 to 10.50.	11.5 to 12.
Monday.	I. Bible-reading II. " III. "	Drill .. Word-building "	Reading .. " .. " ..	RECREATION.	Transcription " "	Arithmetic .. " .. " ..
Tuesday.	I. Bible-reading II. " III. "	Hand-and eye Word-building "	Object-lesson "		Reading .. Composition .. " ..	Arithmetic .. " .. " ..
Wednesday.	I. Bible-reading II. " III. "	Drawing " "			Moral lesson.. " .. Drawing ..	Arithmetic .. " .. " ..
Thursday.	I. Bible-reading II. " III. "	Word-building " Wire-work	Composition .. Object-lesson		Transcription Composition .. Reading ..	Arithmetic .. " .. " ..
Friday.	I. Service, 9 to 9.30 II. " " III. " "		Object-lesson Hand-and-eye Object-lesson		Composition .. Reading .. " ..	Arithmetic .. " .. " ..

MID-DAY RECESS.

AFTERNOON.

	2 to 2.10.	2.10 to 2.40.	2.40 to 3.15.	3.45 to 3.55.	3.15 to 3.45.	3.55 to 4.30.
Monday.	Drill .. " .. " ..	Drawing " "		RECREATION.	Word-building Transcription Drill ..	Reading. Recitation. Composition.
Tuesday.	Drill .. " .. " ..	Object-lesson Hand-and-eye Wire-work	Transcription		Reading .. Correction of composition Reading ..	Composition. Reading. Recitation.
Wednesday.	Drill .. " .. " ..	Copybooks Object-lesson Transcription	Drill .. Reading ..		Composition .. Reading .. Object-lesson, geography	Singing. " "
Thursday.	Drill .. " .. " ..	Hand-and-eye Copybooks "			Reading .. Word-building "	Recitation. Reading. "
Friday.	Bible-reading " "	Object-lesson Composition .. " ..	Transcription Word-building Moral lesson..		Reading .. " .. " ..	Singing. " "

REA STREET SOUTH BOARD SCHOOL.

BIRMINGHAM SCHOOL BOARD.—CLASS TIME-TABLE.

STANDARDS I., II., AND III. GIRLS' DEPARTMENT.

MORNING.

		9 to 9.15.	9.15 to 9.40.	9.40 to 10.15.	10.50 to 11.5.	10.15 to 10.50.	11.5 to 12.
Monday.	I.	Bible-reading	Reading ..	Composition ..	RECREATION.	Transcription	Arithmetic ..
	II.	"	Word-building	Reading ..		Drill ..	" ..
	III.	"	"	"		Transcription	" ..
Tuesday.	I.	Service, 9 to 9.30		Tables, 9.45 ..		Hand-and-eye	Arithmetic ..
	II.	" "		Object-lesson		Composition ..	" ..
	III.	" "		"		Word-building	" ..
Wednesday.	I.	Bible-reading	Needlework			Needlework ..	Arithmetic ..
	II.	"	"			" ..	" ..
	III.	"	"			" ..	" ..
Thursday.	I.	Bible-reading	Word-building	Composition ..		Transcription	Arithmetic ..
	II.	"	Hand-and-eye			Reading ..	" ..
	III.	"	Word-building	Object-lesson		" ..	" ..
Friday.	I.	Bible-reading	Reading ..	Object-lesson		Transcription	Arithmetic ..
	II.	"	Word-building	"		Composition (Grammar)	" ..
	III.	"	Hand-and-eye			Composition ..	" ..

MID-DAY RECESS.

AFTERNOON.

		2 to 2.10.	2.10 to 2.40.	2.40 to 3.15.	3.45 to 3.55.	3.15 to 3.45.	3.55 to 4.30.
Monday.	I.	Drill ..	Needlework		RECREATION.	Needlework ..	Reading.
	II.	" ..	"			"	Recitation.
	III.	" ..	"			"	Reading.
Tuesday.	I.	Bible-reading	Object-lesson	Transcription		Reading ..	Composition.
	II.	"	Hand-and-eye			Transcription	Reading.
	III.	"	Copybooks			Reading ..	Recitation.
Wednesday.	I.	Drill ..	Copybooks			Word-building	Singing.
	II.	" ..	"			Reading ..	"
	III.	" ..	Hand-and-eye			Composition ..	"
Thursday.	I.	Drill ..	Hand-and-eye			Reading ..	Recitation.
	II.	" ..	Transcription	Object-lesson		" ..	Word-building.
	III.	" ..	Correction of Composition	"		Drill ..	Reading.
Friday.	I.	Drill ..	Spelling ..	Moral lesson ..		Drill ..	Singing.
	II.	" ..	Moral lesson ..	Composition ..		Reading ..	"
	III.	" ..	Composition ..	Moral lesson ..		" ..	"

REA STREET SOUTH BOARD SCHOOL.

BIRMINGHAM SCHOOL BOARD.—CLASS TIME-TABLE.

STANDARDS IV., V., AND VI. BOYS' DEPARTMENT.

MORNING.

	9 to 9.15.	9.15 to 9.40.	9.40 to 10.15.	10.50 to 11.5.	10.15 to 10.50.	11.5 to 12.
Monday.	IV. Bible-reading V. " VI. "	Word-building Geography .. " ..	Geography .. Reading .. Copybooks ..	RECREATION.	Reading .. Grammar .. " ..	Arithmetic .. " .. " ..
Tuesday.	IV. Bible reading V. " VI. "	Word-building Geography .. " ..	Composition .. " .. " ..		Grammar .. Reading .. Recitation ..	Arithmetic .. " .. " ..
Wednesday.	IV. Bible-reading V. " VI. "	Drawing " "			Drawing .. " .. " ..	Arithmetic .. " .. " ..
Thursday.	IV. Bible-reading V. " VI. "	Word-building Geography .. Manual training	Composition .. " ..		Grammar .. " .. " ..	Arithmetic .. " .. " ..
Friday.	IV. Service, 9 to 9.30 V. " " VI. " "		Geography .. Composition .. Grammar ..		Copybooks .. Grammar .. Commercial correspondence	Arithmetic .. Science .. " ..

MID-DAY RECESS.

AFTERNOON.

	2 to 2.10.	2.10 to 2.40.	2.40 to 3.15.	3.45 to 3.55.	3.15 to 3.45.	3.55 to 4.30.
Monday.	Drill .. " .. " ..	Drawing " "		RECREATION.	Drawing .. Manual training. Drawing.	Reading. Composition.
Tuesday.	Drill .. " .. " ..	Spelling .. Science Composition ..	Grammar .. Science ..		Reading .. " .. Manual training	Recitation. " Drawing.
Wednesday.	Drill .. " .. " ..	Composition .. Copybooks .. Commercial correspondence	Geography .. Reading .. Recitation ..		Reading .. Geography .. Manual training (shop), 3.25 to 5.	Singing. "
Thursday.	Drill .. " .. " ..	Hand-and-eye Manual training Composition ..	Arithmetic .. Geography ..		Geography .. " .. Reading ..	Reading. " Arithmetic.
Friday.	Bible-reading " "	Reading .. Drill .. Geography ..	Moral lesson .. " "		Drill .. Reading .. " ..	Singing. " "

REA STREET SOUTH BOARD SCHOOL.

BIRMINGHAM SCHOOL BOARD.—CLASS TIME-TABLE.

STANDARDS IV., V., AND VI. GIRLS' DEPARTMENT.

MORNING.

	9 to 9.15.	9.15 to 9.40.	9.40 to 10.15.	10.50 to 11.5.	10.15 to 10.50.	11.5 to 12.
Monday.	IV. Bible-reading V. " VI. "	Word-building Spelling .. Geography ..	Geography .. " .. Copybooks ..	RECREATION.	Reading .. " .. Grammar ..	Arithmetic .. " .. " ..
Tuesday.	IV. Service, 9 to 9.30 V. " " VI. " "		Composition .. Science .. Composition ..		Grammar .. " .. Recitation ..	Arithmetic .. " .. " ..
Wednesday.	IV. Bible-reading V. " VI. "	Needlework " "			Needlework .. " .. " ..	Arithmetic .. " .. " ..
Thursday.	IV. Bible-reading V. " VI. "	Word-building Reading .. Geography or Grammar	Composition .. " .. Arithmetic ..		Grammar .. " .. " ..	Arithmetic .. " .. " ..
Friday.	IV. Bible-reading V. " VI. "	Geography .. Paraphrase .. Arithmetic ..	Reading .. Science .. Commercial correspondence		Grammar .. Science .. Mental arithmetic and science	Arithmetic .. " ..

MID-DAY RECESS.

AFTERNOON.

	2 to 2.10.	2.10 to 2.40.	2.40 to 3.15.	3.45 to 3.55.	3.15 to 3.45.	3.55 to 4.30.
Monday.	Drill .. " .. " ..	Needlework " "		RECREATION.	Needlework .. " .. " ..	Drill. Recitation. Composition.
Tuesday.	Bible-reading " "	Spelling .. Drill .. Composition (correction)	Geography .. Tots, mental arithmetic, & theory Science ..		Composition .. Geography .. Reading ..	Reading. " Composition.
Wednesday.	Drill .. " .. " ..	Correction of composition Ditto .. Recitation ..	Geography .. " .. Commercial correspondence		Reading .. " .. Drill ..	Singing. " "
Thursday.	Drill .. " .. " ..	Composition .. Grammar or geography Composition ..	Recitation .. Copy-books .. Geography ..		Word-building Copy-books .. Reading ..	Reading. " Arithmetic.
Friday.	Drill .. " .. " ..	Copy-books .. Geography .. " ..	Moral lessons " "		Reading .. " .. " ..	Singing. " "

APPENDIX B.

SCHOLARSHIPS.

LONDON COUNTY COUNCIL.—TECHNICAL EDUCATION BOARD.

REGULATIONS FOR JUNIOR COUNTY SCHOLARSHIPS (EXAMINATION APRIL, MAY, 1898).

1. The Technical Education Board will, in July, 1898, proceed to award not more that three hundred junior county scholarships, of which about two hundred may be awarded to boys and about one hundred to girls, but these numbers may be varied in accordance with the results of the examination. Girls of thirteen are eligible for appointment to free scholarships in domestic economy.

2. These scholarships are intended to secure for promising pupils, the pecuniary circumstances of whose parents are such that they cannot reasonably be expected to allow their children to continue longer at school, two years' additional education, with special reference to subjects coming within the statutory definition of technical and manual instruction, in order that they may be fit subsequently to take advantage of further technical training. They are, accordingly, to be distinguished from the intermediate county scholarships, which are of larger amount, and intended to carry on the education of the scholar for a longer period.

3. The children of parents who are in receipt of more than £150 per annum or (in the case of persons paid weekly) £3 a week from all sources will not be permitted to compete for these scholarships. The Board requires parents to sign a special declaration before entering their children for the scholarships. The Board further reserves the right to make such inquiries as it may deem fit into the income and position of the parents. In estimating the amount of income, the joint income of both parents, if both parents are alive, must be taken into account.

4. Each scholarship will be awarded, in the first instance, for one year, and will be renewable for a second year if the scholar's conduct and progress are satisfactory to the Board; in the case of scholars who at the time of the award are under twelve years of age the scholarships will be tenable until the end of the half-year in which they attain fourteen years of age. (For this purpose half-years are regarded as terminating on 31st July and 31st December.) The scholarship will include free education at one of the schools named below, or such other suitable school as the Board may hereafter approve, and a money-payment of £8 (eight pounds) during the first year's tenure of the scholarship, and £12 (twelve pounds) during the second year; and if the scholarship is extended beyond the second year the payment will be at the rate of £12 (twelve pounds) a year.

5. Attention is called to various scholarships which are offered on the results of the same examination by bodies other than the Technical Education Board. They do not contain similar restrictions as to the incomes of parents. Particulars as to these scholarships will be published in the *London Technical Education Gazette* for February, 1898.

6. Candidates must, as a rule, be pupils of public elementary schools, must be in the fifth or a higher standard, and under thirteen years of age on the 1st day of May, 1898, and at that date must have worked for at least two school-years as *bonâ fide* scholars of a public elementary school. Twenty-five of the scholarships, however, are open to pupils from schools which are not public elementary schools, provided that in other respects the candidates conform to the Board's conditions.

7. The parents or guardians of candidates must be resident within the Administrative County of London at the time of the award, and must have resided since July, 1897, within the County of London or within the adjoining Counties of Middlesex, Essex, Kent, and Surrey, or within the County Boroughs of West Ham or Croydon. During the tenure of the scholarship the parents must continue to reside either within the County of London or within one of the counties or county boroughs named above.

8. The names of candidates must be sent to the secretary of the Board by the headmasters or headmistresses of their respective schools, or by the parents or guardians of the candidates, not later than Saturday, 2nd April, on forms to be obtained on application by letter or otherwise at the Board's offices.

9. The examination will be held on Saturday, 30th April, and Saturday, 21st May, 1898, and information will be sent a few days before the examination to the head-teachers of those schools from which candidates are sent up respecting the place at which the candidates will be examined. Head-teachers are requested to see that candidates from their schools present themselves for the examination at the appointed place and time.

10. A special examination will be held on Monday, 2nd May, and Monday, 23rd May, for those candidates whose parents or guardians declare that they have conscientious objections to the candidates undertaking an examination on Saturday. Candidates who, for this reason, wish to be examined on Monday must indicate their wish by writing the words "Monday examination" at the head of their application-forms.

11. The examination will be conducted by the Joint Scholarships Board (established by the Incorporated Association of Headmasters), and will consist of two parts—the general subjects, in the whole of which each candidate must satisfy the examiners, and the special subjects.

General Subjects.—To be taken by all candidates: (1.) Arithmetic (including mensuration). This paper will be set in two parts. (2.) Dictation and handwriting. These subjects will be marked from the same exercise. (3.) Composition. The passage for composition will be twice read out, and after half an hour's interval candidates will be required to reproduce the substance of it in fair English, and in their own words.

Special Subjects.—I. For Boys.—Group A: (1.) Drawing (compulsory for all). (2.) Any one of the three following subjects—*(*a*) Grammar, (*b*) history, (*c*) geography. Group B: Any two of the following subjects may be taken—†(*a*) Grammar, (*b*) French, (*c*) algebra, (*d*) mechanics, (*e*) botany, (*f*) physiology, (*g*) chemistry; (*h*) physics, with alternative questions on magnetism and electricity, and on experimental natural philosophy.

II. For Girls.—Group A: (1.) Needlework (compulsory for all). (2.) Any one of the four following subjects—†(*a*) Grammar, (*b*) history, (*c*) geography, †(*d*) domestic economy. Group B: Any two of the following subjects may be taken—†(*a*) Grammar, (*b*) French, (*c*) algebra, (*d*) mechanics, (*e*) botany, (*f*) physiology, (*g*) chemistry; (*h*) physics, with alternative questions on magnetism and electricity, and on experimental natural philosophy; †(*i*) domestic economy, (*k*) drawing.

The marks assigned are—Arithmetic, 50 each part; dictation, 25; handwriting, 25; composition, 50; other subjects, 50 each; preliminary, 200; final, 200: total, 400. In history and geography a choice of questions will be given. The examination on 30th April will comprise the general subjects, together with drawing and needlework; for girls who take both drawing and needlework arrangements will be made so that they may be examined in drawing on 21st May. Only those candidates who satisfy the examiners in the general subjects will be allowed to take the papers in the special subjects.

12. No credit will be given for answers in any subject unless the candidate shows reasonable proficiency in it.

13. An allowance will be made for the age of the candidates by increasing the marks gained by a certain percentage for every month that the candidate's age falls short of thirteen years on 1st May, 1898, but in no case will this percentage be added for more that eighteen months, so that candidates who are under eleven years and six months will be treated as though they were eleven years and six months old.

14. The examination will be framed generally upon the code of the Education Department in force for the current year, and will not extend beyond the syllabus of Standard VI., but will include the work of that and of preceding standards. In the specific subjects the examination will be confined mainly to stages 1 and 2. In the case of boys special stress willl be laid upon arithmetic.

15. No candidate will be elected to a scholarship who has not shown in the course of the examination that he or she is capable of profiting by the instruction provided at the school at which the scholarship is tenable. The Technical Education Board does not, however, bind itself to award the scholarships simply on the results of the examination, but reserves the right to take any other considerations into account, and, in particular, may, if it see fit, restrict the number of scholars to be elected from any particular school or district. The Board also reserves the right to take any steps to satisfy itself that the parents or guardians of the proposed scholar are not in such a position as reasonably to be expected to maintain the candidate at school without the help of the scholarship.

16. The payment of £8 during the first year and £12 during the second year will be made in full to the credit of accounts to be opened in the name of the scholar in the Post-Office Savings-Bank. The payments will be made, provided that the scholar continue in regular attendance at school, in eight equal instalments (of £1 or £1 10s.) on or about the first days of February, March, April, May, June, October, November, and December, beginning on the first day of October, 1898.

17. The Board reserves the right at any time to determine any scholarship without notice, upon being satisfied that its continuance is for any reason undesirable, and on all questions connected with the award or tenure of the scholarships the decision of the Board shall be final.

18. The schools at which the scholarships will be tenable will be such higher-grade schools, schools of science, and public secondary schools as may be approved by the Board. The schools should be equipped with appliances for the efficient teaching of drawing and elementary science, and in the case of girls' schools arrangements should be made for the practical teaching of cookery or other branches of domestic economy. The provision of manual instruction will be regarded as an advantage.

19. If the school is under the same management as an elementary school, the Technical Education Board must be satisfied that the teaching is entirely distinct, that the ex-standard pupils receive their instruction in separate class-rooms, and that their instruction is given by separate teachers.

20. The scholars appointed will be expected, as a rule, to enter the schools at which their scholarships are tenable immediately after the Christmas holidays.

21. The scholarships of the Board will not be tenable with any other scholarships, exhibitions, or similar emoluments.

22. The regulations for the intermediate county scholarships which the Board has established may be obtained on application at the Board's office. The Board's junior scholars will be eligible to compete for intermediate scholarships.

23. In order to enable junior scholars to pass on to the intermediate scholarships, the Board is prepared to extend for one year the junior scholarships of a limited number of scholars who acquit themselves creditably in the preliminary and final parts of the intermediate scholarships examination in June, 1900.

24. The Board's scholarships give free education in addition to the money-payment at any one of the schools on the list.

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* NOTE.—Candidates who take grammar may take it either in Group A or in Group B, but not in both groups.

† NOTE. — Candidates who take grammar and those who take domestic economy may take either of these subjects either in Group A or Group B, but not in both groups.

25. It is probable that about three hundred junior scholarships will be offered under conditions similar to the above on the results of an examination held in October and November next.

[A short syllabus of some of the subjects of examination will be published in the *Gazette* for January.]

SIDNEY WEBB, Chairman of the Board.
WM. GARNETT, Secretary of the Board.

January, 1898.—116, St. Martin's Lane, W.C.

REGULATIONS FOR INTERMEDIATE COUNTY SCHOLARSHIPS (JUNE, 1898).

The Technical Education Board will, in July, 1898, proceed to award not less than fifty intermediate county scholarships, which will be open alike to boys and girls, except that at least fifteen will be restricted to girls.

(*a.*) These scholarships are intended to secure for promising pupils, under sixteen years of age (though the Board reserves the right to award one-half of the scholarships to candidates who are under fifteen years of age), the pecuniary circumstances of whose parents are such that they cannot reasonably be expected to allow their children to continue longer at school, a complete secondary education of a technical type, with special reference to subjects falling within the statutory definition of technical and manual instruction, in order to fit them for the workshop, the office, or the technical college. The scholarships will be awarded in the first instance for one year, but will be annually renewable if the progress of the scholar is satisfactory to the Board; provided that no scholarship will be renewable after the scholar has attained the age of eighteen years, or be tenable for a longer period than five years, except in the case of scholars who intend to compete for open scholarships at the universities during the following school-year, when the intermediate county scholarships may be held till the end of the school-year in which the scholar attains nineteen years of age, on the Board being satisfied of the exceptional ability and industry of the scholar and the reasonable probability of the scholar obtaining a scholarship at the university. In such cases the payment to the scholar during the extra year of tenure will be £35.

(*b.*) The parents or guardians of candidates must have resided for at least two years previous to the 1st June, 1898, within the Administrative County of London, and scholars must continue to reside therein during the tenure of their scholarships. They must be under sixteen years of age on the 1st May, 1898.

(*c.*) The scholarships will include free education at such schools as the Board may approve, together with a money-payment of £20 per annum to scholars under fifteen years of age, or £25 to scholars over fifteen years, increasing by £5 per annum each year that the scholarship is renewed after the scholar attains the age of fifteen. The tenure of the scholarships will date from the 1st of June, and will be renewable on that date in each year. Thus, a scholar who is fourteen on the 1st of March, 1898, will receive £20 during the first year's tenure of his scholarship, £25 for the second year, £30 for the third and £35 for the fourth year, after which, the scholar being over eighteen years of age, the scholarship will not be again renewable. The scholarships will be paid in equal quarterly instalments on the usual quarter-days to the credit of accounts to be opened in the names of the scholars at the Post-Office Savings-Bank, the first payment being made on or soon after the 29th September, 1898, but no payment will be made unless the Board is satisfied that the scholar is diligently pursuing his or her studies in the school approved by the Board for the attendance of such scholar.

(*d.*) The names of candidates must be sent to the secretary of the Board by the head-masters or head-mistresses of their respective schools, or by the parents or guardians of the candidates, not later than Saturday, 7th May, 1898, upon a form provided by the Board for the purpose and obtainable on application at the Board's offices, St. Martin's Place, W.C. It will also be necessary to state upon the form the place of residence and the occupation of the candidate's father or guardian, and the optional subjects selected by the candidate for examination; and the Board reserves the right to reject any candidate who, in the judgment of the Board, appears to be for any reason unsuitable.

(*e.*) The first part of the examination will be held on Thursday, 9th June, and Friday, 10th June, 1898; the second part will commence on Monday, 27th June, and will extend over that and the following six or seven days; and information will be sent to each candidate at the address given on the form of application respecting the exact hour of examination, and the room in which he or she is required to attend.

(*f.*) The examination will consist of two parts. The preliminary, in each subject of which each candidate must satisfy the examiners, will comprise: Arithmetic (including mensuration for the boys and alternative questions for the girls), English composition, geography, and history (with special reference to social conditions), drawing (freehand and geometrical), elementary mathematics, including algebra, up to and including quadratic equations, and geometry covering the subjects of the first book of Euclid.

The obligation to pass in mathematics and drawing will not, for the present, be enforced upon girls.

The second part will comprise the following subjects, of which any candidate may select not more than four from not less than three separate groups: Group I.—English literature, French, German, Italian, Spanish, Latin. Group II.—Pure mathematics (including algebra, geometry, and plane trigonometry), applied mathematics (including dynamics and statics), or experimental mechanics (including hydrostatics). Group III.—Elementary experimental science (including practical work), heat and light (including practical work), electricity and magnetism (including practical work), chemistry (including practical work), botany (including practical work), the laws of health. Group IV.—Botany (including practical work), the laws of health, drawing (advanced), cookery and domestic economy (including practical work in cookery), plain needlework and dressmaking (including practical work), manual training in wood-work or metal-work.

Candidates who take light and heat, electricity and magnetism, or chemistry must also take elementary experimental science, and will therefore be able to take only two other subjects, which must be selected from two separate groups; but candidates may take elementary experimental science without taking any other subject in Group III. All boys must take elementary experimental science, unless they take manual training in wood- or metal-work; and all girls must take elementary experimental science, unless they take needlework or cookery and domestic economy. Only those candidates who obtain a certain percentage of marks in the preliminary portion of the examination will be allowed to enter for the optional subjects; and in elementary experimental science, heat and light, magnetism and electricity, and chemistry only those candidates who have satisfied the examiners in the paper work will be allowed to take the practical examinations, which will be held in the laboratories of one of the polytechnics.

In preparing the list in the order of merit, an allowance will be made for age in the case of all candidates who are under sixteen on the 1st of May, 1898, by the addition to the marks actually gained by them of a certain percentage depending on the number of months by which their age falls short of sixteen years; but in no case will this percentage be added for more than twenty-four months, so that candidates under fourteen years of age will be treated as though they were exactly fourteen. The maximum number of marks obtainable in each subject will be the same, and the papers will be framed so as to be as nearly as possible of equal difficulty. In the papers on botany and the laws of health some elementary questions in chemistry and physics will be introduced, and these subjects may be taken either in Group III. or Group IV., at the option of the candidate.

(*g.*) No candidate will be elected to a scholarship who has not shown in the course of the examination that he or she is capable of profiting by the instruction provided at the school at which the scholarship is tenable. The Technical Education Board does not, however, bind itself to award the scholarships simply on the results of the examination, but reserves the right to take any other considerations into account, and in particular may, if it see fit, restrict the number of scholars to be elected from any particular school or district. The Board also reserves the right to take any steps to satisfy itself that the parents or guardians of the proposed scholar are not in such a position as reasonably to be expected to maintain the candidate at school without the help of the scholarship, and that the candidate is in sufficiently good health to be able to fully utilise the educational advantages which the scholarship offers.

(*h.*) The Board reserves the right at any time to determine any scholarship without notice, upon being satisfied that its continuance is for any reason undesirable, and on all questions connected with the award or tenure of the scholarships, the decision of the Board shall be final.

(*i.*) The schools at which the scholarships will be tenable will be the modern sides of such public secondary schools as may be approved by the Board as giving adequate attention to subjects falling within the statutory definition of technical instruction. The schools must be equipped with appliances for the efficient teaching of drawing and elementary science, and, in the case of girls' schools, arrangements must be made for the practical teaching of cookery or other branches of domestic economy, either in the school or in some neighbouring institution, should any scholars be admitted who desire to take up these subjects. The provision of manual instruction will be regarded as an advantage. In some cases the scholarships, after they have been held for a year or two, may be made tenable at technical institutes or colleges, provided that the inclusive fees do not exceed £25 per annum. Early application should in all cases be made when a transfer is desired.

(*j.*) Successful candidates will be required to submit to the Board the names of the schools they select to attend, and each scholar is recommended to name two or three schools in order of preference.

(*k.*) The scholarships of the Board will not be tenable with any other scholarships, exhibitions, or similar emoluments, whether awarded by the Board or by any other body, except under special circumstances to be approved by the Board.

(*l.*) The Board's junior county scholars will be eligible to compete for intermediate scholarships, but, if elected, will resign their junior scholarships. Junior county scholars appointed in December, 1896, may obtain extension of their junior scholarships from December, 1898, to July, 1899, if they acquit themselves satisfactorily in the preliminary part of the intermediate scholarships examination. A few junior county scholars appointed in July, 1896, may obtain extension of their junior county scholarships for a third year if they acquit themselves with credit in the whole of the intermediate scholarships examination, though they may fail to obtain intermediate scholarships.

(*m.*) Each scholar when elected will be required to forward for the inspection of the Board an authenticated copy of his or her certificate of birth.

The Board will consider that under ordinary circumstances no candidate whose parents are in receipt of an income from all sources of more than £400 a year will be qualified to hold an intermediate county scholarship; and the Board reserves the right of awarding one-half of the scholarships to candidates not falling below scholarship standard whose parents are in receipt of not more than £250 per year.

The following syllabus is intended to indicate the scope of the examination, but the questions asked will not necessarily be strictly confined to the subjects named. The papers set in the last examination have been published in the *London Technical Education Gazette* for August, 1898.

I. *Preliminary Examination.*

Arithmetic.—General arithmetic, including mensuration of the simpler plane and solid figures. Mensuration will not be obligatory upon girls.

English.—(1.) A short essay on one of three given subjects. (2.) A paraphrase of a passage from a classical English author. (3.) An analysis of a similar passage.

Geography.—(1.) General questions in industrial and physical geography, including the elements of physiography. (2.) The geography of the United Kingdom. (3.) The following sections, of which each candidate may select one only—(*a*) The colonies and dependencies; (*b*) Europe; (*c*) Asia, Africa, and America.

History.—(1.) General questions on English history. (2.) More detailed questions on the following periods of English history, of which each candidate may select one only: (*a*) The earliest historic times until 1485; (*b*) 1485–1688; (*c*) 1689 to the date of the examination.

Drawing.—(1.) Freehand—Outlines of generally symmetrical but not rigidly balanced designs for ornament. (2.) Geometry—Plane geometry up to and including the construction of polygons from given data, and problems on the straight line and circle. The representation of simple solids by plan, elevation, and section.

Elementary Mathematics.—Algebra up to and including easy quadratic equations. Geometry, covering the subjects of the first book of Euclid, with easy riders.

II. *Optional Subjects.*

Group I.—English Literature.—A general paper testing knowledge of classical and current literature, followed by questions on certain selected books, of which each candidate may select the questions relating to one, and only one, subject. The selected subjects for June, 1898, are—(1) Shakespeare, "Julius Cæsar"; (2) Shakespeare, "Merchant of Venice"; (3) Shakespeare, "Tempest"; (4) Milton, "Samson Agonistes"; (5) Scott, "Lady of the Lake"; (6) Chaucer, "Prologue." In the general paper full marks will be given for correct answers to about one-half of the questions.

French, German, Italian, Spanish.—(1.) Translation of passages by classical authors from and into the language. (2.) Knowledge of the accidence and of the fundamental rules of syntax. (3.) Dictation. A simple extract to be read by the examiner and taken down by the candidates.

Latin.—Translations from the easier classical authors; questions on accidence, parsing, and syntax; short English sentences and short piece of connected prose to be turned into Latin.

Group II.—Pure Mathematics.—Algebra, up to and including the progressions, with the use of logarithms. Geometry, covering the subjects of Euclid, Books II., III., IV., and VI., with riders. Trigonometry, up to and including the solution of plane triangles.

*Applied Mathematics, including Dynamics and Statics.**—The elements of dynamics and statics, including the fundamental laws and principles of dynamics and their experimental verification; uniformly accelerated motion; impulses, including simple problems on collision, composition, and resolution of forces, the mechanical powers as employed in practical work, and the theory of the equilibrium of a system of forces in one plane.

*Experimental Mechanics, including Hydrostatics.**—In this subject some knowledge will be expected of practical methods of measuring lines, areas, and volumes, including the use of the vernier, callipers, squared paper, micrometer-screws, &c. Candidates will also be expected to be familiar with the actual construction of simple workshop appliances, such as pulley-tackle, screw-jacks, crabs, &c., and of the method of determining the actual relation between the "power" and the "weight" with such apparatus, and the determination of the loss of power through friction; simple methods of verifying in the mechanical laboratory the elementary laws and principles of mechanics and the laws of friction; the determination of specific gravities; the verification of Boyle's law and other elementary experiments in hydrostatics.

Groups III. and IV.—Elementary Experimental Science, including Practical Work.—Measurements of lengths, areas, and volumes; the chemical balance; weighings; comparison of English and French systems of weights and measures; finding the capacities of different vessels; calibration; determination of specific gravities; principle and construction of thermometer and barometer; changes of volume of gases with alterations of temperature and pressure; distillation, solution, evaporation; elementary calorimetry; chemical and physical study of the atmosphere; behaviour of different bodies on heating in air; combustion, the chemistry of a burning candle; indestructibility of matter; elements, compounds and mixtures; the chemical and physical properties of water; determination of composition by weight and volume. Experimental study of the following bodies: hydrogen, oxygen, nitrogen, carbon, carbonic acid, chalk, quicklime, hydrochloric acid, nitric acid, and sulphuric acid. Construction of apparatus for simple experiments in connection with the above, including the preparation of gases. Determination of volumes of gas given off on treatment of common metals and carbonates with the above acids.

Experimental Physics (two separate subjects): Heat and Light, including Practical Work; Electricity and Magnetism, including Practical Work.—In addition to a general acquaintance with the fundamental laws and phenomena of experimental physics, candidates will be expected to know something of the construction of the more common physical instruments, and to show that they are practically acquainted with laboratory methods of carrying out the more simple physical measurements, such as the measurement of temperature, quantity of heat, co-efficients of expansion of solids, liquids, and gases, thermal conductivity (relative), the refractive index and angle of a prism, the focal length of convex and concave lenses, the curvature of lenses, the wave length of homogeneous light, current, resistance, electromotive force, &c.; and a practical examination extending over three hours will be given, to which only those candidates will be admitted who have satisfied the examiners in their paper-work. [No candidate can take these subjects who does not also take elementary experimental science.]

Chemistry, including Practical Work.—The conservation of matter; the laws of chemical combination, elements, and compounds; formulæ and equations; determination of the exact proportion

* Alternative subjects.

by volume and weight of the constituents of air and water; the more commonly occurring non-metallic elements and their chief compounds; the quantitative investigation of well-known chemical reactions; the more important chemical researches of Black, Priestley, Cavendish, and Lavoisier; vapour densities; specific heats; determination of equivalents; the atomic theory; atomic and molecular weights, methods of determination; the preparation and purification of chlorides, nitrates, and sulphates of common metals; sodium, potassium, and iron, and the chief compounds into which they enter; volumetric analysis restricted to acidimetry and alkalimetry. [No candidate can take this subject who does not also take elementary experimental science.]

Botany, including Practical Work.—The elements of chemistry, physics, and mechanics, as far as they are necessary for the intelligent study of elementary botany. The main outlines of the structure of the following organisms as far as they illustrate the fundamental facts of vegetable morphology: torula, spirogyra, fucus, pteris, selaginella, pinus, helianthus; elementary vegetable physiology and anatomy. The processes of nutrition and fetilisation of plants; the principles of classification of main groups. Candidates will also be required to describe actual specimens from the more common natural orders, and to know their leading characteristics.

The Laws of Health.—The elements of chemistry, physics, and mechanics, as far as they are necessary for the intelligent study of elementary physiology. The general structure of the heart; the circulation of the blood; the main features of the alimentary and respiratory systems; classification of food-stuffs; the action of the various secretions upon them; bread, meat, and milk as articles of diet; adulteration of food; detection of adulterants; the composition of air and water; storage of water; the detection of impurities in air and water; ventilation; the spread of disease by impure water; bacteria.

Drawing.—Any two of the following: (1.) Model: Outline drawing of objects to illustrate acquaintance with practical perspective. The groups may be placed either above or below the level of the eye. (2.) Shading from simple cast of ornament, or from a group of any selected common objects, such as oranges, eggs, books, &c. (3.) Freehand: Design, on the basis of a common plant, to fill a given space. A plant, or a drawing showing the characteristic growth of the plant, will be placed before each candidate. (4.) Mechanical drawing: To make plan, elevation, and section of a simple piece of mechanism.

Cookery and Domestic Economy.—Theoretical: Use of food to the body, its digestion and assimilation; effect of heat on food-stuffs. Nutritive value and digestibility of various foods. Suitable diet for children and invalids and for persons of various occupations. Different ways of cooking food; instances of each; main rules to be observed in cooking. Washing bed- and body-linen, flannels, and coloured materials. Use of soap and soda, ammonia, starch, borax, blue, turpentine, &c., in washing and ironing. Hard and soft water, advantages of each for drinking or for cleansing. Importance of fresh air and sunlight to health. Ventilation. Destruction of refuse. Dustbins, sinks, drains. Stimulants, their use and abuse. Alcohol, tea, coffee, &c. House-cleaning. Care of stoves, iron, tin, brass, and copper utensils. Cleaning wooden and painted tables, boards, &c. Washing glass and china. Practical: Cooking and dishing-up simple dishes; cleaning of the utensils used. [Candidates taking cookery and domestic economy must take the practical examination.]

Needlework and Dressmaking.—Theoretical: Stitches used in plain sewing, appropriate use of each. Various modes of joining materials, appropriate use of each. Setting on bands, gathering and plaiting materials. Patching dress materials, calico, and flannel. Darning linen, calico, knitted and woven woollen materials. Right and wrong way of cutting materials for various parts of garments. Suitable materials for linings. Rules for tacking lining to dress material, and for tacking together various parts of lined bodice. Practical: Drawing or folding, and cutting out under-garments to given measure. Drawing pattern of dress-bodice from given measurements, showing by lines the direction of the materials. Tacking on patches, making a button-hole, or other practical needlework. [Candidates taking needlework and dressmaking must take the practical examination.]

Manual Training in Wood-work or Metal-work.—Candidates who select this subject must send, attached to their application forms, a syllabus of the course of study which they have pursued, and the practical examination to which they will be submitted will be based on this syllabus, if approved by the examiner.

Wood-work.—Candidates must be able to make working drawings of the exercises they construct, and the examination will consist of two parts—viz., workshop drawing and the use of tools. In the drawing examination candidates will be required to make, from memory, plane elevations, and sections, properly projected, of simple solids or ordinary joints. They will also be expected to make plane elevations, and sections from isometric or other conventional drawings submitted to them. Candidates will be expected to answer questions upon the structure of ordinary timber-trees, the behaviour of timber in seasoning, and the most common defects in ordinary timber; the nature and use of glue and other materials used for fastenings, such as nails and screws. Candidates most have a knowledge of the construction and principles involved in the use of the more common bench-tools, and will be expected to sharpen their own chisels and gouges and to sharpen and adjust their planes. Accurate workmanship in a limited field will be regarded as of greater importance than a wide extent of training.

SIDNEY WEBB, Chairman of the Board.
WM. GARNETT, Secretary of the Board.

St. Martin's Place, W.C., October, 1897.

REGULATIONS FOR SENIOR COUNTY SCHOLARSHIPS (1898).

1. The Technical Education Board will be prepared in July, 1898, to award not more than five senior county scholarships of the annual value of £60, in addition to the payment of college

fees not exceeding £30 per annum. The scholarships will be tenable for three years, and subject to annual renewal.

2. The scholarships are intended to provide the means of obtaining advanced technical training in a university, university college, or technical institute of university rank for students (young men or women) of exceptional ability who would otherwise find it impossible to secure such training.

3. Candidates must, as a rule, be under twenty-two years of age on 1st June, 1898, but the Board reserves the right to give preference to candidates under nineteen years of age.

4. The scholarships are offered with the view of encouraging the study of science and art with special reference to industrial requirements, and will be tenable at such institutions giving appropriate education within the statutory definition of technical instruction as may be selected by the scholars and approved by the Board.

5. Candidates must make application in writing, addressed to the secretary of the Board, not later than Monday, 16th May, 1898, and must give a full account of their educational career and financial position, particulars of any public examinations they have passed, and of the course of study which they propose to take up by the help of these scholarships. Each application should be supported by testimonials from teachers or other persons in public positions acquainted with the candidate's circumstances or ability, and the names of not less than three referees to whom the Board may apply for further information should be given. The date of the candidate's birth must also be stated. Applications should be made, upon forms which may be obtained from the secretary of the Board, on or after 18th April.

6. In the selection of scholars the Board will have regard, in the first instance, to the past achievements of the candidates, but the Board reserves the right to require any or all of the candidates to undertake an examination if it think fit.

7. No candidate will be eligible whose parents enjoy an income from all sources of more than £400 per annum.

8. The county scholarships are awarded under "The Technical Instruction Act, 1891," which enables a local authority to provide scholarships for "students ordinarily resident in the district of the local authority." It is therefore essential that candidates should be ordinarily resident within the Administrative County of London, including the County of the City of London.

9. Payments will be made to scholars in quarterly instalments on or about the usual quarterly days. The first payment will be made on or about 29th September, 1898.

SIDNEY WEBB, Chairman of the Board.
WM. GARNETT, Secretary of the Board.

St. Martin's Place, W.C., October, 1897.

REGULATIONS FOR JUNIOR SCHOLARSHIPS IN PRACTICAL GARDENING.

The Board will proceed in July, 1898, to award three junior scholarships in practical gardening, tenable at the gardens of the Royal Botanic Society in Regent's Park. These scholarships offer to boys who wish to become gardeners an opportunity of going through a thorough course of training. The following are the regulations relating to the award of the scholarships:—

1. The junior scholarships in practical gardening are tenable at the School of Practical Gardening which has been established in the gardens of the Royal Botanic Society in Regent's Park.

2. The scholarships will be awarded, not upon the results of a set examination, but upon a consideration of the record and qualifications of the candidates. Each candidate must furnish the Board with a statement as to his past career and his future intentions, and his application must be supported by specific recommendations from his headmaster and other teachers.

3. The scholarships are open to boys who are not less than fourteen and not more than sixteen years of age on the 1st May, 1897.

4. Candidates must be resident within the Administrative County of London at the time of the award of the scholarships, and must continue to reside within the county during the tenure of their scholarships.

5. The scholarships will provide free instruction in horticulture at the gardens of the Royal Botanic Society in Regent's Park. They will also provide a maintenance grant of £20 per annum to scholars under fifteen and £25 per annum to scholars over fifteen years of age. The scholarships will be awarded in the first instance for one year, but will be renewable for a second or even for a third year if the progress of the scholar is satisfactory to the Board.

6. No candidate will be eligible for these scholarships whose parents are in receipt of more than £250 per annum.

7. Applications for these scholarships should be sent in not later than the 7th May, 1898. The requisite forms may be obtained from the secretary of the Board, St. Martin's Place, W.C.

SIDNEY WEBB, Chairman of the Board.
WM. GARNETT, Secretary of the Board.

St. Martin's Place, W.C., December, 1897.

REGULATIONS FOR EVENING EXHIBITIONS IN SCIENCE AND TECHNOLOGY (1898).

[Important additions and alterations have been marked *.]

1. The Technical Education Board will be prepared in June, 1898, to award not more than *120 evening exhibitions in science and technology, which are intended to defray the fees and travelling-expenses of persons occupied during the day in the ordinary avocations of life, and attending classes in science or technology in some polytechnic, school, or other institute approved by the Technical Education Board. The exhibitions will be open to persons of either sex. Candidates

must be ordinarily resident within the Administrative County of London, and exhibitioners must continue to reside therein during the tenure of their exhibitions. The Board will not consider a candidate to be ordinarily resident within the administrative county whose home is outside the administrative county, but who is temporarily residing within the administrative county for the purpose of attending a London school.

2. The exhibitions will be of the value of £5 per annum, and will be awarded in the first instance for one year, but will be renewable at the pleasure of the Board for a second year, and under very exceptional circumstances may be renewed in a few cases for a third year.

3. Payment will be made through the Post-Office Savings-Bank in four equal instalments on or about the first days of October, January, April, and July, subject to satisfactory reports being received of the progress made by the exhibitioner, the first payment being made on or about the 1st October, 1898.

*4. Candidates who compete for these exhibitions must enter under one of the following classes :—

Class A.—Candidates under this head will take the whole of the subjects of examination in Group I., and also select one subject from Group II. (They may also, if they wish, submit works for competition; see section 5.) It is expected that boys who have recently left school or who are leaving school in the summer will enter under this class.

Class B.—Candidates under this head will take one subject of examination from Group II., and also one subject from Group III. (They may also, if they wish, submit works for competition; see section 5.)

Class C.—Candidates under this head will submit works for competition; see section 5. (They may also, if they wish, select one subject of examination from either Group II. or Group III.) It is expected that journeymen and artisans will enter under either Class B or Class C.

N.B.—If a sufficient number of qualified candidates present themselves, at least twenty of the exhibitions will be awarded to candidates who compete under Class A; at least fifty will be reserved for candidates who submit works.

Subjects of Examination.

Group I. (General).—For Class A only—Elementary arithmetic, freehand sketching and very elementary practical geometry, a short essay on some subject connected with every-day life.

Group II. (Science).—Biology, including physiology; botany, building construction, chemistry, experimental physics, geology, geometry, machine construction, mathematics, mechanics, metallurgy, mineralogy, steam.

Group III. (Technology).—Boot and shoe manufacture, bread-making, brickwork, cabinet-making, carpentry and joinery, carriage-building, casting and moulding, electrical engineering, electrical-instrument making, electro-metallurgy, gas manufacture, glass manufacture, iron and steel manufacture, leather manufacture, masonry, mechanical engineering, metal-plate work, oils and fats, oils, colours, and varnishes, painters' and decorators' work, paper manufacture, pattern-making, photo-process work, plumbing, sanitary engineering, ship carpentry and joinery, soap manufacture, surveying and taking out quantities, telegraphy and telephony, watch- and clock-making.

5. Any candidate in any of the classes A, B, or C may submit for competition any specimens of work executed by himself or herself since Easter, 1897. Works must be delivered at the Board's offices, St. Martin's Place, or at some other place to be announced later on, not earlier than the 14th March, and not later than the 11th April. Each work must bear a label specifying the name and address of the candidate, and the place of study (if any) attended by the candidate. These labels may be obtained from the Board's secretary on and after the 1st March. Candidates must be able to produce evidence satisfactory to the Board that the works submitted have been executed entirely by themselves, and the Board may require any candidate to prove his or her ability to carry out the works submitted by executing some portion of them in the presence of an examiner. Copies of mechanical or other drawings will not be accepted as works for this purpose.

6. Candidates must make application on or before Monday, the 14th March, 1898, on forms which will be obtainable on application (by post or otherwise) at the Board's offices, St. Martin's Place, W.C., on and after the 1st March, 1898. Candidates must state fully their occupations and wages (or intended occupations), or, if dependent on their parents, the occupations and incomes of their parents, and no candidate will be eligible for an exhibition who is in receipt of more than £2 per week, or who, being under twenty-one years of age, is dependent upon parents who are in receipt of more than £4 per week from all sources. Candidates must state on their application forms the class of competition under which they desire to enter, the subjects of examination which they select, and if they submit works they must give a general description of the works submitted.

7. The examination in the subjects included in Group I. will take place on Tuesday, the 19th April, that in the subjects of Group II. on Wednesday, the 20th April, and that in the subjects of Group III. on Thursday, the 21st April, from 7 to 10 p.m. on each evening. Each candidate will receive notice, shortly before the date of the examination, of the institution at which he or she will be examined. [The papers set at the last examination were published in the *London Technical Education Gazette* for June, 1897, copies of which may be obtained from Mr. Edward Stanford, 26 and 27, Cockspur Street, S.W., price 2d.]

8. Exhibitioners will be required to attend classes in one or more of the branches of science or technology named in Groups II. and III., including either laboratory-work or workshop practice, during not less than four hours per week from the opening of the classes in September until the end of the session, and they must obtain the Board's approval of the classes selected before joining them.

9. The Board reserves the right to determine the tenure of any exhibition without notice if at any time the Board is of opinion that its continuance is undesirable.

10. No person already holding an exhibition will be permitted to compete again for the same exhibition.

11. An evening exhibition in science and technology may not be held simultaneously with a junior artisan evening art exhibition.

12. As a rule, the Board's exhibitions are not tenable in conjunction with any other scholarship or exhibition which carries with it a money payment to the exhibitioner, and exhibitioners are required to inform the Board in the event of their being elected to any other scholarship or exhibition.

13. The principals of institutions at which the Board's exhibitions are held are required to report to the Board on the conduct and progress of the Board's exhibitioners in December and June of each year on forms supplied by the Board for the purpose, and the continuance of any exhibition will be conditional upon such reports being satisfactory. Principals are requested to inform the Board whenever exhibitioners are frequently absent from their classes through illness or any other cause, and special reports should be sent at any time when circumstances may appear to call for such action.

NOTE.—Apprentices and others engaged in art industries, such as goldsmiths' work, silversmiths' work, carving, pottery manufacture, printing and lithography, bookbinding, and design for furniture or any other artistic trade, should become candidates for the art scholarships or exhibitions offered by the Board, particulars of which can be obtained from the Board's secretary.

SIDNEY WEBB, Chairman of the Board.
St. Martin's Place, W.C., October, 1897. WM. GARNETT, Secretary of the Board.

REGULATIONS FOR DOMESTIC-ECONOMY SCHOLARSHIPS.

The Technical Education Board will, in February next, proceed to award ten free scholarships in domestic economy, to be held at Wandsworth Technical Institute, under the following conditions:—

1. The selection of candidates to be left to the discretion of the Board.

2. Candidates must be resident in the Administrative County of London, and must continue to reside therein during the tenure of their scholarships.

3. Candidates must be either pupils about to leave school, being not less than thirteen years of age and having passed the Fifth Standard, or ex-pupils who have left school for a period of not more than one year, having been thirteen years of age at the time of their leaving, and having also passed the Fifth Standard.

4. The names of candidates must be sent to the secretary of the Board, marked "Domestic Economy Department," not later than the 22nd January, 1898, on forms obtainable by written application at the Board's offices. The Board will require evidence that the pecuniary circumstances of the parents are such that they cannot reasonably be expected to allow their children to continue their education without such aid as the scholarships are intended to afford. No candidate whose parents are in receipt of more than £2 a week, or £100 a year, will be eligible for a scholarship.

5. The Board reserves the right at any time to determine any scholarship without notice upon being satisfied that its continuance is for any reason undesirable, and on all questions connected with the award or tenure of the scholarships the decision of the Board shall be final.

6. Successful candidates must be provided with a certificate of health, forms for which will be sent to successful candidates from the Board's office, and which must be given on the opening day of the term to the head-teacher of the domestic-economy school.

In the case of any candidate who may be judged by the lady superintendent of the domestic-economy school to be physically unfit for the work of the school, a medical examination will be required.

7. Candidates must undertake to attend the school of domestic economy on five days in the week, at such hours as shall be decided upon by the governing body, for a period of five months, during which they will be instructed in cookery, needlework and dressmaking, laundry-work, housewifery, and hygiene.

8. All materials and books will be supplied by the governing body of the institute, and, in order to facilitate the attendance of children of the poorest parents, the scholars will be provided with dinner and tea on the days on which they attend the school, and will retain possession of the dress and other garments made by them during the needlework lessons.

The head-teacher and managers of each public elementary school for girls within the neighbouring parliamentary divisions of the County of London are invited to nominate three candidates for the selection of the Board.

NOTE.—Further scholarships will be offered at the end of the five months' course to girls whose parents shall desire them to remain for a further course of instruction, and the award of these scholarships shall be made by the Board on the recommendation of the head-teacher of the domestic-economy school. The scholarships will entitle the holders to twenty-one weeks' instruction, together with a dinner and tea on each school-day.

A few apprenticeships in dressmaking have been awarded each year by certain of the city companies to girls recommended to them for proficiency in this subject from amongst the Board's free scholars at the domestic-economy schools.

SIDNEY WEBB, Chairman of the Board.
St. Martin's Place, December, 1897. WM. GARNETT, Secretary of the Board.

REGULATIONS FOR ART SCHOLARSHIPS AND EXHIBITIONS (1898).

The Technical Education Board will proceed in April, 1898, to award not more than one hundred junior artisan evening art exhibitions, not more than thirty artisan art scholarships, and not more than twenty schools of art scholarships, under the following conditions:—

1. Candidates must be ordinarily resident within the Administrative County of London, and scholars and exhibitioners must continue to reside therein during the tenure of their scholarships or exhibitions. The Board will not consider a candidate to be ordinarily resident within the administrative county whose home is outside the administrative county, but who is temporarily residing within the administrative county for the purpose of attending a London school.

2. Each scholarship and exhibition will be awarded in the first instance for one year, and will be renewable for a second year, and in the case of artisan art scholarships for a third year, if the conduct and progress of the scholar or exhibitioner are satisfactory to the Board.

3. Payments will be made through the Post-Office Savings-Bank in four equal quarterly instalments on or about the first days of October, January, April and July, subject to satisfactory reports being received of the progress made by the scholar or exhibitioner, the first payment being made on or about the 1st October, 1898.

4. The names of candidates must be sent to the secretary of the Board not later than Monday, the 14th February, on forms which will be obtainable on application at any of the London schools of art, or at the Board's offices, on and after the 1st February, 1898. The Board will require evidence that the candidates are not in a position to continue their education in art without such aid as the scholarships or exhibitions are intended to afford. The Board will, as a rule, consider candidates to be ineligible who, being more than twenty-one years of age, are in receipt of more than £3 a week, or, being under twenty-one years of age, are dependent upon parents who are in receipt of more than £400 a year from all sources.

5. The Board reserves the right at any time to determine any scholarship or exhibition without notice, upon being satisfied that its continuance is for any reason undesirable, and on all questions connected with the award of tenure of the scholarships or exhibitions the decision of the Board shall be final.

6. The schools at which the scholarships will be tenable will be such schools of art and other institutions in London as may be approved by the Board. The schools must be equipped with appliances for efficient teaching.

7. The scholars and exhibitioners appointed in April will be expected, as a rule, to enter the schools at which their scholarships are tenable not later than September, 1898.

8. In awarding the scholarships the Board may take into account any circumstances which in its judgment are of importance, and in particular will make an allowance for age in determining the final order of merit. As a rule no candidate will be eligible who is over twenty-five years of age on 1st April, 1898, but the Board reserves the right to allow an extension of age in special cases.

9. All objects and designs submitted in competition must have been executed by the candidates since Easter, 1897, and they may not be copies or duplicates of works which have previously obtained awards in any other competition.

10. No person already holding a scholarship or exhibition under the Board will be permitted to compete again for the same scholarship or exhibition, but candidates holding a junior artisan evening art exhibition may compete for the schools of art scholarships or for the artisan art scholarships.

11. A junior artisan evening art exhibition and an evening exhibition in science and technology may not be held at the same time by the same candidate.

12. As a rule the Board's scholarships or exhibitions are not tenable in conjunction with any other scholarship or exhibition which carries with it a money-payment to the scholar or exhibitioner, and scholars and exhibitioners are required to inform the Board in the event of their being elected to any other scholarship or exhibition.

One Hundred Junior Artisan Evening Art Exhibitions.—The junior artisan evening art exhibitions are intended to cover the fees and travelling and incidental expenses of students engaged during the day, and attending evening classes in schools approved by the Board for the purpose. They will be of the annual value of £5, which will be paid to the exhibitioner in four equal instalments on or about the first days of October, January, April, and July, subject to satisfactory reports being received of the progress of the exhibitioner, the first payment being made on or about the 1st October, 1898. Exhibitioners will be required to attend classes in art on two evenings in the week during the school session. Candidates should be under twenty-five years of age on the 1st April, 1898, but the Board reserves the right to allow an extension of age in special cases. Not more than fifty of these exhibitions will be awarded on the result of an examination, which will comprise — (*a*) Model-drawing in outline; (*b*) simple problems in plane and solid geometry, in the solution of which neatness and the power of using drawing instruments with accuracy will be regarded of great importance. The remainder of the exhibitions will be awarded on the merits of the works submitted by the candidates, as described below.

Thirty Artisan Art Scholarships.—Not more than thirty artisan art scholarships will be awarded. Of these ten will be of the annual value of £20, in addition to free tuition. The remaining twenty will be of the annual value of £10, in addition to free tuition. The sum of £20 or £10 will be paid in four equal instalments on the first days of October, January, April, and July, the first payment being made on or about the 1st October, 1898. Candidates should be under twenty-five years of age on the 1st April, 1898; but the Board reserves the right to allow an extension of age in special cases. Candidates for the artisan art scholarships must be employed in some trade requiring artistic handicraft. The Board will require to be furnished with satisfactory evidence to show that candidates are actually working at a trade. The holders of artisan art scholarships will be required to attend classes in art on three evenings in each week during the school session at a school of art or other institute approved by the Board, and will be required to execute from time to time works in their own craft to be submitted for the inspection of the Board. All artisan art scholarships will be awarded on the merits of the works submitted by the candidates, as described

below. Candidates will be required to produce evidence satisfactory to the Board that the works have been executed by themselves, and must in all cases submit a declaration to this effect signed by their employers.

Twenty Schools of Art Scholarships.—The schools of art scholarships will be of the annual value of £20, in addition to free tuition, and the sum of £20 will be paid in four equal instalments on or about the first days of October, January, April, and July, the first payment being made on or about the 1st October, 1898. Candidates should be under twenty-five years of age on the 1st April, 1898, but the Board reserves the right to allow an extension of age in special cases. They must have attended for at least one session at a recognised school of art within the Administrative County of London. These scholarships will be tenable at the day classes of a school of art to be approved by the Board. Not more than ten of these scholarships will be awarded on the results of an examination, which will comprise—(1) Drawing in light and shade from the cast of the figure; (2) an original design or an original model in clay of ornament based on some plant to be placed before the candidates. The remainder of the scholarships will be awarded on the merits of the works submitted by the candidates, as described below.

Time and Place of Examination.

The examination for junior artisan evening art exhibitions will be held on the evening of Tuesday, 1st March, commencing at 7 p.m., and each candidate will be informed, shortly before the date of the examination, of the institution in which he or she will be examined. The examination for schools of art scholarships will take place on the evenings of Tuesday and Wednesday, 8th and 9th March, commencing each evening at 7 p.m. Each candidate will receive notice, shortly before the date of the examination, of the institution in which he or she will be examined.

Works to be submitted.

In order to encourage art students to devote more attention to that which should be the chief aim of all art teaching—viz., the application of skill, experience, and good taste to necessary work under real conditions rather than under the artificial conditions which obtain in a set examination—the Board will award not less than one-half of the art scholarships and exhibitions on the merits of works executed by the candidates in art classes, workshops, or elsewhere, and submitted by them under the conditions named below. In preparing works for this competition candidates are recommended to think primarily of producing a valuable study or beautiful specimen of craftsmanship of the kind or kinds in which they are most interested, and, with a view to leave the candidates free to do their best work, the conditions of the competition have been made as general as possible, but the works submitted must come under one or more of the following classes *a*, *b*, *c*, and *d*: (*a*.) Preliminary studies from nature and from existing works of art such as should be made by all who are, or intend to become, designers. (*b*.) Original designs, cartoons, and models. (*c*.) Actual objects designed and made by the candidate. (*d*.) Specimens of good craftsmanship, the designs of which need not necessarily be original.

In every case the candidates must produce evidence to the satisfaction of the Board that the works are their own, and the Board may require any candidate to prove his or her ability to carry out the works submitted by executing some portion of them in the presence of an examiner. No model or other object submitted must be too large to be easily moved by one man. No study or object need be highly finished, or very ornamental. Suitability to a specified purpose, the evidence of an understanding of materials, and good workmanship will be especially considered, and over-ornamentation or pretentiousness in the work submitted should be carefully avoided. A design should be harmonious throughout, but need not be restricted to any particular historical style, though, except in the case of work of the highest order of merit, it is recognised that the designs will almost necessarily recall some phase of past art. Works submitted for competition must be delivered at the Board's offices, St. Martin's Place, or some other place to be announced later, addressed to the secretary of the Board, not earlier than the 14th February and not later than the 28th February. All the works of one student must be sent together, if possible, and each separate work must bear a label specifying the competition for which the work is entered, the name and address of the candidate, and the name of the school, if any, at which the work has been executed. These labels will be supplied by the Board on application on or after the 1st February, 1898.

The Board reserves the right to retain in its possession the works of successful candidates for a sufficient length of time to enable such works to be publicly exhibited should the Board consider such exhibition desirable, but the works may be called for, if desired by the candidates, on or before the 31st March. The Board will not be responsible for returning the works to the candidates, and candidates will be required to make arrangements for taking back their works. The conditions to be fulfilled by works submitted in the classes indicated above will be the following:

(*a*.) *Preliminary Studies.*—Candidates may submit not more than six sheets ("half-imperial," each containing one or more studies) of drawings from "life" or from animals, detailed foliage and flower studies, careful studies of animals, birds, &c., in museums, or drawings of works of art existing in museums, churches, or elsewhere. The drawings may be made in any way, varying from mere notes of characteristic detail in pencil to finished water-colour studies (other than pictures) or measured architectural drawings. The sheets forming a set must be fastened together and protected by a brown-paper wrapper. Any candidate may submit a model in clay, wax, or other material, such model being a study from the figure, foliage, or animals, so designed as to show the candidate's power of modelling and composition.

(*b*.) *Original Design.*—Candidates may submit not less than two or more than four sheets ("imperial," or smaller size) of drawings, or one model. Candidates must specify the materials in

which they propose that their designs should be carried out, and must show a knowledge of the properties of these materials, and a clear sense of the purpose to which the finished object may be applied.

As examples of the subjects which may be chosen for original designs, the following may be mentioned; but it is not intended that the candidates shall limit their choice to the examples named: A fountain for a London open space, wrought- or cast-iron railings, an electric-lamp column suitable for an arc-lamp in a London thoroughfare, a portion of a building (the purpose and materials being specified), a piece of furniture, designs for textile fabrics, designs for wall-papers, designs for embroidery, designs for wall painting or stencilling, designs for stained glass, designs for pottery, designs for title-pages or other book decorations, designs for an alphabet of letters, designs for written pages of ornamental manuscript.

(*c.*) *Actual Objects or Parts of Large Work designed and made by the Candidate.*—Candidates may submit one large work or not more than three small works, the design and workmanship being in each case entirely their own. As examples of works in this class the following are suggested, but not with a view to restricting the choice of the candidates to the articles named: A carved panel of wood or stone for a specified purpose; a frieze or panel in plaster; a cabinet, box, or other small piece of furniture, plain, carved, or inlaid; ornamental metal-work, cast, wrought, repoussé, &c.; ornamental lead-work, such as a garden vase, flower-tub, &c., cast or beaten up and decorated with relief, piercings, punched panels, tinnings, &c.; lithography, such as a poster (of double-crown or smaller size), ornamental woodcuts or colour-prints, embroidery, bookbinding, stained or other ornamental glass, pottery, tiles.

(*d.*) *Craftsmanship.*—Work in this class can be accepted only when associated with good design, and the name of the designer or the source of the design must be specified. Examples of workmanship may be submitted in any of the subjects named above or in kindred subjects, including typography. Works may also be submitted which have been designed by one candidate and executed by another candidate, in which case the design and execution will be separately assessed. In order that credit may be given for design, the design must be original.

General.

Candidates may compete in one or more of the classes *a*, *b*, *c*, and *d*, and candidates who undertake the examinations mentioned above may, if they please, also submit works in any of these classes. Candidates submitting works must state clearly on their application-form the number and nature of the works they propose to submit, and whether they are candidates for junior artisan evening art exhibitions, for artisan scholarships, or for schools of art scholarships. Candidates may enter for more than one class of scholarships or for scholarships and exhibitions, in which case they must state clearly on their application-forms their order of preference in the event of their being successful in more than one competition.

Headmasters of art schools and classes are required to report to the Board on the conduct and progress of the Board's scholars and exhibitioners in December and June of each year on forms supplied by the Board for the purpose, and the continuance of any scholarship or exhibition will be conditional upon such reports being satisfactory, and on works being submitted at the end of the school-year for the inspection of the Board. The headmasters of art schools are requested to inform the Board whenever scholars or exhibitioners are frequently absent from their classes through illness or any other cause, and special reports should be sent at any time when circumstances may appear to call for such action.

Extension of Scholarships.

The Board is prepared to extend the tenure of schools of art scholarships and artisan art scholarships for a further period of not more than three years, and to increase their value to such sum not exceeding £60 per annum as the Board may consider necessary for the maintenance of the scholar, in the case of not more than five scholars per annum who submit to the Board works executed by them during the tenure of their scholarships which, in the opinion of the Board, are of such promise as to call for the extension. The extension will be made, in each case, subject to such conditions as regards time and place of study as the Board may determine.

Higher Scholarships and Special-talent Scholarships.

In addition to the scholarships and exhibitions specified above, the Board may eventually be in a position to award, under special conditions, one or more scholarships to students of exceptional promise who exhibit extraordinary talent in some branch of art.

SIDNEY WEBB, Chairman of the Board.
St. Martin's Place, W.C., October, 1897. WM. GARNETT, Secretary of the Board.

REGULATIONS FOR DOMESTIC-ECONOMY TRAINING SCHOLARSHIPS.

The Technical Education Board will proceed in July next to award not more than eight free scholarships at the training school for teachers of domestic economy at the Battersea Polytechnic under the following conditions:—

1. Candidates must not be less than eighteen nor more than thirty years of age; they must be resident within the Administrative County of London, and must continue to reside therein during the tenure of their scholarships.

2. Candidates must undertake to attend the school regularly at such times as may be appointed by the governing body, during the period of six terms (about two years).

3. Candidates must be able to speak distinctly, and must be provided with testimonials of good character from not less than two responsible persons. The physical condition of the selected

candidates will be examined by a medical practitioner (lady) appointed by the Board, and the scholarships will be granted subject to the result of this examination being satisfactory to the Board.

4. Each scholar when elected will be required to forward for the inspection of the Board an authenticated copy of her certificate of birth.

5. The names of candidates must be sent to the secretary of the Board, marked "Domestic Economy Department," not later than the 7th May, 1898, on forms which will be obtainable on application at the Board's offices. The Board will require evidence that the candidates are not in a position to provide their own training without such aid as the scholarships are intended to afford.

6. The Board reserves the right at any time to determine any scholarship without notice upon being satisfied that its continuance is for any reason undesirable, and on all questions connected with the award or tenure of the scholarships the decision of the Board shall be final.

7. The scholarships of the Board will not be tenable with any other scholarships, exhibitions, or similar emoluments, whether awarded by the Board or by any other body, except under special circumstances to be approved by the Board.

8. The school at which the scholarships will be tenable will be the Training School of Domestic Economy at Battersea Polytechnic.

9. The successful candidates will receive a thorough training in the teaching of cookery, laundry-work, needlework, dressmaking, and housewifery, and will also receive instruction in school method and in hygiene, sick-nursing, and "first aid." All materials required will be supplied by the Polytechnic, and the students will be provided with two meals a day free of expense, and will retain possession of the garments made by them in the course of their instruction.

10. The scholarships will be awarded on the result of a competitive examination. The examination will include certain subjects of the examination for intermediate scholarships as defined below, and will be held at the same time and place as that examination :—

(1.) The preliminary examination will be held on Thursday, the 9th June, 1898, and will comprise the following subjects: Arithmetic, English composition, geography, and history.

The preliminary examination is intended only as a qualifying examination, and the marks will not be counted in the competition. A pass in any of the following examinations will be accepted as a substitute for the preliminary examination: Cambridge senior local examination; Oxford senior local examination; Oxford and Cambridge Joint Board higher certificate; College of Preceptors' examination (first class); Cambridge higher local examination; London matriculation; Queen's scholarship examination (first and second class); L.L.A., St. Andrew's; the examination for vice-chancellor's certificate of Oxford University extension; the Cambridge University extension examination for certificates for affiliation to the University; the Cambridge University examination for the vice-chancellor's certificate of systematic study, including the examination in mathematics and languages; the examination corresponding to responsions, Oxford; the examination corresponding to the previous examination, Cambridge. Candidates who have obtained passes in any of the above examinations should send copies of their certificates to the Board's secretary when they forward their application forms.

(2.) The final examination will be held during the week commencing on Monday, the 28th June, and will consist of two parts—(*a.*) Compulsory: *Needlework, freehand drawing. (*b.*) Optional, which will comprise the following subjects, two subjects only may be taken, of which one must be chosen from each group: A—English literature, French, German, Latin; B—Botany (to include practical work), elementary chemistry (to include practical work), elementary mathematics, the laws of health.

11. No candidate will be elected to a scholarship who has not shown in the course of the examination that she is capable of profiting by the instruction provided at the training school. The Technical Education Board does not, however, bind itself to award the scholarships simply on the results of the examination, but reserves the right to take any other considerations into account, and in particular may, if it see fit, restrict the number of scholars to be elected from any particular school or district. The Board also reserves the right to take any steps to satisfy itself that the parents or guardians of the proposed scholar are not in such a position as reasonably to be expected to maintain the candidate at the school without the help of the scholarship. The Board will consider that, under ordinary circumstances, no candidate whose parents are in receipt of an income from all sources of more than £400 a year will be qualified to hold a training scholarship in domestic economy, and the Board reserves the right of awarding one-half of the scholarships to candidates not falling below scholarship standard whose parents are in receipt of not more than £250 a year.

12. The Board does not undertake to employ the students, or any of them, on the expiration of their training, but they will be free to accept any appointment that may be offered to them, whether in London or elsewhere.

The following syllabus is intended to indicate the scope of the examination, but the questions asked will not necessarily be strictly confined to the subjects named. The papers set in the last examination for intermediate scholarships, in connection with which the coming examination will be held, were published in the *London Technical Education Gazette* for August, 1896.

I. Preliminary Subjects.

Arithmetic.—General arithmetic, including mensuration of the simpler plane and solid figures. Mensuration will not be obligatory.

English.—(1.) A short essay of one of three given subjects. (2.) A paraphrase of a passage from a classical English author. (3.) An analysis of a similar passage.

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* Any candidate failing to satisfy the examiners in this subject will be disqualified.

Geography.—(1.) General questions in industrial and physical geography, including the elements of physiography. (2.) The geography of the United Kingdom. (3.) The following sections, of which each candidate may select one only: (*a*) The colonies and dependencies; (*b*) Europe; (*c*) Asia, Africa, and America.

History.—(1.) General questions on English history. (2.) More detailed questions on the following periods of English history, of which each candidate may select one only: (*a*) The earliest historic times until 1485; (*b*) 1485–1688; (*c*) 1689 to the date of the examination.

II. Compulsory and Optional Subjects.

(*a.*) *Compulsory.*—(1.) *Needlework*—Theoretical: Stitches used in plain sewing, appropriate use of each; various modes of joining materials, appropriate use of each; setting on bands, gathering and plaiting materials; patching dress materials, calico and flannel; darning linen, calico, knitted and woven woollen materials; right and wrong way of cutting materials for various parts of garments. Practical: Tacking on patches, making a buttonhole, or other practical needlework.

(2.) *Freehand Drawing.*—Design, on the basis of a common plant, to fill a given space. A plant, or a drawing showing the characteristic growth of the plant, will be placed before each candidate.

(*b.*) *Optional.—Group A.—English Literature.*—A general paper testing knowledge of classical and current literature, followed by questions on certain selected books, of which each candidate may select the questions relating to one, and only one, subject. The selected subjects for June, 1897, are—(1) Shakespeare, "Hamlet"; (2) Shakespeare, "King Lear"; (3) Shakespeare, "Julius Cæsar"; (4) Shakespeare, "Tempest"; (5) Milton, "Paradise Lost," Books VII., VIII. In the general paper full marks will be given for correct answers to about one-half of the questions.

French, German.—(1.) Translation of passages by classical authors from and into the language. (2.) Knowledge of the accidence and of the fundamental rules of syntax. (3.) Dictation: A simple extract to be read by the examiner and taken down by the candidates.

Latin.—Translations from the easier classical authors; questions on accidence, parsing and syntax; short English sentences and short piece of connected prose to be turned into Latin.

Group B.—Botany, including Practical Work.—The elements of chemistry, physics, and mechanics, as far as they are necessary for the intelligent study of elementary botany. The main outlines of the structure of the following organisms as far as they illustrate the fundamental facts of vegetable morphology: Torula, spirogyra, fucus, pteris, selaginella, pinus, helianthus; elementary vegetable physiology and anatomy. The processes of nutrition and fertilisation of plants; the principles of classification of main groups. Candidates will also be required to describe actual specimens from the more common natural orders, and to know their leading characteristics.

* *Chemistry, including Practical Work.*—The conservation of matter; the laws of chemical combination, elements and compounds; formulæ and equations; determination of the exact proportion by volume and weight of the constituents of air and water; the more commonly occurring non-metallic elements and their chief compounds; the quantitative investigation of well-known chemical reactions; the more important chemical researches of Black, Priestley, Cavendish, and Lavoisier; vapour densities; specific heats; determination of equivalents; the atomic theory; atomic and molecular weights, methods of determination; the preparation and purification of chlorides, nitrates, and sulphates of common metals; sodium, potassium, and iron, and the chief compounds into which they enter; volumetric analysis restricted to acidmetry and alkalimetry.

Elementary Mathematics.—Algebra up to and including easy quadratic equations; geometry, covering the subjects of the first book of Euclid, with easy riders.

The Laws of Health.—The elements of chemistry, physics, and mechanics as far as they are necessary for the intelligent study of elementary physiology. The general structure of the heart; the circulation of the blood; the main features of the alimentary and respiratory systems; classification of food-stuffs; the action of the various secretions upon them; bread, meat, and milk as articles of diet; adulteration of food; detection of adulterants; the composition of air, water, storage of water; the detection of impurities in air and water; ventilation; the spread of disease by impure water; bacteria.

SIDNEY WEBB, Chairman of the Board.
WM. GARNETT, Secretary of the Board.

St. Martin's Place, W.C., 5th April, 1897.

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* Only those candidates who have satisfied the examiner in the paper-work will be allowed to take the practical examination, which will be held in the laboratory of one of the polytechnics.

APPENDIX C.

ALTERNATIVE SYLLABUS OF INSTRUCTION IN ELEMENTARY DAY-SCHOOLS.

INTRODUCTORY NOTES.

THIS syllabus is framed on somewhat different lines to the syllabus hitherto in use, and is not intended to supersede the latter, but merely to provide an alternative course of instruction for such schools as choose to adopt it.

The principles on which this alternative syllabus is founded are a development, adapted to the needs of older scholars, of methods with which teachers are already familiar in the infant-school.*

A leading feature in this syllabus is the introduction of drawing at arm's length. Where there are facilities as regards room, &c., this will be best done by scholars standing in front of their slates or boards, which should be fixed in a nearly upright position. In schools where this cannot be arranged the scholars should sit as far back as possible, leaning against the desk behind, with slate or board propped nearly upright on the desk, and at arm's length from the scholar, who should work freely from the shoulder, never touching the slate or board with the wrist or more of the hand than the top joint of the little finger. The slate or board must not be turned about, nor the position of the body shifted in order to draw curves or lines in various directions. These remarks do not, however, apply to brush-work or drawing with instruments.

The possible close connection of the present course of drawing with other modes of teaching in the schools should not be lost sight of. For example, at many points a good teacher may find it possible to use this course as a basis for hand-and-eye training in other suitable material; while the introduction of each new form—*e.g.*, the egg-form, Standards I. and II.—may be suitably connected with object-lessons or stories on familiar objects which suggest that form.

The forms produced and their combinations will naturally suggest decorative and natural shapes, and it should be the object of the teacher to develop this association of ideas.

The materials required will be (1) slates, with chalks, white or coloured, or soft composition slate-pencil, or, where this is practicable, small blackboards or pieces of blackened millboard with chalks and a damp sponge or rag; (2) cartridge-paper and pencils; (3) camel's hair brush, and one or more water-colours.

Nothing in this syllabus must be taken to imply that importance is not to be attached to accuracy and care in the execution of the work herein suggested.

STANDARDS I. AND II.

(*a.*) *Production and Combination of Curved Freehand Forms.*

The primary object is to give control of the hand, and the first exercise is to let the scholars work, as described above, with free arm from the shoulder, sweeping round and round with slight pressure on the slate or board. Gradually, as control of the hand is acquired, the scholar will be able to draw the lines round and round in the same track. In this way, from beginning with indefinite forms, more or less definite forms will be arrived at, of which the ellipse (Fig. 1, p. 104) may be taken as an example. This "whole form" is selected by the teacher as a suitable foundation. It can be developed in two directions—(*a*) the closed curve bounded by a single line (Fig. 4, p. 104), and (*b*) the mass or surface bounded by a curved line, but filled up (Fig. 4, p. 104). Both these whole forms should afterwards be produced with every variety of direction, size, combination of numbers (both of equal and unequal sizes), and conditions as to position. The combinations will suggest natural or simple decorative forms.

Similarly, the egg-shape may be taken. This new form will then be treated in all varieties of position, size, and combinations, as in the case of the ellipse. The interest and variety of the combinations and resulting patterns will be increased by the use of coloured chalks or tints of colour.

No attempt is made to analyse these whole forms into their elements at this stage.

(*b.*) *Straight-line Forms.*

The straight line should be first produced to connect two dots at a single stroke, which may be repeated backwards and forwards several times at first to acquire power; then in all varieties of length and direction—horizontal, vertical, &c.; then in combinations so as to produce simple figures, such as squares, oblongs, and triangles, and suggestions of simple decorative and common forms.

(*c.*) *Drawing from Memory.*

Drawing from memory may be introduced at this stage, the teacher selecting such objects outside the schools as a pillar post-box, a lamp-post, a haystack, a scythe, or a spade, or occasion-

* The following passages in a circular on the subject (Education Department, Circular 322, 6th February, 1893) may be noted:—

"Two leading principles should be regarded as a sound basis for the education of early childhood: (1) The recognition of the child's spontaneous activity, and the stimulation of this activity in certain well-defined directions by the teachers; (2) the harmonious and complete development of the whole of a child's faculties. The teacher should pay especial regard to the love of movement, which can alone secure healthy physical conditions; to the observant use of the organs of sense, especially those of sight and touch; and to that eager desire of questioning which intelligent children exhibit. All these should be encouraged under due limitations, and should be developed simultaneously, so that each stage of development may be complete in itself. . . . You should direct the attention of teachers to the chief consideration which underlies true methods of infant-teaching, viz., the association of one lesson with another through some one leading idea or ideas."

The development of the above principles in the lower standards of schools for older scholars is dealt with in Circular 332 (Education Department, 6th January, 1894).

ally leaving the choice of the object to the scholar. Exercises of this kind, increasing in difficulty, should be continued throughout the higher standards. Any of the preceding exercises may also be repeated from memory.

(d.) Drawing with Instruments (Foot-rule and Set-square).

All straight-line forms given in the above syllabus may also be done with ruler.
Drawing perpendicular and parallel lines with set-square, through a given point.
Drawing lines of given length (no fractional parts of 1″).

[N.B.—Where it is considered desirable the more elementary exercises in brush-work may be introduced at this stage: see below—Standards III. and IV. (*d.*).]

Standards III. and IV.

(a.) Production of Whole Forms and Analysis of Curved Forms.

The freehand work in these standards carries somewhat further the combinations of whole forms produced in the previous standards, and introduces the formation of the circle (Fig. 1, p. 106). The ellipse, egg-form, and other ovals are analysed first into halves (Fig. 2, p. 106), and afterwards into quadrants (Fig. 3, p. 106), and these elements treated in the same way as the complete forms, being combined in various directions, numbers, and sizes so as to produce decorative forms such as shown in Fig. 4, p. 106, of this syllabus. These, when combined, give a large variety of natural and decorative forms.

(b.) Drawing from Large Diagrams and from Simple Objects.

Drawing of curved forms from large diagrams and from very simple objects, such as a preserve-jar, a flower-pot, &c., of sufficient size to be seen by the whole class, is introduced at this stage, and should be followed by the same exercise to be drawn from memory after the removal of the example.

(c.) Straight-lined Combinations, Freehand and Ruled.

In drawing frets and zigzags, Standard III. (Fig. 6, p. 107), both in freehand and as ruler-work, the teacher may allow those scholars who are quick, and have completed their drawings to his satisfaction, to colour portions of them with pencil or coloured chalks, or tint them in water-colour.

(d.) Brush-work.

The elementary brush form is produced by simply touching the paper with a brush full of colour held horizontally, without moving the brush on the paper. Such touches are then repeated in all varieties of position and combination, like the freehand forms given in Figs. 14 and 15, on p. 105, in Standards I. and II., and Fig. 7, p. 107, in Standard III., and suggestions of natural and decorative forms are easily obtained from these combinations in almost infinite number. This may be followed by the production of simple forms with the brush similar to those suggested in fig. 7, p. 107, in Standard III., and Fig. 5, p. 108, in Standard IV.

(e.) Drawing with Instruments (Foot-rule, Set-square, and Compasses).

Drawing perpendiculars of given length, and parallels at given distance, with set-square and by geometrical methods.

Construction of rectangles and triangles of various sizes, and simple plane figures.

Fractional measurement not less than half an inch. Right angles may be drawn with set-squares.

Construction of equal angles. Bisection of lines, angles, and arcs.

The circle in relation to the measurement of angles. Construction of angles of 30°, 45°, and 60°.

Simple geometrical pattern-drawing based on the above.

Construction of simple scales. Drawing to scale from dimensioned sketches or actual measurement of very simple right-lined objects.

Standards V. to VII.

(a.) Patterns and Ornament based upon Natural Forms.

In the more advanced stages of the work, as shown in Figs. 1, 2, and 4, pp. 109 and 110, in Standard V., ornamental forms derived from the foregoing exercises may be combined into simple patterns and repeats, involving the use of brush-work and washes of colour. The natural forms of plants and animals may be broadly treated as motives of ornament, and employed to fill spaces used in decoration, as in Figs. 3 and 5, on pp. 109 and 110, in Standard V., and Figs. 1 and 2, on p. 111, in Standards VI. and VII.

(b.) Drawing of Simple Objects from the Flat and Round.

In Standards VI. and VII. freehand drawing, as in Standards III. and IV., should be taken, but from more difficult examples, flat and round. Various common objects, such as a box or desk, may be used as models; and large leaves, and parts of plants or flowers, may be drawn in outline. Copying from the flat should also be carried further than in the earlier standards. It need not be confined to the outline of ornament, but may include leaves, flowers, fruit, common objects, and simple renderings of insects, birds, and animal forms.

(*c.*) *Geometrical Construction as a Foundation for Design.*

Geometrical forms may be utilised and regarded as the foundation for ornamental arrangements of natural objects, animals, plants, and the like.

(*d.*) *Geometrical Drawing.*

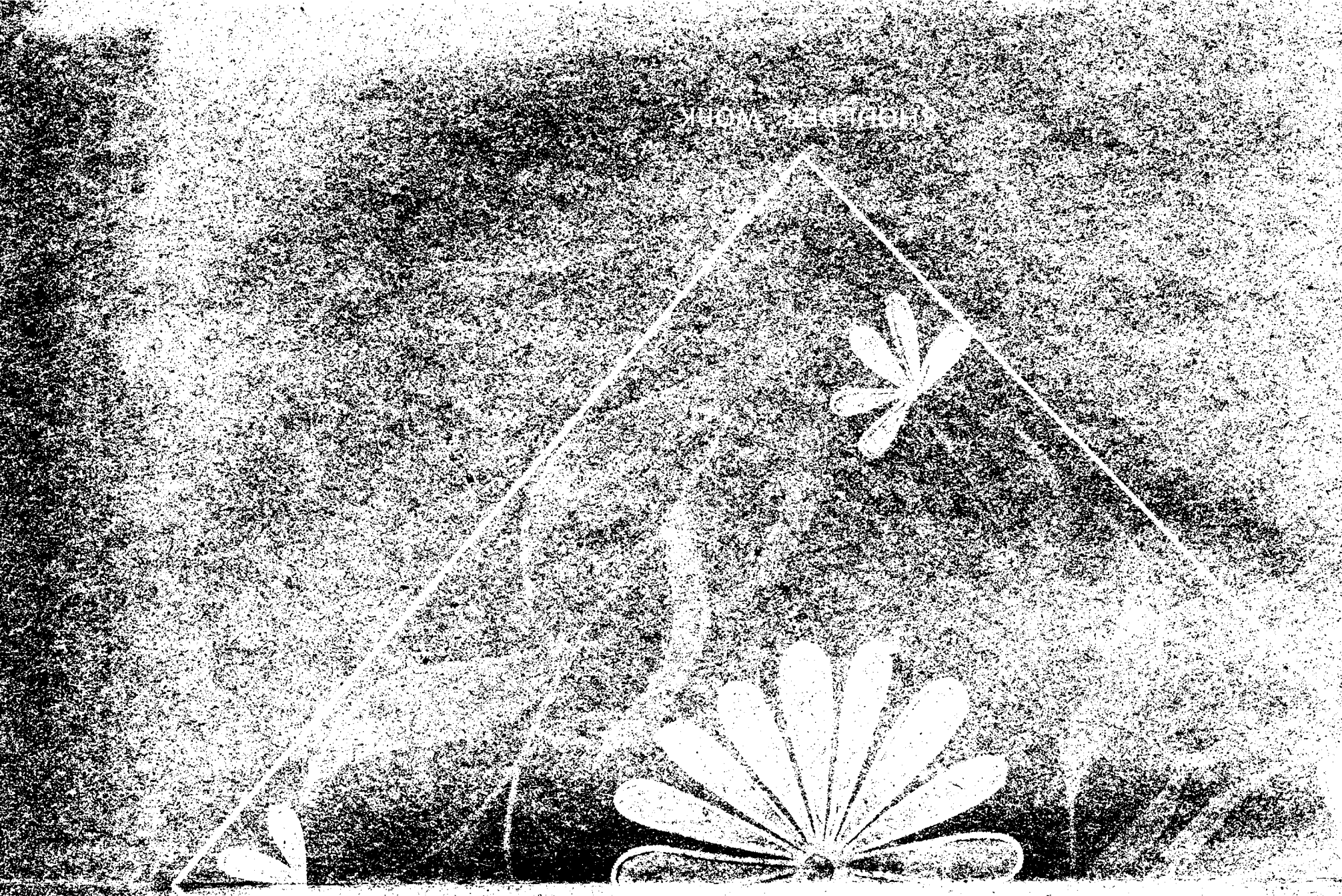
Parallelograms and regular polygons. Proportionate division of lines.
The geometry of the circle and the ellipse. Tangents. Inscribed and circumscribed figures.
Adaptation of these forms to geometric ornament.
Plans and elevations of simple right-lined solids.

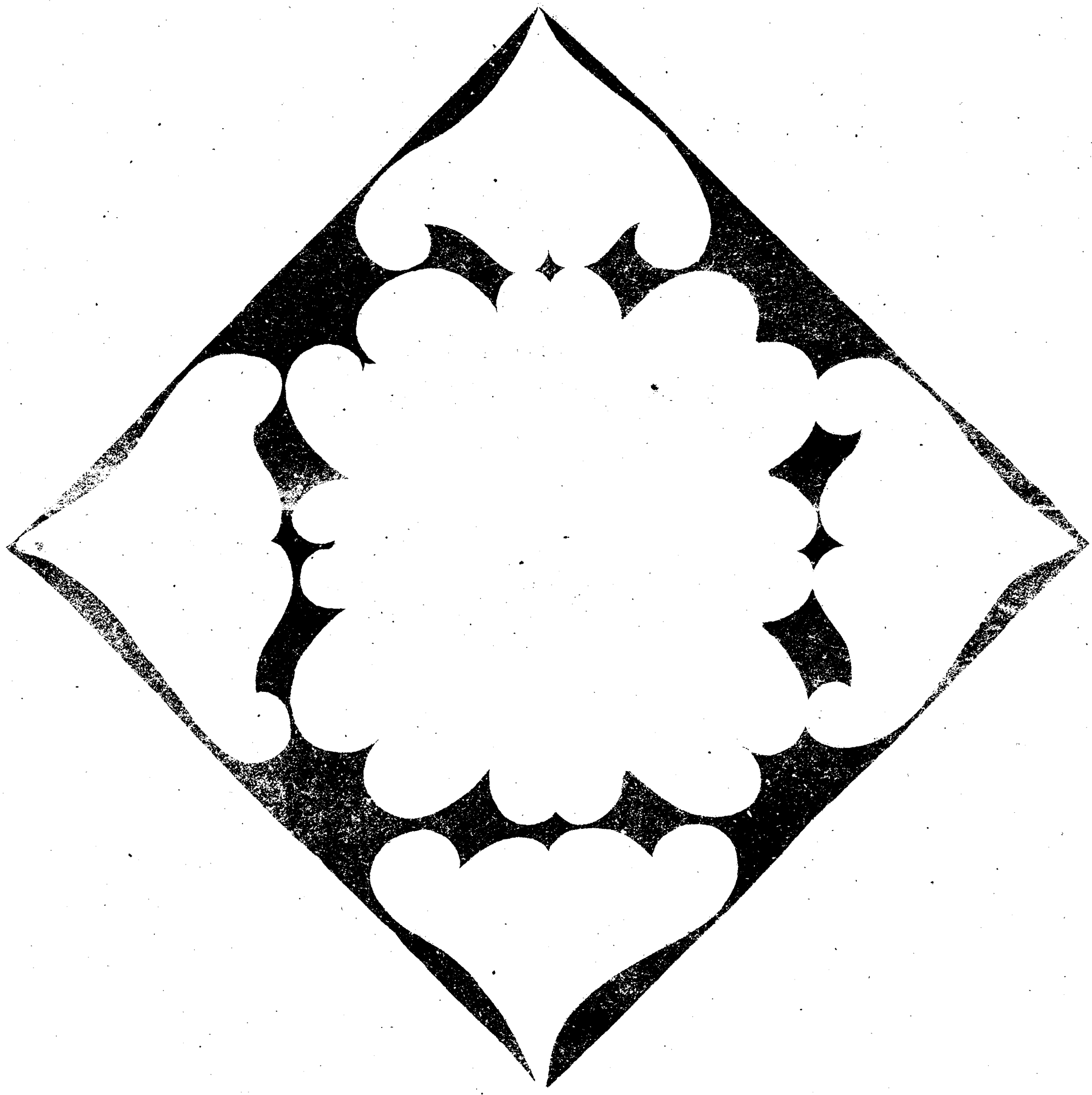
[N.B.—Where provision is made for manual training in wood-work the instruction in advanced scale drawing and solid geometry should be continued in the workshop.]

Approximate Cost of Paper.—Preparation, not given; printing (1,825 copies), £72.

By Authority: JOHN MACKAY, Government Printer, Wellington.—1898.

Price 2s. 6d.]





SCHOOL BOARD FOR LONDON.

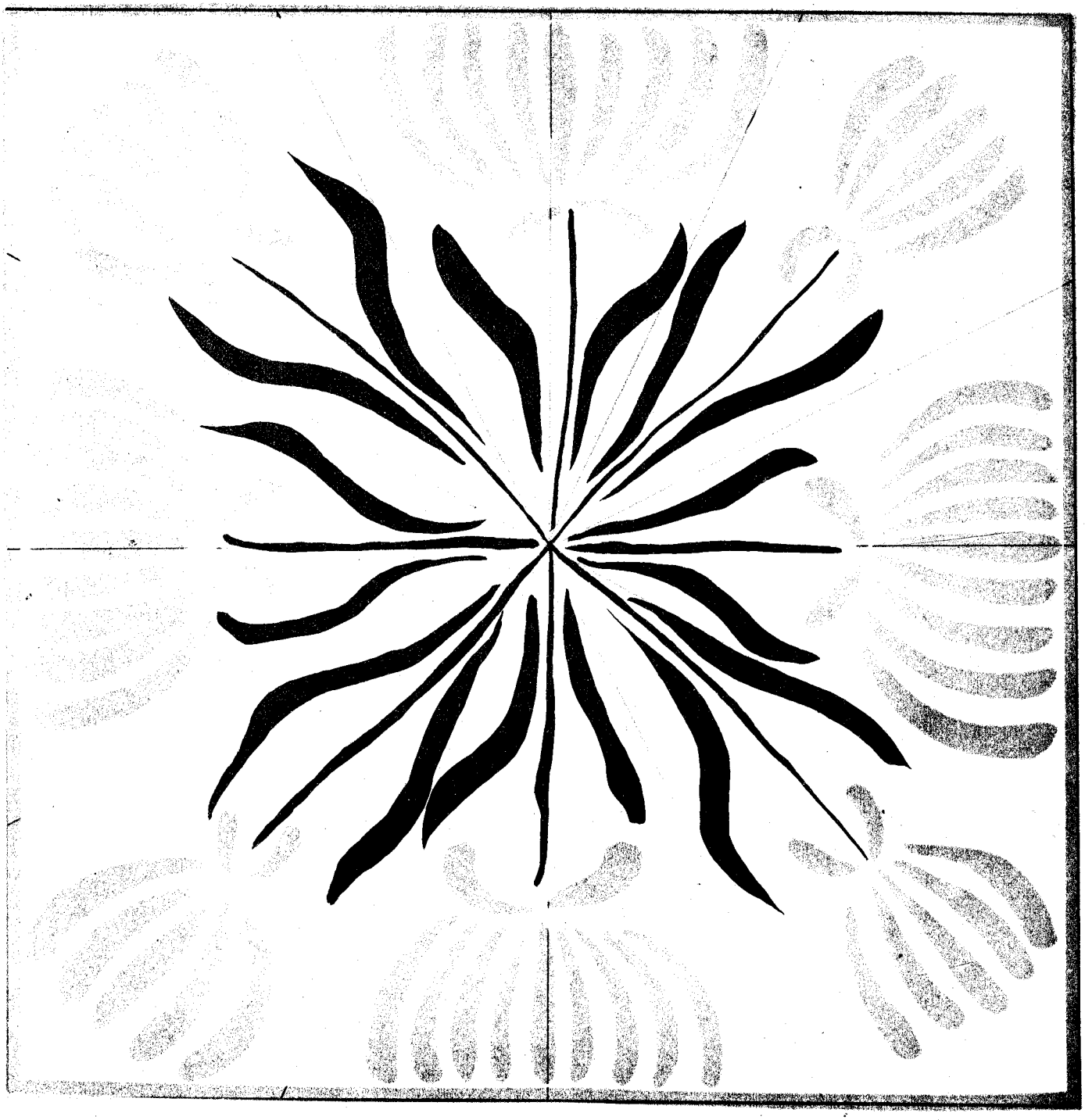
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Drawing Standard III. Name in full William Nash Age 9

SOUTHWARK DIVISION

ALMA SCHOOL

The Alma School.



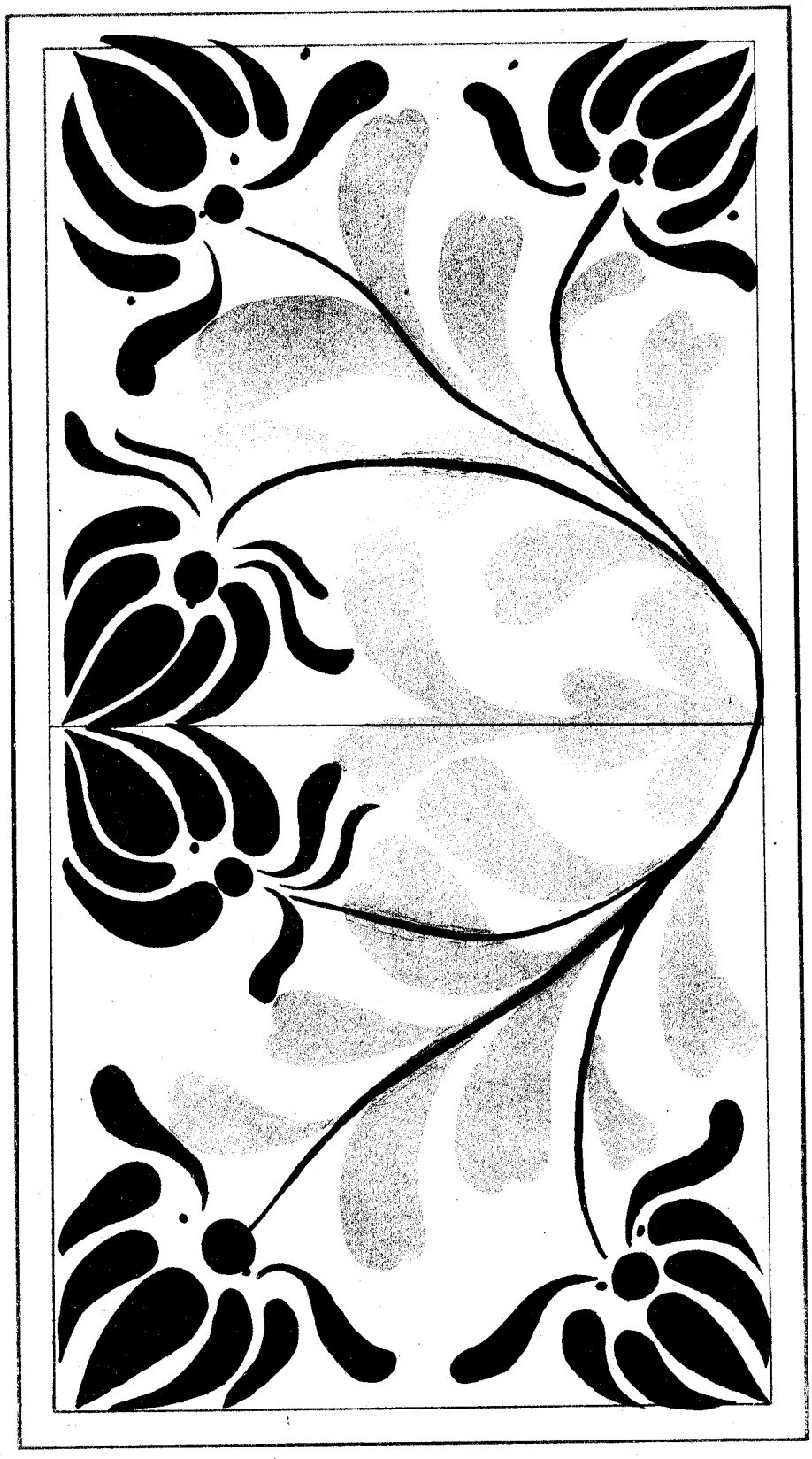
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Drawing Standard, III. *Name in full, H. Easter, Age 9*

SOUTHWARK DIVISION,
ALMA SCHOOL.

The Alma School.



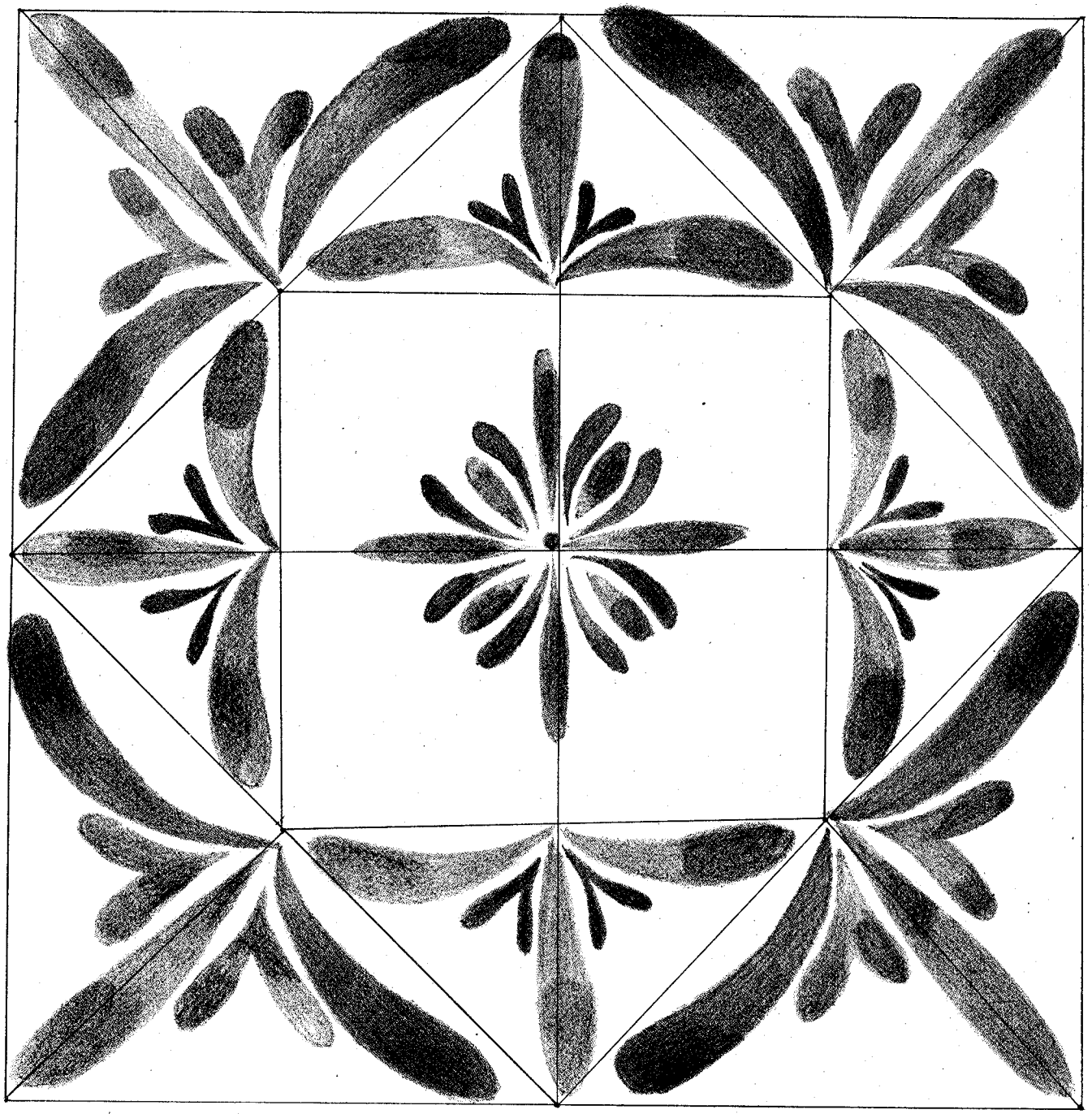
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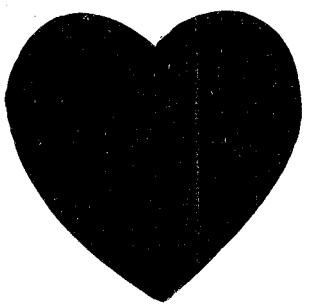
Drawing Standard II *Name in full* F. Linstedt *Age* 9

The Alma *School*

SOUTHWARK DIVISION,
ALMA SCHOOL.



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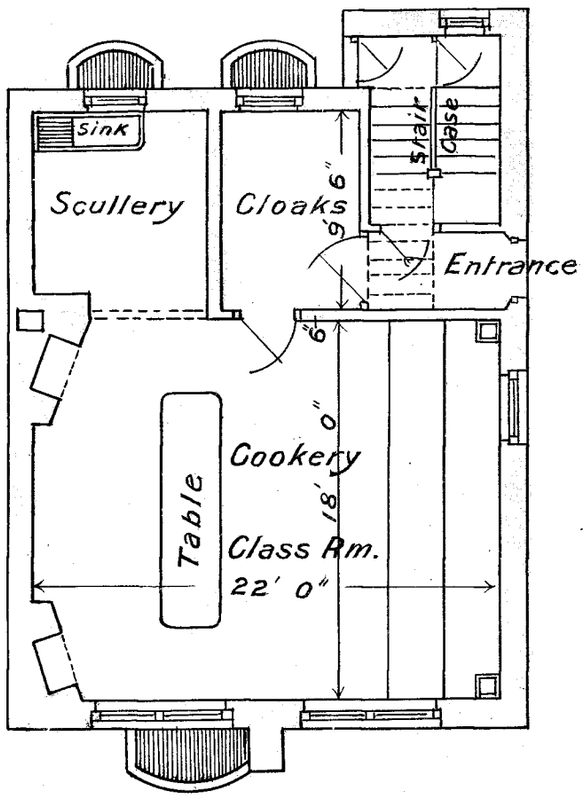
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ALMA SCHOOL.

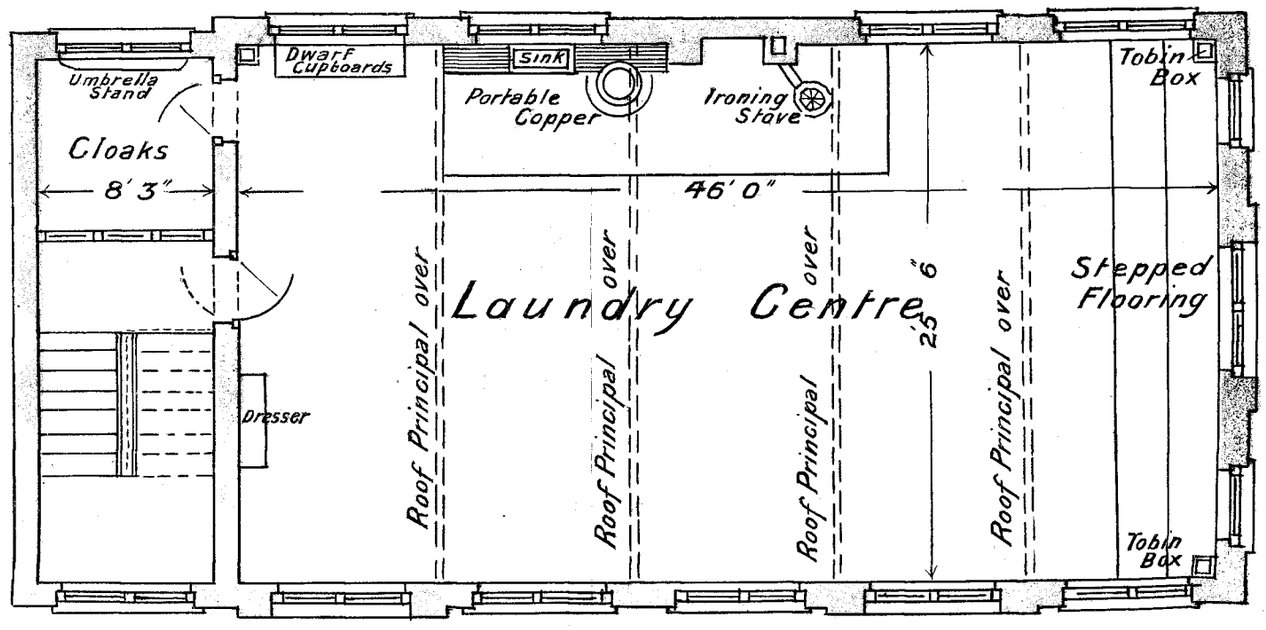
D. Blaney. Age 14
The Alma Board School.
Standard, VII.



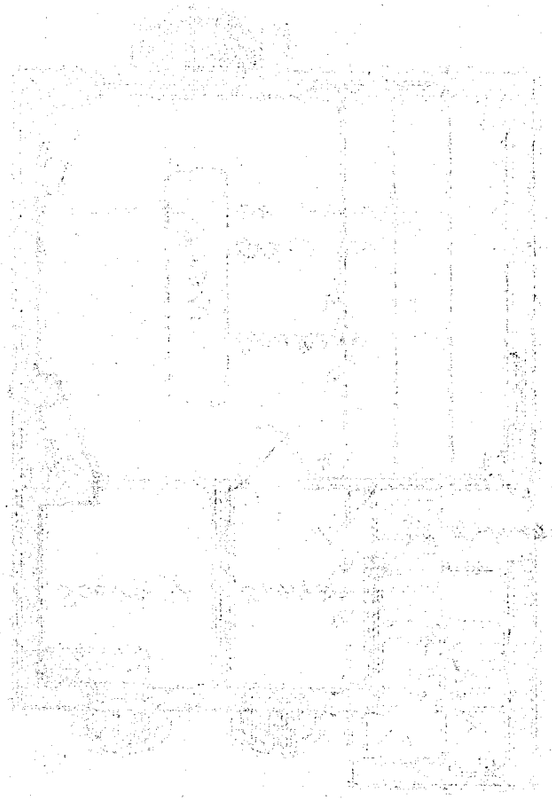
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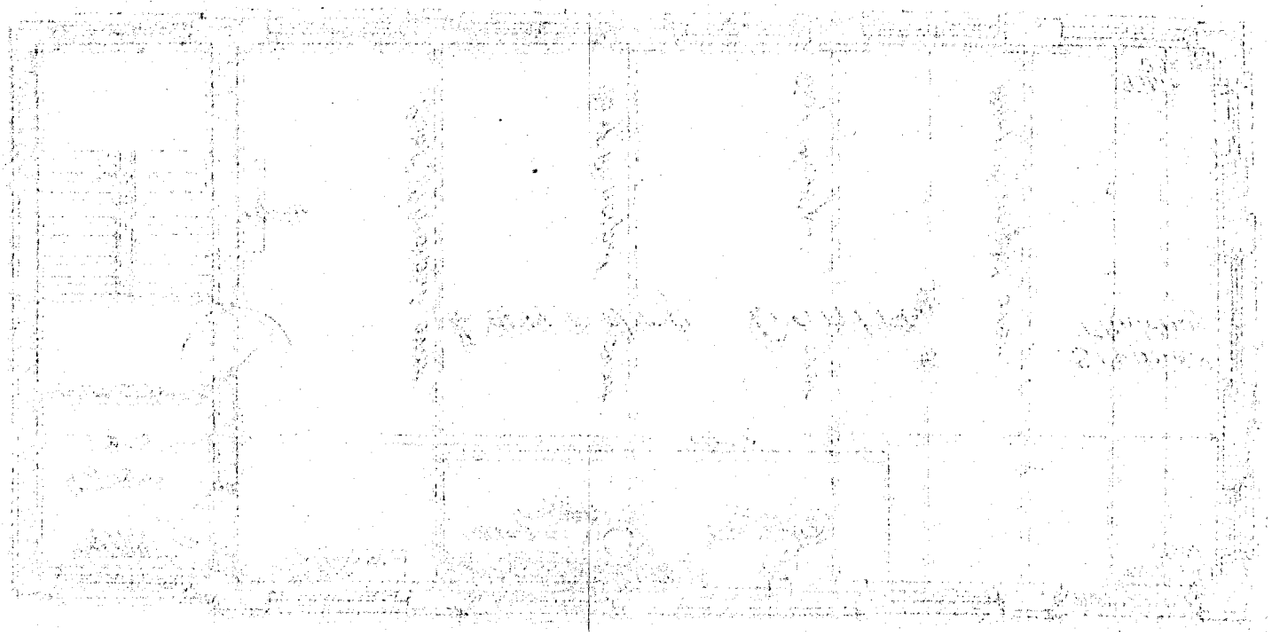
PLANS OF COOKERY AND LAUNDRY CENTRES AT GOODRICH ROAD SCHOOLS









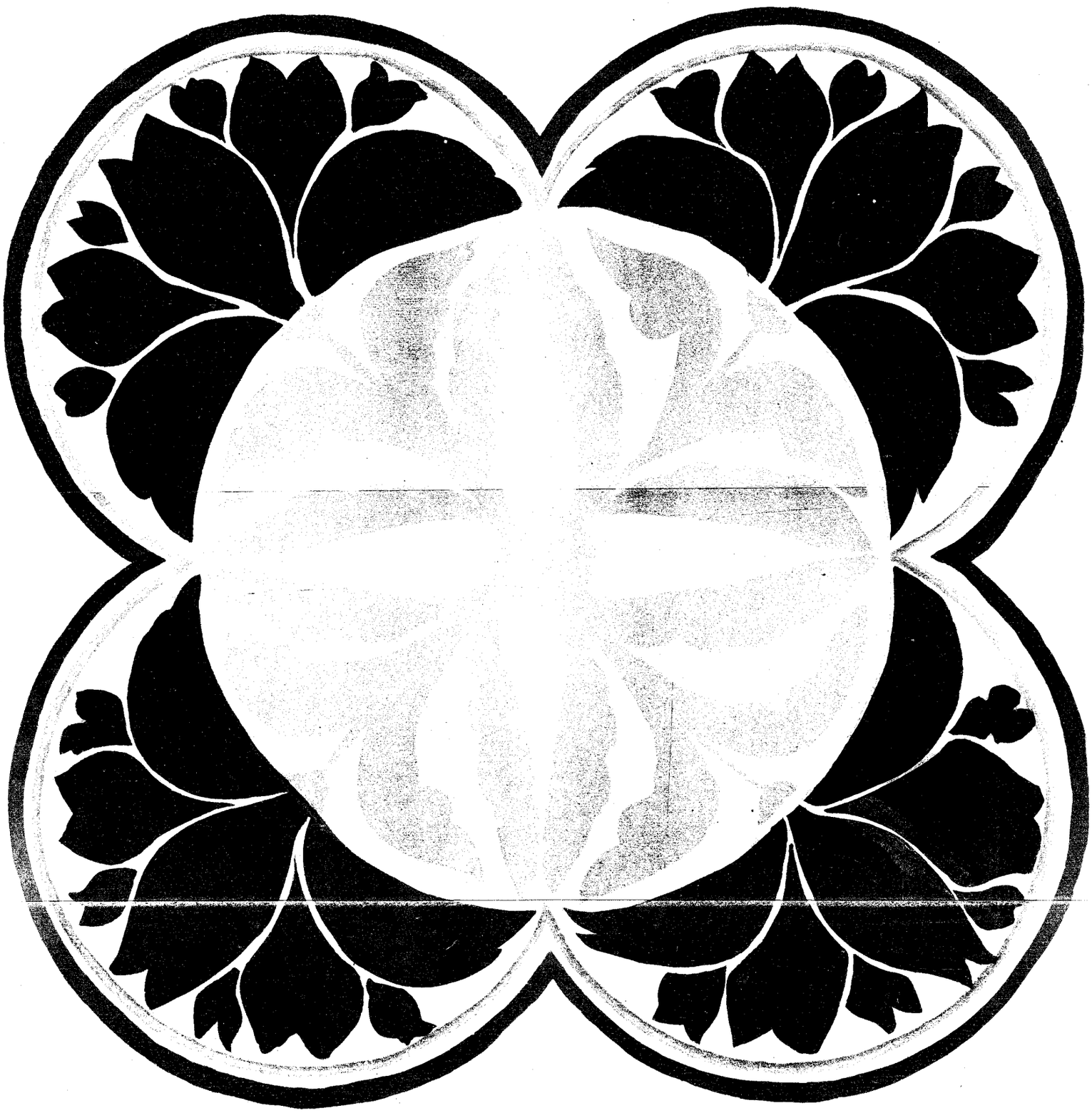


Geo. Barrow, Age 10, *Std. V.*, 10-5-98.

SOUTHWARK DIVISION.
ALMA SCHOOL.



SOUTHWARK DIVISION,
ALMA SCHOOL.



The Alma Board School.

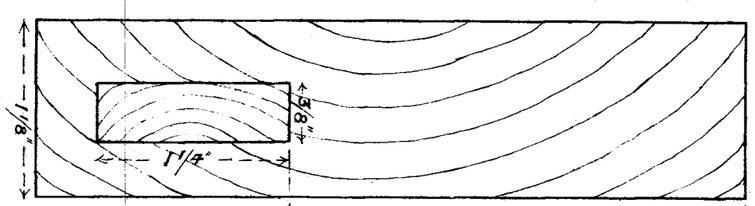
G. Russell, Age 13 Standard, VI.

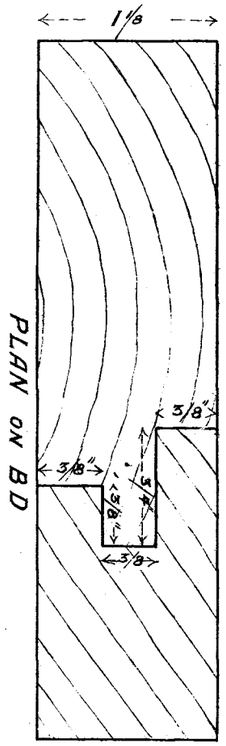
THEORY—Notes on Tools and Materials.

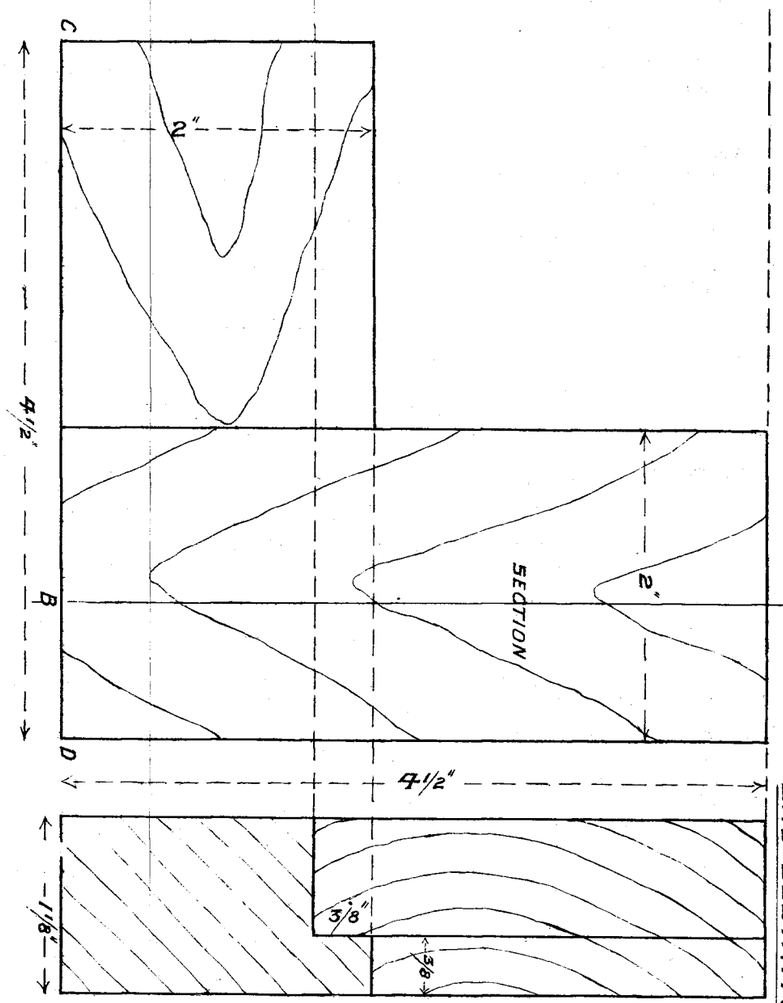
Sketches of Tools, Etc.

REBATE MORTISE JOINT

SECTION ON AB







END ELEVATION

SCALE FULL SIZE.

2nd S. Year. Model No. 5.
work of
WILLIAM ROYLE,
Aged 14. Stand. Ex. VII.
of Central Board School.
WM. BROWN, *Instructor.*

MANCHESTER SCHOOL BOARD.

Department of Hand, Eye and Manual Training

Manchester School Board.

SECOND YEAR MANUAL TRAINING TEST CARD

FOR

THEORY.

Only five of the Questions are to be answered.

1. Write down all you know about the Hand Saw and Back Saw.
2. Describe as fully as you can how you made Model 2—the Desk Tray—from the rough wood.
3. Why is a Hammer Shaft made of Ash, and why is it made smaller near the head? How is the head fixed on?
4. Make neat sketches of the Tools marked A, B, C, D, and name them.
5. What kind of a joint is used for the frame of a school slate, and how would you mark out a similar joint on a planed up piece of wood 1½in. wide x 1in. thick?
6. What is the chief difference between a Mortise chisel and a Firmer chisel (bevel edge), and why are they made as they are?
7. In what position should you stand and where should each hand be placed when boring holes with a brace and bit?

Manchester School Board.

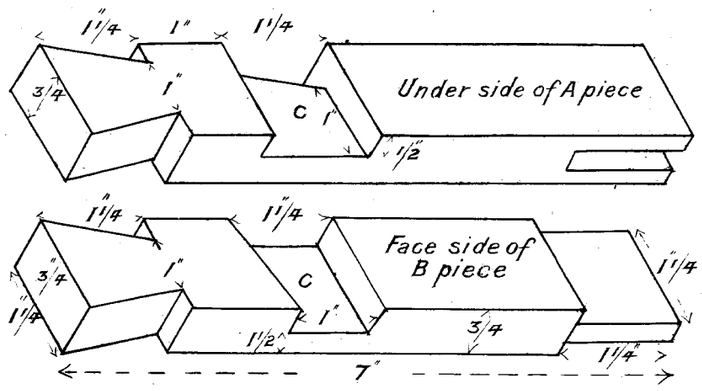
SECOND YEAR MANUAL TRAINING TEST CARD

FOR

DRAWING AND PRACTICAL WORK.

INSTRUCTIONS.

1. The sketch given is a model taken to pieces; it shows two of the joints you have just made. I want you to make an Isometric drawing shewing the joints as a Dovetail cross joint properly projected one from the other.
2. From the piece of wood supplied saw off two pieces 1⅝in. wide; plane these up to 1¼in. FULL x ¾in. FULL; then mark off, and make the several saw and chisel cuts shown, fitting together the pieces at joint C.



Manchester School Board.

MANUAL INSTRUCTION FIRST YEAR THEORY TEST CARD

NOTE.—*You are to work only four of the Questions*

1. A Tenon Saw is also called a Back Saw. Why is this, and how is the blade fixed to the handle?
2. How would you test the accuracy of your planing? What have you to be most careful about when preparing the wood for a joint?
3. Name all the Tools (in their proper order of use) required for making Model 3.
4. The Spur of a Marking Guage is made of round steel, of what kind of materials are the other parts made? Name each part and tell me how you would hold the Guage when setting it to dimensions, and how when using it for marking?
5. That part of a plane which makes shavings is called the PLANE IRON. Would it be of any use if it were really made of iron? If not, why not? What is the cover iron for?
6. Why is the stock of a Trysquare faced with brass?

Manchester School Board.

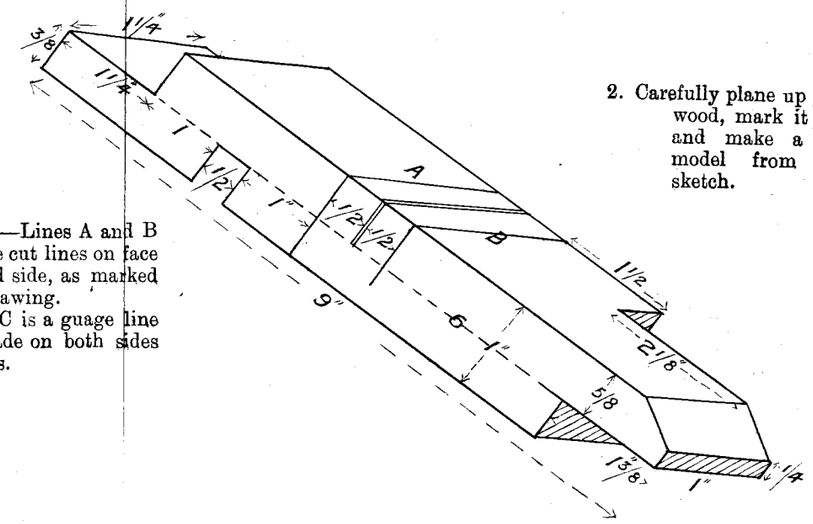
MANUAL INSTRUCTION FIRST YEAR TEST CARD

FOR

DRAWING AND PRACTICAL WORK.

INSTRUCTIONS.

1. The sketch shows roughly the plan, elevation, and end view in one drawing. You are required to make correct drawings in Orthographic projection, giving four views, and inserting all the dimensions.



2. Carefully plane up your wood, mark it out, and make a test model from the sketch.

NOTE.—Lines A and B are to be cut lines on face edge and side, as marked out for sawing.

Line C is a guage line to be made on both sides and ends.

Standard I.—II.

Following the instructions given in the introduction the child working with free action from the shoulder will produce some such form as this. (The object being to obtain control of the hand, the motion round and round should be repeated until the hand can follow in the same track.)

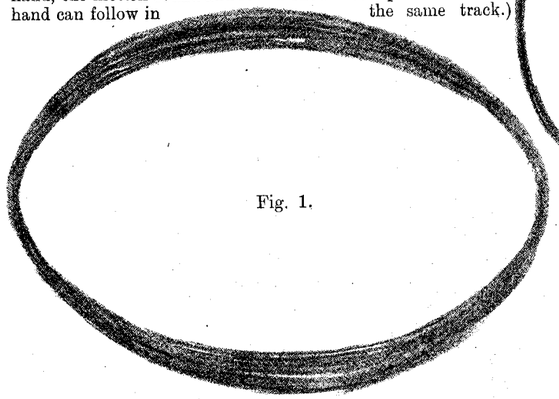


Fig. 1.

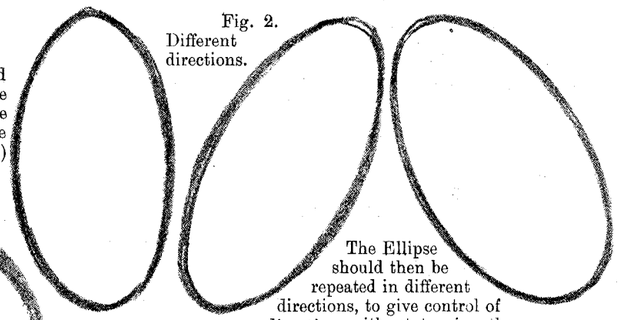


Fig. 2.
Different directions.

The Ellipse should then be repeated in different directions, to give control of *direction*, without turning the paper or changing the attitude.

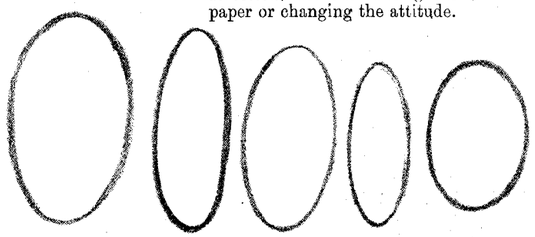
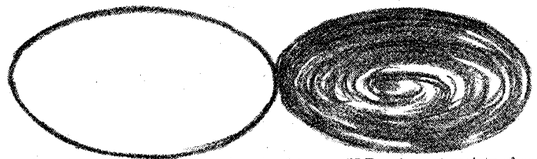


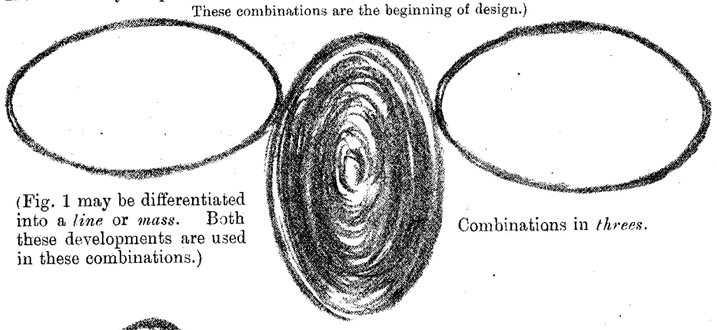
Fig. 3.—Different sizes.
The same form is here drawn with different sizes and shapes.

Fig. 4.—Different numbers (equal sizes).



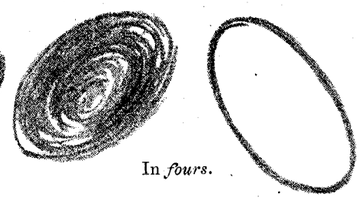
Combinations of the same forms in sets of *twos*. (N.B. A great variety of combinations can be evolved The above is only one specimen of the forms which the children may produce. It is *not* intended as a copy These combinations are the beginning of design.)



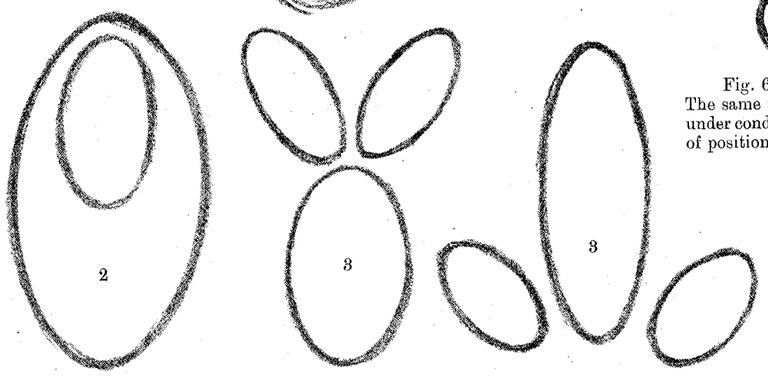


(Fig. 1 may be differentiated into a *line* or *mass*. Both these developments are used in these combinations.)

Combinations in *threes*.



In *fours*.



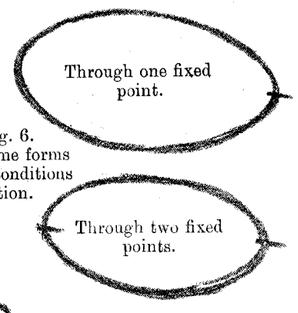
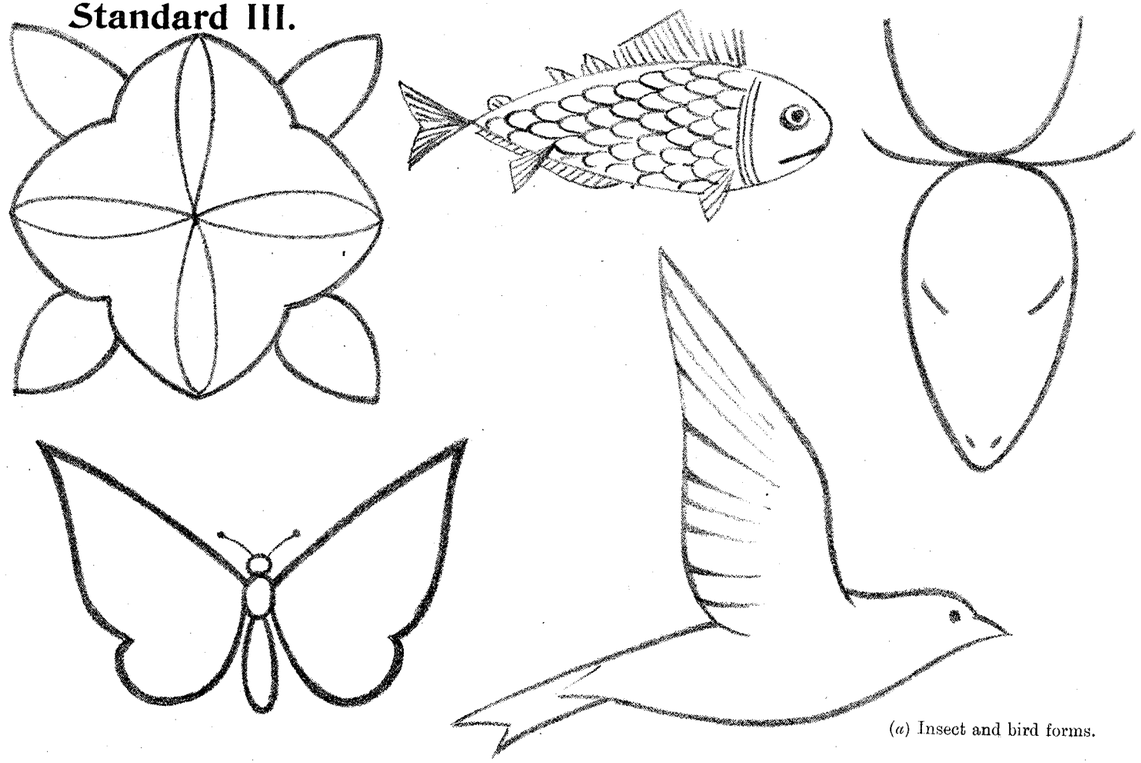


Fig. 6.
The same forms under conditions of position.

Fig. 5.—Different numbers (unequal sizes).

Standard III.



(*a*) Insect and bird forms.

Fig. 5—Suggestions of Decorative and Natural forms by combinations of quadrants, etc.

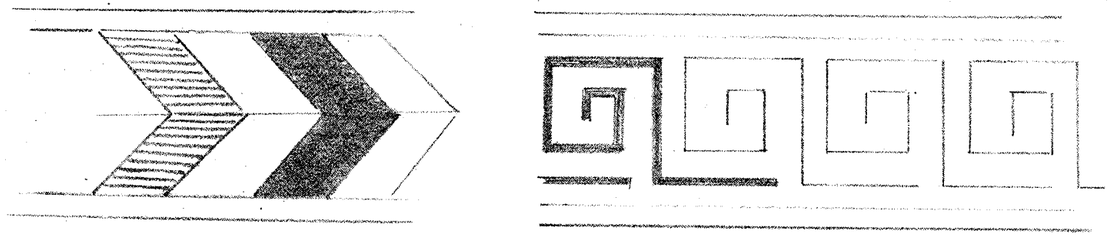


Fig. 6—Decorative forms suggested by Geometrical work of the Standard.

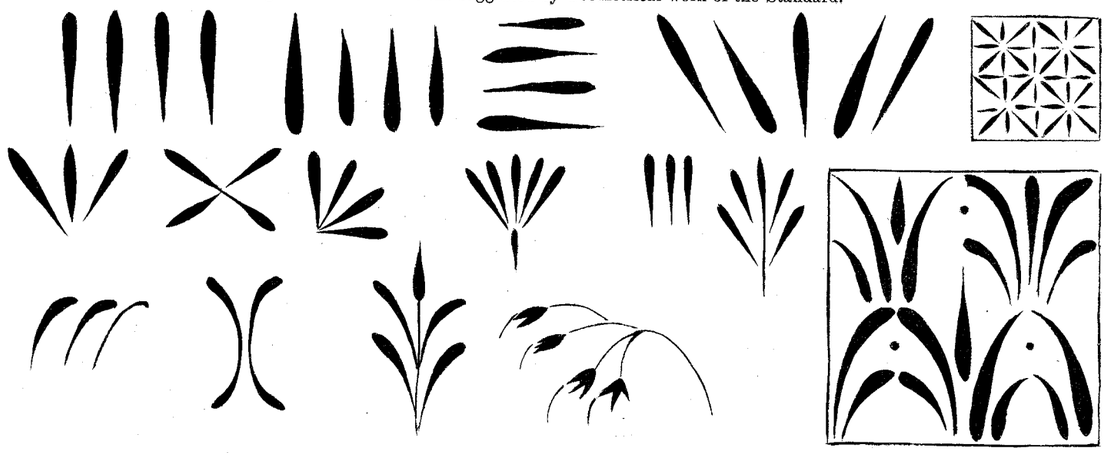


Fig. 7.—Ovate Brush work forms and their combinations at different angles, and to fill geometrical spaces, etc.

Standard III.

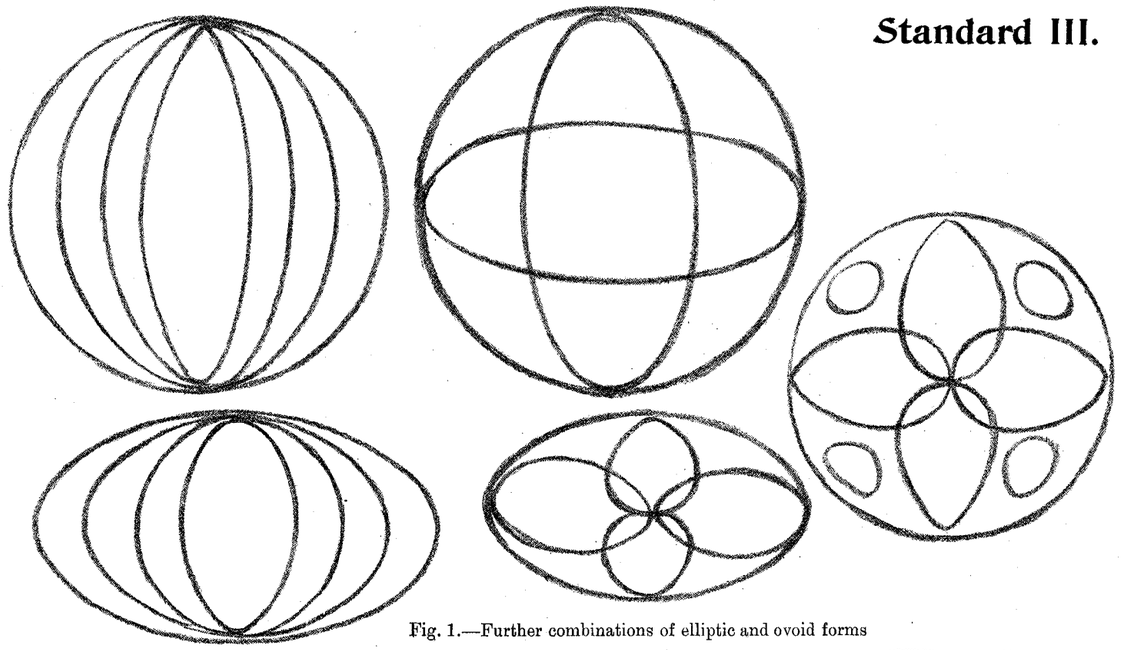


Fig. 1.—Further combinations of elliptic and ovoid forms

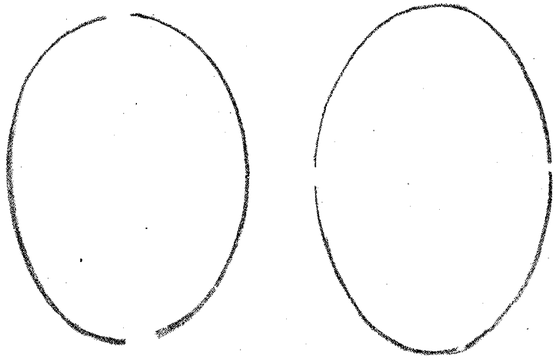


Fig. 2.– Analysis of elliptic forms into halves.

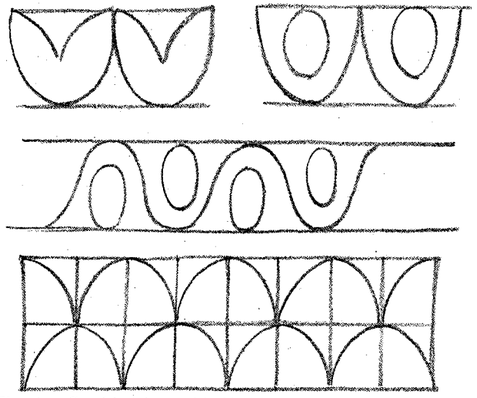


Fig. 4.—Combinations of half-ellipses into decorative forms.

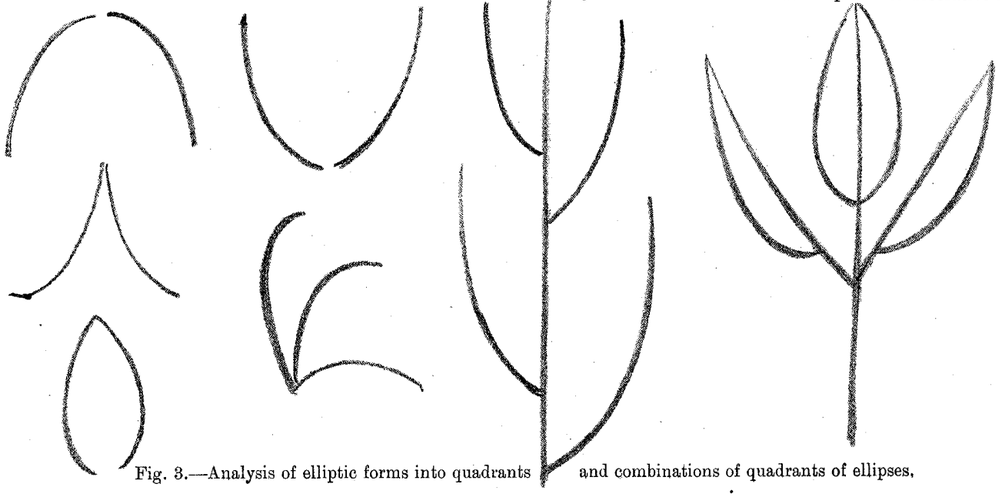
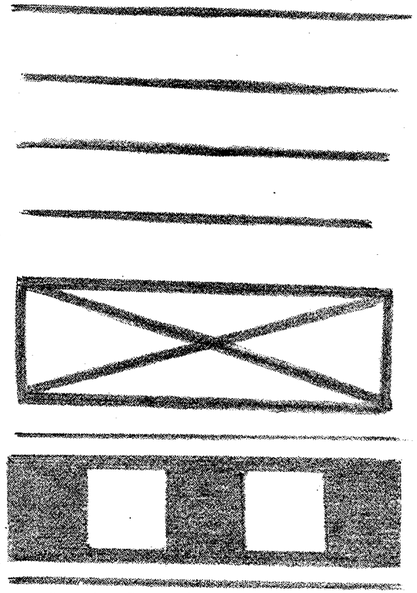


Fig. 3.—Analysis of elliptic forms into quadrants and combinations of quadrants of ellipses.

Standard I.—II.

Fig. 10.—Straight lines (freehand).



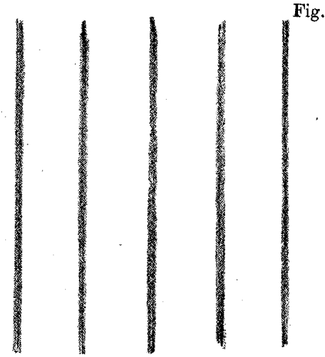
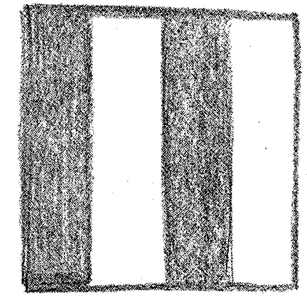
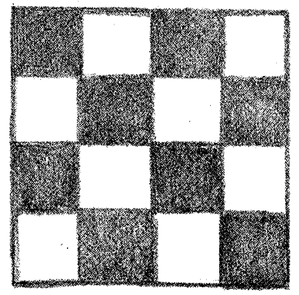


Fig. 11.—Combinations of straight-line forms.





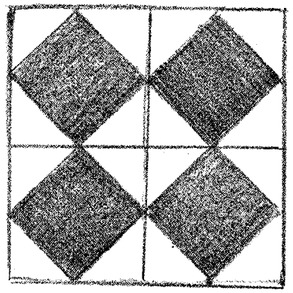
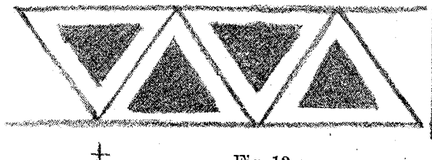
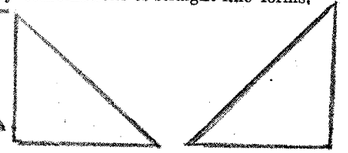


Fig. 12.—Suggestions of decorative objects by combinations of straight-line forms.





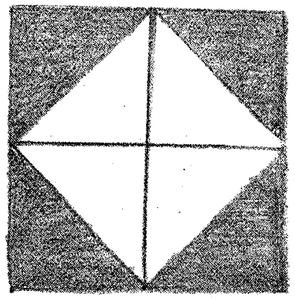
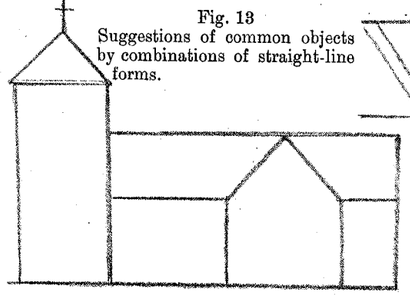
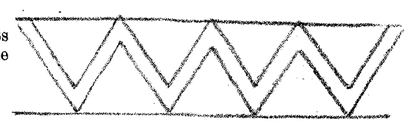
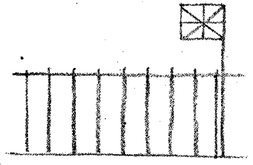


Fig. 13
Suggestions of common objects by combinations of straight-line forms.







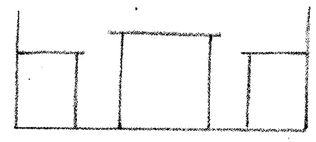


Fig. 14.—Elementary Brush-work forms (made by a single touch without moving the brush on the paper).



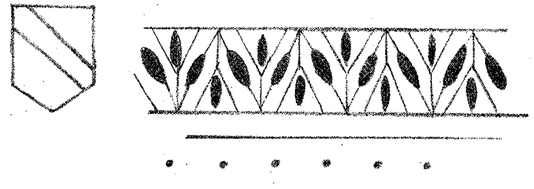
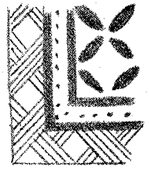
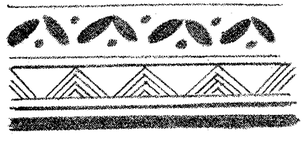
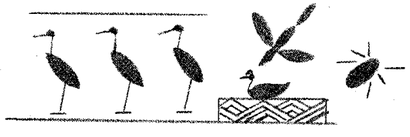


Fig. 15.—Suggestions of decorative and natural forms by combinations of elementary brush forms.

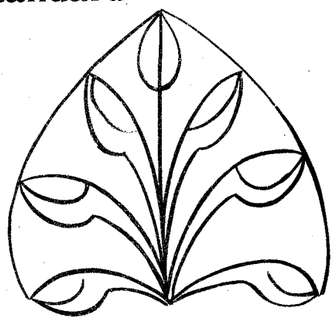


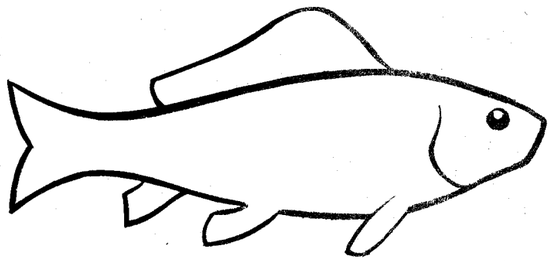




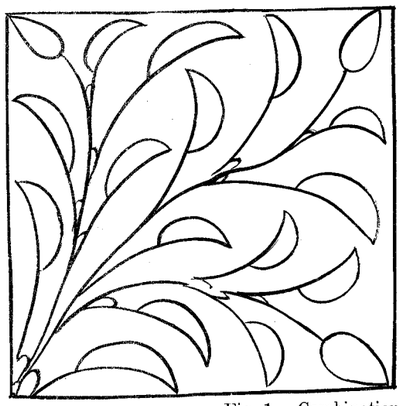


Standard IV.





(*b*) Fish form.



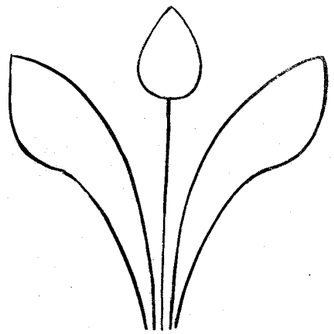
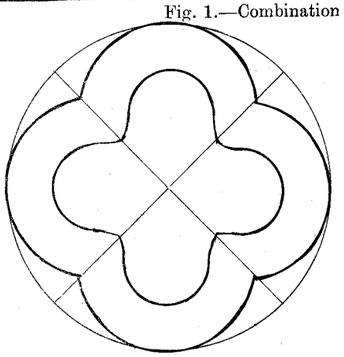


Fig. 1.—Combination of quadrants of ellipse and oval.



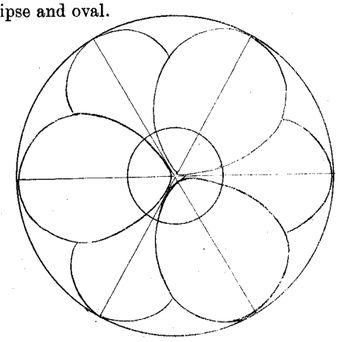


Fig. 4.—Suggestions of Decorative forms by combinations of previous elements in geometric patterns.

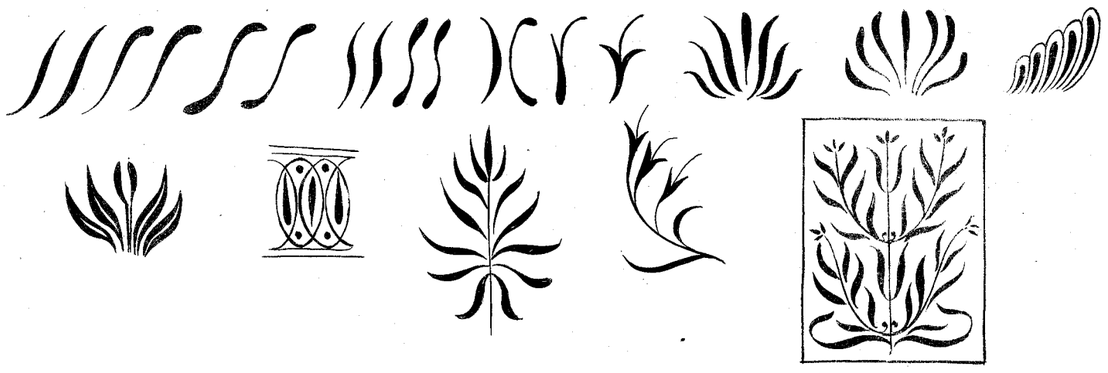


Fig. 5.—Further combinations of Brush forms.

Standard V.

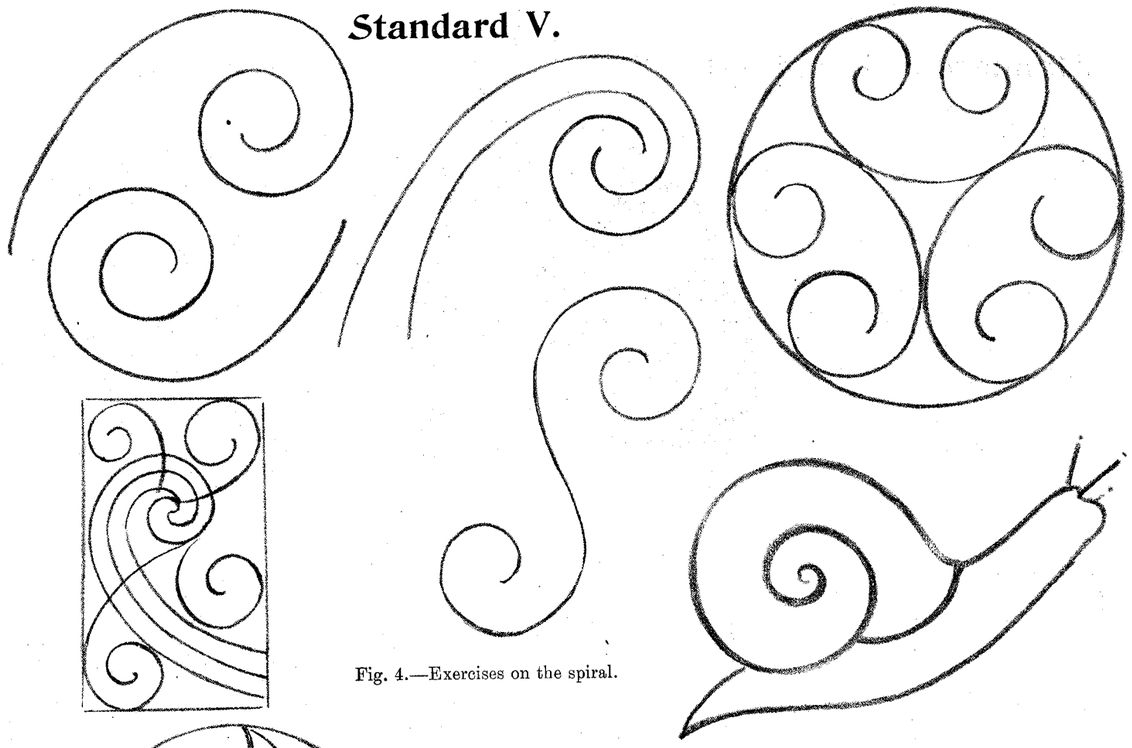


Fig. 4.—Exercises on the spiral.

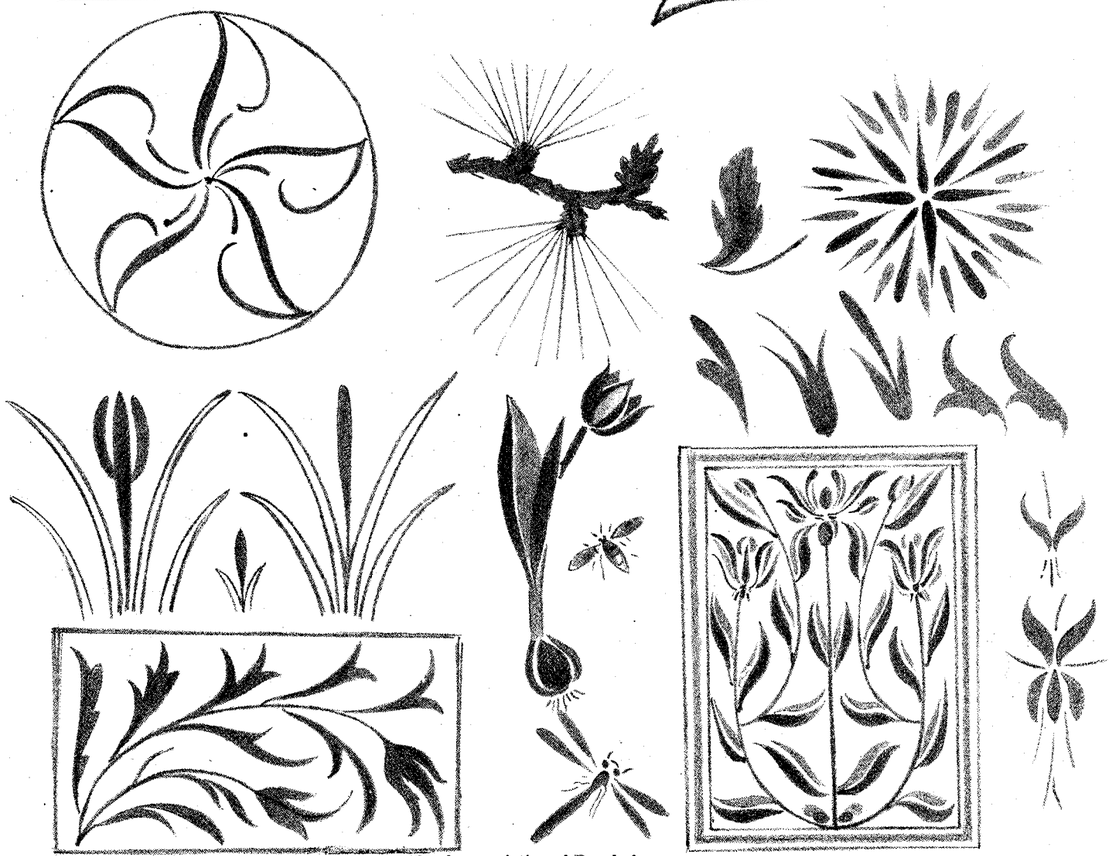


Fig. 5.—Further varieties of Brush forms.

Standards VI. and VII.

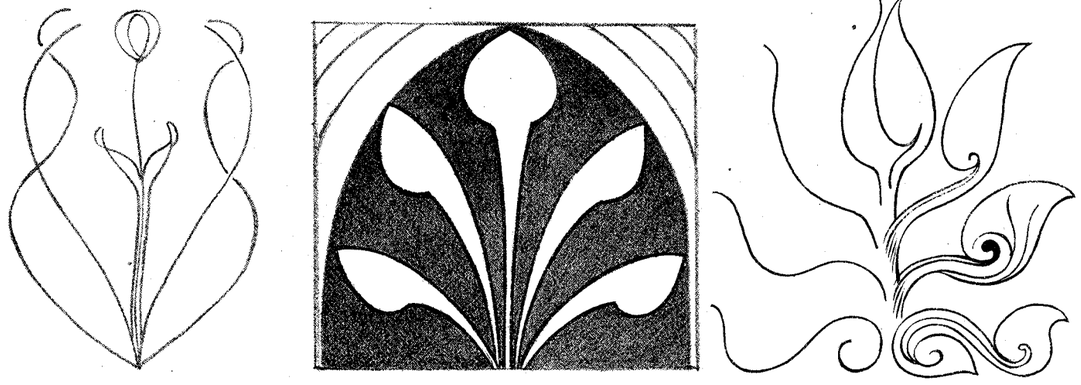


Fig. 1.—Further variety of outlines and tinting.

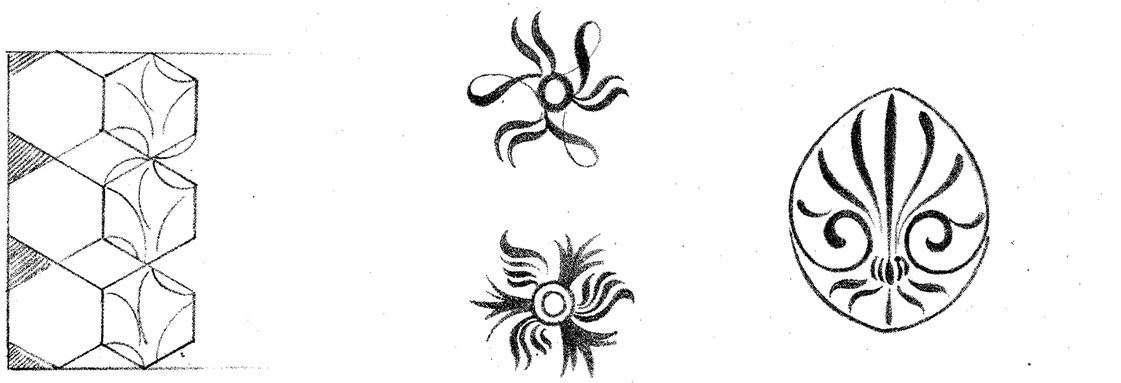


Fig. 2—Patterns on Geometric Basis. (To be filled in with brush forms.)

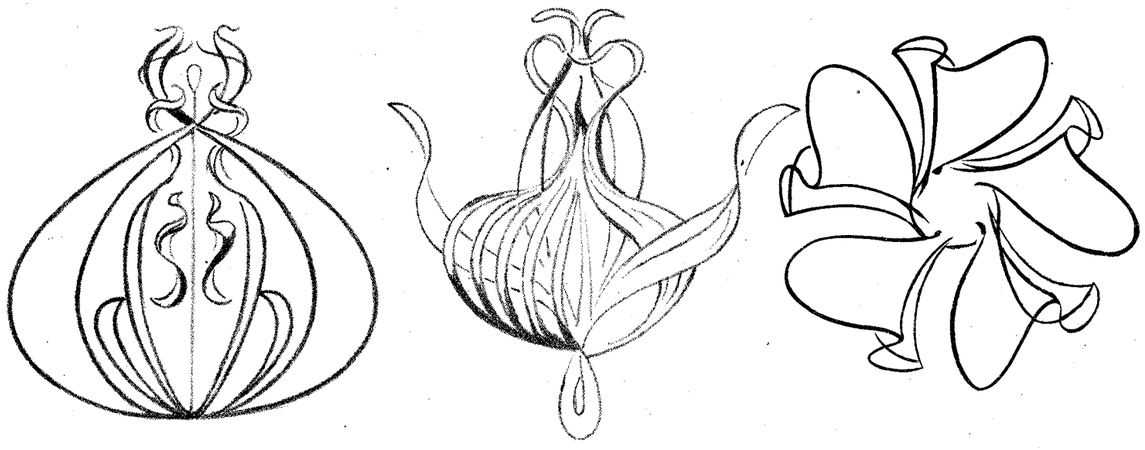


Fig. 3.—More complex combinations of previous forms.

Standard V.

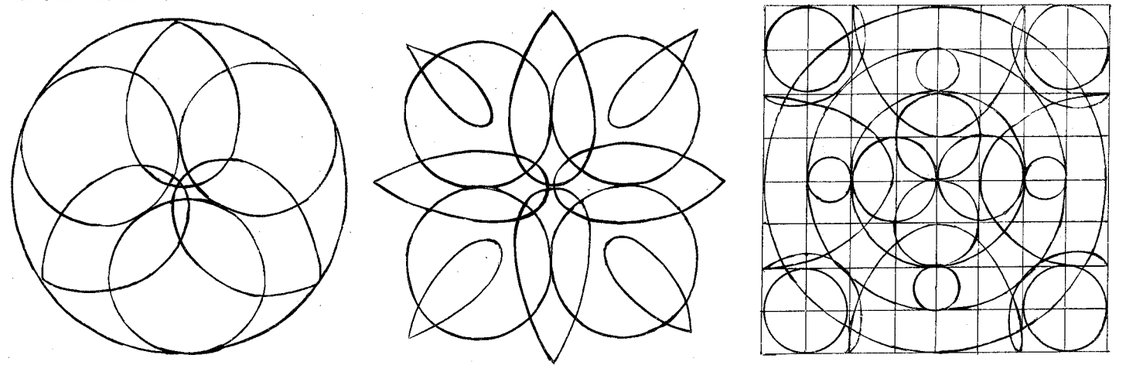


Fig. 1.—Freehand combinations of circles with previous forms and elements.

Fig. 2.—Decorative forms on Geometric Basis with brush forms introduced.

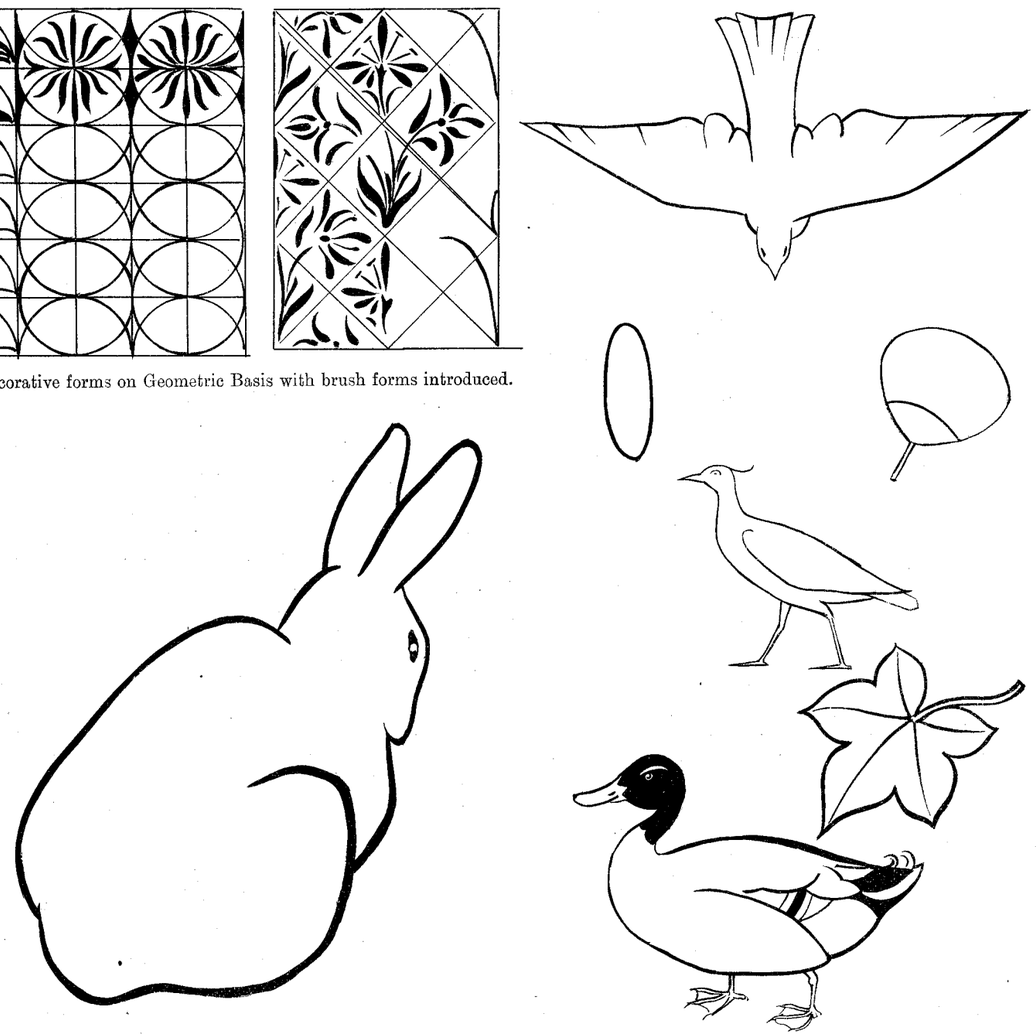


Fig. 3.—Suggested simple examples to be copied from the flat or from the object.