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Authorized for Use in Public Schools.

TEACHERS' MANUAL

FOR

FREEHAND DRAWING

IN

INTERMEDIATE SCHOOLS.

BY

PROF. WALTER SMITH,
STATE DIRECTOR OF ART EDUCATION FOR MASSACHUSETTS.

Intended to accompany the Drawing-Books for Intermediate Schools, by the Same Author.

TORONTO:
ADAM MILLER & CO.

1878.

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INTRODUCTION.

THE size and arrangement of the books belonging to this Intermediate Course are such, it is believed, that the transition from slate-work to drawing in the book will not prove difficult for the young learner. If he has, during the Primary Course of cards and slates, drawn somewhat on practice-paper, then he will be, in a measure, prepared fo. the severer exactions of drawing systematically on paper in a book.

Even the smallest pupils can easily handle the Intermediate drawing-books, the size so well adapting the books to their hands and desks. Then the earlier exercises require the drawing of no long lines. As a part, too, of these exercises have been taken from the cards, in order to graduate the difficulties in the transition from slate-work to books, the pupil is not obliged to learn, at the same time, both the manipulation of new material, and the drawing of new forms. But, after a little, the exercises are almost wholly different from those on the cards, even when they illustrate the same principles of design; while, as facility in the use of the pencil is gained by practice, the drawings are required to be done on a much larger scale, for the purpose of more fully testing and training the powers of the learner.

THE FIRST BOOK.

The first book, after attending to the drawing of straight lines, to their division, and to the judging of distances, concerns itself with plane geometrical figures, with geometrical patterns, or designs, for woven fabrics, for covering surfaces, for borders and mouldings, and with objects produced by the potter, the silversmith, and the like. The principles of design, as thus applied, were touched upon in the Primary Course, but are more fully explained in this Manual.

The drawing-book, which goes into the hands of the pupil, contains copies illustrating all the principles explained in the Manual, which is specially designed for the teacher. Some of the copies the pupil is to reproduce of the same size; but others to enlarge, that he may thus be trained in proportional enlargement. Then the Manual contains a great number of additional copies for dictation and blackboard lessons, — the latter to teach proportional reduction, as the pupil must reproduce them in his book on a much smaller scale; the former to serve for reviews, for developing the imagination, and for training the pupil to close attention. From time to time the pupil is also required to draw a form from memory. Finally, he must quite often produce an original design according to the principles he has been taught, — best of all proofs that the principles are understood, and that the knowledge acquired is of real worth. Thus the learner, from these five different modes of drawing, cannot fail to obtain a varied and most valuable discipline. The same features are adhered to throughout the three books.

The paper required for the blackboard, dictation, and memory exercises, and for the original designs, is afforded by the blank pages found in each of the books. Detailed directions are given for filling each blank page.

THE SECOND BOOK.

The second book, after a fuller explanation than is given in the Primary Course, of conventional forms and of the principles of design, as derived from nature, and employed in decoration, takes up historic ornament, — takes it up in such a way that the learner acquires a clear notion of what is meant by *style*, a matter of prime importance in art education. Some of the leading features which characterize the three ancient styles of decorative art, — Egyptian, Greek, Roman, — and distinguish them from one another, are pointed out and illustrated. Something is also said of the Moresque.

There is nothing in all this, when properly done, beyond the ready comprehension of the young learner. Indeed, he can as well be made acquainted with the forms, the thoughts, and the principles which the ancients embodied in their decorative art, as with their religious myths, their heroic legends, and military exploits. Even the little that is here given will enable the learner to discriminate, in several important features, between the three historic styles named, and to make original designs characteristic of either, instead of mingling their features in one nondescript mass, a thing which has been not infrequently done by practical designers. With these three ancient styles is laid the foundation for the study of all styles, ancient, mediæval, and modern. Unless we possess a knowledge of what has been done, and how it has been done, we cannot work intelligently or with confidence in any new direction, in developing a new style.

THE THIRD BOOK.

The third book is devoted mainly to model and object drawing. Up to this point the pupil has dealt with only two dimensions, — length and breadth. He now begins to draw models and objects perspectively, representing their three dimensions, — length, breadth, and thickness. If he simply reproduces the copies in the drawing-book, then it will still be flat drawing, and not drawing from the solid. The copies must be used, when properly used, in connection with models and objects such as the publishers of this system of drawing have had made to accompany the books. By using, at first, both flat copies, and solid models and objects, — the former to show what should be the appearance of the latter when properly drawn, — the pupil more readily apprehends the principles which he must observe in representing solids. Thus the difficulties are graduated both for him and for the teacher. But his work is not confined to a reproduction, with the aid of models and objects, of the given flat copies: on the blank pages he is to make drawings of models and objects, the same as already used, but placed in different positions, or of other solids, artificial or natural. This will be drawing from the solid, pure and simple.

The models and objects to be drawn consist of regular geometrical solids, or they have marked geometrical features. As the learner who pursues this system begins, in flat drawing, with plane geometrical figures, followed by forms having marked geometrical outlines, so he proceeds in a similar manner when he begins to draw from the solid. Thus he takes the regular before the irregular, the simple before the complex. Unless he can first properly draw regular geometrical solids, he should by no means be set at work upon natural or artificial objects, whose general forms are pretty certain to be geometrical, to which are added numerous irregular details. The irregular details are more difficult to draw than the regular general forms, yet are of no consequence, unless the latter are correctly rendered. The best possible introduction to drawing from nature and from the human figure is the model and object drawing here described.

This whole course of drawing, from the primary school onwards, is based upon geometry; by which it is not simply meant that the pupil is to draw plane and solid geometrical figures as exercises in themselves, but is to refer all things drawn to regular geometrical forms. Nature follows such forms in all her works, and so does man, either wittingly or unwittingly, in all that he constructs. The perception of these general forms greatly assists in drawing the specific forms with all their variable details. The most successful art instruction, whether an industrial or a purely æsthetic result was sought, has always proceeded upon this geometrical basis.

The drawing from models and objects in this Intermediate Course is all outline. There is no shading to consume the time, and waste the energies, of the pupils. A dozen objects can be drawn in outline, where a single object can be drawn and properly shaded. No amount of shading can make a good drawing, when the outline is defective. The outline is of the first importance. Therefore, until solids can be readily represented in outline, it is worse than useless to attempt light and shade. Everywhere good instruction recognizes this fact in the education of young children.

Freehand drawing from the solid requires some knowledge of the principles of perspective. The little that is required in this Intermediate Course can be easily illustrated, and is of such simple character, that quite young pupils can master it without much difficulty. Faithful instruction on the part of the teacher, with the flat copies and models and objects combined, will soon enable the pupils to work understandingly and with good effect. It will be seen that circular forms are taken before rectangular forms, because they involve less of perspective difficulties, and are usually more pleasing for children to draw.

CHARACTER OF THE MODELS AND OBJECTS.

One of the educational ends to be attained by drawing from the solid is the development of the imagination, the training of the pupil to "see in space," as it is termed, — to make a clear mental image of a solid, with its lines all in their right positions. The great value of this power is unquestionable; and no other study is so well calculated to develop it as model and object drawing. Now, so far as this development of the imagination is concerned, it matters little whether the forms of the models and objects be graceful or homely. But as the development of the taste, of the power to discriminate between that which is beautiful and that which is not, must never be overlooked in drawing, it becomes absolutely essential that the models and objects, like the prints, which are placed before the pupils, should be of the most beautiful character possible. The taste cannot be developed, while the eyes are always looking at things that have no beauty.

THE PRIMARY COURSE REVIEWED.

The first two Intermediate books review the Primary Course. They do much more than this, indeed. The third book deals with features almost wholly new. Hence those who have never drawn at all, but are old enough to draw in a book, can begin with the Intermediate Course. They will lose nothing in the way of principles, but will need to work much harder. Thus there are two places where pupils, according to age, can begin this system of drawing: they can begin with the Primary cards or with the Intermediate drawing-books.

GRADATION.

One of the marked features of this course of drawing is its logical and systematic gradation from the primary to the high school. As it is a comprehensive course, embracing five general departments, — Flat Outline Drawing and Designing (freehand), Model and Object Drawing (freehand), Plane Geometrical Drawing (instrumental), Perspective Drawing (instrumental), Mechanical Projection and Working-Drawings (instrumental), — the gradation is determined, (1) by the relation which these general departments bear to one another; (2) by the relation which the leading features and minor details of each department bear to one another; (3) by the difficulties which the principles present to the understanding; (4) by the quality of the manual execution demanded at different stages of progress. The whole arrangement is believed to be according to reason and the best experience.

But it is impossible to judge it correctly from any one feature alone. Thus, to say that the gradation is bad, because many of the exercises in the Intermediate books are no more difficult to draw than others on the Primary cards, simply shows an ignorance of one of the things — the quality of the manual execution at different stages of progress — which have had an influence in determining the gradation. In the Intermediate Course the drawings are to be much better executed than in the Primary Course. It is deemed of chief importance that the general features of the gradation be right: errors of detail, indeed, there should not be; but they are of secondary consequence.

In a certain sense, even the Primary Course is complete by itself; that is, the pupil who goes no farther acquires a good amount of clear-cut knowledge of drawing and design, which, taken alone, is both available and useful. The same may be said of the Intermediate Course, and of the Grammar Course, — said with more emphasis. This results from the fact that the gradation is, in a measure, according to cycles, and not wholly on a straight line.

CERTAIN FEATURES WHICH CHARACTERIZE THE INSTRUCTION.

There is no inculcation of arbitrary processes, with the claim that they are the best for all pupils, and under all circumstances. Those methods are preferred which the experience of the practical draughtsman has shown to be best. Precedence is always given to knowledge, and not to manual execution. The teacher who has, at the end, nothing to show but finely drawn lines, has given poor instruction. His class should be able to sustain a thorough examination, based on the principles which the Manual so fully explains, and which he should impart to his class as they proceed with their drawings. Again: it is regarded as a matter of vital importance, that the pupils, from the outset, and always, draw with considerable rapidity, though they draw rudely: otherwise spirit and boldness, as well as knowledge, will be sacrificed to delicate, laborious finish. This is the rule of the best schools.

IMPROPER USE OF THE BLACKBOARD.

The uses which can be properly made, and should be made, of the blackboard in teaching drawing are described in the body of the Manual; but nothing is said of the improper use to which the blackboard is often put, where the nature of drawing is not well understood. We refer to its employment simply for the purpose of providing the pupils with copies, while they are drawing in blank drawing-books. Now, there are three serious objections to this: —

1. As one of the leading objects to be attained by drawing is development of the taste, and as this cannot be developed unless the pupils are provided with beautiful copies and objects to draw (the more beautiful the better), it becomes absolutely essential for every teacher of drawing, who is obliged to work without beautiful printed copies in the hands of his pupils, to be an expert draughtsman, or he cannot provide on the blackboard copies having the requisite beauty for even the most elementary instruction. Now, drawing in the public schools must be mainly taught by the regular teachers, or not taught at all. Most of these teachers are not expert draughtsmen, and so cannot teach without printed copies; but, with such copies in the hands of their pupils, they can do good work, and do it easily.

2. But, even if the regular teachers were all expert draughtsmen, it would still be insufficient. In the

first place, they would have neither the time nor the strength to make all the drawings required. In the second place, even if the drawings were beautifully made on the blackboard, it would not suffice for the development of taste in class instruction. Only the four or five pupils who might chance to sit directly in front of the blackboard drawing would get a proper view of it: all the others would look at it more or less obliquely; and so for them nearly every line would be distorted, the whole figure losing its beauty, and becoming a teacher of ugliness. Therefore, all good schools of art, where class instruction is given, prohibit the use both of the blackboard and of wall-charts, if the purpose is simply to provide the pupils with drawing-copies.

As a rule, the amount of time spent by the teacher at the blackboard in general explanation and sketching should not exceed one-tenth of the whole time given to a lesson. The remaining nine-tenths should be devoted to the individual instruction of the pupils. This precludes the average teacher from making beautiful drawings on the blackboard, which, as already stated, are not necessary when the pupils are provided with accurately drawn copies in their books before them. Indeed, it cannot be too often repeated, that the blackboard should only be used to explain principles, and to illustrate right and wrong methods of work. Its use for pictorial purposes is always to be avoided.

3. Every methodical person will perceive, at a glance, that it is impossible suitably to grade the instruction in drawing, and make it effective, without

a suitable series of text-books. When such books are lacking, there will be waste of effort on the part of teachers, waste of time on the part of pupils, and good results here and there only by chance.

DRAWING MATERIAL, AND ITS CARE.

In addition to suitable books and models, the pupils should be provided with the best of pencils and rubbers. The best work cannot be done with poor materials. The best pencil is the cheapest. No instruments are needed for this Intermediate Course, beyond a cheap rule, such as the school-square prepared for this purpose by the author. Books, pencils, and rubbers should be in charge of the teacher, when the drawing lesson is not in progress. The pencils should all be carefully sharpened by some one appointed to do this work between the lessons; and the rubbers should be examined as to their cleanliness, a thin shaving being removed from their surface, if that is found to be dirty. Not more than one minute should ever be consumed in distributing or collecting the books, pencils, and rubbers for a class of forty.

THIS MANUAL.

The teacher will find in this Manual all needed explanation of principles and of methods of work. The drawings have a black background, as when drawn on the blackboard, where the teacher, for one purpose or another, will have occasion to draw many of them. The drawings are small; but they will serve just as well the purpose for which the Manual is intended; that is, to aid the teacher in the instruction of pupils who use the drawing-books containing larger copies. It is expected that the teacher will thoroughly instruct his pupils in the methods of work, in the definitions of terms, and in the principles of design, which are given in the Manual, — a thing that cannot be done without frequent reviews.

INSTRUCTION BY THE REGULAR TEACHERS.

If the introduction of drawing into the public schools is to be at all speedy and successful, it must be taught in the ungraded schools, and in the graded schools below the high, by the regular teachers; that is, by the teachers who give instruction in the other branches. Except where the departmental plan is adopted, it is now the custom for a single teacher to attend to several things at the same time, — to reading, arithmetic, geography, grammar, for example. As it is not deemed necessary, certainly is not deemed practicable, to have special teachers for instructing pupils in any of these studies; so it is no more necessary or practicable to have special teachers to instruct the pupils in drawing. There may, indeed, be special teachers to instruct the regular teachers, and to inspect their work; but the latter must, and they can best, instruct the pupils.

Elementary drawing, when treated in a rational, systematic manner, is one of the easiest and one of the most delightful things to teach children. This is the almost universal testimony of those who have fairly tested the matter. But it can be successfully introduced into the public schools only upon certain conditions. Like other studies, it must be made compulsory, and not be left to the decision of the teacher and pupil. There must be examination and promotion, as in other branches. Both the practical and educational value of drawing entitle it to such treatment, which every one considers essential to success in all other studies.

Satisfactory results in drawing are no more dependent upon special artistic gifts on the part of the pupils, than satisfactory results in arithmetic are dependent upon special mathematical gifts. It is only necessary that the pupils set about the study of drawing as they set about the study of arithmetic, geography, grammar. Nor are special gifts required on the part of the teacher. It is by no means imperative that he should be an expert with the pencil or crayon in order to teach with success elementary drawing, as presented in this system; but he should be a good teacher in general, well acquainted with the best principles and methods of instruction. It is presumed that every regular teacher possesses this general knowledge, to which, with a reasonable amount of effort, the special knowledge demanded by elementary drawing can soon be added.

CHAPTER I.

GENERAL DIRECTIONS, AND PRINCIPLES AND METHODS OF TEACHING DRAWING.

PUPILS who have drawn on the slate only, and have learned to do quite good work with that, are often discouraged by their first attempts at drawing on paper. This is due to difference in material used. Yet pupils who have used the cards of the Primary Course, drawing on the slate, possess a decided advantage over those, who, never having drawn at all, begin at this stage with paper. The advantage consists partly in manual skill, but much more in the training which the eye has received, in a knowledge of how to go to work, and in a knowledge of the principles of drawing and of design.

Economizing Instruction.

When pupils of these two grades are thrown together in the same school, they can be taught drawing together, though at some disadvantage. As you never expect all the members of a class to show equal proficiency in any other study, so never look for it in drawing. Unless, therefore, the differences in attainment be very marked, require all the pupils in the school, not only to execute the same drawing at the same time, but require them, when you give the description, to execute the same part at the same time. By thus keeping the pupils together, you will be able to teach all at once, instead of teaching each separately, and so will economize instruction. But you must, of course, give each more or less of individual attention, as opportunity serves; while each should be required, at regular intervals, to draw on the blackboard on a large scale, for such practice is productive of that freedom which should be obtained from freehand drawing.

Those who draw badly under this class treatment, nevertheless, can be made to draw rapidly, which, in itself, is a thing of prime importance from the outset of one's drawing career. Fineness of execution comes with practice: it should never be made the leading feature when one is beginning to draw. If it is, then those much more valuable features — freedom, spirit, knowledge — are usually rendered subordinate, the final result being lifeless art and a slow workman. Keep it, indeed, always in mind, that drawing, when properly taught, is much more an exhibition of knowledge than of mere dexterity in the use of the pencil.

Body. — Hand. — Pencil. — Book.

There is no one way in which it is always best to sit, to place the hand, hold the pencil, and keep the book. As a rule, it may be assumed that the pupil who takes an interest in his work, and is anxious to do it, will be likely, influenced by this feeling, to put his body in the position that will best enable him to do as his mind desires. There can be given, however, a few useful general directions.

Whatever the position of the body, it should always be easy and healthy, the eye never any nearer the paper than is essential for a clear view of the lines. Neither the arm nor the fingers should be constrained or cramped, but at all times perfectly free, that the pencil may be readily moved, and the drawing continued for hours, if necessary, without special fatigue of the muscles. The pencil should be held with the fingers about an inch and a half from the point. The smaller the pupils, however, the nearer the point of the pencil should the fingers come; thus accommodating the pencil to the fingers. For a horizontal line, hold the pencil as a pen is usually held in writing; for all other lines, change its position as required in order to draw the different lines with ease. When lining in a drawing, hold it more nearly upright than when making the sketch.

As a rule, the book should lie square in front of the pupil, whether he sits directly facing the desk, or not, — a matter to be determined by comfort, — since that position of the book affords a better view of the drawing than one gets when the book is partly turned. There must, however, always be an unobstructed view of the space where the line is to be drawn. This is a prime condition, which can be secured in two ways: by changing the position of the hand and pencil, as already recommended, or by turning the book. It takes more time, and is more trouble, to do the latter than the former; and so the former, when it will answer the purpose, is to be preferred. But, when you are drawing a curve line, the concave, and not the convex side should be towards the hand; for this affords much the best view of the line. In order to have it thus, turn the book if necessary. There is no other time when it is decidedly best to turn the book simply for the purpose of drawing a line, since we soon learn to draw lines readily in different directions by so drawing them. If, however, any pupil fails to acquire such power after a reasonable amount of practice, permit him to turn his book as he chooses.

While, as a rule, the book need not be turned simply for the purpose of drawing lines in different directions, yet it should be turned in order to examine and correct a drawing at different stages in its progress; since errors can be more easily discovered when the drawing is viewed on all sides. For the purpose of examination, it is best to hold a drawing vertically before the eye, and far enough off to afford a good view of the whole at once.

It is the tendency of young pupils, at first, to turn their books when they need not; that is, to turn them for the purpose of drawing all lines one way, horizontally for example. At the same time they neglect to turn them when they should; that is, for the purpose of deliberately, critically viewing the drawing on all sides, in order to detect errors.

There should be nothing arbitrary about the methods of the schoolroom: they should, in a word, be those which the practical draughtsman has found it best to employ in the execution of his work, those which will enable the pupils to execute their drawings with the greatest ease and rapidity according to the nature of the work to be done.

Lines of Different Lengths.

Length of line is a thing always to be considered. Long and short lines cannot be drawn with ease in the same manner; but it is impossible to indicate just the length of line that can be best drawn in one way, and just the length of line that can be best drawn in another way. This much may be said, however, with advantage to the learner: —

Draw the shortest lines with a movement of the fingers alone; the next longer with a movement of the hand at the wrist; the next with a movement of the forearm at the elbow; the next with a movement of the whole arm. When drawing very long horizontal lines on the blackboard, carry the body forward with the hand. When drawing vertical lines on the blackboard, stand far enough from the board to allow the extended arm to drop easily downwards. Thus we have five movements: the finger, hand, forearm, whole arm, and body movements. At the outset the pupils need to be instructed quite carefully in these movements: after a little they will employ, even without thought, just the right movement for each line.

Trial Lines. — Sketching. — Lining in. — Erasing.

Commence to draw a line by making it so faint that it can just be seen. This trial line may be continuous or discontinuous. If it is found to be in the wrong position, then, without erasing, draw a second similar faint line, and a third, and a fourth, if necessary. When, at last, you have a trial line in the right position, finish it by going over it again and drawing it dark — not black, but gray — and of the required thickness. Now, and not before, erase the erroneous lines. Sometimes, however, when the lines are numerous, it is well to erase the erroneous ones in part, if not wholly, before finishing, or "lining in" as it is called. Again: if the trial lines have been made a little too dark, use the rubber freely before lining in, rendering the lines just visible, as the drawing can then be more readily and neatly finished.

If it is a combination of lines that is to be drawn, as in the case of a design, draw all the lines faint before making any one heavy, thus producing what is called a sketch. Having got a satisfactory sketch, line in, that is, finish the whole in a line of the requisite character. When this has been done, use the rubber freely, and thus give the drawing a clean appearance. With practice the pupils will consume less and less time in making the preliminary sketch, and, after a while, will often be able to execute their drawings without many erasures.

Teachers sometimes find, that, if they permit their pupils to erase erroneous lines, many will draw so heedlessly that they will consume a large part of their time in erasing. The result is, of course, very slow drawing, and not necessarily good. So they prohibit all erasing whatever, preferring to take the first line sketched; or, permitting a second to be sketched, have the better one lined in, with no erasure of the other line. The whole figure is left as thus drawn. If your pupils make an injudicious use of the rubber, give them this heroic treatment for a season, when they will learn that only thoughtful drawing can be rapid and good drawing.

If you permit erasing, always see that the rubber has a straight and clean edge before the lesson begins, and that the pupil does not moisten and soil this edge by holding the rubber in his hand while drawing. If he does, then he will make dirty work of his erasing. Look carefully after this matter.

Delicacy of Touch. — Firmness of Line.

When your pupils begin to draw on paper, one of the first things they need carefully to cultivate is delicacy of touch. The inexperienced are apt to make their first lines altogether too heavy, and so, if they are wrong, much time is lost in erasing, while the appearance of the drawing-book is marred. Then, too, the point of the pencil is frequently broken off. On a slate such lines are less objectionable, since they can be readily removed.

Do not mistake the application of what is said about delicacy of touch. It does not mean that such a touch is specially needed to produce delicate lines when you are finishing a drawing: it means, rather, that it is needed to produce the first lines, which constitute the sketch, and which should be drawn so faintly as to be just fairly visible. When the drawing is lined in, finished, then the line should always be firm and not weak, bold and not wavering and timid. A firm, bold line can be had only when the pupil knows just what he is to do, and then firmly and boldly does it. Look well after this.

In order to secure this firmness and boldness of line, which is of so great value, some of the best schools of art require their students to begin to draw with charcoal. But this is found impracticable when children are to be taught in class. They can manage the lead pencil much more easily, and secure much better results. Require your pupils constantly to act upon the suggestion here given, and not waste their efforts in trying to secure a fine, delicate result when lining in their work, instead of that which is firm and bold, even though it may be somewhat rough.

Management of the Eye.

Do not look directly at the point of the pencil when drawing an original line, as you look at the point of the pen when writing. With inexperienced pupils there is a tendency to keep the eye fixed upon the point of the pencil; and so you must instruct them otherwise. Not only are there different varieties of lines, but, when they are drawn freehand, it is commonly under one of three conditions, each of which demands a somewhat different management of the eye.

1. When a line is to be drawn to hit a given point, as is usually the case, keep this point always in view, or you can never know whither you are

going. Imitate the carpenter, who does not look at his hammer, but at the head of the nail he desires to hit. So far as possible, keep the whole space where the line is to be drawn, with the point to be hit, in the field of vision at the same time.

2. When a line is to be drawn without reference to hitting a given point, keep the whole line, as it is drawn, in view. In this way mistakes can be prevented, which is much better than correcting them after they have been made.

3. When one line is to be drawn parallel to another, keep both lines — the line drawn and the line being drawn — in view at the same time. By practice you will learn how to do this.

These directions hold good only when you are drawing a line for the first time, not when finishing a line already faintly drawn. In the latter case the eye accompanies the point of the pencil.

Rate of Motion of the Pencil.

The motion of the pencil may be as rapid as the eye can distinguish clearly; but it should not be more rapid, for then the line will be right only by chance. Hand and eye must always work together, the latter directing the former. Again, the motion should always be steady, uniform, from the beginning of the line to its end, never hesitating or jerky. Give particular attention to this matter, observing how each pupil handles his pencil.

It is expected that these general directions will be given to the pupils, not all at once, but as required, and that they will be repeated until the pupils have learned to follow them from habit: when a certain way of thinking or doing has become a habit, then, indeed, it is thoroughly mastered, and not before. Be very watchful of your pupils when they begin to draw, and keep them, if possible, from acquiring any bad habit, which they must afterwards unlearn. To unlearn is the hardest sort of learning.

A Clear Understanding of Technical Terms.

Perhaps it may be thought, as you advance, that undue stress, for drawing, is laid upon the definition of technical terms. But the work of the teacher is at all times twofold, — to impart positive knowledge, and to train the mind. Even if we regard only the first, we find, that the clearer the understanding which the learner has of the limitations of the terms used in any study, — in arithmetic, grammar, drawing, for example, — the more readily he will master the study. Without this clear understanding, his knowledge must always be vague, uncertain. If we regard the second, we find that the habit of loose learning, instead of the habit of critical discrimination, once acquired, hinders him in all his other studies, plagues all his subsequent life.

All technical terms do not present the same obstacles to the learner. To make a comparison: The technical terms of grammar seldom or never have clear-cut limitations when applied, but are subject to numerous exceptions: again, it is difficult, or quite impossible, to exemplify them with ocular illustrations; and so, never becoming other than mere abstractions of the mind, it is exceedingly hard for young learners to comprehend and apply them. Now, just the reverse is true of the greater part of the many technical terms employed in drawing. They are clear-cut in their limitations; they can be exemplified by ocular illustrations, and so do not remain mere abstractions of the mind: hence, quite young pupils, when taught in the right way, come quickly to understand their proper use.

Ocular and Verbal Instruction.

For all, but especially for children, ocular illustration is very much better than verbal explanation. Remember this in your attempts to teach children the exact force of the technical terms used in drawing. It is far from enough for them to learn the definitions of these terms by heart, and to repeat them glibly. This most children can easily do, without understanding one of the terms: it is only what so frequently happens in the case of geography, arithmetic, grammar. The pupils must *see* the definitions illustrated again and again: they will then understand them; and, provided they do clearly understand them, it is of little consequence whether they can repeat them word for word.

Learning by Use.

We best learn the use of words by using them, and so make no attempt to avoid the use of technical words when they would be appropriate. Do not, for example, use "level" for "horizontal," "upright" for "vertical," with the thought that your pupils will more readily comprehend what they are doing, if it is described by the former words instead of the latter. Repeated use will make the latter, and all technical terms, just as expressive as any possible substitutes, just as instantaneously suggestive to the child-mind, while they commonly have the advantage of meaning one thing only. Expect of your pupils, at all times, correct usage of terms.

The two principal objections that will be made, if any are made, against carefully teaching the technical terms of drawing, are these: 1. *They are hard to understand.* This objection will be founded on the erroneous belief that the length of a word, or the infrequency of its use, makes its meaning hard to understand, — a thing which depends wholly on the meaning itself, as it is not a question of mouth, but of mind. Thus the meaning of the word "wheelbarrow," with all its length, is as easily comprehended as the meaning of the word "cart;" while it is incomparably more difficult for a child to understand the meaning of the word "verb," because it is a mere abstraction, than of the word "circumference," which can be fully exemplified by ocular illustration. 2. *These terms will not often be used, even if understood; more popular though less exact words being substituted for them.* But this is a good reason why they should be thoroughly taught in school, since there are many occasions, out of school as well as in, when their employment becomes absolutely essential.

Looking Beyond To-day.

In each study the earliest things even should be be taught with reference to all there is to follow, also with reference to the bearing upon other branches of knowledge. The teacher who fails to look beyond just what he is doing to-day must ever fail to give the best instruction. It is in drawing, perhaps, earlier than in any other study, that children can be reasonably required to consider the exact force and limitation of words. See, therefore, that your pupils, in the outset of their drawing career, acquire, if possible, a habit of critical verbal discrimination, — a habit that will be of so much value to them, not only in the subsequent stages of drawing, but in all other studies. Aside from this habit, the exact knowledge itself of many of the terms employed in drawing will also be of use in various other studies, especially in those based upon geometry, because drawing, when taught according to the plan followed in this system, is itself based upon geometry.

Misjudging the Capacity of Children.

When we find that children learn certain things with great difficulty, we are too apt to conclude, without trial, that they cannot learn certain other things any better, if at all. In the first case the things to be learned may not be adapted to the age or natural development of the children, and so cannot be easily learned; but, in the latter case, the opposite may be true, and so, upon trial, the learning would be found easy. Not having duly meditated upon the "fitness of things," we judge that failure at one point argues failure at all points.

Thus, for example, when many children find it a tedious task, as they do, to master the alphabet, with its arbitrary forms and names, all meaningless to them, it is concluded that they cannot profitably use their eyes in the study of botany even, nor profitably use both hands and eyes in the study of drawing. The children having grown somewhat older, the technical terms, the logical abstractions, of grammar, not at all adapted to their age or natural development, confuse and confound them; and so it is concluded they can do no better with the definitions belonging to any other study, however unlike grammar. It may be that they fail, when beginning to draw, to make beautiful lines; and so it is concluded they will never do well in any department of drawing, although success in some of the departments, as in original design, one of the most valuable, depends very little upon expert use of the pencil. Thus, by judging from failure in one direction, we are too apt to underrate the capacity of children in other directions.

Seeing and Doing.

First of all things children love to see and to do. Drawing is both seeing and doing: hence, in its earlier stages, it is better adapted than almost any other study to immature minds. At the outset it makes very slight demand upon the reasoning powers: there is no call for connected chains of thought; while the peculiar force of the technical terms which it employs can be exemplified by ocular illustrations, and thus the eye be made to help the mind.

It is hoped that the points presented in this little discourse upon the great art of teaching will be remembered and practised through all the stages of drawing.

Dictation, Blackboard, and Memory Lessons. — Preliminary Analysis. — Original Design.

Further along, as you have occasion to give your pupils dictation, blackboard, and memory lessons, these lessons, which constitute important features in this course of drawing, will be duly explained. Explanation will also be given of preliminary analysis, and of the different progressive steps to be taken for training your pupils in original design.

Use of this Manual.

Unless you are already familiar with drawing, and have also had much experience in teaching it, your success will depend almost wholly upon a proper use of this Manual. Before beginning to instruct a class, go through it, if possible, by yourself, carefully studying the text, and executing the drawings, part on the blackboard, part in the drawing-books. With the difficulties and the capabilities of each, you will have thus familiarized yourself somewhat before beginning class-instruction. If you have not time to do so much, then keep ahead of your pupils as far as you can, and be sure to draw the lesson for the day two or three times before taking the class in hand. These drawings, for preparation, may be rudely and quickly done, but should be done exactly in accordance with the printed directions, unless you can improve upon them.

Before your class begin to draw, read to them the directions which go with the copies in their books. Read these directions slowly, and at each step request each member of the class to raise his hand, thus signifying that he perceives in the drawing-book before him what it is that he is required to do. When you have finished the description, call upon some one of the class to repeat it, looking at the drawing in his book. See that all the class follow him, to discover if he makes a mistake. If he does make a mistake, request the one who discovers it to continue the description. And so on until the description has been finished. When you are satisfied that the class understand the figure to be drawn, proceed to draw it. They are now wide awake; and they have learned so much about the drawing to be executed that they will save, in its execution, much more time than has been thus expended, while they will have been taught to deliberate upon what they are about to do; which is one of the best of lessons, and one of the hardest for children, young or old, to learn well.

Carefully study the questions at the end of each chapter; for they refer to the principal points which have been explained in the chapter. They indicate the general character of the questions which you should put to your pupils every day, and which they should be able to answer understandingly when they have completed their drawing-books.

QUESTIONS. — What is said of teaching pupils together? Of drawing rapidly? Of the position of the body? Of the position of the pencil? Of turning the hand? Of turning the book? Describe the five movements for drawing lines of different lengths. What is said of delicacy of touch? Of firmness of line? Of sketching and lining in? Of using the rubber? Of the management of the eye in drawing different lines? Of the motion of the pencil? Of the use of technical terms? Of ocular and verbal instruction? Of learning the meaning of words by using them? Of critical verbal discrimination? Of misjudging the capacity of children? Of seeing and doing? Of the use of the Manual? Of teaching pupils the steps to be taken before they begin to draw a copy?

CHAPTER II.

STRAIGHT LINES DEFINED.—HOW TO DRAW THEM.—JUDGING DISTANCES.

EVERY department of learning employs certain terms; and they must be clearly understood, or satisfactory progress cannot be made in mastering that to which they relate. Some of these terms not only have their strictly technical meaning, but popular usage also gives them a meaning somewhat different. Between the two we must learn to distinguish with the utmost precision. Unless your pupils learn to do this in drawing, they will fail, to say nothing of other loss, in two of the best things, — preliminary analysis of forms to be drawn, and dictation lessons.

A Point. — Lines. — Surfaces. — Solids.

Illustrate the definitions which follow by drawings on the blackboard, and by all other available means. Require your pupils not only to repeat the definitions, but, above all, to illustrate them. Do not dwell upon them long at any one time; but, as you advance through the book, often turn back to them, by way of review.

A Point.—*A point is position only: therefore it has no length, breadth, or thickness.*

This is a scientific definition, but is as readily comprehended by a child as by a philosopher. It is common usage to speak of the point of a pencil, and to call a dot a point, though both have size. They may be regarded as indicating points.

A Line. — *A line has length, but no breadth or thickness.*

Think of a point as moving, and its path will form a line. In common usage, the mark made by the point of a pencil is called a line; but this has breadth, and so does not conform to the scientific definition.

Lines are right or straight, as 1; curved, as 2; and broken, as 3. Straight lines are horizontal, oblique, or vertical. Curved lines are circular, elliptical, &c. Lines are said to be continuous, as 1 and 2; or discontinuous, as 4. Two lines are said to be parallel, when they lie side by side, and have the same direction; as 1 and 1, 2 and 2. They are, therefore, at the same distance apart throughout their whole length. It will be seen that a broken line consists of a series of lines, united, but having different directions.

Surface. — *Space enclosed by lines is called surface: it has, therefore, length and breadth, but no thickness.*

Think of a line as moving sidewise, and its path will form a surface. Illustrate by using a piece of wire, straight or curved, to represent a line; moving it sidewise through the air. The surface may be a plane, to all parts of which a straight rule can be applied exactly; or it may be concave, that is, hollow like the inside of a bowl; or convex, that is, bulging like the outside of a bowl or ball.

With a rectangular piece of stiff paper, or cardboard, you can illustrate the three definitions which have been given. The angles, or corners, where the edges meet, will represent *points;* the edges themselves will represent *lines;* and the surface of the paper will show what is meant by a *plane.*

A Solid. — *Space enclosed by surfaces is called a solid: it has length, breadth, and thickness.*

Observe that the word "solid," as thus defined, has no reference whatever to hardness, as it has in popular usage, but only to magnitude, volume, capacity. Different varieties of the solid will be described towards the end of this Intermediate Course.

Thus there is (1) the *point*, which has no dimension; (2) the *line*, which has one dimension, length; (3) *surface*, which is bounded by lines, and has two dimensions, length and breadth; (4) the *solid*, which is bounded by surfaces, and has three dimensions, length, breadth, height or depth. All these things can be illustrated with a cube.

A Horizontal Line.

It has already been said that there are three kinds of straight lines, — horizontal, vertical, and oblique.

A Horizontal Line. — *A horizontal line is a straight line which inclines neither up nor down.*

A line is said to be horizontal when every part of it has the same level. The floor of the schoolroom is horizontal; that is, level. A line either straight or crooked, drawn in any direction on a level floor, is horizontal in an absolute sense, because the floor on which it is drawn is horizontal. But in general usage, and in drawing, the terms horizontal, vertical, oblique, are applied only to straight lines as drawn on an upright even surface, like that of a blackboard, against the wall of the schoolroom.

Therefore, when drawing in the drawing-book, imagine it to be in the position, not of the floor, but of an upright blackboard, the upper edge of the book representing the upper edge of the blackboard. A line on the blackboard is said to be horizontal when it runs right and left, keeping the same level throughout its whole length. A line in the drawing-book is said to be horizontal when it has the same direction as the upper edge of the book.

Lines may usually be regarded and described in four ways. 1. According to their general appearance they are straight, curved, broken, continuous, or discontinuous. 2. According to the relation they bear to one another they are perpendicular, oblique, or parallel. 3. According to their position with reference to the centre of the earth they are horizontal, vertical, or oblique. 4. The definitions may be modified somewhat, according to the surface upon which the lines are drawn.

DRAWING-BOOK EXERCISE I.

Horizontal Lines.

Directions.—Here we have six horizontal lines to be drawn in a given space, and at the same distance apart. On the left-hand side of the space, make six dots, just large enough to be seen, to indicate the left ends of the required lines. Since all the lines are to be drawn horizontal and parallel, no points are needed at the right. Beginning at the points on the left, first draw faint trial lines. When these faint lines have been got in the right position, and of the right length, line them in. Do not wet the pencil, else the lines, which should be gray, will be too black. Endeavor to make the lines of uniform thickness.

These horizontal lines cannot be drawn to fill the allotted space in the drawing-book by the use of the fingers alone. To draw them with ease, the smaller pupils will need to use the forearm ; and all will need to move the hand.

The teacher should draw on the blackboard to illustrate, while the pupils draw in the books.

When drawing horizontal lines, hold the pencil as a pen is usually held, with the arm close to the side of the body. When finishing a line, hold the pencil more nearly upright than when first drawing the line faintly. In this way uniform thickness can be more readily secured. See that the line is firm and bold. As the pencil-point grows blunt, making the last lines thicker than the first, rub the sides of the lead point on a piece of paper, which should always be kept at hand for this purpose.

A Vertical Line.

A Vertical Line. — *A vertical line is a straight line which extends up and down, and does not incline in any direction.*

All vertical lines have the same direction, as do all horizontal lines. But this must be understood as only practically true, — true when the lines are drawn on the black-board or on paper, and not true absolutely.

A vertical line, as truly indicated by a cord with a weight suspended from the lower end, while the upper is held in the hand, always points directly to the centre of the earth. No two absolutely vertical lines can, therefore, have exactly the same direction. There must be a minute difference, however near to each other they may be drawn. The farther apart they are drawn, the greater must be the difference in direction. Suppose a vertical line, drawn at one place, to be continued to the earth's centre; then suppose a similar line to be drawn at another place, one-quarter of the way round the earth from the first place: these two lines would meet each other at the centre of the earth, just as two pins stuck into an orange in the same manner would meet at the centre of the orange. Illustrate, and thus give a lesson in geography, as well as in drawing.

A line in the drawing-book is said to be vertical, when it has the same direction as the right-hand edge of the book, let the position of the book be what it may.

DRAWING-BOOK EXERCISE II.

Vertical Lines.

Directions. — At the top of the given space in the drawing-book, make six very small dots, equidistant, to indicate the upper ends of the required vertical lines. Draw downwards, beginning with the line farthest to the left. In order to draw the lines easily, throw the elbow out from the side, and turn the hand somewhat. The larger pupils can draw the lines with the hand movement, but better with use of the forearm.

Having drawn the lines, divide five of them as indicated, — the second line from the left into halves, the next into thirds, the next into fourths, the next into fifths, and the last into sixths. The division of a line into thirds is more difficult than the division into halves or fourths. To divide a line into four equal parts, first divide it into two equal parts, and then each of these into two equal parts. To divide a line into six equal parts, first divide it into two equal parts, and then each of these into three equal parts.

Proceed in like manner when a larger number of equal parts is required. If it is a composite number, as, nine, twelve, fifteen, begin with the largest divisions that the case will admit, as, halves, thirds, fifths, and then subdivide these until the required number of equal parts has been obtained. Thus, for twelve equal parts, first divide the line into halves, and then each half into halves, giving fourths, and, lastly, each fourth into thirds, giving twelfths. If the number of parts required is prime, as, five, seven, eleven, this process cannot be followed: you must then begin at one end of the line. Frequently ask your pupils how they would divide a line into a certain number of equal parts; as, ten, fifteen, eighteen, twenty-four. This will be a good exercise in arithmetic, as well as in drawing.

An Oblique Line.

An Oblique Line. — *An oblique line is a straight line which inclines more or less.*

All horizontal and vertical lines, as drawn on the blackboard or on paper, have the same direction; but all oblique lines have not, since the degrees of inclination are numberless. All straight lines drawn in the drawing-book, and not parallel to either edge, are to be regarded as oblique lines.

DRAWING-BOOK EXERCISE III.

Oblique Lines.

Directions. — To draw these eleven oblique lines, first make seven dots, at equal distances apart, on the left side of the given space, and six additional dots at the bottom, to indicate the starting-points. Beginning at these points, draw very faint lines upwards; the longest first, and all the others parallel to that. This properly done, finish the lines, commencing at the upper left-hand corner. If you commence at the lower right-hand corner,

then you will be apt, while drawing the last lines, to rub the first-drawn lines, and so soil the paper.

The lines forming this exercise, when drawn in the allotted space in the book, call for the finger and hand movements alone, unless the pupils are quite small, when they will need to make some use of the forearm in order to draw the longer lines with ease.

When lining in, — that is finishing drawing after it has been sketched in light line, — observe this general rule: Work rather from the left towards the right, than from the right towards the left, unless you draw with the left hand, when the reverse would be better; and work rather from the top towards the bottom, than from the bottom towards the top.

When drawing oblique lines that incline to the right, as do the ones in this exercise, place the elbow away from the body, turn the hand somewhat, and begin at the lower ends of the lines. When drawing oblique lines that incline to the left, place the elbow still farther from the body, turn the hand, — turn the body also, if necessary, in order to draw with ease, — and begin at the upper ends of the lines. You need not turn the book, as you can soon learn to draw such lines without doing so, and thus will save time afterwards.

If you find, however, after a fair trial, that any of your pupils cannot draw well and rapidly the different kinds of straight lines without turning their books, then permit them to turn the books, provided they can thus draw their lines better and quicker. It is only a question of time and ease, remember.

Judging Distances.

This is a matter of importance; and you should frequently exercise your pupils in dividing lines drawn on their slates or on paper, and also longer lines drawn on the blackboard. There are two ways : —

The first will teach the pupils to judge of comparative distances ; that is, to determine one distance by comparing it with another. Exercise No. 2 illustrated this, since the several parts of the divided line were to be made equal by comparing one with another. The second will teach the pupils to judge of definite distances ; that is, to determine when a line is one inch long, three inches, a foot, &c.

After the lines have been divided by judgment of eye alone, require your pupils to test their work with the square, that the exact amount of error may be ascertained. In the second case, especially, this must be done ; since no progress can be made in acquiring power to judge of definite distances, without a final appeal to a fixed standard. This appeal is best made by actual measurement. Briefly, then, do not first divide the line by aid of the square, but by judgment of eye alone : *use the square to test and correct the divisions.*

When any thing of importance depends on the line being of definite length, imitate the draughtsman, and use the scale at once. It is for the teacher, however, to consider, first of all, educational results. The eye must be trained to judge distances, proportions ; and the scale should be employed *only when it helps to give this training.* Thus to train the eye is vastly more important, as school-work, than to get the drawing of right proportions in the least possible time.

In judging distances along a given line, the eye is influenced somewhat by position. Thus a vertical line will appear shorter than a horizontal line of the same length. It will be well to remember this.

The following modes of procedure will be found useful in training the eye to judge distances. Others can be readily devised.

Directions. — 1. Draw on the blackboard two parallel horizontal lines of the same length. Divide the upper one, by judgment of eye, into any number of equal parts; as, two, three, four, eight, ten. Divide the lower one, by aid of a scale, into the same number of equal parts. The two can thus be compared.

2. Draw on the blackboard two parallel horizontal lines of the same length. Beginning at the left, divide the upper line, by judgment of eye, into feet. Then, with a rule, beginning also at the left, divide the lower line into feet. Compare the results of the two divisions.

3. Draw on the blackboard two parallel horizontal lines of equal length. Beginning at the left end of the upper line, mark off, by judgment of eye, one foot, then eight inches. Proceed thus, marking off first one foot, and then eight inches, until the right end of the line has been reached. In a similar manner divide the lower line by the aid of a scale. Repeat, changing, from time to time, the distances marked off.

4. Draw on the blackboard a horizontal line of any length. Halve it. From the point of division, draw a vertical line upwards, equal to one-half of the horizontal line. Extend it the same distance below. In each of the four angles thus formed, draw two oblique lines, each line starting from the point of intersection, and each equal to one-half of the horizontal line. Test them by applying the scale. Now divide each, by judgment of eye, into halves and thirds, and then test the result by actual measurement. This will train the eye to judge distances along lines having different directions.

Having first shown your pupils what you desire to have done, by doing it yourself on the blackboard, frequently require each of them to do the same on the blackboard. Do not, however, confine this drill to the blackboard, but also use the slate and practice-paper. When using the latter, direct the class, causing all to do the same thing at the same time. As circumstances require, you will, of course, vary the length of the line to be drawn; making it inches on the slate, or paper, rather than feet, as on the blackboard.

Drawing Lines in all Directions. — Delicacy of Touch. — Uniform Motion.

Directions. — The following drill-exercise on the slate is excellent for quite young or unskilful pupils. See that the pencils are long, and well sharpened; that the slate is kept in the same position throughout the exercise, — the side, and not the end, towards the pupil.

All the members of the class being in readiness, require them, working together, first to make a dot, indicating the middle of the left end of the slate, then another dot, indicating the middle of the right end; and in like manner indicate the middle of the upper side, then of the lower side. Now require them to hold the point of the pencil directly over the left-hand dot, keeping it there until you say, *One*, when they must carry the pencil steadily forward, without touching the slate, to the right-hand dot. Require them to hold the point of the pencil just over the right-hand dot, until you say, *Two*, when they must move the pencil steadily across the slate, without touching it, to the left-hand dot again. Repeat this a half-dozen times, more or less, requiring the pupils to bring the point of the pencil nearer to the slate, without quite touching it, at each repetition. When you think the pupils have thus got the direction of the required line, say, *Draw.* They must touch the slate lightly, and move the pencil from point to point with a uniform rate of speed.

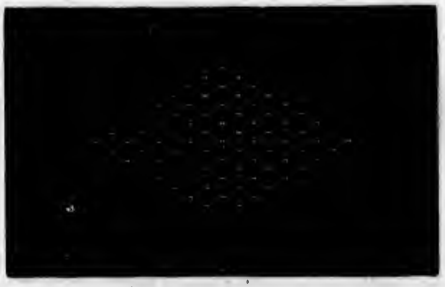
Require them to draw a vertical line in the same way, uniting the upper with the lower dot. Require them, also, to draw a left oblique line in the same way, connecting the upper left-hand corner of the slate with the lower right-hand corner; and then a right oblique line connecting the other two corners. Finally, require them to draw the lines in any order, as you dictate, with considerable rapidity, that they may learn to distinguish with ease one line from another, and to change the position of pencil, hand, and arm, as demanded by the different lines.

After a few exercises of this kind, make an addition to it. When the lines have been drawn, as already described, require your pupils to divide the end and side halves of the slate by dots indicating the centres of these halves; and then to connect these points so as to cover the slate with horizontal, vertical, and oblique parallel lines. The given illustration shows the result.

This exercise may be profitably repeated at frequent intervals, until your pupils have acquired delicacy of touch, which is of so much service when one is drawing on paper, and which they will soon acquire, if you rigidly insist upon their carrying the pencil many times across the slate before drawing the line, with the pencil-point as near the slate as they can get it without touching.

If you find some inclined to draw too rapidly, others too slowly, have them draw now and then by count; have them, for example, draw a line across the slate while you count four.

Parallel Lines. — Cross-Hatching.



Directions. — Draw two parallel lines, as 1 and 1, at some distance apart. Halve the space between them by a third parallel line; as 2. Halve the two spaces by two other parallel lines; as 3, and 3. Halve the four spaces by four other parallel lines. Continue thus. When the breadth of the lines is equal to the breadth of the spaces between them, you will have what is called "half-tint." In a similar manner draw the lines obliquely across the first lines. This will produce what is called "hatching," and sometimes "cross-hatching."

Much shading is done in this way: it is called "shading with the point." It is a laborious process: hence easier methods are frequently used in its stead.

For certain purposes, cross-hatching is an excellent drill-exercise, if rightly practised, and should receive attention from time to time. It gives quickness of eye, and steadiness of hand. The lines should always be parallel, never touching, however closely drawn, if the children can attain to this.

Neither upon this nor upon any drill-exercise should the pupils be kept engaged more than a few minutes at any one time; for they will soon grow weary, as such exercises do not, like a design, represent thought. But occasionally revert to them, as you advance through the book.

The Three Historic Lines.

Apelles, who lived more than twenty-one hundred years ago, was the most distinguished of Greek painters. Protogenes, living at the same time, was also a famous Greek painter. The two were fast friends. On a certain occasion Apelles paid a visit to Protogenes, who was then dwelling at Rhodes. When Apelles entered the studio of his friend, he found only a servant there. Taking up a brush, he drew a straight line across a canvas on the easel. As he was about to leave, he said to the servant, "Tell your master, when he comes in, that that man" (here he pointed to the line he had drawn) "wishes to see him." After a little, Protogenes returned; and his servant gave an account of what had happened. Looking at the line, Protogenes perceived that his friend Apelles had come to see him; for he knew there was no other man in Greece who could draw so beautiful a line. He took up the brush, and drew a second straight line beside the first, and, going out, said to his servant, "Tell that man" (here he pointed to the line drawn by Apelles), "when he comes in, that that man" (here he pointed to the line drawn by himself) "will be very happy to see him." Upon the return of Apelles, the servant did as he was directed. Apelles looked at the line drawn by his friend, and saw that he was surpassed. He took the brush again, and, putting his whole soul into the effort, drew a third line between the first two, and more beautiful than either. When Protogenes saw this line, he felt it would be vain to attempt to excel it. Thus runs the story. But it is further related that the canvas bearing these three lines of such marvellous beauty was carefully preserved for centuries at Rome. It is proper to add, however, that it is a matter of dispute whether the line, in this anecdote, meant a mere abstract line, or a sketch of some subject.

An art-students' association, of which the author was a member, took for its motto, —

Nullus dies sine linea;

and each member bound himself to comply with it strictly. The association interpreted the motto to mean, that no day was to be regarded as finished until the drawing or sketch of some subject had been made. He who retired to rest without having made his line — that is, drawing or sketch (it might be no larger than his thumb-nail) — was deemed to have broken his pledge. In this case a *line* meant many lines, — a picture of some sort.

Every person, in whatever he does, no matter how slight the thing, gives some indication of his quality. Unless he can draw a beautiful line by itself, he cannot draw beautiful lines in combination for a design or for a picture. But do not infer, from the anecdote of the two Greek painters, that any amount of time and labor can be profitably spent in drawing nought but meaningless lines. There are teachers who tell their pupils that at least an hour should be given to the freehand drawing of a square, — a fearful waste of time and labor! When a perfect square is required, instruments must be used to draw it. When the object sought is the power to judge of proportion, that can be as well acquired in the execution of drawings which impart knowledge and improve the taste. Avoid all needless consumption of time and labor.

Hear what Apelles himself has to say about the matter: "My friend Protogenes excels me in all things but one: he never knows when to take his hand from the canvas." By this the great painter implied that laborious finish is not the thing of first importance. Do not, however, conclude that careless, slovenly work is ever to be tolerated; for it is not. Shun extremes.

QUESTIONS. — What is a point? a line? Describe the different kinds of lines. When are lines parallel? What is a surface? Describe a plane. Other kinds of surfaces. What is a solid? How many dimensions has a line? a surface? a solid? Name the three kinds of straight lines. What is a horizontal line? a vertical line? an oblique line? How are all these lines regarded as drawn? How is the drawing-book to be regarded? How should you work when finishing a drawing? What is said of judging distances?

CHAPTER III.

STRAIGHT LINES COMBINED.—ANGLES.—TRIANGLES.—QUADRILATERALS.—POLYGONS.

WE now come to those combinations of straight lines which produce angles and plane geometrical figures. Perchance your pupils will not regard the drawing of these as delightful work; but experience has shown that such work cannot be safely omitted. In "The Primary Manual" it was explained and illustrated, to some extent, and will be further explained and illustrated, that Nature, whatever she produces, follows, in a general way, regular geometrical forms, deviating from these only in details; and that good art, especially industrial art, employs only the general forms of Nature, and follows her general laws of growth. The eye that can readily distinguish the general form of an object can also, with that as a basis for judgment, more readily distinguish its particular form, with its regular or irregular details; while the hand that can draw the former can more readily draw the latter. Indeed, unless it can first draw the former, it cannot draw the latter with any reasonable approach to accuracy. Therefore, in drawing the simple, severe forms of geometry, we are taking the first and a most important step towards learning to draw any object whatever, natural or artificial.

For a long time the elementary schools in England have been largely under the control of the different religious sects. It is some twenty-five years since the education of the working-people in art began to receive special attention throughout that country. The very first to give drawing a conspicuous place in the schools under their direction were the Friends, or Quakers. It may strike one as strange, at the first thought, that they, with their plain, practical views of life, should be found among the leaders in English art education. But, when we consider the important industrial bearings of such an education, there is no longer room for wonder. It was not for the sake of beautiful pictures or statuary, but for the sake of better and more thrifty laborers, that the Friends emphasized art instruction in their schools. As they aimed only at industrial results, so they began with the severe course of training essential to secure such results; ignoring the picture element, which was made the leading feature in so many other schools. But while the Friends, in their elementary work, aimed wholly at practical ends, the result showed that they did just the things essential to secure the highest artistic ends; for when the boys and girls trained in their schools entered the art-schools wholly under the supervision of the government, where the end sought was both practical and artistic, they almost invariably outstripped those students who had come from schools where drawing began with Nature and the cast, and not with geometrical forms, conventional ornament, and the use of instruments.

Thus it was demonstrated by this English experience, as it has been demonstrated again and again by the continental experience of Europe, that the plan followed in this system of drawing for American schools is the best for producing either an industrial or purely artistic result. God never intended that the useful and the beautiful should be separated, or sought in different ways.

Angles.

An Angle. — *An angle is the difference in direction of two straight lines, which meet, as* a *and* b, *or only tend towards each other, as* c *and* d.

Observe the exact force of this definition. It is not essential that the lines meet in order to form an angle. An angle is not, strictly speaking, a corner: it is not the space between the two lines: it is the difference in their direction. The size of an angle, therefore, does not depend at all upon the length of the lines forming it. Nor does the name of an angle depend at all upon the position of the lines.

Though it is not mathematically correct, yet it is popular usage, to apply the name "angle" to the vertex, or point where the two lines meet. For convenience, we shall frequently use the word in this way. But see that the pupil also understands the strictly scientific usage: otherwise he will not get a clear comprehension of some things.

A Right Angle.—*When a vertical line meets a horizontal line, or only tends towards it, the angle formed is called a right angle.*

If the vertical line meets the end of the horizontal line, then one right angle is formed; but if the lines meet as in the cut, then a right angle is formed on each side of the vertical line, *cd*.

It will be well, sometimes, to use other definitions for the purpose of illustration. Thus, when one straight line, *ab*, crosses another straight line, *cd*, making four equal angles, each is called a right angle. Again: the angle formed by the meeting of any two straight lines perpendicular to each other is called a right angle.

When we simply say that a line is perpendicular, we mean that it is vertical; but when we say that a line, as *ab*, is perpendicular to another line, as *cd*, we mean that the two lines form right angles; and the perpendicular line may be, in an absolute sense, vertical, oblique, or horizontal. See that your pupils clearly understand the two uses of the word "perpendicular."

Geometry proper does not employ the terms "horizontal" or "vertical," as it knows no up and down, no right and left. It deals with lines only in their relations to each other, and hence its straight lines must be either perpendicular or oblique; the former when they are at right angles to each other, the latter when they are at any other angle to each other.

An Acute Angle. —*Any angle less than a right angle is called an acute angle.* (See p. 59.)

An Obtuse Angle. —*Any angle greater than a right angle is called an obtuse angle.* (See p. 59.)

While a right angle is always the same, the size of an acute or an obtuse angle is always indefinite. If we wish to give the exact size of any angle, except a right angle, it must be done in degrees. To illustrate: Draw two straight lines, *ab* and *cd*, perpendicular to each other. From the point of intersection, *o*, as a centre, strike two circles. The two intersecting straight lines, which form four right angles, will divide each circle into four equal parts. Thus the opening of a right angle is equal to one-fourth of a circle, large or small. People have agreed to divide a right angle into ninety equal parts, called degrees, and indicated thus, 90° (ninety degrees). An acute angle is any angle less than 90°. The angle formed by the lines *eo* and *bo*, being one-third of a right angle, is an acute angle of 30° (thirty degrees). An obtuse angle is any angle larger than 90°, but less than 180°. The angle formed by the lines *ao* and *eo*, being equal to one right angle and two-thirds of another, is an angle of 150°.

But the opening of a right angle is equal to one-fourth of any circle; as, *ac*, large or small: hence any whole circle has 360 degrees. When a degree measures the difference in direction of any two straight lines, it always means the ninetieth part of a right angle; when applied to a circle, it always means the three hundred and sixtieth part of the circle, and so designates a less or greater absolute distance, according to the size of the circle. Thus a degree of the distance around the earth is about $69\frac{1}{6}$ miles; while a degree of the distance around an orange or a pencil is only the fraction of an inch.

The number 360 was fixed upon to designate the degrees into which a circle should be divided, because, being the common multiple of so many numbers, but few fractions occur when it is used in making actual calculations; thus, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, &c., will divide 360 without a remainder.

If your pupils have not yet learned, in connection with geography, measurement by degrees, they may as well learn it now and here. A judicious employment of familiar illustrations will enable young pupils to comprehend the subject readily. Take it up at different times, but do not dwell long upon it at any one time.

The angle formed by the meeting of two planes, as by the floor and wall of the room, is called a dihedral angle. All angles may be divided into two classes,—right angles, or those which are formed by lines or planes perpendicular to each other; and oblique angles, or those which are formed by lines or planes oblique to each other.

DRAWING-BOOK EXERCISE IV.

Lines forming Angles.

Directions. — After what has been said about drawing straight lines, the pupil will need very few or no directions for drawing the lines which form these angles. The lines should be firm, not wavering; gray, not black; and of equal size throughout their whole length. See that they are neatly drawn where they meet. Remember that the name of an angle depends upon the relation which the two lines forming it bear to one another, and not at all upon the position in which they may be drawn.

Triangles.

A Triangle. — *Any plane surface or figure bounded by three straight lines is called a triangle.*

Triangles have different names according to the character of their angles. While the comparative sizes of the three angles of the triangle vary as the comparative lengths of the sides vary, yet the combined size of the three angles is always equal to two right angles, or 180°. Show your pupils that this is so.

A Right Triangle. — *A triangle containing one right angle is called a right-angled triangle, or right triangle.* (See p. 63.)

The longest side of this triangle is called the hypotenuse; the two shorter are called, the one the base, the other the perpendicular. There is something very curious about this kind of triangle. If you construct a square on each of its sides, whatever may be their comparative lengths, the square on the longest side will always be just as large as both of the other squares. If, as shown

in the cut, the shortest side, *bc*, is three feet long, and the next, *ab*, is four feet long, then the side *ac* will be five feet long; for the square of three (that is 3×3) is nine, the square of four is sixteen, and the sum of both $(9 + 16)$ is 25; while the square of five is also twenty-five. Multiply these sides by any number, giving sides six, eight, and ten feet long, or twelve, sixteen, and twenty feet long, &c., the figure will remain a right triangle, the squares of whose sides can be expressed in whole numbers.

Carpenters, when putting up buildings, frequently make use of this fact in order to place their timbers so as to give a square corner. You can easily illustrate. Draw a line, *ab*, on the floor, or on the ground, four feet long. At one end (*a*) of this line fix one end of a cord five feet long; swing the cord around, keeping it straight, and on the floor, until its movable end is three feet from the end (*b*) of the drawn line. Draw a straight line from the end of the cord to the end (*b*) of the first line, and you will have a right angle, or square corner, where the two lines meet. If your first line is drawn eight feet long, then your cord will need to be ten feet, and the second line six feet long.

This is worth knowing; and children will take pleasure in learning it, if you will only require them to do the work of illustration for themselves. All such illustrations, rude as they may be, serve to stamp on the mind the definitions and facts you desire never to be forgotten. There are many we have not space to describe, which may be employed in teaching geometrical forms. Use, from time to time, all of which you may have knowledge.

An Equilateral Triangle. — *A triangle having three equal sides and three equal angles is called an equilateral triangle.* (See p. 63.)

In any triangle, equal sides are opposite equal angles. If all three angles are equal, then all three sides are equal; and the converse. As the three angles of a triangle are always equal to two right angles, each angle in an equilateral triangle must have 60°.

An Isosceles Triangle. — *A triangle having two equal sides and two equal angles is called an isosceles triangle.* (See p. 63.)

This triangle is always supposed to be standing on its unequal side, the equal sides being the legs. The word "isosceles" means having equal legs.

A Scalene Triangle. — *A triangle having all its sides and all its angles unequal, but having no right angle, is called a scalene triangle.* (See p. 63.)

Place this triangle upon any one of its sides, horizontally, and it will appear to lean to the right or to the left, as the right or the left leg is the shorter. The word "scalene" implies this, as it means limping, and, therefore, leaning, as a limping man leans.

All kinds of triangles are embraced under the names which have been given. Sometimes, however, the term "acute-angled triangle," meaning that all of the angles are acute, is used; and sometimes the term "obtuse-angled triangle," meaning that one of the angles is obtuse.

Two triangles, however much they may differ in size, are said to be similar when they have the same shape; and they have the same shape when their corresponding angles are equal. Various important things can be done by means of similar triangles. To mention a simple matter: it is by similarity of triangles that one can measure the height of a tree or church-steeple, using only his cane or his shadow; or the width of a river, without crossing it, using two or three little sticks. Learn how these things are done, if you do not already know; then please and profit your pupils by teaching them.

Any two triangles, however much they may differ in shape, indeed, any two plane geometrical figures, are said to be equal when they have the same area. They are, also, said to be isoperimetrical when they have the same distance around. Of any number of isoperimetrical figures, the circle has the largest area; the next largest area is that of the figure which comes nearest to the circle in shape; while the figure that is farthest from the circle in shape has the smallest area. Exercise your pupils in making isoperimetrical figures of different kinds with a cord having its two ends tied together.

The triangle is the strongest of all figures, since you cannot change its form without changing the comparative lengths of its sides; not so with a quadrilateral, pentagon, and other figures: hence carpenters frequently put braces into buildings, which cut the sides into triangles, and so greatly strengthen the buildings.

DRAWING-BOOK EXERCISE V.

Triangles.

Directions. — The pupil will need very few or no directions for drawing these triangles. In the case of the equilateral and isosceles triangles, draw the horizontal base-line first; from the centre of this draw upwards a vertical line, by the aid of which it will be an easy matter to make the side lines of the required length and slope. Draw all the corners neatly.

It is quite easy to discover an error in form or proportion, when you view a drawing from all sides. Hence, always insist that your pupils examine their sketches in this way before they line in their forms. But they should hold the book in a vertical position, and directly in front of the eye; otherwise the drawing will be viewed obliquely, and so appear distorted.

Quadrilaterals.

A Quadrilateral. — *Any plane figure having four straight sides is called a quadrilateral.*

If it has four right angles, it is also called a rectangle. The term "rectangle," therefore, embraces less than the term "quadrilateral."

A Square. — *A plane figure having four equal straight sides and four equal angles is called a square.* (See p. 66.)

Doubtless some of your pupils, through carelessness, if not through ignorance, will define a square simply as a figure having four equal straight sides, which is just as true of the rhombus; or simply as a figure having four right angles, which is just as true of the oblong. Show them that the definition of a square is incomplete, unless it describes both sides and angles. Sharpen their wits with these geometrical definitions: it will do them good, and will make them say what they mean when they say any thing. You can do no greater kindness to a pupil than by encouraging this habit.

Diameter of a Square. — *A straight line drawn through the centre of a square, parallel to two of its sides, is called a diameter of the square.* (See p. 66.)

According to this definition, a square has two diameters only. This is not strictly accurate, since the word "diameter" means "*a measure through*," and other straight lines besides these two can be drawn through the centre of the square. But in drawing we have frequent occasion to use the two lines which are here called the diameters of the square. They are thus designated for the lack of some more specific and appropriate word.

Diagonal of a Square. — *A straight line connecting opposite corners, or angles, of a square, is called a diagonal.* (See p. 66.)

A square has two diagonals. They are of equal length, cross each other at the centre of the square, and each divides the square into two equal, similar parts. The diagonal of any figure is a line connecting any two corners, or angles, not adjacent.

A Rhombus. — *A plane figure having four equal straight sides, but unequal angles, is called a rhombus.* (See p. 66.)

An Oblong. — *A plane figure having four right angles, with only its opposite sides equal, is called an oblong.* (See p. 66.)

A Rhomboid. — *A plane figure having only opposite angles and opposite sides equal is called a rhomboid.* (See p. 66.)

The oblong and the rhomboid are called parallelograms, because their opposite sides are parallel.

You can very soon give a clear and permanent knowledge of the different geometrical figures, and all their features, 1, by requiring your pupils to name them as you rapidly draw on the blackboard; 2, by requiring your pupils to draw rapidly on their slates, or on the blackboard, as you designate, the forms and their parts.

DRAWING-BOOK EXERCISE VI.

Quadrilaterals.

Directions. — The pupil needs but little instruction as to the best way to draw these quadrilaterals. In the case of the square, first draw the horizontal diameter, then the vertical diameter. When these are right, draw the sides of the square. Lastly, draw the diagonals, which will cross where the diameters intersect, if the square has been correctly drawn. Do not draw the sides of the square in heavy line, until all the lines have been drawn faintly, and in the right position, with about one-eighth of an inch for margin.

Leave the pupils to draw the other quadrilaterals according to their own judgment. From time to time they should thus be left to work by themselves.

Polygons.

A Polygon. — *Any plane figure having more than four straight sides, and, consequently, more than four angles, is called a polygon, which means "having many angles."*

A Regular Pentagon. — *A plane figure having five equal straight sides, and five equal angles, is called a regular pentagon.* (See p. 67.)

A Regular Hexagon. — *A plane figure having six equal straight sides, and six equal angles, is called a regular hexagon.* (See p. 68.)

A Regular Octagon. — *A plane figure having eight equal straight sides, and eight equal angles, is called a regular octagon.* (See p. 68.)

Polygons may be irregular, having their sides, and consequently their angles, unequal. The regular polygon always has the largest area.

For our present purpose it is not essential that these figures be drawn with absolute accuracy. When it is essential that they be thus drawn, instruments must be used. The directions, therefore, for drawing them freehand will be simple, yet such as will enable the learner, with a little practice, to draw them quickly, and with approximate precision. More than this is not required here.

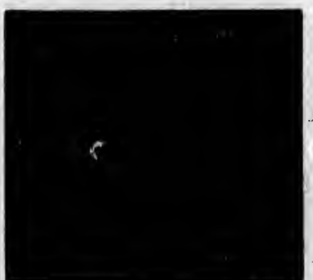
DRAWING-BOOK EXERCISE VII.

The Pentagon.

Directions. — Draw the horizontal line, *ab*; at its centre, draw the perpendicular line, *cd*, of an indefinite length, only making sure to have it long enough. On the perpendicular mark a point, *o*, making *od* a little less than *ab*. Have this correct by measurement. Through *o* draw *ef*, of an indefinite length. Fix the points *c*, *e*, *f*, by judgment of eye, so that when they are united with one another, and with the ends of the line *ab*, all the sides of the pentagon will be equal. Turn the figure around for examination. Not only must the five sides be equal, but the five diagonals, of which only one is drawn in the copy.

DRAWING-BOOK EXERCISE VIII.

The Hexagon.



Directions.—Draw the horizontal line, *ab*, in the middle of the given space. Divide this line into four equal parts. Through the outer points of division, draw two vertical lines, of indefinite length, above and below. Fix the points *c* and *d*, by judgment of eye, so that the lines *ac* and *ad*, when drawn, shall be equal to each other, and to *ce*, the distance between the two vertical lines. Examine the figure carefully by turning it around. See that the opposite sides are parallel.

DRAWING-BOOK EXERCISE IX.

The Octagon.

Directions.—Mark a point to indicate the centre of the space given in the book. Above this, about one-third of the distance to the margin of the space, mark a second point, and a third one below. Through the outer points, draw two horizontal lines, *ab* and *cd*, of indefinite length. Next draw two vertical lines, *ef* and *gh*, of indefinite length, and at the same distance apart as the horizontal lines. The intersections of these four lines will form a square, with the first point in its centre. Fix, by judgment of eye, the points *a* and *e*, so that the line *ae*, when drawn, shall equal *eg*, or the distance between the vertical lines. Thus much done, the other lines composing the octagon can be quickly drawn.

Revert to these geometrical figures until your pupils understand their distinctive features, and can fairly draw them. Do not dwell upon them long at any one time. As so many designs are constructed on a geometrical basis, the pupil will have occasion to draw the given figures quite frequently in the regular course of these lessons. It will be an excellent practice now and then to require your pupils to tell you how the figures should be drawn, step by step, while you draw them on the blackboard.

But remember that the drawing of these geometrical forms by freehand is in part educational, and in part to enable the pupil to secure an approximate accuracy when instruments are not available, or when perfect accuracy is not required. Every person requiring a perfectly accurate hexagon or octagon will draw it as only it can be drawn, viz., by mechanical means.

QUESTIONS. — Why is the drawing of geometrical forms a good introduction to the drawing of natural forms? What is said of the Friends in England? what of the useful and the beautiful? What is an angle? Describe the different kinds. Upon what does the size of an angle depend? Describe a perpendicular line. How many kinds of straight lines are known to geometry proper? How many degrees in a right angle? how many in a circle? Why not 361? What is a triangle? Describe the different kinds. What is said of the right triangle? What is a quadrilateral? Define a square, its diameter, its diagonal. Define a rhombus, an oblong, a rhomboid. What is a polygon? Define a pentagon, a hexagon, an octagon.

CHAPTER IV.

RIGHT LINE GEOMETRICAL DESIGNS.

For reasons given in the Introduction, which need not be repeated, the blackboard can be used only to great disadvantage in providing pupils with copies. If there are not, therefore, other objects to be attained, the blackboard should be wholly discarded. But there are other objects; and they must not be overlooked by the teacher of drawing, especially if he has a large class under his instruction.

Blackboard Instruction.

A part of their drawings the pupils should make of the same size as the copies, others larger, others smaller. When you wish to exercise them in making their drawings smaller than the copy, when, indeed, *reduction* is the main thing to be taught, then the blackboard can be properly used. In this case the drawings should be simple, should be such that you can quickly put them on the blackboard, — such that they will suffer the least possible from bad execution, and from being viewed obliquely by the pupils. They should also have exact proportions, that the pupils may be able, from your description, to draw them accurately, even when viewed from the side of the room.

Again: the blackboard can be properly employed when you wish to teach principles or methods; since these can usually be illustrated sufficiently well by rude drawings, and since they can be as easily explained to a class of forty, by the aid of a blackboard, as to a single pupil without its aid.

Again: the pupils themselves should, from time to time, draw on the blackboard, enlarging to the utmost the copies given in their books. This will not only exercise them in *enlargement*, but in the freest kind of freehand drawing.

The centre of a blackboard drawing should always be on a level with the eye of him who makes the drawing, otherwise it must be viewed obliquely. In order that you may examine any drawing properly, the eye must be so far removed, that it can easily take in the whole at once. The distance should not be less than three times the breadth of the drawing. When the drawing is on paper, hold the paper in a vertical position, with the eye directly opposite the centre of the drawing. In this way both the beauties and defects of a drawing can be readily perceived.

When giving a blackboard lesson you can follow one of two general methods: —

Directions. — 1. Draw the whole figure on the blackboard prior to the lesson, that the class may see what they are to do before they begin. Then direct them, line by line, how to proceed, causing the whole class to do the same thing at the same time. Occasionally leave the pupils to execute the drawing without any directions whatever, each relying on his own judgment for the proportions and mode of procedure.

2. Clearly state what is to be first done; then do it yourself

on the blackboard. Having allowed the class sufficient time to do it also, proceed in the same way with the next step. This method has some special advantages. The pupils must give strict attention, while they are kept in a perpetual state of expectation as to what is coming next, and of surprise when it does come. When you employ this method, draw all the lines faintly at first, requiring your pupils to draw theirs in the same manner. Having made the sketch, line in. After you have done your part of such a lesson, allow your pupils a little time for completing their drawings.

See the Primary Manual, Chap. VI., for illustrations of the use which can be made of symmetrical arrangement in giving blackboard lessons according to the second method. A little practice will acquaint you with all the minor details of procedure.

Drawing from Dictation.

Dictation exercises constitute an important feature in this course of drawing. You give only a verbal description of the figure to be drawn, while the pupils translate the spoken words into lines. After a while, quite elaborate drawings can be made in this way.

The educational value of this exercise is very great for both teacher and pupils. The teacher must use language with the utmost precision; while the pupils must give the closest attention to the spoken words, first making a mental picture of what is required, and then drawing it. If you find it necessary to repeat any part of the description, do not change your language, unless it was wrong, but give it just as you gave it at first. To draw from dictation, the pupils must know the exact force of all the terms employed. There is no possible escape. Hence a dictation exercise is, in some respects, an excellent one for review.

You can give dictation lessons in two ways, according to the capacity of your pupils: —

Directions. — 1. Dictate a line to be drawn. Having waited a sufficient time for the class to draw it, draw the same on the blackboard yourself, that each pupil may see whether he has it right, or not. Thus proceed with each step of the exercise.

2. After the whole figure has been slowly dictated by yourself, and drawn by the pupils, then draw it yourself on the blackboard in the order dictated. The pupils can then verify their work by comparison with yours. It will be seen that this method is more difficult than the first, since the pupils cannot verify their work until the whole figure is completed.

From time to time require your pupils to originate little dictation lessons of their own, and to write out the descriptions. Examine the descriptions to see that they are correct; then direct as many of the pupils as opportunity will allow to give their lessons to the whole class, just as you would yourself. By dividing the class into two or more sections, especially if the class is a large one, two or more pupils can be exercised in this commendable way at the same time. From time to time require some one of the class to dictate for you to draw on the blackboard. The figure should be devised at the moment it is dictated. This will please your pupils, and profit them too. Adhere to one general line of progress, but strive to vary your methods of instruction in all rational ways: variety is more agreeable than monotony, and affords a better discipline.

Right-Line Figures for Blackboard and Dictation Lessons.

Having now learned to draw some of the pure geometrical forms, we will begin to use them as a basis for the construction of designs. It will often be found that the drawing of the geometrical basis is more difficult than the subsequent drawing of the design. Thus the drawing of even a square will frequently be more of a task than the drawing of the design constructed on it. Yet, without the geometrical basis, it would be almost impossible to draw the design accurately.

The six straight-line figures which immediately follow are intended to fill the first blank page in the drawing-book. They must, of course, be given as blackboard lessons. But, before you draw them on the board, some of them can be used for dictation lessons; the pupils drawing on their slates or on practice-paper. The first four, certainly, are simple enough to be drawn in this way by quite young pupils. All of the figures for filling blank pages may first be drawn by the pupils on their slates, in the form of either dictation or blackboard lessons, before they draw them in their books, if you find that this helps along the drawing in the books.

This preliminary work should always be done rapidly, since the object is not to produce accurate drawings, but, in the case of dictation lessons, to teach the pupils to translate spoken words into graphic forms, and, in both cases, to familiarize the pupils with the figure they are to draw in their books.

Instead of retarding, this should expedite the work in the books, as the pupils will go about that so much more intelligently. You will probably find it well sometimes, if the pupils are quite young and unskilful, to have similar preliminary drawings made even of the copies given in the drawing-books. It is not essential that you examine this preliminary work.

The Greek Cross.

Through the centre of the first blank page draw a horizontal line. Divide this into thirds, and through the points of division draw two vertical lines, thus dividing the page into six equal spaces. These lines, faintly drawn, can be erased after the drawings are finished. If they are not erased, then the drawings should be made somewhat smaller, to give a handsome page.

Directions. — Mark a point in the centre of the upper left-hand space. Through this draw a vertical line, 1 2, and a horizontal line, 3 4, each two inches long; the one bisecting the other, that is, dividing it into two equal parts. These having been made correct by actual measurement, use them as the diameters of a square, and through their ends draw the sides of the square. Divide the diameters into thirds, and through the points of division, 5, 6, 7, 8, draw lines parallel with the sides of the square. Having done all this with a faint line, draw heavily those portions which form the cross, and erase the remainder.

These are directions for drawing the cross in the book. For preliminary practice on slate or paper, in the form of a dictation or blackboard lesson, the directions will need to be varied slightly. You will readily see in what respect. When you have put the copy on the board according to the first method for blackboard lessons, add the numerals indicating the best order in which to draw the lines.

You should always draw a figure two or three times yourself, before giving it to the class. You can thus get more rapid work from your pupils, and at the same time better results.

Greek or Eastern churches are built on a ground-plan like this cross.

The Latin Cross.

Directions. — Through the centre of the middle upper space draw a vertical line, 1 2, two inches long, half above, and half below, the centre. Divide this line into four equal parts; through its extremities, and extending equally on either side, draw horizontal lines 3 4, 5 6, equal to three parts of 1 2. Draw 3 5 and 4 6 parallel with 1 2. Through the centre and upper point of division of 1 2 draw 7 8 and 9 10. Divide the upper end of the oblong into thirds, and from the points of division draw lines parallel with 1 2. Line in the cross, and erase construction lines.

Many churches and cathedrals are built on this form as ground-plan by the followers of the Latin or Western church.

The Maltese Cross.

Directions. — In the upper right-hand space draw a square, as it was drawn for the Greek cross. Add the diagonals. Divide the diagonals into thirds, the sides into fourths. Guided by these points of division, draw the outline of the cross. Sketch the form without turning the book, except for the purpose of examination; but turn the book, much or little, when lining in.

This form is frequently used by goldsmiths and jewellers in the manufacture of articles for adornment of the person.

The Cross of St. Andrew.

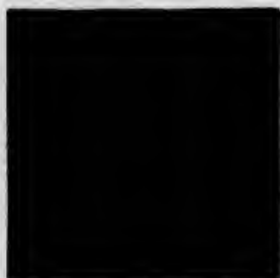
Directions. — Through the centre of the lower left-hand space draw a vertical line, 1 2, two inches long, half above, and half below, the centre. Divide this into thirds. Through its ends draw two horizontal lines, 3 4, 5 6, each equal to two-thirds of 1 2, and extending equally on either side. Unite the ends of these, forming a rectangle, or oblong. Draw the diagonals; and through the points of division on 1 2 draw lines parallel with the diagonals. Line in the cross. Remember the construction-lines are always to be carefully erased, unless you find it necessary, as sometimes happens, to retain them in order to make certain that the pupils have used them in drawing the figure.

In order to interest your class in their work, to instruct and stimulate them, impart any information you may possess relating to the various forms they have occasion to draw.

The Shield of the House of Savoy.

Directions.—Through the centre of the middle lower space draw a vertical line, 1 2, two inches long. Divide it into thirds. Through the points of division, 3, 4. and the upper end, draw horizontal lines, equal to two-thirds of the vertical line. Draw the outline of the shield. Divide 1 4 and 5 6 into eight equal parts. On the two parts of each, nearest the centre, construct a square. On each side of this construct a square, and then line in the cross. Tell your class something about the House of Savoy, about its past and its present fortunes. Much that is interesting may be said.

A Silver Cup.



Directions.—The proportions of this cup must be determined by judgment of eye alone. Put it on the blackboard, adding the numerals to indicate the order in which the lines should be drawn. Leave each pupil to reproduce the cup, without further help, in the lower right-hand space. Since the blackboard copy is to be the pupil's only guide, you will need to take time to draw it quite accurately before the lesson comes off. In this case the blackboard copy should be as good as you can well make it.

From time to time the pupil should be left, as in this exercise, to draw without specific directions. This is a feature of such importance, that it should never be overlooked in any system of drawing. It enables you to find out what the pupil can, and what he cannot, do by himself. Thus, if he has been required to use his common-sense, and has been taught a simple process of drawing, an exercise now and then like the present will give him a chance to apply the instruction he has received, and will show how much of the instruction is retained. The pupil is also greatly profited by a healthy variety, not only in the things drawn, but in the modes of teaching, because the faculties receive a more varied training. Indeed, without variety in both subject-matter and method, there can be no intelligent progress in drawing.

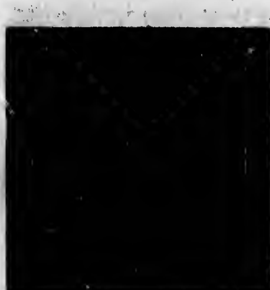
Tell the Truth.

Observe that the lines denoting the junction of the handle with the cup are drawn a little inside the outline of the cup. If they coincided with the outline, then we should be justified in taking the cup to be square, or the handle to be without thickness; for that is what the drawing would actually represent. However rude a drawing may be in execution, it should always tell the truth, and not a lie.

Yet pupils are often set to drawing from books, with numerous copies fundamentally false. Some of them, to take simple illustrations, represent foreshortened lines of equal length with the actual lines. Others represent ellipses by two segments of a circle. Others fail to represent thickness at all, when it is imperatively demanded by the truth. Others make a mixture, one part of the copy representing thickness, another part omitting such representation, when it should be all the one, or all the other. Here we are given, for example, a gate and two posts: one post is represented as having thickness, the other not. If we were told, in a verbal description, that one of the posts had thickness, the other not, we should straightway denounce it as false. No more should we tolerate falsehood in a graphic representation. The pencil and the tongue should equally adhere to the truth.

Four Concentric Squares.

Divide the second blank page by a vertical line, so as to place a third of the page at the left of the line. Divide this space by a horizontal line into two equal parts.



Directions. — In the upper left-hand space construct a square on its diameters, 1 2. 3 4, two inches long. Add the diagonals. On 1 2, 3 4, as diagonals, construct a second square. Now divide 1 2, 3 4, into six equal parts each. Through the outer points of division draw lines forming a third square, its sides parallel to the sides of the first square. Unite the inner points of division, and thus form a fourth and the innermost square, with its sides parallel to the sides of the second square.

Concentric Figures. — *When two or more figures have a common centre, they are called concentric figures.*

Parallel circular curves, short or long, are also said to be concentric: if continued sufficiently far, they would form circles having a common centre.

A Hexagon and a Six-Pointed Star.

Directions. — In the centre of the lower left-hand space draw a vertical line two inches long. Divide it into fourths. Through the outer points of division draw the horizontal lines, 3 4, 5 6, of indefinite length. Fix the points 3 and 4, by judgment of eye, making the distances 1 3 and 1 4 each equal to the distance 3 5. Draw the hexagon, and unite its alternate angles to form the two equilateral triangles. Erase the dotted lines. The pupil is never to add the numerals to his drawings: they indicate the order in which it is best to draw the lines.

An Octagon and an Eight-Pointed Star.

Directions. — Mark a point in the centre of the last space, — the two-thirds of the blank page. Draw two vertical lines, 1 2, 3 4, the one an inch to the left, the other an inch to the right, of the point, and of indefinite length. Then draw two horizontal lines, 5 6, 7 8, at the same distance apart, of indefinite length, and intersecting the vertical lines so as to form a square, with the point at its centre. Fix the points 1 and 5 at the same distance from the corner of the square, making the distance 1 5 equal to 1 3. Draw the octagon; then draw the straight lines connecting the centre of each side with the centre of each third side from itself. Line in carefully, having first erased the dotted lines.

When your pupils are drawing geometrical forms, request them to name both natural and artificial objects whose general shape resembles that of the figure they are engaged upon.

A Pentagonal Form.

Directions. — Draw a horizontal line. On this construct a regular pentagon, according to the mode described on p. 67. Bisect each side, and from the points of bisection draw straight lines to the opposite angles, which straight lines will form axes of symmetry. The points of the smallest pentagon are halfway from the centre to the sides of the largest pentagon. You can do what you choose with this figure. The pupils would be profited by drawing it several times on the blackboard.

The last five figures have no specific names: therefore they may be called, in common, geometrical forms. To draw geometric forms without any mechanical help is at all times a difficult matter, not only for a beginner, but for a person of experience. The work, however, is greatly facilitated by such simple methods as have been described.

Axis of Symmetry.

When a line drawn through a figure divides the figure into two parts, which are not only just alike, but balance each other without change of position, the line is called an axis of symmetry. Observe that the regular pentagon in the last exercise has five axes of symmetry, each a line drawn from an angle to the centre of the opposite side. The equilateral triangle has three, the regular hexagon six, axes of symmetry. Call the attention of the class to other figures.

Examination and Criticism of Drawings.

From the very first, the pupil should be taught to discover his errors by viewing his drawing in several positions. The eye soon becomes accustomed to an error viewed in one position, which it quickly detects when the drawing is turned. Portrait-painters often make use of a mirror, which gives them a reflection of their work reversed in position. This is a good corrective both of bad drawing and of bad color. The effect is similar to that of reversing a drawing, as here recommended. The error is doubled, and so more easily perceived.

Frequently ask your pupils whether they have ever seen such a form as the one they may chance to be drawing, — as, for instance, the Latin cross, or the shield of the House of Savoy, — and to tell where it was seen, and of what it was made. If there is no response, direct them where to look for similar forms, and point out the difference between these and the form they are drawing. Ask for any criticism or observation on the objects. When you have pursued this course for a while, you will find your pupils looking at all objects about them with new eyes, as it were, because with a new understanding.

Time Drawing.

Throughout this course of drawing, great importance is attached to rapid execution, provided always that it is intelligent. When the pupil, in the advanced stages of his art culture, comes to draw from the human figure or from nature, it will often be absolutely essential that he draw rapidly: otherwise a change of position or of light will introduce a new effect, and spoil what he has done, it being but a part of a whole now lost forever. Turner, the greatest of landscape-painters, owed his great power to this ability to draw the effects of nature with astonishing rapidity. Again: when the pupil leaves school, and comes to put his art knowledge to practical use as a workman, he must execute rapidly, or put up with the wages of the slow workman. Hence the habit of drawing rapidly should be early formed, and persistently cultivated.

For securing rapid execution, time-exercises are very valuable. The pupils may do their drawings on the blackboard, or on practice-paper. Alternation is best. When they are done on paper, each pupil should attach his name, time allotted to the exercise, and the date; the drawings to be preserved for the inspection of school officials. These exercises should usually be very brief, always comparatively brief. Thus, if either of the last nine copies are used, the time allotted to pupils having some little skill should not exceed five to ten minutes. All should begin and end at the word given by yourself. You should also inform the class when a quarter, one-half, three-quarters, of the time, has expired.

Many teachers pursue the same method in map-drawing. They find no practice better calculated to impress upon the mind the general geographical features, which are by far the most important.

Borders and Mouldings.

All mouldings may be called borders; but all borders cannot be called mouldings: borders is the more general term. The following distinction is usually made between them. If the form projects above, or is depressed below, the surrounding surface, it is then called a moulding: there may be color applied or not. If it is simply flat ornament on an even surface, as in woven fabrics, and often in pottery, — therefore, always involving color, — it is then called a border. In a moulding, the enrichment projects: in a border, it is flat.

Designs for borders and mouldings involve, to a large extent, the same principles. They must, of course, be somewhat modified to adapt them to the material of which the decorated object is made. Thus a design which is to be painted on a vase can be made more elaborate than one which is to be cut in stone. Again: they must be somewhat modified according to the position in which the ornament is to be viewed. Thus a moulding which is always to be seen in a horizontal position must frequently be made different from a moulding which is always to be seen in a vertical position; while a border which is to be seen in all positions may require to be still further modified. If a design has a right way up, it should be always so seen. Not only mouldings and borders, but all designs, must, in their practical applications, be thus adapted to material and position. More will be said about this farther along, as illustrative designs are drawn.

DRAWING-BOOK EXERCISE X.

The Zigzag.

Directions.—To complete the copy in the drawing-book, first extend the horizontal lines across the page, then divide the enclosed space into squares, and draw the oblique lines.

Among the oldest and most widely-used ornaments is the simple zigzag,—here given as a copy,—or some of its modifications. Observe the parallel horizontal lines, one above and one below, without which a border or moulding seldom or never produces its best effect.

DRAWING-BOOK EXERCISE XI.

The Greek Fret.

Directions.—To complete the copy in the drawing-book, first extend the horizontal lines, the outer and next to the outer, across the page; then, with vertical lines, divide into squares the space for the fret; subdivide each of these large squares into sixteen small squares, by drawing three horizontal and three vertical lines, the middle one to be drawn first. Line in.

There are few ornamental forms older than the Greek fret: there is not one that has been so widely used. Sometimes it is called the "key ornament," because there are varieties which resemble a key; sometimes, the "meander," because its lines so frequently change their direction; sometimes, the "labyrinth," because of the involved intricacy of certain specimens, especially as elaborated by the Greeks. When the lines are oblique, it is called a "raking fret."

Notwithstanding there are so many varieties of this ornamental form, yet its construction is always simple, always by the aid of a basis of intersecting straight lines. Its germinal form is seen at A. Instead of straight lines, curved lines are sometimes used. Celtic art is especially inclined to the use of curved lines. But whether the arrangement of the lines is rectangular, raking, or curved, the leading characteristics of the ornament remain plainly discernible.

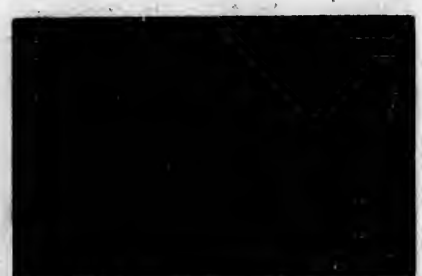
A

Though the Greek fret is so rigid, so arbitrary, in its character, yet there is something about its meandering lines, which always and everywhere pleases the eye. It has been used by all nations and tribes, and is more extensively used today than any other form for enrichment. It may be seen in the decoration of architecture, of textile fabrics, of pottery, glassware, buffalo-robes, shoes, books, &c. Request your pupils to tell whether they have ever seen it, where, and if like the specimen given in the copy.

DRAWING-BOOK EXERCISE XII.

Isosceles Triangles Alternately Reversed.

Directions.—The pupil should be able to complete this moulding without specific directions: hence none are given.



When this design is viewed in a vertical position, the effect is not agreeable, as it is not seen the right way up. It would not, therefore, answer well for a vertical moulding.

Geometrical Drawings.

A geometrical drawing of an object to represent breadth and height does not aim at pictorial effects, because it ignores the principles of perspective, which would give such effects. The object is drawn as though all the rays of light proceeding from it were parallel, and continued parallel forever, instead of converging, and entering the eye; which they are regarded as doing in a perspective drawing. This will be explained towards the close of the book.

The two exercises which immediately follow are geometrical drawings of toy-houses. They are not pictures. With a little license we may call the first an end-elevation of a toy-house, the second, a front-elevation. The plan would show the dimensions on the ground, and features of construction.

DRAWING-BOOK EXERCISE XIII.

End-Elevation of a Toy-House.

Directions. — Draw a square, 1 2 3 4, on its diameters. Extend the vertical diameter upwards, one-half of its length, to 5. Draw the oblique lines for the roof. Divide 1 2 into eight equal parts, and from the points of division draw downwards lines parallel with the sides of the square. Divide 1 6 into thirds, the lower point of division giving the bottom of the upper windows. From 4 set off one-third of the distance 3 6, thus obtaining the elevation of the bottom of the lower windows. Finish according to the copy. See that the eaves extend sufficiently beyond the walls.

DRAWING-BOOK EXERCISE XIV.

Front-Elevation of a Toy-House.

Directions. — Draw a vertical line, 1 2, and divide into three equal parts at 3 and 4. Through 1, 2, 3, and 4 draw horizontal lines a third longer than 1 2. Draw 5 9 and 6 10, and add the diagonals of the oblong; also the vertical lines which pass through the centres of the windows and of the door. It will now be an easy matter to finish, following the copy. Before the pupils draw this figure, have them analyze it after the manner which will now be described.

Preliminary Analysis.

Teach your pupils that they should always analyze a form, before beginning to draw it: otherwise they cannot proceed intelligently. Just as young pupils are apt to begin to work a problem in arithmetic before they have fairly read it, so they are apt to begin the drawing of a figure before they have examined it, to learn what it means, and how best to begin. This is the haste that makes waste. While pupils should aim to draw rapidly, they should, nevertheless, always draw deliberately. From time to time conduct the analysis yourself, causing the whole class to participate. You can then make it an excellent review of many things, besides acquainting them with the particular form they are about to draw, besides teaching them to observe and to deliberate. The mode of conducting this preliminary analysis was illustrated in "The Primary Manual." Here is another illustration, with Drawing-Book Ex. xiv. for a subject.

Teacher. — What is the shape of the front of this house?

Pupils. — Oblong.

Teacher. — What other words might be used to describe its shape?

Pupils. — Parallelogram, or rectangle.

Teacher. — Does a parallelogram always have equal angles?

Pupils. — No. It is only necessary that its opposite sides be equal and parallel.

Teacher. — Does not a rectangle sometimes have all its sides equal?

Pupils. — It does; and then it is called a square. It is only necessary that a rectangle have all its angles right angles.

Teacher. — Which word, then, do you prefer in describing the side of this house?

Pupils. — Oblong.

Teacher. — What is the shape of the roof?

Pupils. — Oblong.

Teacher. — Shape of the chimneys, windows, and door?

Pupils. — They are all oblong.

Teacher. — How many oblongs, then, in all?

Pupils. — Ten.

Teacher. — What other forms do you see?

Pupils. — Four triangles, — three over the windows, one over the door.

Teacher. — What kind of triangles?

Pupils. — Isosceles, because they have two equal sides.

Teacher. — What kind of angles have they?

Pupils. — Each has two acute angles and one obtuse.

Teacher. — What else, then, may you call the triangles?

Pupils. — Obtuse-angled triangles.

Teacher. — Are there any other angles in the drawing?

Pupils. — Yes, right angles.

Teacher. — What kind of lines in this drawing?

Pupils. — Horizontal, vertical, and oblique.

Teacher. — Is the line 7 9 oblique, or vertical?

Pupils. — Vertical.

Teacher. — But it represents the end of the roof; and the roof slopes, or inclines.

Pupils. — But the line in the drawing does not incline, and so is not oblique.

Teacher. — Does the line 7 9 represent the full width of one side of the roof, just as the line 1 5 in the preceding exercise represents the full width?

Pupils. — We do not know.

Teacher. — This has not been explained, and I will tell you now; for it is something quite important for you to know. We say that such a line as 7 9 is *foreshortened;* which means that the fore view, or front view, of the object is shortened, because it is partly turned away from the eye, and so is seen obliquely. When I hold this pencil, for example, square in front of you, the view shows you its full length. But now I turn one end from you, and, though you really see the whole length of the pencil, yet it appears to be shorter than before. Can you think of any thing you should learn from this?

2.8
3.2
2.5
3.6
2.2
2.0
1.8

1.0

Pupils. — That when we draw an object, if any part is turned from us, we should allow for foreshortening.

Teacher. — Good. When two objects are actually of the same length (take these two pencils), but one is seen obliquely, thus: the other not, thus: how should they be drawn?

Pupils. — The one seen obliquely should be drawn shorter than the other.

Teacher. — Are there any other foreshortened lines in this drawing, besides 7 9, 8 0?

Pupils. — We think not.

Teacher. — How do you know that the sides of the house would not lean either towards or from you, were you standing before it, as represented in the drawing?

Pupils. — Because the sides of houses do not lean.

Teacher. — But that is not a satisfactory answer. Suppose this were the drawing of an object you had never seen, would you then feel sure that the side towards you is perpendicular, or not? Would you feel sure that the line 7 9 is oblique in the object itself?

Pupils. — We now see that we could not tell.

Teacher. — Indeed you could not. Hence drawings from which houses, steam-engines, ships, machinery, and many other things, are made, give two representations of each part, that the workmen may know just its shape and size. Such drawings are called "working-drawings," because they tell men how to work. All of you who expect ever to become machinists, shipbuilders, carpenters, mechanics of any kind, should learn, by and by, how to make these drawings; for such knowledge will enable you to do more and better work, and, therefore, to earn larger wages. The two drawings of toy-houses in your books are neither pictures nor working-drawings. They are the latter so far as they go; but they only tell half the story, and other drawings, called plans and sections, would tell the other half.

It is not expected that your analysis will be just like the above: this is a suggestion. Vary it to suit circumstances, taking only a part of the things touched upon, adding other things, changing the language, the order of the topics, &c.

Working-Drawings for a Toy-House.

An illustration of what are called working-drawings is here given. You can use it as you deem best. A working-drawing is so called because one can work from it, making whatever is required; provided always he can read the drawing, that is, tell what it does require. Working-drawings are made to an exact scale, showing the exact proportions of the different parts of the object. The drawings here given are thus made; and a carpenter, calling each sixteenth of an inch one foot, for example, could readily construct the required toy-house. The two drawings at the right are not absolutely essential for our present rude building purpose. They are given for another object.

The drawings numbered 1, 2, 3, are called plans; 4, 5, 6, elevations. A plan supposes the eye to be at an infinite vertical distance, and looking directly down upon the object, and represents what would then be seen. An elevation supposes the eye to be at an infinite horizontal distance, and looking at the side of the object.

Plans 1 and 2 are horizontal sections. No. 1 represents what is seen when the toy-house whose front elevation is given at 4, and end elevation at 5, is cut horizontally across through the middle of the lower windows. It shows the position of the door, windows, chimneys, stairway, kitchen, sitting-room, also the thickness of the walls and other parts. No. 2 is a similar representation of a horizontal section through the middle of the upper windows. The stairway, it will be seen, is a winding one, the lower half shown on plan 1, the upper half on plan 2.

No. 3 is a plan of the roof and chimney-tops, the double dotted lines indicating the walls of the house, which would not be seen by the eye looking directly down upon the house. No. 6 is an elevation of the house when viewed at an angle of 45°, as represented in the plan, from which the elevation is made. Different points in the elevation are secured by means of the dotted lines drawn perpendicularly upwards from the *same* points in the plan. Observe

that the full length of the roof is shown by the line *ab* in the plan; but, in the elevation, *a′b′* shows it *foreshortened*, as it appears seen at an angle of 45°. Thus the foreshortened lines in the elevation can be obtained from the full line in the plan.

But observe that neither the plan nor the elevation gives the full length of the line which represents the width of the roof from the eaves to the ridge-pole. But one who understands working-drawings can, by the aid of the two foreshortened lines, *ae* and *a'e'*, determine just the length of the actual line which they represent. Indeed, the true length of any line, whatever its actual position, may always be obtained from its plan and elevation combined. On this simple fact, which enables one to represent the exact proportions of any object, rests the whole vast superstructure of working-drawings, for machinery, building, and engineering purposes.

Blackboard Lessons.

Divide the blank page (7) into three equal parts, by horizontal lines. These may be drawn with a straight-edge. But remember that all lines in the drawings are to be drawn with the free hand alone.

Modification of the Zigzag.

Directions. — In the upper space of blank page (7), reproduce the zigzag, Ex. X. Begin by drawing two parallel lines across the page, one inch and a quarter apart, the upper one a trifle farther from the edge of the book than the lower one is from the line of division. Having drawn the zigzag lines, as in Ex. X., repeat the zigzag inverted. Add the small rhombuses and triangles; then the outer parallel lines.

This exercise illustrates how easy a thing it is to make a new design out of an old one, to convert a simple design into one more elaborate by a symmetrical addition of new lines. In like manner, an elaborate design may often be converted into a simple one by removing some of the lines. This is a lesson which the pupils should learn early.

A Greek Fret.

Directions. — In the central space of blank page (7), draw two parallel horizontal lines across the page, one inch and a quarter apart, to form the edge of the fret. Divide the space between them into squares by vertical lines. Subdivide these squares, as in Ex. XI. Line in the fret, add the outer horizontal lines, and erase all construction lines not used in the form.

The same basis of intersecting straight lines is used in this as in Ex. XI.; but the result is somewhat different. Request your pupils to devise other modifications of their own, and thus stimulate their invention. They can use the same basis, or a greater or less number of lines. The only "inventive drawing," — a term we sometimes hear used, — that is of any real worth, is the new combination of lines according to some rational method, and not as the thoughtless fancy of the pupil may dictate. All invention, to be of any worth, must be methodical and intelligent.

Four Additional Varieties of the Fret.

Simple as is the construction of the fret ornament, yet its varieties, even if we confine ourselves wholly to straight lines, are almost numberless. Four varieties are here given, which you can use as you think best.

Directions. — 1. Draw seven parallel horizontal lines equidistant. This can be best done by drawing the two outer lines first, and then the central one. Draw the vertical lines necessary to divide the whole into small squares. On these squares construct the fret, as in the copy. This is a Greek specimen.

2. Draw seven parallel horizontal lines equidistant. Draw the vertical lines necessary to divide the whole into squares. On these squares construct the fret, as in the copy. It will be seen that this is quite different from the last variety, though formed on the same intersecting lines. This is an Egyptian specimen.

3. To construct this variety, draw six parallel horizontal lines equidistant. Across these draw equidistant vertical lines, producing a series of squares. On these squares, lightly sketched, construct the fret, as in the copy, repeating the figure three or four times. This is a Greek specimen.

4. Draw nine parallel horizontal lines equidistant. Draw the outer lines first, and then the central one. Across these draw the necessary vertical lines to produce a series of squares. Line in the fret, following the copy. Repeat the figure three or four times. Erase construction lines. This is an Egyptian specimen.

Moulding of Crosses and Squares.

Directions.—In the lower space of blank page (7), draw two horizontal lines across the page, one inch and a quarter apart. Divide the space between them into squares, and add their diagonals. Divide the diagonals into eight equal parts, and through the points of division nearest the centre of each square draw lines parallel with the diagonals. Line in the crosses, and add the outer parallel lines. When the work on this page has been all completed, erase the two horizontal lines which divide the page into thirds, otherwise the page will look too crowded ; or make the mouldings narrower.

The Star Cross.

Divide the blank page (8) by a vertical line, so that one-third of the page shall be on the left, two-thirds on the right. Draw a horizontal line dividing the left-hand space into halves.

Directions.—In the upper left-hand space draw a two-inch square on its diameters. Add the diagonals. On the diameters of this square, as diagonals, draw a second square. Divide each side of the first square into thirds. Complete the figure, observing that every line in it is parallel with either the sides or diagonals of the larger square. Before lining in erase those lines which are not to make part of the finished drawing, and which are indicated in the copy by dotted lines, and thus avoid mistakes.

Cross and Squares.

Directions.—In the lower left-hand space (p. 8, blank) draw a two-inch square, with its diagonals. In a square the diagonals are always equal, and cross each other at the centre of the square. Divide each diagonal into eight equal parts. By the aid of these points of division complete the figure. This will make a good time exercise, to be drawn by the pupils on the blackboard, or on their slates. If it is so used, you will need to draw it carefully on the blackboard before the class begin to draw.

Two Triangles Interwoven.

Directions.—In right-hand space (p. 8) draw an equilateral triangle, sides four inches long. Divide each side into thirds, and through the points of division draw lines to form a second triangle of the same shape and size as the first. Draw the inner triangles parallel to the outer ones. The triangles having been all sketched complete, interweave the bands, when you line in, making each go under, then over, the other, as in the copy.

When you have to draw figures, portions of which are invisible, sketch the invisible as well as the visible portions; then erase the former. By doing thus, you can readily get the visible lines in their right places. See that your pupils do the erasing before they begin to line in, or they will make many mistakes, and waste much time with the rubber.

Twelve-Pointed Star.

Directions.—Draw a hexagon and triangles, as in the blackboard exercise on p. 81. Draw two other triangles by connecting the centres of the alternate sides of the hexagon. Line in. Make such use of this exercise as you deem best.

Remember that the time to make most use of the rubber is just before you begin to line in a drawing. All the lines, and parts of lines, which do not belong to the form, should then be carefuly erased, otherwise you will frequently line in portions you should not.

Patterns for Covering Even Surfaces.

Patterns for covering even surfaces are often called diapers. They are usually based on the triangle or square, two elementary geometrical forms, either of which, when repeated, will cover flat surface without leaving interstices. By using curved lines instead of straight lines, or by using the two combined, you can easily secure a great variety of patterns, which, to the uneducated eye, will appear to be constructed in ways altogether different.

Diaper patterns can be properly used whenever you have a flat surface to be decorated, as in the case of woven fabrics, floors, &c. Because they can then be properly used, it does not follow, by any means, that they are always the best form of decoration to be employed at such times.

DRAWING-BOOK EXERCISE XV.

Hexagons, Repeated for Covering Surface.

Directions.—First extend the vertical lines of the copy near to the bottom of the allotted space in the drawing-book; then draw the horizontal lines. Sketch and line in the hexagons.

Since each hexagon can be divided into six equilateral triangles by straight lines drawn from all its corners to its centre, we may say that the basis of this pattern is the equilateral triangle.

DRAWING-BOOK EXERCISE XVI.

Octagons and Squares, Repeated for Covering Surface.

Directions.—Extend the vertical lines of the copy downwards; then draw horizontal lines dividing the whole space into squares. Draw the octagons by judgment of eye. The square is the basis of this pattern, as it is also of the next.

Were we to use this pattern for a marble floor or pavement, we would fill the squares with marble of one color, the octagons with marble of another color. Were we to use the preceding design for the same purpose, only the alternate hexagons would be of the same color. Such patterns are especially suitable for floors and pavements, as the ornament applied to them should always be flat. If it represents relief, then it gives the disagreeable impression that we are walking on a rough surface.

DRAWING-BOOK EXERCISE XVII.

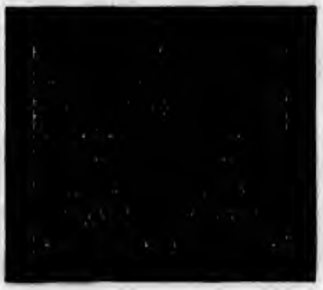
Squares and Crosses, Repeated for Covering Surface.

Directions.—No directions are needed for drawing this pattern. From time to time, pupils should be left wholly to themselves to test their capacity, to show whether they retain what they have been taught, and whether they possess any originality.

See that you do not require overmuch of your pupils in the way of original, unaided effort; otherwise they will become disheartened. Avoid, also, giving too much assistance; for then they will never become original and self-reliant. Just when to help, and just how much, is, indeed, one of the most difficult things to determine satisfactorily. When a word will save from a prolonged stupid effort, give it. All effort is not of equal value. When a word will deprive of mental discipline, and of the pleasure of unaided conquest, then withhold the word.

Triangles, Alternately Empty and Filled, for Covering Surface.

Directions. — Draw an equilateral triangle, *abc*. Halve each of its sides. Through the points of division draw lines parallel with the sides of the triangle. By the aid of these lines construct other triangles, and parts of triangles, inside and outside the first. A larger number of triangles may be readily obtained by dividing the sides of the first triangle into a larger number of equal parts. Inside of the triangles thus obtained, draw similar triangles slightly smaller, and fill every other one with an ornamental form, as in the copy.



Questions. — What is said of the use of the blackboard? Of blackboard lessons? Of dictation lessons? Of original dictation lessons by the pupils? Of truthful graphic representation? Of leaving pupils to draw given forms without directions? Of drawing geometrical forms without mechanical aid? Of the use of mirrors by portrait-painters? Of class criticism of the form drawn? Of time-drawing? Mention reasons why the pupils should learn to draw rapidly. Describe borders and mouldings. How do material and position influence designs? What is said of the zigzag? Of the Greek fret? What is a geometrical drawing? a plan? an elevation? a working-drawing? What is said of preliminary analysis? When is a line said to be foreshortened? What of inventive drawing? Describe diaper patterns. When can they be properly used?

CHAPTER V.

PLANE CURVES, AND PLANE CURVED FIGURES.—DESIGNS COMPOSED OF STRAIGHT AND CURVED LINES.

CURVES may be divided into two general classes, mathematical and unmathematical. The former have properties clearly defined and invariable. They can always be drawn with mechanical aids, and cannot otherwise be perfectly drawn. The circle, spiral, ellipse, cycloid, parabola, are mathematical curves. Whether drawn large or small, or with any other modification of appearance, each curve must always have certain peculiar properties. Thus every point in a circular curve must be at the same distance from a common point called the centre. In an elliptical curve the combined distance of each point from two common points, called the foci of the ellipse, must always be equal, however flat or full the curve may be. Unmathematical curves have no precisely defined properties: they are distinguished by their general appearance. Provided they conform to this general appearance, they are correctly drawn. Hence, while mathematical curves can be drawn freehand with only an approximation to accuracy, unmathematical curves can be accurately drawn in this way; but some of the latter curves will, indeed, be much more beautiful than others. The oval, or egg-shape, is an example of the unmathematical curve. Drawing employs curves belonging to both of these general classes.

Mathematical curves may be divided into plane curves and ascending curves. The former, like the circle, the ellipse, the parabola, are drawn in the same plane; the latter, like the thread of a screw, have no two points in the same plane. Mathematical curves are yet further distinguished. In this Intermediate Course, however, we shall have occasion to deal only with plane curves, both mathematical and unmathematical. See that your pupils acquire a distinct notion of what is meant by a plane. Remind them that all lines, straight or curved, drawn on the same blackboard, are drawn in the same plane; and so they are drawn in the same plane when drawn on the same flat sheet of paper.

In describing curves, certain terms of rather loose application are sometimes employed. Thus the term "abstract" is applied to all curves which do not enclose space, and do not represent any created object, natural or artificial. Certain curves which are never produced by mechanical means, like numerous modifications of the ogee, are called "hand-curves," because they are always drawn with the free hand alone. A curve which reverses its direction, like the ogee, is called a "reversed curve." It really consists of two curves, each of which may be a mathematical or an unmathematical curve.

As your pupils go on with their drawing, see that you make them perfectly familiar with the features, especially the mathematical features, which distinguish different curves and curved figures. By ocular illustration, by comparing one curve and figure with another, and by frequently repeating your instruction, you will, after a little, accomplish this.

Plane Curves, and Plane Curved Figures.

A Plane Curve. — *A plane curve is a line which lies in one plane, constantly changes its direction, and has no three consecutive points in the same straight line.*

A Plane Curved Figure. — *Any figure bounded by a plane curve is called a plane curved figure.*

While there is an infinite variety of plane curves, mathematical and unmathematical, they are all embraced under the definition given above. Neither a reversed curve, like the ogee, nor a plane spiral, forms an exception; for, when we speak of three consecutive points of a line, we mean that no other points come between these three. Any three points in a reversed curve, or spiral, found to lie in the same straight line, would also be found to have parts of the curved line between them. Hence they would not be consecutive points.

A Circular Curve. — *A line which lies in one plane, and bends equally in every part, is called a circular curve.*

A curve of this character is always struck from one point, and, if continued far enough, becomes a circle. It is sometimes, in popular usage, called a "simple curve."

The Circle and its Parts.

A circle may be struck with open compasses; one foot of the compasses being fixed, and marking the centre of the circle, the other revolving, and tracing the circumference: hence its definition.

The circle may be divided in different ways, as shown in the accompanying cut; and it has many important mathematical properties, which will have to be learned and used in more advanced drawing.

A Circle. — *A circle is a plane figure bounded by a curve, called its circumference, all parts of which are at the same distance from a point within, called the centre.*

This is the strict mathematical use of the word "circle," and makes it consist of the space enclosed by the curve. In popular usage the word frequently denotes the circumference, and may be defined thus: —

A circle is an endless plane curve which bends equally in all its parts.

Discriminate carefully between these two meanings. For convenience, the word must be frequently used in this double sense. The connection will always show what is intended.

Radius of a Circle.—*A radius of a circle is a straight line drawn from the centre to the circumference.* (See p. 107.)

The radius of a circle is equal to the opening of the compasses with which the circle was struck.

Diameter of a Circle—*A diameter of a circle is a straight line drawn through the centre, and touching the circumference on both sides.* (See p. 107.)

Thus the diameter is double the radius. It is the longest straight line that can be drawn in a circle, and divides it into two equal parts, called semicircles. There may be numberless radii and diameters.

A Sector.—*The space included between any part of the circumference and two radii of a circle is called a sector.* (See p. 107.)

A Quadrant.—*The space included between a quarter of the circumference and two radii of a circle is called a quadrant.* (See p. 107.)

Thus a quadrant is a sector; but all sectors are not quadrants. It would not be sufficient to describe a quadrant simply as a quarter of a circle: the circle must be divided in a particular way.

An Arc.—*Any part of a circumference or other curve is called an arc.* (See p. 107.)

A Chord.—*A straight line connecting the two ends of an arc is called a chord.* (See p. 107.)

In drawing, it is frequently convenient to speak of the chord of a curve as its base.

A Segment.—*The space enclosed by an arc and its chord is called a segment.* (See p. 107.)

Altitude of a Curve.—*The altitude of a curve is the perpendicular distance from the base to the highest point in the curve.* (See p. 107.)

We do not describe curves as oblique, horizontal, or vertical, but say, "a curve on an oblique base," "a curve on a horizontal base," "a curve on a vertical base." Whatever may be the position of a curve, it has base and altitude all the same. In teaching drawing, especially in blackboard and dictation exercises, you will have frequent occasion to use these terms.

DRAWING-BOOK EXERCISE XVIII.

The Circle and its Parts.

Directions for the Circle.—In the middle of the lower portion of the allotted space draw a horizontal line and a vertical line, each an inch and a half long, and mutually bisecting. Upon these two lines, as diameters, draw the circle.

The Quadrant.—In the left-hand upper corner draw a horizontal line one inch long. At the left end of this draw a perpendicular line of the same length. Add the curve, completing the quadrant. See that you do not make the curve too flat: it should represent the quarter of a circle.

The Semicircle.—To the right of the quadrant draw a horizontal line two inches long. At its centre draw upwards a

vertical line one inch long. Add the curve, completing the semicircle.

The Segments. — Draw the segments about the circle, giving the chord, or base, of each curve a different direction.

The pupils need not add the names of the different parts; as, diameter, chord, &c.

When it is essential that the circle be drawn with mathematical precision, then use the compasses. It is not essential that it be so drawn here, and the compasses must not be used. Practice will enable one, after a little, to draw a circle practically accurate with the free hand alone.

Doubtless, many of your pupils will make bad work at first with the circle thus drawn. They will declare they can never do it in a respectable manner. When such is the case, ask them if they can see imperfections in the circles they have drawn. If they say, "Yes," then tell them, for it is true, that the hand, with practice, soon learns to correct all the imperfections discoverable by the eye. Tell them that the very fact that they can see their errors is cause for encouragement; since, if they did not first see them, it would be impossible to correct them. Tell them there is no limit to progress, so long as the eye can detect imperfections when there are any. Only he who cannot perceive the imperfections in his drawing, when they are prominent, has reason to be discouraged. When the eye of the pupil thus fails, you will find it well to show him the imperfections by mechanical means.

For artistic purposes, the circle is the least beautiful of all the curves, since the eye can so readily detect its character, — that it bends equally in all its parts. The more subtle a curve, that is, the more difficulty we have in discovering its true character, the more it pleases the eye. The same is true of proportions, the eye deriving less pleasure from simple than from subtle proportions. More about this further along.

The Ellipse.

In drawing, much use is made of this figure. Whenever a circle is seen obliquely, it assumes the appearance of an ellipse. Hence, in model and object drawing, the ellipse must be frequently drawn. Again: elliptical curves being more beautiful than circular curves, they are often employed in design.

An Ellipse. — *An ellipse is a plane figure bounded by a curve, every point of which is at the same combined distance from two points called the foci.* (See p. 116.)

According to this definition, the space bounded by the curve, and not the curve itself, is the ellipse. But the word "ellipse," like the word "circle," is, for convenience, often used to describe both the curve, and the enclosed space.

The ellipse being a mathematical figure, it can be drawn with perfect accuracy only by mechanical means. There are various ways to do this. One is described in the Primary Manual; you should make your pupils familiar with this way if they do not already understand it. Here is another: —

Drawing the Ellipse by Mechanical Means.

Directions. — Draw two straight lines, 1 2, 3 4, of indefinite length, mutually perpendicular, and bisecting each other. From the point of bisection, *o*, mark off on either hand, along one of the lines, as at 1 and 2, the same distance, namely, one-half of the long, or

transverse, diameter of the proposed ellipse. Call it two inches in the present case, making the whole distance, 1 2, equal to four inches. From *o*, on either side, mark off along the other line, as at 3 and 4, the same distance, namely, one-half of the short, or conjugate diameter of the proposed ellipse. Call it one inch, making the whole distance, 3 4, equal to two inches.

You now have the diameters of the proposed ellipse. The one, 1 2, is twice as long as the other, 3 4. Any other proportion could be taken as well. The ends of these diameters give four points in the required curve. For one skilled in drawing ellipses freehand, these points would suffice; but for the beginner they are not enough.

Take a piece of paper having a straight edge: from one end mark off a distance equal to 1 *o*, or one-half of the transverse diameter of the proposed ellipse. Put the letter *t* by the side of this mark, also by the side of the transverse diameter. Commencing at the same point, mark off on the same edge of the paper the distance 3 *o*, or one-half of the conjugate diameter. Put the letter *c* by the side of this mark, also by the side of the conjugate diameter. Lay the strip of paper on the diameters of the proposed ellipse, so that the mark *t* shall fall on the conjugate diameter *c*, and the mark *c* on the transverse diameter *t*, at the *same time*. The corner of the paper will give a point in the required curve. Mark it.

Change the position of the paper, observing always to keep t on c, and c on t, until a sufficient number of points have thus been accurately obtained. Through these points draw the curve freehand.

This method, which is only in part mechanical, is a very convenient method. Using a stick, instead of a slip of paper, you can thus draw large ellipses on the blackboard. With a few trials, your pupils will become masters of the method.

Before an ellipse can be drawn with a good degree of accuracy by the aid of the diameters alone, the eye must become familiar with the figure by looking at ellipses accurately drawn. Therefore, require your pupils, from time to time, to draw ellipses in the manner just described. After they have been thus drawn on paper, or on the blackboard, require them to go carefully over the figures many times with their pencils or crayons. Such practice will at last so work the curve into both hand and eye, that it can be drawn freehand with a good degree of celerity and precision.

The definition says the combined distance of each point in the boundary of an ellipse from two points called the foci is always the same. To find the foci, you have only to draw a straight line from an end of the short diameter, on either side, to the long diameter, making each of these lines, as $3f$ and $3f'$, equal to $1o$, one-half of the long diameter. Where these two lines touch the long diameter, will be the two foci, as f and f'. Now, from any point in the curve, as a, draw a straight line to each focus, and you will have $af + af' = 3f + 3f'$. This it is that distinguishes the ellipse from all other curves. Why it has this peculiar characteristic, will be clearly seen by consulting the Primary Manual, and drawing an ellipse as there described.

The centre of an ellipse is at the point where the transverse and conjugate diameters cross each other, as at *o*. This point will bisect every line drawn through it from one side of the ellipse to the other; that is, the centre of the ellipse and the centre of the line will coincide. Any straight line thus drawn divides the ellipse into two equal similar parts, just as the circle is divided by its diameter. Hence, by tracing an ellipse on transparent paper, you can easily determine whether it is accurately drawn; for, if it is, the trace can be exactly applied to the original, with ends and sides reversed.

Centre of a Plane Curve. — *The centre of any plane curve is that point in the plane of the curve which bisects every straight line drawn through it, and terminated by the curve.*

If no point will do this, then the curve has no centre.

Centre of a Straight Line. — *The centre of a straight line is that point which is equally distant from the extremities of the line.*

The word "centre" can be applied to the exact middle of a line, as well as to the exact middle of a circle.

The Oval.

The oval is not a mathematical figure; for it has no properties mathematically defined and fixed. It is named from its general appearance, as its name implies. It is simply an egg-shaped figure; that is, it resembles the longitudinal outline of an egg, or the flat surface that would be obtained on dividing an egg, lengthwise, into two equal parts. As the variations in the shape of eggs are innumerable, so are the variations in the shape of ovals; but the general appearance, in either case, remains always the same.

The Oval. — *The oval is a plane figure bounded by a curve having the shape of an egg viewed sidewise.* (See p. 116.)

There are different ways, of course, to define an oval. You can use any other definition for which you have a preference. The thing of real value is, for the learner to get a correct notion of the figure, not simply to memorize a definition.

When drawing an oval, we may make its boundary-line circular in part, in part elliptical; or we may make it wholly of portions of different circles, or of different ellipses; or we may use curves which are neither circular nor elliptical. It is only essential that the figure be egg-shaped; that its two parts, when it is divided lengthwise, as the long diameter divides it, be similar and equal, balancing. No other line will thus divide it. The ellipse has two axes of symmetry; the oval, one.

In popular usage the ellipse is often called an oval; but this should never be, for the two figures are quite unlike. If you teach your pupils properly, they will never confound the two.

DRAWING-BOOK EXERCISE XIX.

Drawing the Ellipse and the Oval, Freehand.

Directions for an Ellipse 2 × 3 (*a*).—In the middle of the left-hand upper space draw the transverse and conjugate diameters of the ellipse, making the former two inches and a quarter long, the latter one inch and a half, which will give an ellipse with the proportions of 2 × 3. Through each end of the diameters draw a portion of the boundary-line. When these are satisfactory, unite them by drawing the intervening portions. See that the ellipse has no abrupt curve anywhere; also see that its sides are not too flat. Compare carefully with the copy.

It will be well to require your pupils, before they attempt to draw the ellipse in their books, to draw it on their slates: first by the aid of a slip of paper, as described on p. 112; then with the free hand.

Observe that each of its diameters divides the ellipse into two equal and similar parts; and that both together divide it into four equal and similar parts. By comparing these parts with one another, you will facilitate the drawing of the ellipse.

An Oval (*b*).—In the middle of the upper right-hand space draw a vertical line two inches and a quarter long. Divide it into thirds. Through the upper point of division draw a horizontal line equal to two parts of the vertical line, and extending the same distance on either side. On the horizontal line, as a base, draw a semicircle for the large end of the oval. On the lower two-thirds of the vertical line, draw one-half of an ellipse for the small end of the oval.

Observe that only the long diameter divides the oval into two equal and similar parts, balancing. It has, therefore, but one axis of symmetry. Compare with the ellipse, which has two.

An Ellipse 3 × 7 (c). — In the middle of the lower space draw the long and short diameters of the ellipse, making the former three inches and a half long, the latter one inch and a half, which will give an ellipse with the proportions of 3 × 7. Complete as in the last exercise but one.

Do not weary your pupils by keeping them too long at work, at any one time, with the circle, ellipse, and oval; but rather revert to them quite frequently, until they have fairly mastered their different features.

DRAWING-BOOK EXERCISE XX.

Quatrefoil, Filled.

Directions. — Mark the centre of the space allotted in the drawing-book. Through this point draw two lines, one vertical, one horizontal, each an inch and a half long, and each bisecting the other. On these two lines, as diameters, construct a square. Extend the diameters one-half of their length beyond each side of the square. On each side of the square draw a semicircle passing through the end of the extended diameter. This will complete the copy in the drawing-book. Now make of each semicircle a complete circle. Then through each corner of the square draw a semicircle, connecting the centres of the two adjacent sides of the square. Add the other curves in the Manual copy. Draw the figure on the blackboard, as the class draw it in their books.

DRAWING-BOOK EXERCISE XXI.

Quatrefoil, Filled.

Directions.—Mark the centre of the space allotted in the drawing-book. Through this point draw two straight lines, one vertical, one horizontal, each two inches long, and each bisecting the other. On these lines, as diameters, construct a square; then unite their ends to form a smaller square. Draw the diagonals of the larger square. From each corner of the smaller square mark off about one-sixth part of the side of the square. On each side of the smaller square draw a semicircle, connecting these points of division, and touching two sides of the larger square. Line in. This gives the copy in the drawing-book. Now draw a circular curve to connect each end of each semicircle with its middle. Next draw a circular curve, convex towards the common centre of the squares, to connect the centres of each two adjacent sides of the smaller square. Finish.

DRAWING-BOOK EXERCISE XXII.

Trefoil, Filled.

Directions.—Mark the centre of the space allotted in the drawing-book. Through this point draw a vertical line two inches long, and divide it into four equal parts. Through the upper point of division, and extending equally on either side of the vertical line, draw a horizontal line, not quite two inches long, but long enough to form an equilateral triangle when its ends are united by straight lines to the lower end of the vertical line. Divide each side of the triangle into four equal parts. On the two central parts draw semicircles. This gives the re-

sult shown in the drawing-book. Now add the other curves contained in the Manual. Draw on the blackboard as the class draw in their books.

Symbolism in Art.

When we use an object to convey a meaning which the object itself does not necessarily imply, it becomes a symbol. Thus the letters of the alphabet are symbols: by common agreement they are employed to represent sounds which they do not resemble in the remotest degree. A bundle of rods is a symbolic representation of strength in union. The stars on the American flag are symbols, each standing for a State. When, however, a man is painted with hammer and tongs, the latter are not symbols: they are the instruments themselves which a blacksmith uses in his labor, and show, without any conventional agreement, that the man holding them is a blacksmith. But, when the human figure is painted with a bridle in the hands, we have a symbol which the ancients employed to represent temperance. Constancy they indicated by an attitude, — by the human figure leaning against a column.

Much is made of symbolism in Egyptian art, and in Christian art of the Middle Ages. Of Christian symbolism we have examples in the trefoil and quatrefoil figures, which have just been drawn; the former a symbol of the Trinity, the latter a symbol of the four Evangelists. The cross is a symbol of Christianity itself. Indeed, the numbers 3, 5, 7, became sacred, — 3 meaning the Trinity, 5 the five wounds, 7 the seven sacraments. These numbers were to be seen in the plan of a church, — a nave and two aisles; in the number of the lights in the windows, in the foils of the tracery, in the number of points or leaflets of sculptured foliage. Thus a Gothic rosette does not have four, six, or eight leaflets. Even painting became so far symbolic as to use a special color for the garment of each saint, and a special emblem to denote the sufferings of each martyr.

For an extended account of symbolism in art and architecture, see chap. vi. of the author's "Art Education," issued by the publishers of this book.

DRAWING-BOOK EXERCISE XXIII.

Moulding of Circular Curves.

Directions. — Extend the horizontal lines across the page, and divide into squares. Sketch the whole in light lines first. Having secured a satisfactory sketch, line in. If the work is properly done, a series of circles will form a part of the result. This design will appear the right way up when viewed from any point, and repeated any way.

Observe how simple are the elements composing this form, — two curves only, if we omit the outside straight lines. Repetition of these two curves produces the apparently intricate design. An analysis of the different exercises in this book will show, in each instance, that the final result has been secured by the repetition of two or three simple elements. If those elements can be well drawn, then the whole figure can be well drawn, with a due allowance of time.

DRAWING-BOOK EXERCISE XXIV.

Moulding of Circular Curves Interlaced.

Directions.—Extend the horizontal lines across the page, and divide into squares. Draw the long curves full; then erase those parts which go under. The smaller circles occupy about one-third of the breadth of the moulding. This design will appear the right way up when viewed from any point, and when repeated up and down, or right and left. The long curves are parts of perfect circles.

DRAWING-BOOK EXERCISE XXV.

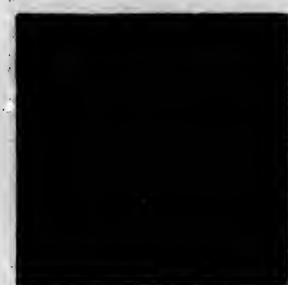
Moulding of Flower-Forms Alternately Reversed.

Directions.—Having extended the horizontal lines across the page, and made the proper divisions, first draw throughout the whole the long, continuous wave curve. Having got this to your satisfaction, the other curves can then be easily added. Strive to make the curves graceful. This design can be seen to best advantage only when horizontally repeated on a vertical surface.

Blackboard Lessons.

Draw a vertical line so that two-thirds of blank page 13 shall be on the left of this line, and one-third on its right. Draw a horizontal line dividing the one-third into two equal parts.

Square, and Interlacing Curves.



Directions.—Mark the centre of the largest space on the page by a point; through this draw the horizontal and vertical diameters for a five-inch square. Draw the square, and add its diagonals. Divide the diagonals into thirds. Through the points of division draw equal circular curves, one on each side of each diagonal, and touching the diagonal near its ends, as shown in the copy. Draw the inner parallel curves, making the bands interlace. Before lining in erase the parts not to show when the drawing is done.

The Unit of the Dog-Tooth Moulding.

Directions.—In the upper right-hand space draw a two-and-a-half-inch square, with sit diameters and diagonals. Add the indentations at the centres of the sides. Line in. By repeating this unit, leaving a slight space between the repeats, and adding parallel outlines, you have the dog-tooth moulding, which is often cut in stone for an architectural ornament.

The centre of the figure is higher than any other part, each of the four sides of the figure sloping from the centre to the edge, and so the diagonals represent ridges. This feature cannot be shown without shading, which young pupils should never attempt in the earlier stages of their drawing career.

Rosette of Right and Curved Lines.

Directions. — In the lower right-hand space draw a two-and-a-half-inch square, with its diameters and diagonals. Mark the centre of each semi-diagonal, and through the points of division draw the smaller circle. Draw the outer circle so as not quite to touch the sides of the square. Add the foils on the diagonals in the corners of the square. Line in. The centre of a drawing when placed on the blackboard should be on a level with the eye. The lines may extend above and below the eye as far as they can be readily drawn.

Drawings executed from Memory.

Let the pupil fill p. 14, which is blank, with forms drawn from memory. You can leave him to make his own selections, or you can indicate the ones you would have drawn. Preference should be given to historical forms, some of which, like the one on the titlepage of this book, should be drawn again and again. Before the pupil begins, he should determine the number of the forms, and the size of each to be drawn on the page, and divide the page accordingly. After he begins to draw he should not refer to the form he is endeavoring to reproduce.

Blackboard and Dictation Lessons.

The figures which follow are intended for blackboard and dictation lessons, to be used when you think best. They can be drawn on the blackboard, or in the place of some of the figures which have been designated for the blank pages in the drawing-book.

Rosette: Square and Circular Curves.

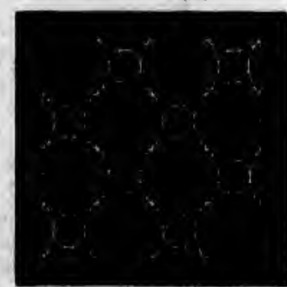
Directions. — Draw a square with its diameters and diagonals. Halve each semi-diameter, and connect the adjacent points of division by semicircles convex towards the corners of the square. Draw a circle enclosing this quatrefoil, and not quite touching the sides of the square. If this is given as a blackboard lesson, let the pupils draw it large from the copy without directions. The pupils themselves should quite frequently draw on the blackboard, a thing they usually like to do. The drawings should be large.

Rosette: Octagonal Form.

Directions. — Draw a square with its diameters and diagonals. Within the square construct an octagon as shown. Halve the semi-diameters of the square, and through the points of division draw a second square having its sides parallel with the sides of the first square. By the aid of this complete the figure. Let the pupils draw it from a blackboard copy without directions. The important educational discipline to be got from this practice has been previously explained, and need not be repeated here.

Diaper Pattern: Squares and Circles.

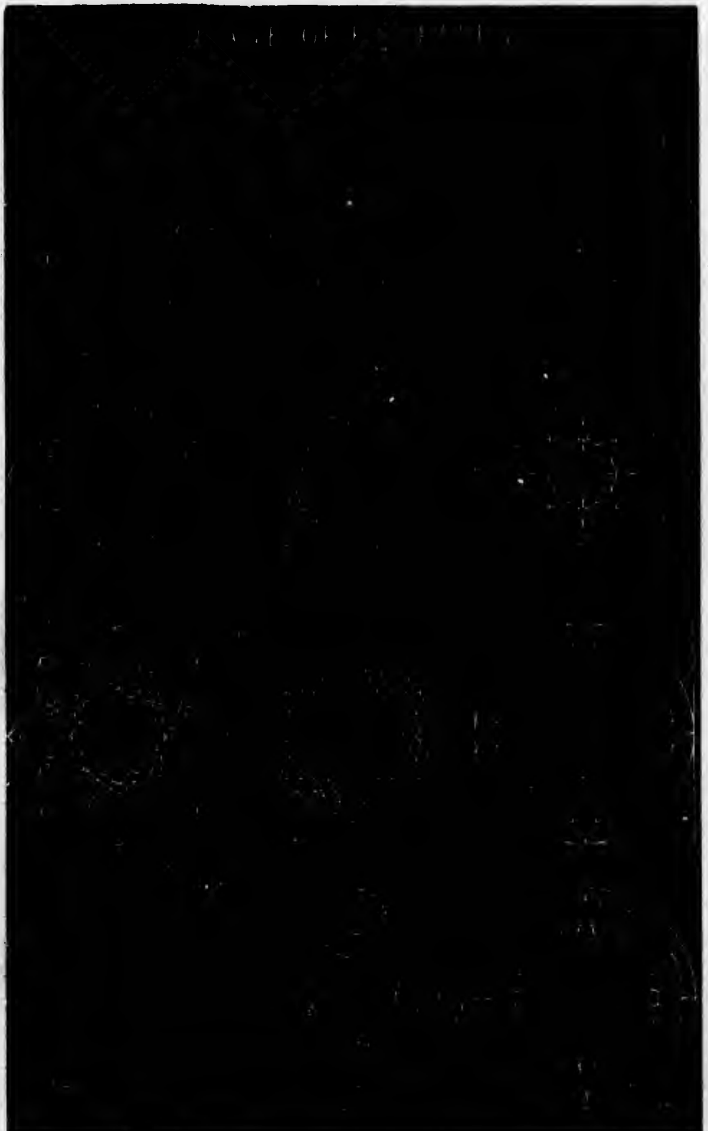
Directions.—Draw any number of connected squares. Add circles circumscribing alternate squares. Within the other squares draw circles touching, but not cutting, the first-drawn circles.



This will serve as a pattern for a pavement, the different parts to be filled with different colored marbles. Other curves might be added, thus greatly modifying the appearance of the pattern. But it is better to err, if you err at all, in the way of simplicity, than by an over-abundance of lines. It not infrequently happens that the effect of a design is weakened by too many lines. It is the tendency of the uncultivated taste to overdo in the application of ornament, whether it consists of form or color.

Square Rosette of Interlacing Lines.

Directions.—Draw a square, its diameters and diagonals. Divide the diagonals into ten equal parts. Connect the three outer points of division on each semi-diagonal by lines parallel with the sides of the square. Through the points of division nearest the centre, draw lines parallel with the diameters. Draw the oblique lines for the interlacing. Having thus sketched the form, erase the lines which are not to show when the drawing is done. Also erase the other lines until they are just visible: then line in.



Page of Rosette Forms.

Directions. — The geometrical rosette forms on the opposite page can be used for blackboard lessons at such times as you may deem best. No one of them needs more than a word of description. It will be seen that the first seven are constructed on the same basis of two equal concentric squares, the diameters of the one coinciding with the diagonals of the other.

Form I. — Draw a square on its diameters. Add its diagonals. Mark off such parts of the diagonals as will be equal to the diameters of the first square; and on these, as diameters, draw a second square which will be equal to the first. Add the circular curves.

Form 2. — Reproduce Form 1. Continue every other curve to the common centre of the squares. All the curves are parts of circles.

Form 3. — Reproduce Form 2. Add the small circle at the centre, and the remaining circular curves.

Form 4. — Reproduce Form 1. Next draw the larger inner circle. Finish according to copy.

Form 5. — Reproduce Form 1, making it large. Draw the larger inner circle, making it equal to one-half the diameter of the whole figure. Draw the smaller circles.

Form 6. — Reproduce Form 1. Add the parallel lines, and complete the figure.

Form 7. — Reproduce Fig. 1, making it large. Draw the interlacing bands.

Form 8. — Draw two interlacing triangles, as on page 99. Add the interlacing circles.

Forms 9 and 10. — These are so simple, that no directions at all are needed.

Form II. — Draw all the straight lines, and all the circles, full; then erase the parts not wanted.

Form 12. — The drawing of this is too simple to require any directions. All the curves are circles or parts of circles.

Ornaments and Pictures.

In the production of an elaborate ornament, we start with a simple germ, perfect in itself. One feature after another is added to this. The additions are made in accordance with the general laws of natural growth, symmetrically about a centre, for example, as Nature arranges the petals of a flower. With each new addition we have a new design, as illustrated by the progressive steps which lead to Form 3, p. 126. Each new design is perfect in itself, because there is no superfluous line, and no line is wanting to complete the symmetry of the figure. At last, through the different symmetrical progressive steps, we reach the elaborate final result that was desired.

A picture must have symmetry, indeed, but of its appropriate kind: there must be no regular repetition of lines or features, as in a design for decorative purposes. A picture, too, may have different degrees of elaboration, at any one of which, should the painter stop, the picture, nevertheless, would be a complete whole, though not in the highest degree elaborate; but, as already said, no stage consists of the symmetrical repetition of a particular feature. Here we have one of the things which distinguish an ornament from a picture.

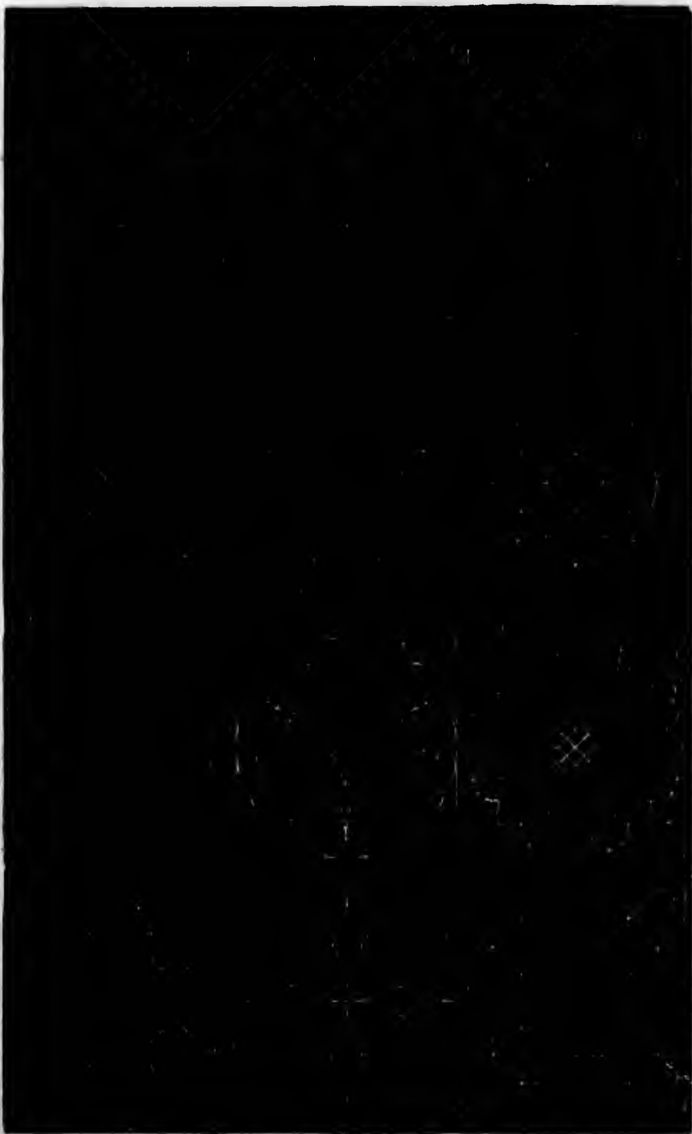
But, further: having constructed our ornament, we may repeat it, in some regular order, again and again, without offence to the taste; with delight, rather. Indeed, the regular repetition of an ornamental form usually increases its pleasing effect.

But who would care to hang upon the walls of his room a score of landscapes, or other pictures, all exactly alike? Could any arrangement, regular or irregular, make the effect agreeable? Rather, the feeling would always be one of disgust. Or who would care for half a dozen of the most beautiful marble statues, exactly alike, and symmetrically arranged, as, back to back, in the form of a hexagon? The effect would be simply ridiculous. Here, then, is another thing which distinguishes an ornament from a picture, or piece of statuary. The latter cannot, without offending the taste, be repeated as wholes; but an ornament can, and so is adapted to the purposes of beautifying in the industrial arts. Single pictures, indeed, may be thus used when the form of the object will permit, and the material of which it is made; as in the case of porcelain.

Rosette: Hexagonal Form, with Interlacing Lines.

Directions.—Draw a hexagon. Divide each of its sides into fifths. On this basis construct the figure, drawing all the lines full at first, and then erasing parts so as to represent interlacing bands. Let your pupils draw this form on the blackboard; or you can use it in any other manner you please.

When it is drawn on the blackboard, the centre should be on a level with the eye, otherwise the form will be viewed obliquely, and so will be distorted.



Page of Rosettes.

Directions. — But little is demanded in the way of directions for drawing either of the forms on p. 130. In each case begin by drawing a square; adding its diameters and diagonals, or not, as required. The forms can be used either for blackboard or dictation lessons. If used for the former, the pupils can be left to draw them without any verbal directions, as it has been advised that they should be sometimes left.

Borders of Interlacing Lines.

Directions. — (*a*). Draw the outer parallel horizontal lines. Across these draw very light vertical lines far enough apart to make a series of squares. Draw other light vertical lines dividing the squares into thirds. Now draw the inner parallel horizontal lines, making the space between them equal to six-eighths of the space between the outer lines. Finish the figure on this basis.

Directions. — (*b*). Having drawn the squares, with their diameters and diagonals as a construction basis, proceed to draw the interlacing curves, drawing the longer ones first.

Perhaps you have found it a hard task to bring your class thus far; and perhaps you are not satisfied with the result. The reverse would be wonderful, if, while your pupils are new to the subject, you are also just beginning to teach drawing, and to learn it, perchance, yourself. Such must be the situation in many schools where this book is used for the first time. Instruction in drawing has its peculiar difficulties; but if you go to work earnestly, and in accordance with the general principles of teaching, you will soon ascertain how to meet these difficulties, though peculiar. The second class you take over the ground will not give you half the trouble you experienced with the first; and at the same time the pupils will do their work better and with more ease. But drawing has not only its peculiar difficulties; it has also its peculiar advantages. When you have become familiar with teaching it according to this system, you will find it one of the most satisfactory of all studies to teach.

Questions. — How may curves be divided? What is a mathematical curve? a plane curve? a plane curved figure? a circular curve? a circle? Name parts of a circle. How must a circle be divided to give a quadrant? Define the diameter of a circle: its radius. What is an arc? a chord? a segment? Define the altitude of a curve. What two meanings has the word "circle"? Describe an ellipse: an oval. How do these two figures differ from each other, and from the circle? What is said of learning by contrast and comparison? Why is the ellipse much used in drawing? Describe the method of drawing it with a slip of paper. What is said of symbolism in art? What kind of forms are preferable for memory lessons? How do ornaments and pictures differ?

CHAPTER VI.

REVERSED CURVES, AND APPLICATIONS.—ABSTRACT CURVES.

WHEN two curves that tend in opposite directions unite, forming a continuous line, they produce what is called sometimes a reversed curve, and sometimes a compound curve. It has no fixed qualities, and so is not a mathematical curve: yet its segments, separately considered, may be mathematical curves; that is, circular, elliptical, &c. When the segments are of such a character, then the whole curve may be struck with instruments. But the variations of this curve are numberless; and, practically, most of them must be drawn with the free hand. For this reason they are often called hand-curves.

The reversed curve is very extensively employed in practical design. When the use for which an object is intended permits an æsthetic treatment of its form, then the reversed curve is quite certain to be called into requisition for the purpose of helping to make that form beautiful. Again, in nearly all varieties of applied enrichment it renders conspicuous service. Hence we should learn the proper treatment of this curve, that we may be able, when using it, to obtain the most satisfactory results. So easily can it be modified, so readily can the elements of its beauty be learned, and in so many ways can it be applied, that it usually proves a favorite line with all.

DRAWING-BOOK EXERCISE XXVI.

Three Reversed Curves.

Directions. — In the allotted space draw three vertical lines at suitable distances apart. Divide each line into thirds. By the aid of these three straight lines thus divided, draw three reversed curves like the ones in the copy. Avoid all sudden, angular change of direction, for that is always disagreeable. Imitate the copy, making your lines as graceful as possible.

Observe how little the three curves resemble one another; and observe, also, how the difference in their appearance is secured. The first is drawn through the lower point of division in the base line, the other two through the upper points; and then no two segments of the curves have the same form of curvature. Thus it is seen how easily the appearance of a reversed curve can be changed; (1) by drawing it through a different point of division in its base line, (2) by giving the segments a different curvature.

That point in the curve farthest from its base, namely, the point of its greatest altitude, is the feature which specially determines the character of the curve. Thus, in *b* and *c* the curves on the upper thirds, and lower two-thirds, of the base lines are intended to be the same in shape, though they are drawn on different scales. The character of *b* is specially determined by making the greatest altitude of each segment near an end of the base line; but in *c* the greatest altitude of each segment is near the point where the curve reverses its direction.

DRAWNG-BOOK EXERCISE XXVII.

A Vase.

Directions. — In the centre of the allotted space draw a vertical line, and divide it into three equal parts. Through each end draw a horizontal line, equal to one-third of the vertical line, and extending equally on either side. Carefully complete the oblong, and divide its sides into three equal parts. On this oblong draw a vase in outline, using reversed curve *a* of the last exercise. Make the right and left sides just alike, which can be quite easily done by the aid of the straight lines, and could hardly be done without them. See that the curves bend gracefully, with no abrupt change of direction. Finally, add the pedestal.

Subtlety of Proportion and Curve.

The height of this vase is three times as great as its width, giving the proportion of three to one. Any other proportion could have been taken as well with the same curve; but any other proportion might not have been as pleasing, or it might have been more pleasing, as it was more simple or subtle than the one used. With the same curve draw a vase, by way of experiment, twice as high as wide; that is, two to one: then draw another as wide as high; that is, one to one. Contrast these with the copy, and with one another: you will see that proportion has a decided influence upon the pleasing appearance of the vases. The proportion, one to one, gives the most disagreeable form of all. Why is this? We can only say that the simpler the proportion, and the more easily it is detected by the eye, the less pleasing the effect; while the more subtle the proportion, and the more difficult it is for the eye to make it out, the more pleasing the effect.

What is said of the general proportion of the vase holds equally true of the proportion of the segments of the curves. The one is twice as long as the other, giving the proportion of two to one. Were they equal, giving the simplest proportion of all, one to one, they would be less beautiful than now. But the proportion neither of the segments of the curves, nor of the vase as a whole, is the most pleasing that might have been selected. The proportion five to thirteen, for example, would be more pleasing than one to three. Sometimes a building, having four stories inside, has its outside finished in three unequal stories. This divides the outer surface into segments of more pleasing proportions.

As a subtle proportion is more beautiful than a simple one, so the more subtle of two curves affords the eye the greater pleasure. The origin of the circular curve, struck as it is from one point, is more readily detected than the origin of the elliptical curve, which is struck from two points; and the former is less beautiful than the latter. As the taste develops, and the hand acquires skill in drawing, the subtle gracefulness of hand-curves may be increased to almost any degree.

DRAWING-BOOK EXERCISE XXVIII.

A Pitcher.

Directions. — In the allotted space draw an oblong, as in the last exercise, with the same proportions and divisions. Next draw the contour, or outline, of the pitcher, using curve *b* of Ex. XXVI. Strive to make the two sides of the pitcher exactly alike. Now add the handle, drawing it so as to indicate that it has thickness; that is, the junction of the handle with the body of the pitcher must be shown by lines which do not coincide with the general outline of the pitcher, but lap over slightly. Finally, add the lines forming the lower portion of the pedestal.

DRAWING-BOOK EXERCISE XXIX.

A Vase.

Directions. — In the allotted space draw an oblong, as in the last two exercises, with the same proportions and divisions. Draw the contour of the vase, using curve *c* of Ex. XXVI. Make the opposite sides of the vase symmetrical. See that there are no sudden, ungraceful turns in the lines anywhere. Add the horizontal bands as in the copy.

Horizontal lines ought not to be placed on a vase so as to divide it into two equal parts; for the proportion one to one is the least pleasing of all. Therefore, in placing horizontal lines on a vase, consider well the relative proportion of the parts into which they will divide it. Agreeable variety may be secured by drawing the lines near together in one place, and wide apart in another.

Designs for Pottery.

Ceramic art affords man a wide field for the display of his æsthetic taste. The clay with which the potter works in the production of table-ware, vases, and many other things, is so plastic that he can easily give the most beautiful forms to the productions of his hand. It also furnishes a surface to which exquisitely graceful decoration can be readily applied. Thus the potter has fully at his command the two general elements which contribute to the beauty of an industrial product. There is a beauty which inheres in form itself; that he has: there is a beauty which is secured by the application of ornament; and that he has also.

But not only is the potter favored by the character of his material: the uses to which his productions are put allow and justify a large expenditure of art in securing beauty both of form and of decoration. The cheapness of his material is also to his advantage. By giving to worthless clay a value even of silver or gold, as he can, he feels that he is adding to the wealth of his country no less than to the enjoyment of those who buy the products of his hands and taste. He also has the assurance that these products will be carefully preserved; for, unlike objects made of silver or gold, they will be worthless when broken. Many a beautiful work of art has been destroyed because it was made of precious material. It is a barbaric taste which is pleased only with objects made of precious material: a refined taste admires the art, whether the object which displays the art be made of clay or gold. Art can make the rudest substance contribute to our pleasure and refinement. A noble power is this, and worthy to be sought by study.

Every design for an industrial purpose must specially consider five things: (1) the use to which the object is to be put; (2) the material of which it is to be made; (3) the means by which it is to be made; (4) the form best adapted to the intended use; (5) the applied ornament. The beauty conferred by art must come from the form of the object, and from the applied ornament; precedence always being given to form. No amount of decoration can make an object beautiful, unless its form, in the first place, is beautiful.

The contours of pottery products should have some definite proportion to give character. In the absence of a pronounced line of contour, we have a want of character, and weakness. The highest result is secured by the proper union of beauty and character. While there may be so little of the latter as to give us nothing but weakness and puerility, there may, on the other hand, be so much as to give us only eccentricity. There is opportunity for great improvement in the designs of ordinary pottery products. The public taste is rising; and those who persist in making homely articles will soon find themselves without a market. Nothing commands a readier sale, and a better price, than beauty. To make an object beautiful, does not necessarily imply that it must be costly. Often the beauty can be secured without additional expenditure, provided the workman has taste. If he lacks taste, whatever he makes will show that lack.

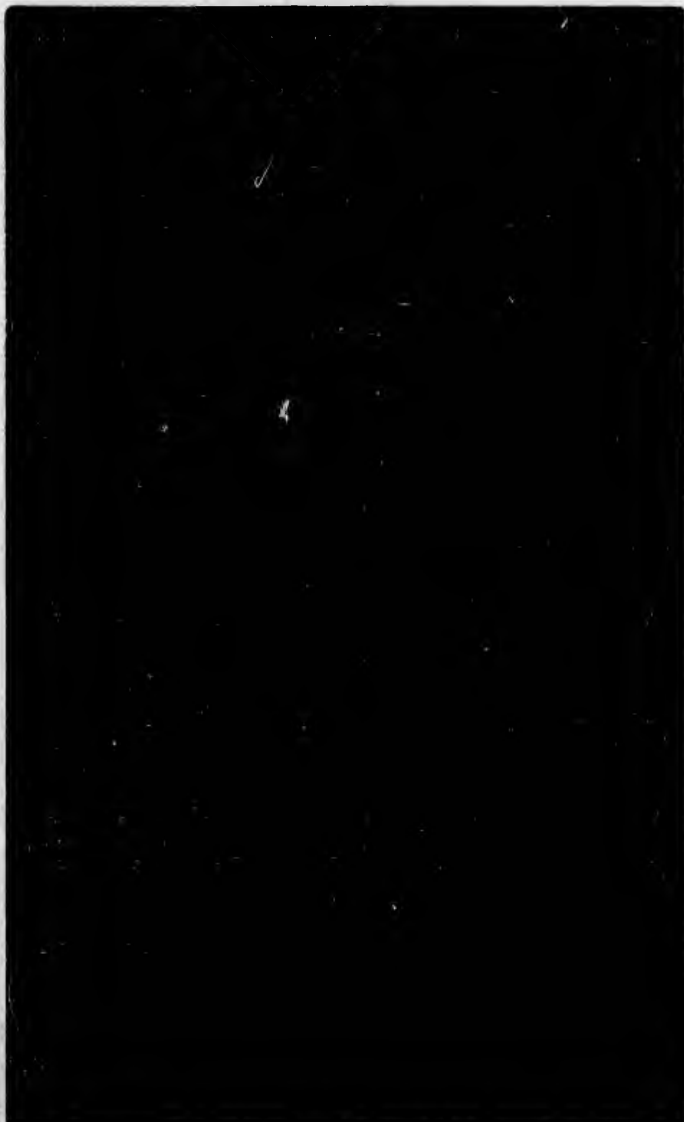
Blackboard and Dictation Lessons.

The twelve examples given on the opposite page show how easy it is to modify the reversed curve by changing the comparative length of the segments, or by changing their curvature. The twelve examples which follow show the applications of the twelve curves, enough to teach the general mode of designing the contours of pottery forms.

Directions.—No. 1 is the *ogee*, as it is called in architecture. It consists of two circular curves: hence the curvature of each segment is the same in every part; and where the curves unite the change of direction is instantaneous and complete. Were the change gradual and imperceptible; that is, were the curvature of each segment the greatest at its centre, and then gradually decreased towards each end, becoming a straight line for the shortest distance possible at the point where the curve reverses its direction,—then we should have what is sometimes called the "line of beauty." An abrupt change of direction is less pleasing than one which is so gradual you cannot say that here is the point where the change occurs.

The segments of No. 2 are circular curves; but they are parts of larger circles than the segments of No. 1. No. 3 also consists of circular curves. The segments of Nos. 4, and 5 consist of elliptical curves; they are the same in both cases, but united differently. This is true of Nos. 6 and 7. The base lines are divided, some into halves, others into thirds. They might, of course, have been otherwise divided. Examine these curves with a good degree of care.

After the separate curves, come their applications in designs for the contours of pottery forms. The numbers which these forms bear indicate the curves which have been used. Thus the pitcher is numbered 2, which indicates that curve 2 is used for the contour of its sides. The general proportions of the figures, shown by the oblongs on which they are constructed, are either two to one, or three to one. This can be



easily determined by the eye. No further directions are needed for drawing these forms, which can be used either for blackboard or for dictation lessons. If used for the latter, state, in the general directions, the greatest altitude of the segment of each curve. Thus the greatest altitude of curve 1 is one-fourth of the base. State also the point at which the greatest altitude occurs. Aim to make all the lines as graceful as possible.

A Vase.

Directions.—Draw an oblong having the proportion of three to one. Divide its sides into thirds, and through the upper points of division draw curves like the one numbered 10, on p. 141. Though the curvature is very marked, yet draw the curve so that the eye cannot readily detect the exact point where the direction of the curve is reversed. See that the curves exactly balance each other. Add the horizontal lines. Frequently let your pupils draw these pottery forms, of large size, on the blackboard.

Abstract Curves.

Abstract curves represent no created thing, natural or artificial: hence their name. Usually they are not regarded as enclosing space. The curves to which the term is applied, in this course of drawing, can be drawn, in the main, with the free hand only; and so they may be called hand-curves. The drawing of such curves is excellent for training the hand and eye, and gives a knowledge of lines which must be often used.

In drawing abstract curves, special attention should be given to three things: (1) to gracefulness of curvature, (2) to the tangential union of lines, (3) to the balance of lines. How to secure gracefulness of curvature, has been explained; and nothing more need be said here. By tangential union, it is meant that one line should blend insensibly into another, so that when they unite they shall both be going in the same direction. In the given cut the straight line *ab* is a tangent to the circle, because it simply touches the circle, and does not cut across it. Such a union of lines is always more pleasing than a secant union, where the lines would cut across one another, if they were drawn further. Drawing-book Ex. XXXIV. illustrates both kinds of union. Hence, when there is nothing to prevent, unite lines tangentially. By balance of lines, it is meant that, when the curves are drawn on an axis, they should be drawn symmetrically; the curves on the right balancing those on the left.

DRAWING-BOOK EXERCISE XXX.

Abstract Curves.

Directions.—(*a*). In the centre of the allotted space draw a vertical line three inches long, and divide it into thirds. Through the upper end of this line draw a horizontal line two inches long, extending equally on either side of the vertical line. With these as guide lines draw the curves given at *a*. Make the change of direction gradual and pleasing.

(*b*). Instead of the curves at *a*, those at *b* may be drawn. In this case make the horizontal line, drawn through the top of the vertical line, of the same length as the latter. Add the two oblique lines; halve them; and through the points of division draw the curves. See that the curves blend insensibly into each other.

DRAWING-BOOK EXERCISE XXXI.

Abstract Curves.

Directions.—In the centre of the allotted space draw a vertical line three inches long, and divide it into thirds. Through the top of this line, and through the points of division, draw horizontal lines, making the uppermost two inches long, the others a trifle less. Add the curves, which are all circular. Observe that the curves which are convex towards the straight line, form a tangential union with it. Turn the drawing for the purpose of carefully examining the curves.

DRAWING-BOOK EXERCISE XXXII.

Abstract Curves.

Directions.—(*a*). In the centre of the allotted space draw a vertical line as long as the space will admit, after making due allowance for margin. Divide this line into fourths, and draw the balancing curves as in the copy.

(*b*). If the curves at *b*, instead of those at *a*, are used, begin in just the same manner, but modify the curves as they are modified in the copy. It will thus be seen how easy a matter it is to change the character of the result by varying the number of the parts into which the axis is divided, and the points of division through which the curves are drawn.

Exercises for Blank Pages 17 and 18.

Directions. — Draw a vertical line, dividing the blank page (17) into two equal parts. In the left-hand half draw that one of the forms belonging to Ex. XXXII. which has not been used. Enlarge it to fill the whole space. In the right-hand half reproduce Ex. XXIX., enlarging it to fill the whole space. Instead of these exercises you can, if you think best, use any others, few or many, to fill the page; but, whatever forms are used, let them be drawn large.

Draw a vertical line dividing the blank page (18) so as to place two-thirds of the page to the left of the line. Draw a horizontal line dividing the right third into halves. In the left-hand space draw Ex. XX., Ex. XXI., or XXII., with added design, from memory. Enlarge so as to fill the two-thirds of the page. Before putting the drawing into the book, the pupil may execute it as many times as he chooses; but, after he begins in the book, he should not be permitted to refer to the copy. Give each pupil the same amount of time. Notify the class when one-quarter, one-half, and three-quarters of the time has expired.

In the upper half of the right-hand third of the page, have each pupil draw an original geometrical design, symmetrically arranged about a centre, after the manner of copies which he has drawn. In the space below have him write a description of the design, like the descriptions that are given in this Manual, and such that the class could reproduce the design from the written description given as a dictation lesson.

Examine both the design and the description before the pupil puts them into his book. It is expected that the pupil will have made several trials in the way of original design before he reaches this point. He can work up his original designs, in part at least, when he is out of school.

Page of Curves and Ornamental Forms.

Directions. — The various forms on p. 146 can be used, from time to time, as blackboard lessons. No specific directions are required for drawing any of them. As a general rule, first determine the main divisions of the central line, and then the breadth of the form as compared with its height. Depend upon the eye for all the rest.


CURVES AND ORNAMENTAL FORMS.

Original Design and Written Description.

Original design is almost identical with original composition. In the latter we do not expect from young persons new ideas, but, at most, only a new statement of ideas which are old. So in original design we should expect only a new arrangement of old forms. In determining the merit of an original design, we should look more at the thought displayed, at the originality of the arrangement, than at the manual execution. When original design is taken up, you will find your pupils, to a greater or less degree, changing places. Some, who have hitherto done poorly in copying, will take front rank in original design, with a great increase of love for drawing; while others, who excel in manual execution, will show a lack of original power.

Children should learn to compose at a very early age; many say even before they study technical grammar at all. One of the hardest things for them, in the outset, is to express their thoughts clearly. Now, the first condition, if we would have clearness of expression, is a subject of such a nature that our knowledge relating to it is clear. Children have such a subject when they attempt to write, as here required, the description of a simple original design. With a fair degree of care, every thing can be stated with the utmost precision. If you desire to teach your pupils to compose, you will find it well to require of them frequent written descriptions of original designs, and of other forms given by yourself for blackboard lessons. Always teach two or more things at once when it can be done. In this case you can teach drawing, composition, writing, and spelling together.

DRAWING-BOOK EXERCISE XXXIII.

A Spiral Form.

Directions. — *a*. In the allotted space of the centre draw a vertical line, 1 2, five inches long. Divide this line into thirds at points 3 and 4. Divide the upper and lower thirds into halves at points 5 and 6. Draw the curve, making its altitude at 6 a trifle less than the distance 1 6; its altitude at 4 a trifle less than the distance 1 3; its altitude at 5 a trifle more than the distance 5 2. Draw the curve with great care, turning it about frequently, when sketching it, for the purpose of examination.

b. This is simply curve *a* reversed. Draw the vertical line to the left of the centre.

DRAWING-BOOK EXERCISE XXXIV.

Abstract Curves.

Directions. — In the centre of the allotted space draw a vertical line, and divide it into fourths. Add the horizontal lines, making the second one from the top a trifle the longest. Draw the longest lines first, the one on the left hand, then the one on the right. Turn the book frequently while sketching. Observe how the curved lines unite with the straight central one. The two outer unions are tangential; the inner, secant. The pupils who succeed in drawing these curves well must possess a good degree of skill.

Summary of Principles of Design.

Nearly all the designs which have been thus far given are geometrical, being combinations of straight and curved lines without an attempt to represent objects, natural or artificial. A few are outline designs for vases, pitchers, and the like. There are no conventional forms, such as will be given in the next chapter and in the next drawing-book. The principles of design which have been exemplified may be briefly summed up, thus: —

I. *Beauty resulting from subtlety:* (1) in proportion; (2) in curves; (3) in the union of two lines.

II. *Beauty resulting from orderly arrangement:* (1) by symmetrical repetition about a centre; (2) by symmetrical repetition on an axis; (3) by regular repetition of the symmetrical unit, (*a*) horizontally, (*b*) vertically, (*c*) in all directions, to cover surface.

III. *Adaptation of the design to position:* (1) when it is to be viewed from all sides, as a carpet pattern; (2) when it is to be viewed from one side, as an ornament for a vertical surface, the unit being repeated, (*a*) horizontally, (*b*) vertically.

IV. *Adaptation of the design to use, material, and mode of manufacture:* (1) the object having that form, (*a*) best for its intended use, (*b*) best for the material of which it is to be made, (*c*) best for the mode of manufacture; (2) the decoration being in harmony, (*a*) with the object and its intended use, (*b*) with the material, (*c*) with the manner of production.

At different points, these principles of design have been more or less fully explained and illustrated. You should not permit your pupils to finish this drawing-book without a reasonable effort, on your part, to acquaint them with these principles, and with their application in the production of original designs. It is not to be expected that children can be taught in a few lessons all that is meant by purity of taste, and originality in design. But they can be taught something: they can be taught to avoid the grossest errors in taste, and they can be taught to do a little in the way of intelligent original design. Whatever progress you make should always be in the right direction.

QUESTIONS. — What is said of reversed curves? How may their appearance be modified? What is said of subtlety of proportion? of subtlety of curve? of designs for pottery products? of proportion in contour? of beauty inherent in the form of an object, and of its decoration? Name the five things which a design for an industrial purpose should always consider. What is said of abstract curves? of the tangential union of lines? When are lines said to balance? What is said of original design? of composition? Give a summary of the principles of design which have been thus far illustrated.

PART II.

INTERMEDIATE COURSE.

INTRODUCTION.

THE child having passed through the Primary Course, — thus learning names, terms, and expressions used in teaching drawing, — and in the Intermediate Book, No. 1, having practised with the lead pencil on paper, may now be expected to have an elementary knowledge of lines, and to have overcome the first difficulties of drawing on paper. In the Second Intermediate Book, new exercises are introduced, such as, in a more elaborate form, will be practised further on in the Grammar Course, or, if that be never arrived at by the pupil, will give him the first ideas of design, as pursued in the workshop.

The teacher should carefully consider the purpose for which drawing is taught, so as to endeavor in the right way to achieve that purpose.

Industrial Drawing is taught in the public schools, firstly, for the purpose of improving industrial manufactures, both in creating skilled designers and an appreciative public. Secondly, that the educational influence resulting from a development and training of the observing powers may add to the intelligence of the pupil, and assist him in studying other subjects. These are the grounds upon which it is rightly claimed that all children should be taught to draw. Even if no use whatever had to be made of drawing as an art by half of those who learn to draw, the intelligence, sensitiveness, and accuracy which drawing alone creates are needed by every human being every day of his life. Ability to draw is, perhaps, the least valuable of the results which the teaching of drawing leaves behind; for, if nothing more were acquired than the proper use of the senses of seeing and touch, every child would be repaid by such an acquisition for the time spent in attaining it. We are all victims to the delusions of eyesight until we are taught to see; and a man's account of what he has seen is apt to be very superficial, or strangely distorted, unless he can deduce the fact from the appearance, which he never can do until he has produced the appearance from the fact, and that is only possible by drawing.

In the minds of the uneducated in art, there is a perpetual conflict between what the mind knows (the world of facts), and what the eye sees (the appearance of those facts). The two things, though relating to the same, are both imperfect alone, only complete and reliable by association, which those who never learn to draw, and therefore never test their knowledge, never attain to the knowledge of. Drawing is a criticism made by ourselves on our knowledge of facts or objects as they appear to the eye under varying conditions; and when our ability to see, and skill to display by expression, the fact in its appearance, are trustworthy, then we may be considered competent witnesses, and not before. Thus the process of drawing necessitates observation, comparison, analysis, in a subject where every step is susceptible of demonstration, and in which truth or error can be tested by the evidence of the senses, as well as by mental criticism. It is, perhaps, the one subject of education capable of this double criticism, and is, therefore, especially valuable as an agent in education. What may thus be carried out in drawing can be applied to other subjects, both in school and in after-life; and, if this result be achieved by teaching drawing in an intelligent manner, we shall have more than justified its introduction as a subject of study in all schools, from the kindergarten to the university.

If every child learns to draw well by going through the lessons as arranged in the graded course of work now offered to the public, it may be of great advantage to him at some future time. If he should be the one person in ten thousand who is unable to learn, the exercises will be of great value towards developing an intelligence which is at the zero-point, and can only, probably, be reached by appeal to the senses.

The soundest plea for the teaching of drawing, therefore, is not that it is an amusement, an accomplishment, or even a weapon and means of advancement, a pleasure or profit in itself, but because, in addition to all this, it enables the teacher to shed a flood of light on many departments of education, sensitizes the mind to receive impressions which may be relied upon, and develops the constructive and analytical faculties of the human being.

It is obvious, that, as only a few will ever have the opportunity to apply their knowledge of drawing to the pursuit of their trade or professional purposes, they will have to seek secondary or technical instruction in special schools. But we should proceed in teaching drawing on the basis that all children are to learn; and our instruction must be of this general character, benefiting all by elevating the intelligence, rather than of a special kind, whereby only a few will reap the advantage.

Education in public elementary schools should be such as, by its general usefulness to all, will prepare all for their future vocations in life as intelligent beings, leaving to technical or secondary education the task of preparing each for his specialty. But the general course must not leave untouched the elementary preparation for a vast class of occupations connected with industry, manufacturing or commercial, or it will incur the charge of being only a class-education, suitable only to the few. And here let it be said, that the reason why drawing should be taught in the primary schools upwards, is that there alone can it be satisfactorily taught to all. If, in any frenzied panic about education, the subject were to be eliminated from all grades of schools but one, or if, in adopting it for the first time, only one grade of schools were to be taught, instead of selecting the high schools as the most important place for it (which is frequently done), I should plead for the primary schools as being the places where the greatest good could be obtained from drawing, and where it would have the most general influence upon the pupils and the public.

The views here expressed will account for the spirit pervading the instruction given in this Manual. Hand skill is not the most valuable part of drawing, and therefore is never described as the one thing to be attained. The desire of the author is to lift this subject from its past character as a specialty, and place it in its true position as an element in all intelligent education, to destroy the false notion that only a few can learn to draw, and relieve it from the air of mystery with which those who cannot draw have been in the habit of regarding it.

The principle upon which all this instruction is arranged is, that the regular teachers are as well able to impart it as the scholars are to learn it. It is recognized in the world of art, that the artistic expert usually lacks the teacher's instinct. And experience has demonstrated, that, given the practised and successful teacher of general subjects, and you have the best possible material out of which to make a good teacher of drawing.

It may be difficult for the teacher who takes up this subject late in life to become an expert in drawing; but it is not difficult, if proper appliances be provided, for any teacher to learn readily how to draw well enough to teach it satisfactorily. And any teacher who does not possess elasticity and intelligence enough to do this condemns himself as unfitted to have charge of education, which is always progressing, and cannot content itself with the antiquated and abandoned standards of the past.

In this section of the instruction, a new feature is introduced into the Manual, for the convenience and guidance of those teachers whose opportunities to study drawing have not been sufficient. Not only are the steps in every lesson described, and illustrated by diagrams figured for reference, and occurring in the text, but the exercises for the blank pages are given in the same way, and engravings of the appearance of the pages in the pupils' books are also given; so that there can be no possible mistake of what each lesson is to be like, when finished, or the whole page, when the exercises on it are complete.

This is not, however, intended to prevent individual teachers from filling up the blank pages in a different way from that indicated, if they prefer to do so. Some teachers represent that they have neither time nor skill to invent blackboard or dictation lessons: for them this Manual provides such lessons. Other teachers prefer to design such lessons for themselves, for their own improvement, and in order that they may the better teach from examples of their own invention. To them the blank pages filled may be suggestions, and are not intended to cramp their own inventiveness, which is better in them than the most scrupulous imitation of others.

Pages of lessons for the blackboard, and illustrations of historical ornament and of objects, are also provided, from which the teacher may select examples to use instead of those given on the blank pages, or for additional lessons on slate or blackboard. The directions for drawing these are short, because most of them explain their own construction; and the teacher who employs these copies ought to be able to add all necessary instruction for the pupils.

The lessons in this book are so arranged, that most of them can be executed in half an hour, — a time which is long enough for lessons to children. If it be found, however, that, from the pupils' want of previous practice, the drawings cannot be sketched and finished in that time, let them be well sketched in one half-hour, and well finished in another. More time than that spent over one lesson will waste the time of many, if not all, of the pupils. It will be found by observation that either quick or dawdling working is a habit; and it is as easy to form one as to fall into the other.

If you would keep children happy and well employed, give them enough to do, and let it be of a pleasant sort, employing their curiosity and their constructive faculties. As a matter of fact, children generally work hard either at their play or their amusements; and nothing so soon kills a child's interest in any thing as loitering over it, or working at it after the freshness of novelty is passed. Make use of this trait of child-character in your lessons in drawing, and they will then enlist the lively interest of your pupils.

The more you can ally your instruction with natural forms or objects, the more will the pupils lay hold of the instruction, and understand it. For this reason, the forms of leaves, and the outlines of objects, are freely given as copies. These will enable the teacher to point out the characteristics of similar forms not being drawn; and thus whole fields of education may be illumined.

It is believed, that, though appeals to the taste and knowledge of the pupils have not been so insisted on in this book as in some others, the teacher will none the less see that one of the objects sought for by teaching drawing is to increase the knowledge, and to refine the taste, and to do it by the almost imperceptible growth of observation, and love of the beautiful in nature and art.

CHAPTER I.

SYMMETRY, CONVENTIONALIZATION, AND REPETITION.

In sketching, the pencil should be held loosely with the fingers, and the pupils should be warned against griping the pencil with a pinching grasp, which they will do unless trained to do differently, Also, let the teacher require the pupils to mark their first lines faintly, so that corrections may be made without involving rubbing out with heavy erasure. Freehand drawing must be done by a hand that feels free, not a hand too strongly controlled.

DRAWING-BOOK EXERCISE I.

Bohemian Glass Pitcher.

Directions.—The left half of the pitcher is drawn, and the pupil has to complete the pitcher by drawing the right half. Continue the horizontal lines at 1, 2, 3, 4, 5, as much to the right of the central line as they extend to the left. Then complete the outline of the pitcher, observing the egg-shape form of its body between 2 and 3. The handle is not to be repeated ; but, if the teacher finds the exercise too short, a second handle may be drawn, symmetrical with that in the copy. Notice in drawing the handle, that, at the points in the neck and body of the pitcher where it is attached to them, it is drawn within the profile.

DRAWING-BOOK EXERCISE II.

Square Rosette.

Directions.—The exercise is intended to show the value and effect of repetition in design. One-eighth of a square is filled by a portion of a lotus-like flower. The form is first to be repeated in the triangle to the left of the central line; and the unit of the design filling one-quarter of the square will then be complete. This unit is to be repeated in the three remaining quarters of the square; and the whole rosette will then be finished.

This exercise illustrates repetition about a centre, and in a geometric form. Draw the outer curve near the diagonal, which will end near 6, and balance that ending in 5. Then draw the left half of the central leaflet, ending at 1. Add the berry and stalk. This done, repeat the flower three times in the three triangles, and complete the rosette; the longest lines, those from 5 to 6, being the first lines drawn in each triangle.

The two copies on this page of the drawing-book will serve as illustrations of two principles in design; and they are exercises which will prepare the pupils for intelligent practice in design, when they are called upon to exercise it.

These principles are symmetry and repetition. In the pitcher, one repeat gives symmetry: in the rosette, seven repeats form a complete arrangement, illustrating the power of repetition.

This latter being an exercise in freehand drawing, the pupil draws every part of it without any mechanical assistance, *because here he is learning to draw*, and, by drawing, fixing also in his mind the principles which constitute design. When he comes to design, then he will practise it, as in the workshop, by drawing the unit or element of the design, as shown in the half of the flower above, and then mechanically repeating it as often as the arrangement requires. The drawing of repetitions like this fixes also in the minds of the pupils by the most effective means, that of drawing, how the form is to be repeated to make a rosette, also, what are the axes of symmetry, and which is the unit of design.

In drawing, we must learn through our fingers'-ends more than through our ears: we are more liable to forget ideas than lose skill developed by practice.

DRAWING-BOOK EXERCISE III.

Conventional Leaf.

Directions.—One half of a leaf is given, and the pupil is to complete it by drawing the other half. Make the horizontal lines project as far to the right as they do to the left from the central line, or midrib, of the leaf. Draw the right enclosing curve. Divide the horizontal lines into two equal parts, and to these divisions draw the curves forming the lobes of the leaf. The three veins which spring from the midrib, and end in the points of the lobes, must be drawn last. The veins should join the midrib tangentially, not so as to cut across the midrib, if continued.

The object of giving an exercise like this is to teach the value of symmetry. One-half of an object being accurately drawn, the pupil has to balance his work with a perfect half, and thus educate his eye in a very important part of drawing. The exercise is not a difficult one; and, when given, it may be made the occasion for requiring good manual execution from the pupils.

DRAWING-BOOK EXERCISE IV.

Conventional Ivy-Leaf.

Directions.—Draw a central line in the space below the copy, of the same length as the leaf above. Divide it into six equal parts, and through the centre draw a horizontal line, one-sixth of the central one on either side. Draw the four veins of the leaf, and then, beginning from the top, draw the lobes of the leaf on the left side. Repeat on the right, and complete the leaf.

The sketches *a* and *b* are leaves drawn from Nature, — *a*, the house-ivy; *b*, the hedge-ivy. Another species of ivy, which grows on trees as a parasitical plant (which is the character of ivy wherever it grows), has a leaf not so short-lobed as the house-ivy, and not so long-lobed as the hedge-ivy, being, therefore, much more like the conventional leaf than either *a* or *b*. The teacher should point out from the three forms here given,

that conventionalism is a retaining of the general features of leaves, without imitating the peculiarities of individual leaves. The thumb-nail sketches *a* and *b* are not intended to be copied by the pupil.

DRAWING-BOOK EXERCISE V.

Ivy-Leaf Rosette.

Directions.—Draw the square in the space below, with its diameters and diagonals. Draw the circle at its centre, and in one-fourth of the square draw one leaf to fill it, like the copy. Repeat this leaf in the three remaining quarters.

Here is an application of a natural form to the purpose of design, and it is one of the simplest arrangements that can be made of a leaf. This treatment is called repetition from or around a centre, and is the principle Nature applies in the construction of a flower; each petal being a modified leaf, repeated in whorls, or circles, round the seed and reproductive organs, placed in the centre of the flower.

For very young children, a good exercise in memory-drawing is to draw such a design, after having done it in their books. It will be seen that all there is to remember in the example is the shape of one ivy-leaf, which, by repetition, makes, apparently, quite an elaborate composition, though actually the simplest arrangement.

Another interesting task for a class is to require each child to bring four leaves of some sort (if at the proper season of the year), and having once seen how to fill a square, making a rosette, as in the ivy rosette previously drawn, to make a fresh design by copying the leaves they bring with them. Make them arrange the four natural leaves on their slates first, to see how they will look, and then explain, that, if the leaves are different in shape and size in Nature, in ornamental design we have to make them all the same shape and the same size; and so they will see the difference between a natural rosette and a conventional one. These experiments on slates will be useful as occasional exercises to vary work on paper, teaching, also, the relationship of Nature to drawing, and drawing to arrangement, or design.

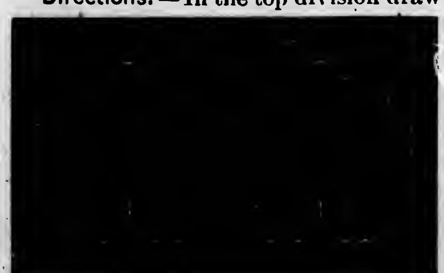
BLACKBOARD EXERCISES FOR PAGE 3 OF DRAWING BOOK.

Horizontal Repetition.

The blank page is to be divided into three equal parts by drawing two horizontal lines at the divisions, as shown in the illustration on p. 170. In these divisions the three horizontal mouldings are to be placed as exercises in drawing from the blackboard.

Heart-shaped Moulding.

Directions.—In the top division draw two horizontal lines, an inch and a quarter apart; and, starting one inch from the left edge of the paper, mark off along the top line five divisions of an inch and a quarter in length, from which draw vertical lines



to form five squares. Each of these squares is to contain one heart-shaped leaf. Divide, therefore, the square into two equal parts by a vertical diameter, and sketch the curve of the leaf on either side. When all the leaves are completed, add the circle and stem between the leaves.

Let the teacher draw but one of these leaves on the blackboard for a copy, and then leave the pupils to repeat the form in the other squares, remembering, that, in good instruction, the pupil must sometimes be left to himself. About a tenth or an eighth part of the time given to a drawing-lesson from the blackboard should be spent by the teacher at the board, in drawing, and in general class instruction, and the rest of the time in examining and correcting the work of individual pupils.

The sketches *a* and *b* are from the convolvulus

and morning-glory leaves, both heart-shaped, and types of a great number of natural leaves having the same or similar forms. Being simple in character, they are good subjects for design, especially for mouldings; and the

pupils may be required to bring such leaves to the school for material in design: without any great hardship being inflicted on them, they may be taught to see how many of the kind are to be found. The more you can set children to work in using their eyes, and the more their eyes are employed in discovering the beautiful forms to be seen in the world of foliage and flowers, the better for the children now, and the better for their inteligence and happiness hereafter.

Heart-shaped Moulding. — Running Pattern.

Directions. — Lay out the space in the same way as for the last exercise. Let the horizontal lines be an inch and a quarter apart, and the five squares therefore on that base. Next divide each square into two equal parts by the vertical diameter, and each half of the square again into two equal parts by a vertical line, as shown in the last division to the right. This

gives the central line for the small ovoid form near the bottom, and also for the point where the two leading lines cross near the top. Draw the outer leading lines in each half square in three squares, before adding the lower lines or inner lines, on which the cross points are, and then add the latter. Draw the whole of the forms, and then rub out the invisible parts. Finish.

Though the squares are five in number, the drawing of three will be found sufficient for one lesson, and the completion of the remaining two might be made the subject of another exercise, without further assistance from the teacher.

It has always been a special point in the author's instruction to vary both the method of giving the lessons, and the subjects of them also. Remember we have to educate, not cram; to develop the intelligence, not teach tricks. If the pupil goes through all this training, and ends by not being able to draw at all, he will yet have learned by it to discover what he might do better than by any other training. Cultivate intelligence, and let the individual and his individual circumstances determine in what direction it shall be applied. Sometimes help the pupil all you can, if the subject or way of treating it be new; and sometimes studiously refrain from helping him at all, when he knows all he can know about it, and only has to apply his knowledge, and thus develop self-reliance.

Ivy-Leaf Moulding.

Directions.—In a similar manner as in the last two exercises, divide the space into five squares on a side of an inch and a quarter. Also divide each square vertically by a diameter. In each square draw an ivy-leaf and berries, as shown in the diagram; the leaf being similar to those already drawn. Draw one complete leaf, and one complete cluster of berries, on the board, and require the pupils to repeat them the required number of times, after their first copy has been corrected and criticised.

The half-page illustration of these exercises worked out is given in order to show the teacher how the blank page in the pupil's book will look when completed. Though on a smaller scale than the work will be in the drawing-book, the proportion is exactly the same. Thus the teacher is furnished not only with the process of making each unit of the

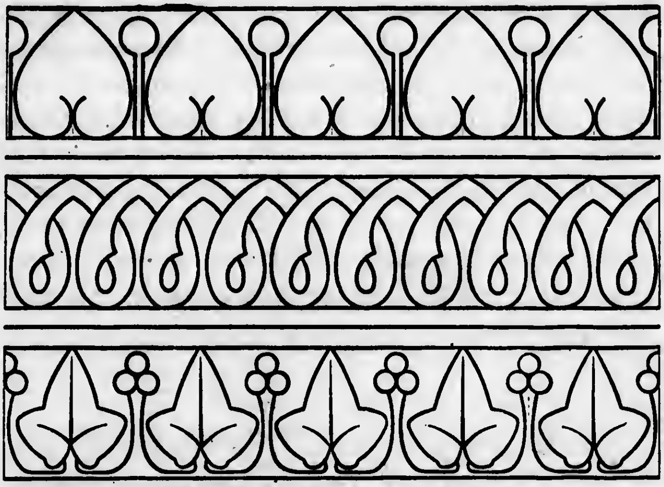


ILLUSTRATION OF PAGE 3 OF DRAWING-BOOK.

design, but with the appearance of the pupil's book, if the instruction given is attended to.

EXERCISES FOR PAGE 4 OF DRAWING-BOOK.

Drawing from Dictation.

When the teacher dictates a form to the class, each line drawn should be tersely and accurately described: if a straight one, both as to position and length; if a curved one, as to its curvature or altitude.

Each step should be simple; and the order to execute it should be as direct and authoritative as if for military drill, whilst the pupils should be required to obey promptly and methodically. It will be evident that this can only be accomplished by first teaching the definitions of plane geometrical drawing as a basis of preparation. The class must be kept together at any cost. The word of command, when given by the teacher, must be instantly obeyed by the pupils; and, if the teacher finds they cannot thus follow, it is evident that a simpler exercise should be taken. Never mind imperfect work, if the effort be made; the imperfection will disappear by degrees: but *do* mind that every child makes the effort to the best of his ability.

Dictation Lesson. — A Wineglass dictated.

Directions. — Divide the blank page (4) of the Drawing-Book into two equal parts by a vertical line in the centre. The left-hand half is to be used for either a dictation or memory exercise. The following is a dictation-lesson, which may be thus dictated to the class: —

Draw a central vertical line 1 2, letting it begin at a distance of an inch from the top, and end an inch from the bottom, of the page. Divide this into two equal parts in 3. Through 1 and 2 draw horizontal lines equal in length to one-half of 1 2, one-half on either side of 1 2. Call the line through 1 by the numerals 4 5; and that through 2, by 6 7, 4 and 6 being on the left side. Through point 3 draw a horizontal line 8 9, equal to one-half of 1 3; the first numeral being always to the left, and the second to the right. Draw 4 8 and 5 9, two oblique lines. Divide 1 3 into two equal parts in 0, and through the division draw a horizontal line terminated by the oblique lines. Call this line 11, 12. Draw lines from 0 to 8 and 9, and lines from 11 to 3, and 12 to 3, leaving out the part between 0 8 and 3, and between 0 9 and 3. Divide 3 2 into two equal parts in point 13.

Explain to the class that the subject is a wine-glass, and then draw on the board what you have dictated.

Require those who have gone wrong to put their work right from the copy on the board. Then draw the curve of the stem, and add the other details on the board, which the pupils may copy. The teacher will find that the prevailing tendency will be to make the stem of the glass too thick: therefore it will be better to warn them against this fault before they begin.

The author lays great stress upon the importance of teaching by dictation, as one means of securing accuracy of thinking, and clearness of understanding; and it is hoped that teachers will not slight these exercises.

Blackboard Lesson. — Leaf-Moulding.

Directions. — The right-hand half of page 4 may be devoted to two vertical mouldings which illustrate vertical repetition. Divide this half into two equal parts by a central vertical line. In the left-half draw two vertical lines one inch apart, and divide the space thus partially enclosed into five squares. Draw oblique lines, as shown at *b*, to join the stem, and add the oblique lines which form the midrib of the leaf. Then draw the leaf in each square, and complete the moulding as shown at *a*.

It may be objected, that the leaf used is not symmetrical on its axis, and, therefore, it is not conventionalized, or rather too much conventionalized. But some leaves have this inequality as a natural feature, such as the elm-leaf and others; and, therefore, one principle of Nature is expressed by the arrangement.

Ivy-Leaf Moulding.

Directions.—In the right half of the space prepare a series of five squares for another example of vertical repetition, this time of an ivy-leaf moulding. Two examples are given: if *a* be taken, it will be prepared for, as in the last lesson, by a series of oblique lines, which in this case will form the midribs of each leaf. If the teacher prefers to take *b*, then a leaf on a vertical central line will be drawn in each square; and, when the leaves are completed, the clusters of berries have to be added at the sides. The ivy-leaf has been drawn so frequently, that it cannot be necessary to give any further description of the method by which it should be drawn.

Heart-shaped Running Border.

Directions.—If the teacher prefers this copy to the two preceding ones, it can be taken to fill one-half of the space devoted to the blackboard lessons on this page. The leading form suggests a heart shape, and also the Gothic form called the *vesica piscis*, or form of a fish, a very favorite shape in early Christian art. The space in the drawing-book will allow of three repetitions of the element or unit of pattern. Each may be enclosed in a square, leaving a space on each side; or the teacher may draw the design on the blackboard complete, and let the pupils copy it, having first seen that their construction lines and proportions are approximately right, as an exercise in reducing the size of a copy without having every proportion pointed out to them.

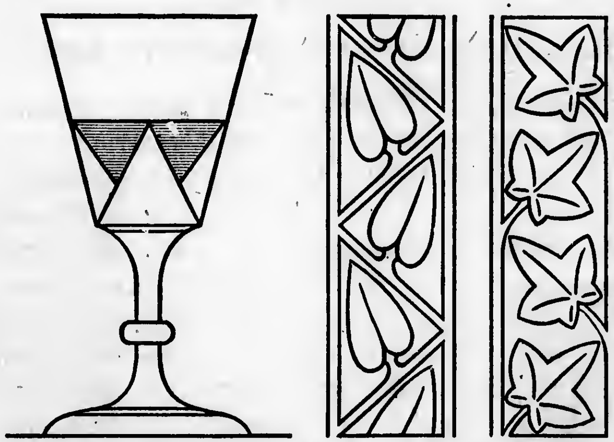


ILLUSTRATION OF PAGE 4 OF DRAWING-BOOK.

The above cut shows how page 4 of the drawing-book will look when completed according to the instruction given.

QUESTIONS. — What is said of symmetry? Of the union of the veins of a conventional leaf with its midrib? Of drawing the copies with and without mechanical aids? What is meant by a conventional leaf? What is said of pupils bringing natural leaves to school? During a blackboard lesson, what part of the time should the teacher spend at the blackboard? What is said of variety in subjects taught, and methods of instruction? Of keeping the class together?

CHAPTER II.

CONVENTIONALIZATION APPLIED TO DESIGN.

Conventionalization, as we have seen, is the taking of a natural form, and, while adhering to its general type, adapting it to ornamental purposes.

It will be readily seen, that, in drawing conventional forms before natural forms, we pursue the only rational way of arriving at skill in rendering natural forms. If we were to put natural forms of leaves before children in the first instance, we should simply burden them with a mass of detail and delicacy of proportion which they could not comprehend. For purposes of comparison with the conventional leaf, the teacher has given here sketches of natural leaves.

The small sketches *a* and *b* are maple-leaves from Nature. There are other varieties of the maple, which are more deeply cut in the divisions of the leaf. The conventional leaf given as an example on the next page has its lobes more divided from one another than either *a* or *b*, but is the accepted type of a maple-leaf as used for decorative or ornamental purposes in surface decoration, stained glass, metal work, wrought iron or brass ornament, chandeliers, screens, or gates.

DRAWING-BOOK EXERCISE VI.

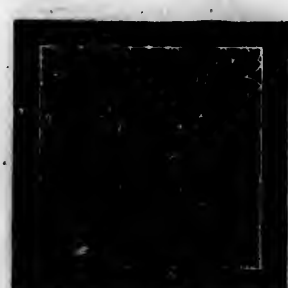
Maple-Leaf conventionalized.

Directions.—In the space below, draw a vertical line as long as the leaf. Divide it into four equal parts; and through the centre draw a horizontal line nearly as long as the vertical, half on either side. At the bottom of the vertical draw a second horizontal line nearly as long as the first. Fix the central point from which the ribs or veins spring, and draw them to the ends of the horizontal lines. Add the margin of the leaf; and, when the form is completely sketched, erase working-lines, and finish.

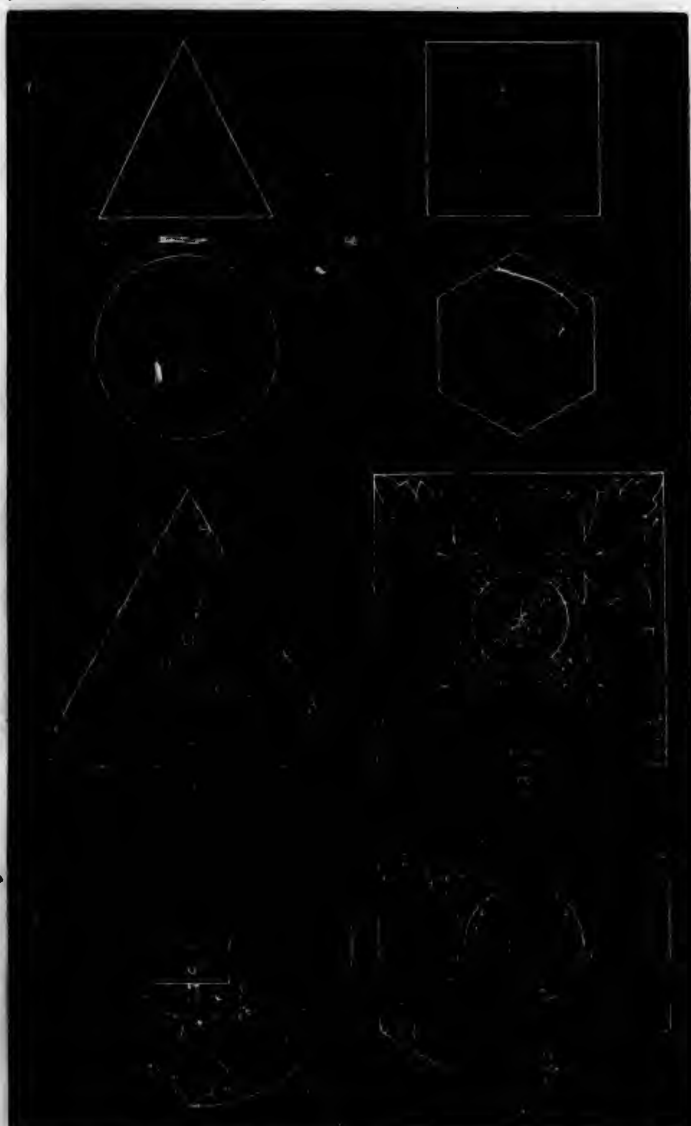
7/4

Maple-Leaf Rosette.

Directions.—Apply what has been said about design to this exercise. In the large space to the right, let the pupils draw either an equilateral triangle, or square, or circle, or regular hexagon, as large as the space will allow, leaving a margin of paper on all sides. And it is a good plan to divide up the class into a certain number of groups; each group, or row, to draw one geometrical form. Thus let the first row draw a square; the second row, a circle; the third, an equilateral triangle; and the fourth, a hexagon.



The drawing of these geometric forms is sufficient for one lesson. Talk to the pupils, and tell them that the next lesson, which will be given on such and such a day, will be to make a design from the



maple-leaf to fill the geometric shapes; and every child who can find maple-leaves is to bring as many as he or she may wish to put in the shape drawn. Those who cannot do so will have to use the conventional leaf directly from the copy already drawn.

As this is the first design to be entered in the book, it would be advisable to let the pupils try it on their slates first, and when they see what size the leaf must be, to fill the space nicely, then let them put it into one division of the geometric form, which they have previously made. The preceding page gives four treatments of this exercise, to suggest to the teacher how it may be treated in the four forms recommended. Others will occur to both teacher and scholars; and those who have the inventive faculty will be more pleased to design their own patterns than to borrow them. In every class, however, there will be a number of children who cannot, or who believe they cannot (which for practical purposes is the same thing), make a design. These stupid children, as they are more stupidly called, must be taken under the wing of the teacher, and helped more than the rest. To such let the teacher show the examples on page 177, and get them to work out one like either. This practice will implant, or create, or develop the constructive faculty, which is the origin of design; and design has just as much to be created, or implanted, or developed in drawing as other things in other studies.

In teaching drawing after this manner, as has frequently been said, it is not the showy results in the shape of beautiful work we are striving for, so much as it is to awaken the mental faculties of construction, origination, and design, which we know to exist in and be especially valuable to every human being. Doing bad or poor work is a condition of the child which should never distress the teacher, nor cause her to distress the child. Let it go on, rather than frighten or harass the pupil, until the love for making patterns takes root, and then you will have no more trouble. It *will* take root in every child sooner or later, it is only a question of time when it will do so, and the poor little things who seem to have no faculty for the work are merely in an undeveloped state, or belong to families or races which develop later on in life. Let me say here, that some of the greatest men and women who have ever lived have belonged to this class ; and this consideration should make us very indulgent to their representatives of the present, now under our charge.

The Practice of Original Design.

It may be of use to the teacher if some information be given concerning the practice of original design in the class-room.

The essential feature of the plan of industrial drawing which we are endeavoring to carry out, is, that it shall be practical in its objects and its methods ; and we should aim to prepare our pupils for an industrial life by practising them in such work as may be some time required of them in the workshop, office, or studio. It is one of the essential requirements of industrial drawing in either of these places, that it shall be accurate, not approximately accurate as if done by the freehand alone, but as accurate as it can be made by the use of instruments such as the compasses, ruler, square, and scale. Whatever these implements cannot be made to do has to be done by the freehand; but whatever they *can* be made to do is done by them. Then, also, where one freehand form or detail is repeated, its repetition must be effected by mechanical means. Thus, if a leaf occurs four times, and that leaf is symmetrical, one-half of the leaf is drawn, as at *a;* and this half is transferred on the opposite side of the central line, as at *b*, and then finished. It is then transferred to each quarter; and thus four times repeated it will be accurate and reliable.

In preparing the geometric shapes for design, advantage should be taken of all the mechanical implements available, so as to secure the first condition of industrial drawing; viz., accuracy. And, to adopt the economy of time necessary in the workshop, no freehand form should be drawn more than once by the freehand; and its repetition should be effected either by use of tracing-paper, or by rubbing the pattern, and transferring the design from one side of a line to the other.

Remember, then, that in designing, and in working out designs, the child should rule every straight line, and strike every curve with the compasses, which can be so drawn. Measurement should be obtained by a scale or ruler with inches marked on it; so that a line which professes to be three inches long is not a guess line, somewhere near it, but a true line, capable of standing the test of the measure.

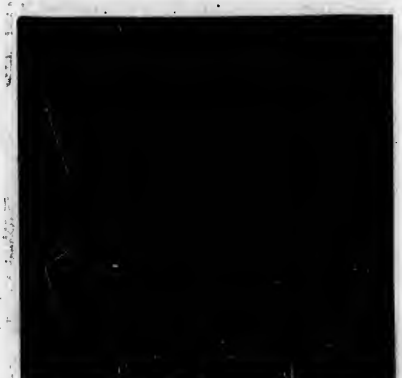
For very young children who have not been taught geometrical drawing, the teacher may insure an approach to accuracy by showing them how to test their squares with the ruler. Thus in drawing a square, if the two diagonals are of the same length, and the four sides are equal, the form must be a square. When a square has been drawn by the child, let him with his ruler subject it to this test.

For the repetition of freehand work, one mode is by rubbing. Begin by drawing the unit of repetition, as at *a*, with a black pencil (F or H B), in the square which has been already drawn, together with its diagonals and diameters. Fold the square on the diagonal 1 2, and rub the

back of the paper, behind the drawing, either with the thumb-nail, or a knife-handle, — any thing *hard and smooth*. This will transfer the trace as at *b*, which is then to be lined in. Fold the square again on the diagonal 3 4, and rub again on the back, making a trace as at *c*. Line that trace in. Next fold the square on the vertical diameter at *e*, and rub the back to transfer the two leaves to the remaining quarters, and leave the trace as at *d*. Finish by lining in the two transfers.

This folding and repetition should be done on thin paper, like note paper or thin manilla paper; and the creasing of it will, of course, destroy the appearance of the sheet on which it is done. To place the design in the drawing-book, the geometric form should be carefully made in the book. Paper on which the design has been drawn should be placed, face downwards, on the geometrical form, be held very firmly to prevent its shifting, and then be rubbed hard and steadily until the whole is transferred in faint lines to the shape marked out in the book. It may then be carefully lined-in or finished.

Another method of mechanical repetition is by the use of tracing-paper. Let us suppose that the form to be filled is a pentagon, and the design used as shown at *a*. First draw the pentagon, and divide it into ten equal parts, by drawing a line from each angle to the centre of the opposite side. Now draw one-tenth of the rosette, and over this unit place a piece of transparent paper, either thin note paper, or tracing-paper as bought in the stores. With a soft pencil (F or H B) trace the design on the paper as it shows through, and also trace the lines of the triangle enclosing it. Then turn it over, and transfer to the other side of



the central line by rubbing, and thus give a trace which will enable you to line-in one complete unit, as at *a*. Trace the complete unit, and rub it four times round the centre of the pentagon, placing the lines of the enclosing triangle on each triangle in the pentagon which has thus to be filled. If any difficulty is experienced by rubbing the back of the pattern to transfer it, let the pupil go over the lines of the pattern with a hard pencil from the back of the paper, as the design will always show through the transparent paper, and the pressure of the pencil on the paper will transfer the design as accurately as the line is drawn.

In thus repeating, there may be inaccuracies from the shifting of the paper, or because the geometric shapes have not been perfectly accurate. When the transfer is completed, such inaccuracies or accidents may be remedied by the freehand; or, if the transfer be very faulty, it should be rubbed out, and the faulty portions be transferred again with more care. Then the design is to be lined-in with a sharp pencil, and a clean steady line, having no variations of thickness or blackness.

The teacher who is not practically acquainted with the processes described should ask any designer or draughtsman to show her the operations. They are perfectly simple, and easy of accomplishment, after having been once seen, though any description in writing may appear to make them complicated proceedings.

Another method of repetition, generally used when color is worked with, is called pricking and pouncing. Designs for carpets, wall-paper, or cotton fabrics, worked in tempera color (which is powdered color mixed with water and gum or isinglass, the latter to make the color adhere), are usually worked out on a colored ground; and when the complete design has been made, and drawn out accurately on thin paper, the pattern forming the outlines is pricked through at intervals of about the thirty-second part of an inch apart, so as to make a line of little holes, looking like the dotted lines in the illustrations of this Manual. When the design has been thus indicated by perforation, the paper is placed on the colored ground on which it has to be wrought; and a pounce, made of wash-leather charged with finely-powdered color (such as white-lead, or black-lead, or any other powder which is not the color of the ground), is rubbed or dabbed over the perforated paper. Every little hole allows the powder to reach the colored ground below, and thus the pattern appears on the ground, when the perforated paper is removed. This is by far the most ready means of multiplying a pattern, but more suitable to the designing-room of a factory than the class-room of a school, because of the number of appliances required.

Draughtsmen, when designing a symmetrical form, often make use of a small rectangular piece of looking-glass, which when one of its edges is placed on the central line, and the glass itself held at right angles to the paper, repeats the pattern on the opposite side of the line just as it would appear if drawn, and thus enables the draughtsman to see the effect of his design without the trouble of drawing the repetition. A piece of looking-glass about four inches by three inches would be large enough for the use of a child; and it saves a great deal of labor, by enabling a faulty arrangement to be corrected without wasting labor on it.

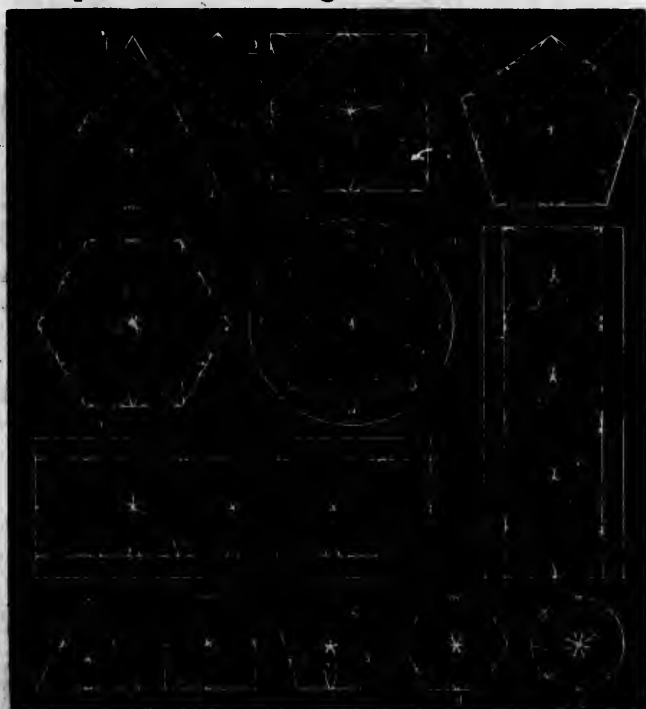
If the teacher once comprehends the value of even the simplest exercises in design, it will be easy enough to make the children interested. And a distinction must be made, and made very clearly and emphatically, between the training and benefit obtained through freehand drawing, and that which proceeds from original design. The first is an exercise of the eye and the taste; the second, of the hand-skill as a workman, and of originality. The second an industrial application of the first; and the rules of practice in the two departments should not be confounded.

In freehand drawing from copies, the straight lines should not be ruled, nor should tracing or transferring be resorted to. The eye and hand must be here trained into ready and faithful service; and this cannot be attained without considerable practice, which drawing from copies is thus meant to provide. In the one case, therefore, the pupil must realize that he has to rely upon himself, and his skill of sight and hand, his appreciation, and his ability to execute; in the other, he has to bring all these to bear upon the arrangement of his design, and work it out like a workman, as though he were already in a factory.

Remember, therefore, that, in copying as an exer-

cise in freehand drawing, it is not right to resort to mechanical help when the object is to train the eye, the hand, and educate the taste; and that at the same time, when designing is practised, it is right to take advantage of all mechanical help; for, without it, the exercises will be playing at design, not practising it.

Having thus described the processes by which designing may be practised in the schoolroom, an example is given of the variety caused simply by the repetition of units in geometrical forms.



REPETITION IN DESIGN.

The page of figures are given as illustrating to the teacher the influence of repetition of the same unit, or element, in various enclosing forms. The unit is a trefoil, or three-pointed leaf, shown at *a*. It is repeated in (1) an equilateral triangle, (2) a square, (3) a pentagon, (4) a hexagon, (5) a circle, (6) in squares as a horizontal moulding, (7) in squares as a vertical moulding. The character of the unit is retained, though its proportions of width to length are altered.

Such exercises as these form valuable preliminary practice in design, if given from the blackboard. Let the unit, or element of repetition, *a*, be drawn first by the whole of the class. Then divide the pupils into four groups; the first group to draw a triangle; the second, a square; the third, a pentagon; and the fourth, a hexagon; which forms are to be the enclosing forms within which to inscribe a design similar to those seen in the illustrations.

In teaching the drawing of these rosettes, the enclosing figures being completed, the centre of each should be marked by a point, and also the centres of each side of the figure. Then draw simple curves from the sides to the centres, as shown in the small figures, 1, 2, 3, 4, 5, below, and add the pointed foils, or ends of the leaves, in the angles of the figures. The lesson is an easy one, and the teacher can draw one foil, or leaf, in one division of each figure on the blackboard, requiring the pupils to repeat the unit, as many times as the enclosing figure has sides, in the remaining portion. In filling the circle, the circumference should be drawn on vertical and horizontal diameters, two other diameters being drawn bisecting the right angles at the centre, thus dividing it into eight equal parts. The unit, or element, is then to be drawn on each semi-diameter as a central line. A series of arcs drawn around the points of the leaves, and usually called cusps, may be added, and the whole be enclosed by an outer circle.

The vertical and horizontal mouldings are composed of squares continuous in either a vertical or horizontal direction; the unit being placed on the diameters of each square. In the vertical design, half the unit is placed at the side of the central figure, to fill the space. When the filling is completed, parallel lines to the sides of the squares are to be added to give unity to the design. When several independent units of form are grouped together, as in the case of these squares placed side by side, or one above another, it is necessary to have lines to unite these parts together, either circumscribing them, as in polygons, or by parallel lines, as suggested, enclosing many units together.

It will be seen in this variation of use, the unit is really half the leaf, symmetry adding the other half. Symmetry may be said to be repetition on one axis: repetition round a centre is symmetry on many axes.

QUESTIONS. — Why draw conventional forms before natural forms? What is said of the given conventional maple-leaf? Of the pupil sketching his original design before drawing it in his book. Of mechanical aids in original design? Of transferring and tracing? Why not make original designs wholly by freehand? What distinction should be made between freehand drawing from copies and original design? What of parallel lines enclosing units of ornament?

CHAPTER III.

CONVENTIONALIZATION, HISTORICAL ORNAMENT, &c.

In this chapter, for the purpose of implanting in pupils' minds some associations in regard to their exercises, we have introduced forms derived from the Egyptian, Greek, Roman, and Moorish styles.

DRAWING-BOOK EXERCISE VII.

A Lotus Ornament.

Directions. — The example is to be copied the same size as the illustration. Draw in the centre of the space a central line equal in length to 1 2, and a horizontal line, 3 4, of the same length. Draw 3 2, 4 2. Bisect 1 2 in 5, and through 5 draw a horizontal line, cutting the oblique lines in 6 and 7. Draw the double ogee curve, beginning at 3, through 6, to 2, and repeat it on the right side; then the simple curves from 3 and 4 to 5. This gives the principal form. Continue central line, 1 2, above 1, and below 2. The flower form above 1 is to be drawn by judgment of the eye, as also the stem between 1 and 5, and below 2.

At *a* and *b* are two Egyptian renderings of the lotus-flower, the first approaching to the natural form, the second more conventionalized, as used in important ornamentations.

The teacher should sketch these illustrations on the board, and tell the pupils about the lotus flower and plant, and its symbolic meaning in Egyptian art. It was the plant which first developed and blossomed after the annual overflow of the Nile, and was regarded by the Egyptians as we regard the first violet in spring, or the young foliage of trees, after the winter is past. But the Egyptians treated their art as symbolic of natural laws and beauties; and therefore, to them, the lotus-plant appeared as symbolic of life returning after death, wherever it was used in their ornament. Every detail and feature of Egyptian ornament was symbolic of something else than itself, and conveyed the idea of which the form was the outward expression.

The form given as a drawing exercise is not a close adherence to the Egyptian type; and the introduction of the historic element into these lessons is for the purpose of arousing the interest of the pupils, not to make them imitators of Egyptian, or any other art. Most children will know enough of Bible history to be interested in Egyptian forms, just as the relics of Egyptian art and industry in a museum are invariably the most attractive portions of it to the multitude.

BLACKBOARD EXERCISES FOR PAGE 7 OF DRAWING-BOOK.

Greek and Moorish Ornament.

GREEK FORM.

Directions.—In the left-hand part of this page draw the sprig of ornament given in the illustration, derived from the honeysuckle, or anthemion form of the Greek ornament. Begin by drawing a central vertical line from within an inch of the upper margin to within an inch of the lower. One-sixth of the line from the top, draw a horizontal line equalling three-quarters of the vertical line, half on either side. These are all the construction lines required. Next draw the ogee curve forming the outer line of the side leaves, starting from the left and right extremities of the horizontal line, and then the inner curves of the same leaves. Next draw the central leaf, and the two members forming the husk at the base.

When the pupils have drawn the construction lines, the teacher should draw the curves, on the blackboard, one step at a time, and point out their delicacy or graceful curvatures, the class following as each is added, until the sketching in the books is completed. Then every drawing ought to be examined and corrected before it is lined in or finished. By referring to the specimens of historical ornament, on pages 231, &c., the teacher will see contrasted some of the features of the four historical styles.

MOORISH FORM.

The right-hand space is to be devoted to the Moorish ornament, a variety in the type form of the style, just as the Greek example is a variety in the type of the Greek

honeysuckle. Draw a vertical line one-third of the page from the right edge (dividing the space into two unequal parts), extending to within an inch of top and bottom of the page. About one-sixth of this line from the bottom, draw a horizontal line equal to the vertical line; and, at a distance of a little less than half the vertical line from the bottom, draw a second horizontal line having a length of rather more than half of the first horizontal line drawn, half on either side of the central line. With these lines as guides, draw the outer curves from the upper point of the vertical to the extremities of the horizontal lines, the left-hand curves first, and then the right-hand ones. Let the completion of the example be an exercise of the eyes of the pupils; the drawing being made on the board, no proportions being stated, though the teacher should criticise and explain the character of the curves, and the direction of the lines.

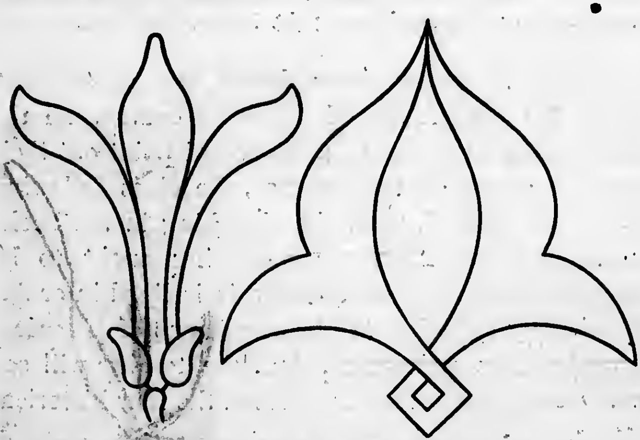


ILLUSTRATION OF PAGE 7 OF DRAWING-BOOK.

Representation of natural forms was forbidden by the Mohammedan religion. This was the religion of the Moors, and their ornament shows the influence of their faith. Note that the curves are so drawn as not to produce a loop. Absence of looped curves, as well as absence of natural forms, is a marked characteristic of Moorish ornament.

EXERCISES FOR PAGE 8 OF DRAWING-BOOK.

Dictation Lesson. — Geometrical Form.

The two examples are to be drawn in a space having the same proportions as the page of the drawing-book. The representation on page 195 will be a guide to the teacher, showing how the pupil's book is to look when the page is complete. The page is to be divided into two equal parts by vertical line, the left-hand division to be the least, and be used for the dictation lesson. The teacher should dictate as follows: —

Directions. — Draw a vertical line in the centre of the left-hand space, from within a half-inch of the top to within the same distance of the bottom. Call this line 1 2. Divide it into six equal parts, by first dividing it into two equal parts, and then each half into three. Call these points 3, 4, 5, 6, 7, beginning the numeration at the next division below 1. Through points 3 and 7 draw horizontal lines equal to two parts of the vertical, one part on each side. Call these lines 8 9, 8' 9', putting 8 on the left side. Draw 8 8', 9 9'. Draw horizontal lines through 4 and 6, terminating in 8 8', 9 9'. Treat 0 0 on 8 8' as the diameter of a semicircle, and draw it, curving to the left away from the central line.

In the same way draw a semicircle on 0' 0', curving to the right away from the vertical line.

Erase the dotted lines, and line in the figure.

Memory Lesson. — Pitcher.

Directions. — A lesson in memory drawing must vary according to the capacities and experience of the children in a class. Exact forms which can be described in words, or whose names suggest the forms definitely, are the best subjects to use at first, the exercise being closely allied with dictation drawing. Afterwards a vase, which has been previously drawn, and whose proportions of constructional lines can be recalled, may be given; the irregular lines, such as the profile, or the handle, being a fair tax on the memory.

How much the memory may be assisted in the early stages of these memory lessons must depend on the thoroughness in which pupils have been taught, and have learned. If a class has been well taught, their intelligence developed, rather than crammed, and a free healthy play allowed for the faculties, all the powers of the mind will be strong, the memory as well as others. But, if the exercises have been dull and uninteresting, the copies not pleasing, and no information about them given, and no association with other forms suggested, then the child's memory of them will be a blank.

Memory lessons, like dictation lessons, should be frequently given as review exercises, either on slates or on paper.

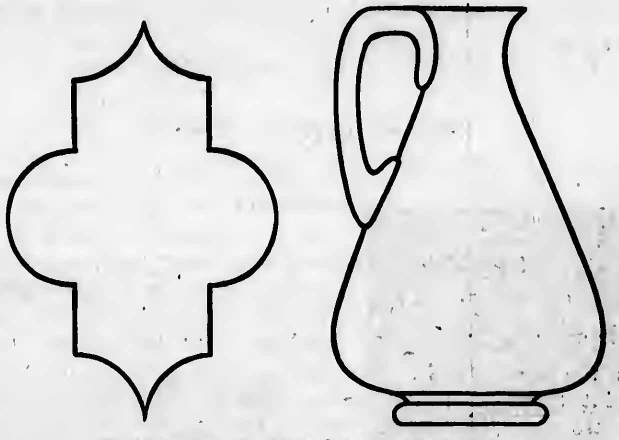


ILLUSTRATION OF PAGE 8 OF DRAWING-BOOK.

It may be that at first there will be need to allow much help. The teacher may have to draw the subject on the board before the lesson begins, and let the class see every step; then to erase from the board, and let the pupils draw the examples with refreshed memories. Or, where little faculty of memory exists, the pupils might be required to draw the copy on their slates as the teacher does on the board, and, when complete, to erase it, and then to draw it in their books.

Every teacher will readily discover how it is best to proceed with her class so as to make the memory exercise improving to the pupil without being distressing. But it has been found that one thing is essential, — however much help may be given before or after a lesson in memory drawing, during its progress the pupil should not be allowed to look at the original drawing or copy.

In the exercise given here, the construction lines may be dictated, and the rest left to the memory. If the pupils have not drawn the vase (in Intermediate Book 1, Ex. 28), they should first draw it on their slates as a blackboard exercise, and then be required to draw it from memory.

DRAWING-BOOK EXERCISE VIII.

Vine-Leaf conventionalized.

Directions.—Draw the vertical line 1 2, for the vine-leaf, in the space for it. Fix the point 3, which is not in the centre of 1 2, but rather nearer the bottom than the top. Draw 4 5 and 6 7, horizontal lines determining the width of the pairs of lobes forming the sides of the leaf. The line 6 7 equals 3 2. Having fixed these lines, mark off on 4 5 the points 8, 9, and on 1 2, the point 0. Then draw the outline of the lobes.

The vine-leaf as thus drawn is a good example with which to point out and explain what is meant by a conventional leaf, if conventionalism be not yet understood. Thus the general outline and character of a vine-leaf is retained; but many details are omitted in the natural leaf. The edges of the leaf are cut up into many divisions, and the margin is, therefore, called serrate, or saw-like; and if the leaf were drawn from Nature, or introduced into a picture, these minor divisions would have to be shown. For ornamental purposes, such details are not expressed, as they are liable to weaken or confuse the ornamental effect; and this is the origin of conventionalization,—the adapting of a natural form to the uses of industrial art.

DRAWING-BOOK EXERCISE IX.

Conventional Leaf.

Directions.—Draw in the space allotted for it a central line 1 2, and upon it draw faintly the general outline of a heart-shaped leaf, as shown by the dotted line on the left. When the form is well balanced and satisfactory, the small divisions can be added. Observe that the curve of the small divisions is composed of two parts; the longer one tending away from the central line, and the other, which is the shorter of the two, cutting in abruptly towards it.

DRAWING-BOOK EXERCISE X.

Vase, in the Greek Style.

Directions.—One-half of this vase is given in the drawing-book; and the exercise is to draw the balancing half. The horizontal lines should be all carried across the central line 1 2, in the order of the numerals, and drawn as much to the right of 1 2 as points 3, 4, 5, 6, are to the left of it. When this has been done, draw the profile or contour of the body of the vase, and then add the handle.

Point out to the pupils that the body of the vase is ovoid, or egg-shaped, with the large end uppermost; and also state that this form of curvature, tending to the ellipse or oval, is one of the features of Greek ornament, in opposition to the roundness of Roman, or the flatness of Egyptian ornament. Sketch examples on the board to show the distinction between the three styles. By referring to the forms of historical ornament on pages 231, &c., simple examples will be found for this purpose.

Draw a detail of an Egyptian, Greek, and Roman moulding, — that is one feature, or unit. Use these three blackboard examples to point out what was remarked about the flat, elliptical, and circular character of the three styles of ornament.

DRAWING-BOOK EXERCISE XI.

Acanthus-Leaf conventionalized.

Directions. — The leaf is to be copied the full size in the right-hand space. Draw a central line 1 2 equal in length to that of the copy, which line will be the midrib of the leaf. Divide it into four equal parts, as shown by the three crosses. Divide the two upper parts of the line into three equal parts each. Draw a horizontal line through the centre of the vertical line equal on each side of the central line to one and one-third part of the central line. Draw now the enclosing line of the leaf, as shown in dotted curved lines; and then draw horizontal lines through the three crosses on the central line, to terminate at the curved outer line. Now add the eyes, or loops, for the division of the leaf, and we have the development and constructional lines of the leaf as shown in sketch *a*.

If the teacher looks at the sketch *b*, the second stage of the drawing will be seen, the veins and loops of the divisions of the leaf and the general features being given. In the sketch *c*, the leaf is shown completed, the three members of each great division being drawn as though they were one. In *d*, the natural leaf is given for comparison.

The acanthus-leaf is the most frequently used foliage in ornamental art. It was first used by the Greeks; a particular variety, called the *Acanthus spinosus*, or prickly acanthus, being employed, a plant much resembling the larger varieties of the thistle, in its sharp edgings or margin of the leaf.

Another variety, called the *Acanthus mollis*, or soft acanthus, more nearly resembling the leaf of the parsley and many wild plants, was adopted by the Roman ornamentists, and so developed by them that the acanthus scroll of the Trajan Forum in Rome may be said to be the most magnificent decorative foliage ever produced. This variety had rounder points, more elaborate divisions and enrichments of the leaf, than the prickly acanthus used by the Greeks. It is the Roman acanthus, with various modifications, which is so extensively employed now in almost all branches of decorative art; and it is this form which is given for a copy.

CHAPTER IV.

OBJECT DRAWING, BLACKBOARD EXERCISES, AND HISTORICAL FORMS.

For the purpose of giving variety to the exercises, geometrical views of a few objects are given in this chapter. The difference between a geometrical view and a perspective view of an object will be seen by comparing Exercise 12 and the same form in a perspective view, in Exercise 4, Book 3.

DRAWING-BOOK EXERCISE XII.

Greek Vase.

Directions.—Draw a central vertical line, 1 2, the same length as in the copy. Draw 3 4 through 1, three-fourths the length of 1 2; half the length of 3 4 being on each side of 1 2. These proportions being secured, notice the egg shape of the body; and, in drawing the profile, let the curve be very refined and gentle. The shape is very subtle and beautiful, and should be well copied. The horizontal lines of the mouldings are to be noticed also.

The principal difference between this and Ex. 10, is, that more of the large end of the egg-form is cut off at the top of this vase than in that example, giving thereby more character and individuality.

DRAWING-BOOK EXERCISE XIII.

Padlock.

Directions. — To be drawn the same size as the copy, and directly below it. Draw 1 2 immediately under the central line of the lock, and divide it into three equal parts in 3 and 4. Through 3 draw a horizontal line, 5 6, and divide it into three equal parts in 7 and 8. These are the constructional lines and divisions. Begin the curved outlines by drawing the longest curve, 5 2 6, and carry the curve above 5 6, to pass through 7 and 8, and end in a straight line below 5 6. Draw the hasp above 5 6, the upper line passing through 1. Point 9 is halfway between 3 and 4; and 9 0, the central line of the key-cover, should be drawn so as to make the cover symmetrical. Draw it, and, lastly the keyhole, which may be given as an exercise, without proportions being described.

See if the pupils will draw a cover which will conceal the keyhole, the purpose for which it is made. The point 0 ought to be just below the bottom of the keyhole, if measured from 9 down the central line towards 2. Then ask them to measure the *width* of the cover in their drawings, and apply it to the widest part of the keyhole, and see if it would protect the hole from wet and dirt by covering it. Practical tests of the usefulness and working capacity of useful objects as drawn, are among the best tests of good drawing.

DRAWING-BOOK EXERCISE XIV.

Earthenware Pitcher.

Directions. — The pitcher is to be drawn the same size as the copy, and in the space beneath it. Draw the vertical line 1 2, and divide it into four equal parts in 3, 4, 5. Through 4 draw a horizontal line, 6 7, equal to three parts of 1 2. Draw the horizontal lines, 8 9, 10 11, 12 13, 14 15, in their respective places, and length proportioned to parts of 1 2, as truly as your eye judges; the two lines, 8 9, and 14 15, being equal and nearly as long as two divisions of 1 2; and those at 10 11, and 12 13, being a little longer than one division of 1 2.

The horizontal lines which mark either the narrowest or widest parts, or the termination of a curve, should be drawn before the outline of the form be drawn. Those which occur between two such divisions, as, for instance, those on the neck of this pitcher, may be added after the outline is done, as their lengths will be determined by the oblique lines of the outline.

Having drawn the leading horizontal lines, draw the outline, handle, and spout.

DRAWING-BOOK EXERCISE XV.

Moresque Ornament.

Directions. — The example is first to be copied in the space below the illustration, and of the same size. No simple proportions are given; the exercise being to práctise the pupil in seeing proportions not reducible to a simple fraction of the whole height. Draw the central line in the middle of the space, and add, at their proper positions, the three horizontal lines. Next draw the two longest curves, near the central line, and add the outer ones,

which end at the extremities of the horizontal line. See how the stems of the leaves interlace, and remember to draw them across or through one another at first, afterwards rubbing out the invisible parts. Lastly draw the conventional apple or berry on the central line.

Enlargement of Previous Exercise.

The same exercise is now to be drawn in the large space on a central line twice as long as the copy; the general directions for drawing it being the same as before. The teacher should be sure that the proportions of the dotted constructional lines are approximately correct in the children's drawings, before allowing them to begin the curves. It is unwise to let a drawing get altogether wrong for want of close attention and correction in the early stages. Any measurement the teacher wants to get quite true may be obtained by measuring it from the copy, and doubling it for the enlarged drawing, if, as in this exercise, the drawing is to be made twice the linear size of the copy.

The teacher will see, by a scrutiny of the lines employed in Moorish ornament, that simple curves, and the compound curve, called the ogee, or line of beauty, are the most frequently-used curves in the style. This will enable the teacher to describe the curvature in words, as well as to illustrate it effectively by means of base lines on the board; the altitude of each curve being approximately measured by a proportion of the base.

For further illustrations of the Moorish style, see the examples on page 237.

EXERCISES FOR PAGE 13 OF DRAWING-BOOK.

The page is to be filled by two exercises; the first in dictation, the second from the blackboard. Commence them by requiring the pupils to divide the page vertically into two equal parts.

Dictation Lesson. A Vase.

Directions.—In the centre of the space to the left, draw a vertical line to within half an inch of the top, and continue it to within the same distance of the bottom, of the page. Call it 1 2, the numeral 1 being at the top. Divide 1 2 into three equal parts in 3, 4; 3 being next to 1. Through 1 draw a horizontal line equal to two parts of 1 2, one on each side of it, which mark as 5 6. Through 3 and 2 draw horizontal lines equal to one part of 1 2, half on either side, calling that through 3, 7 8, that through 2, 9 0. From 5 draw a simple curve inwards towards 1 2, ending in 7, its altitude one-sixth of its base. From 7 draw a curve to 9, rounding fully from 7 outwards (away from 1 2), and being flatter as it approaches 9; the altitude to be on the base 7 9, one-fourth its length from 7, and one-fourth of the base in height. Repeat these curves from 6 to 8, and from 8 to 0. The body of the vase should be ovoid in general character, large end uppermost.

The lesson here given is one of the most perfect blackboard lessons yet given. Its proportions and curvature can be stated in exact terms of language. The true test of good blackboard-drawing is, when few guide-lines have to be erased. In this, only five lines have to be erased when completed.

Blackboard Lesson. Shield and Crown of the House of Savoy.

Directions. — In the centre of the right-hand space, draw a vertical line to within one inch and a half of the top, and one-half inch of the bottom, of the page. Divide this, as shown at the side of the diagram, into four equal parts, — in 3, 4, 5. Through 3 and 5 draw horizontal lines 6 7, 6' 7', each equal to half of 1 2, Draw 6 6', 7 7', 6' 2, 7 2. Bisect 6' 2 and 7' 2, drawing a compound curve called the ogee, through the bisection on either side. Through 4 draw 8 9. Divide the lines from 4 to 3, 5, 8, 9, into three equal parts, and, through the divisions nearest to those numerals draw lines at right angles to the central lines of the cross, each equal to a third of 4 8, half on either side. Complete the cross by joining the extremities of the lines last drawn. [The numerals are placed on a line at the side; but the teacher is to suppose 1 2 to be the central line of the figure.]

The Crown. — The upper division, 1 3, is divided into three equal parts, the rim of the crown taking up the lower third, the spheres and lozenge shapes, the middle, and the bars, the upper third. The ball and cross are added, a little more than a third of 1 3 in height.

In this exercise, the curves and upper portions of the crown are to be drawn by judgment of the eye, both by teacher and pupils; and, the great proportions being given, the details of the rest may well be left to the judgment of the eye. Thereby the pupil acquires a sort of instinctive criticism, which is the only safe guide in after-practice of drawing from nature. Every drawing-lesson should give both exact and inexact proportions, so as to develop the

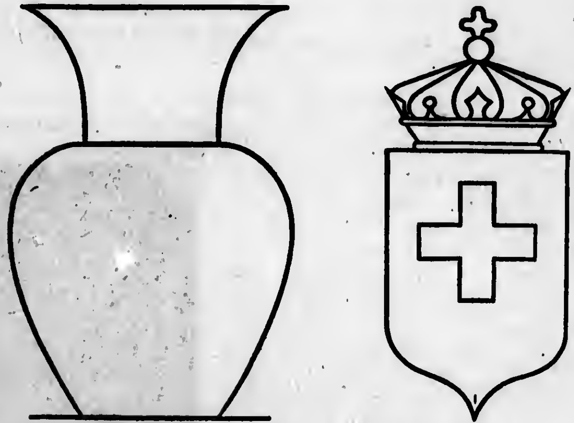


ILLUSTRATION OF PAGE 13 OF DRAWING-BOOK.

mental criticism and the judgment of the senses; and it will be the wholesome and healthy exercise of both of these faculties which will result in intelligent skill.

EXERCISES FOR PAGE 14 OF DRAWING-BOOK.

Memory Drawing.

Directions. — Draw a vertical line on the page, dividing it into two parts, of which the left space shall be one-third, and the right space two-thirds, of the page. In the left space give the square ivy-leaf rosette to be drawn twice from memory. Draw two vertical lines near the outsides of the space, leaving a margin of half an inch on both sides. Divide this space into two equal parts by a horizontal line. Then draw a square in the upper half between these parallels, and a second square in the lower half. Draw the diameters and diagonals of both squares, and then remind the pupils of the character of the ivy-leaf, and require them to draw the rosette in each square from memory. If necessary, let them turn to the exercise on the second page, and look well at it, before beginning to draw it; but, after the work is begun, let no leaf of the book be turned for reference.

Ivy-Leaf Design.

Directions. — Let the pupils now apply the knowledge they have of the ivy-leaf to an original treatment of it. In this exercise the teacher may depart from the rosette arrangement, in some cases, letting the design be more of symmetrical arrangement on a vertical axis. Four examples are given of this manner of treatment; two being simple in character, the third and fourth more elaborate. The teacher will note, that, in each, the first thing to be clearly discerned is the geometrical shape. Let those pupils who have tried, and have failed to make any kind of a design for themselves, copy one of those here given; though even an indifferent arrangement made by the child itself will be more educational to it than copying the designs of others.

Variations of the Ivy-Leaf Design.

Though a fairly good drawing may be made by children in the regular hours of study, generally, a design cannot often be made by any one at a fixed time. It is a work of thought and experiment, and, therefore, the pupil should have time enough given in which to experiment. Before the time arrives when the design for this place has to be put in the book, the teacher should set the children to work on

their designs, and require them to practise at home

as a preparation, bringing their sketches to the teacher for criticism and suggestion. When even a moderately satisfactory result is arrived at by the pupil, then let the teacher have it placed in the drawing-book as a privilege. Again let it be said, Beware of insisting on too high a standard for children. Keep them interested and happy in their work, even if they do it very badly. Educate the spirit of, and instinct for, constructive work of some sort, and let the time when excellence shall be attained take care of itself.

The work in drawing will seldom be better than that of the same child in any other subject. Starting on a basis of nothing, when the skill and knowledge of the child are at zero,

we have to add, little by little, to that nothing, and rise by degrees above that zero, through various imperfections, until we approximate to the relatively good: the perfect we never reach. Let this thought sober the criticism, and restrain the impatience, and comfort the distress, of the teacher, when the sorry work of the

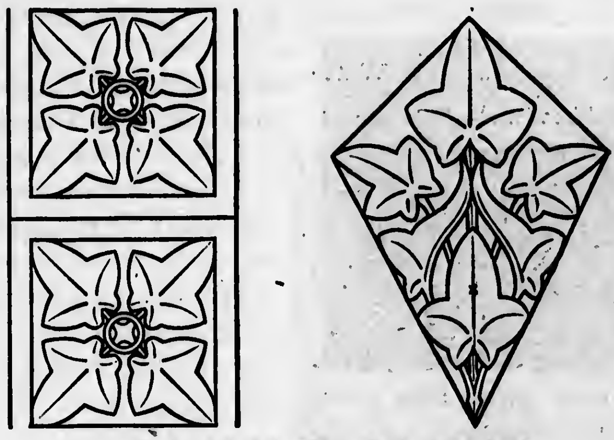


ILLUSTRATION FOR PAGE 17 OF DRAWING-BOOK.

pupils is being examined. Let her remember that all the brilliant geniuses before whose names, memories, or shrines, a whole earth bows in admiration, never produced, even in the maturity of their skill, any thing but imperfect work, and died before they had accomplished more than an approximation to the truth, or even reached a realization of their ideal. With these things in mind, we can afford to be tolerant of the imperfections of young children; for this imperfection is the claim they have upon us for help and guidance.

In the development of originality in pupils, by designing lessons, the teacher will find much encouragement. Frequently it will be found that pupils who have shown but little interest in the study, and have consequently made but indifferent progress, will suddenly awake to enthusiasm when they see its application to design.

DRAWING-BOOK EXERCISE XVI.

Watering-Can.

Directions.—This example is to be drawn in the space to the right, and of the same size as the copy. Draw a central line in the middle of the space 1 2, and divide it into three equal parts, as shown by stars on the copy. Lines 3 4 and 5 6 are each equal to half 1 2. Draw them and the sides 3 5, 4 6. This gives the cylindrical body of the can. Draw its top by a simple curve from 3 to 4, and mark the opening near 3. Add the handles and spout, measuring their dimensions by the eye, in comparing them with the width and height, 3 4 and 1 2. Thus the handle to the left projects beyond 3 5 nearly the half of 3 4, and vertically it projects a little above 3, and ends a little below the second star, on line 3 5. In the same way analyze the position of the spout before drawing it.

This is a copy which may be successfully reproduced on a large scale on the blackboard by pupils, the form being simple in character. Very imperfect work in the books may sometimes be corrected by requiring the class to draw the same example several times. Thus, begin with drawing it on slates; then draw it for the second time on a large scale on the blackboard, each pupil drawing it the same size as the teacher does; and, lastly, let the pupils draw it in their books. Two or three repetitions of lessons in this manner will much improve the book-work.

DRAWING-BOOK EXERCISE XVII.

The Oxford Pitcher.

Directions. — The construction here given, as well as the same form in the drawing-book, shows how to begin this exercise. The pupil is to complete the diagram given in the book, thus making a copy the size of the illustration. The pitcher is to be drawn twice as large as the illustration in the space assigned. In the centre of the space allotted, draw a central line, 1 2, twice as long as the same line in the copy. Draw 3 4 and 5 6, also twice as long; i.e., on each side of the central line in the drawing will be a line as long as the whole of 3 4 or of 5 6 in the copy. Then draw 3 5, 4 6. Draw next the horizontal lines. Add the spout at 3, and round off the angles at 5 and 6. Then draw the handle.

The two objects, the watering-can and the pitcher, illustrate one principle of good drawing, which should be early impressed on the pupils. It is, that in objects which are, taken altogether, not symmetrical, there will probably be some symmetrical parts, and the unsymmetrical parts will be details only, such as handles and spouts. The draughtsman looks for the symmetrical parts, and draws them first, thus securing balance and consistency in the more important portions of the object.

Here comes in the same element in drawing from objects, which is so much insisted on in drawing from flat copies or ornaments, namely, the geometrical basis. Just as the accurate geometrical arrangement of parts in a flat ornament is one of its essential characteristics, so, in the appearance of an object, there will be portions in which solid geometry occurs as a basis; and the knowledge which enables us to draw the geometric solids will enable us to draw all objects having the geometric solids as the bases of their forms or construction.

DRAWING-BOOK EXERCISE XVIII.

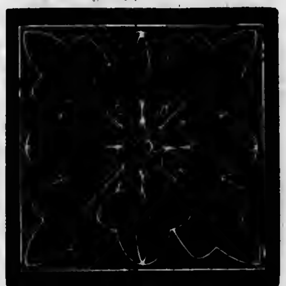
Acanthus Ornament.

Directions. — The copy is to be increased in size to twice as large as the example. Draw in the centre of the space, to the right, a vertical line, 1 2, twice as long as 1 2 in the copy. Divide it into two equal parts, and through the division draw 3 4, equal to 1 2. Treat these as the diagonals of a square, and draw the square. First draw the curve from 3, through 2, to 4. The large husk is to be then completed by adding the lobes of the leaf-like part above 3, 2, 4.

This example shows how valuable simple constructional lines are in obtaining proportion. The acanthus husk is not usually considered as of very simple proportion, yet here it is designed on one of the simplest geometric forms, that of the square; and every part of the square is useful in fixing the position of some important feature.

DRAWING-BOOK EXERCISE XIX.

Acanthus Rosette.



Directions. — A square rosette, having in each fourth of the square an acanthus-like husk, will be produced by repeating the quarter given, in the three remaining quarters of the square. Begin by drawing the long outer line of the husk which commences near the ends of the diameter, and passes to touch the small circle at the centre of the square, in the three quarters not filled; then fill up the points or edgings of the side lobes, and, lastly, those of the central lobe.

The teacher might allow those pupils who draw this example well to put half-tint consisting of parallel lines on the background, that is, on the portion of the square not included within the acanthus forms. Half-tint is drawing lines parallel to each other, leaving the width of a line between two lines.

But the mere daubing of a surface with lines running every way is not half-tinting it. The lines should all run one way, either vertical, horizontal, or oblique, and then the surface will look flat. If there is much difficulty in obtaining this result at first, let half-tinting be practised on the slate or blackboards; for let it be remembered, that to erase faulty half-tinting will spoil any drawing, and, when the pupil is allowed to use this means of distinguishing the parts of a drawing, it must be done firmly and deliberately at once, and not done to be erased.

EXERCISES FOR PAGE 17 OF DRAWING-BOOK.

Blackboard Lesson. — Conventional Leaves and Flowers.

Directions. — Divide the page into two unequal parts by a vertical line, making the left half slightly the larger.

In the centre of the left space draw a vertical line 1 2, leaving a margin of half an inch at the top and bottom of the book. Divide 1 2 into four equal parts in 3, 4, 5. Through 1 and 5 draw horizontal lines, equal to half the vertical, 6 7 and 8 9. Draw the curve from 6 through 4 to 2, and then that from 7 through 4 to 2. Next draw the leaf from 7 to 5, and add that below 6 to 5, remembering to make the points of the leaf sharp, and the lobes rounded. Between 1 and 3 draw the flower, its centre midway between 1 and 3. Repeat this flower round 8 and 9 as centres, and then draw the stems of leaves and flowers.

The usual method of proceeding in sketching an outline design is to draw the left side first; but in this case, where the complete leaf occurs on the right side, it will be better to draw the right leaf first. The flower at 8 should, however, be drawn before that at 9. The pupils might be required, as a home exercise, to adhere to this arrangement of leaves and flowers whilst taking another subject for a design. Thus the morning-glory, the geranium, the convolvulus, and many other common plants, would be fitting subjects for design, with an arrangement borrowed from the above.

Dictation Lesson. Conventional Ornament.

Directions.—In the right space draw a central vertical line the same height as that used for the blackboard lesson on the same page. Divide this line, 1 2, into four equal parts in 3, 4, 5, remembering always to divide it first into two equal parts, and then each part into two, thus getting four equal parts. Through 4 draw a horizontal line, 6 7, equal to two parts of the vertical line, half on each side of it. Draw simple curves from 1 and 2 to 4, on both sides of 1 4 and 2 4, their heights equal to one-eighth of their bases. From 6 and 7 draw simple curves to 4 on both sides of 6 4, 7 4, their heights equal one-sixth their bases. Draw the right line 1 6, and divide it into three equal parts. On the upper two-thirds as base draw a simple curve to the left of the line, its height equal to one-fourth its base; and on the lower third of 1 6, draw a simple curve, its height equal to one-fourth its base. Repeat this on the three other lines, 1 7, 6 2, 7 2. Divide 6 4 and 4 7 each into two equal parts in 8 and 9, and draw 3 8, 8 5, 3 9, 9 5. Between 3 and 1 draw a circle whose diameter coincides with the line 3 1, and reaches from 3, one-fourth of 3 1. Below 5 repeat a similar circle down the line 5 2. From 8, towards 6, draw a circle on the line 8 6, its diameter beginning at 8, and taking up one-third of the line between 8 and 6. Repeat this circle in a similar position between 9 and 7. Erase the parts of the lozenge shape which go behind the conventional leaves, and finish the figure.

The constructional lines are divided by points to show every proportion to the teacher. The dictation given above is all that is barely necessary; but it should be amplified and repeated as much and as often as the teacher thinks advisable, so as to give

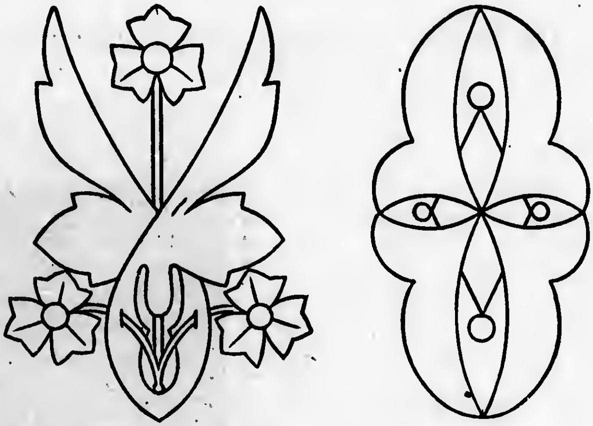


ILLUSTRATION OF PAGE 17 OF DRAWING-BOOK.

a clear and complete understanding by the language used of the form described. The illustrations above show how the examples, properly drawn, will appear in the drawing-book.

Teachers sometimes inquire, why, in this course of lessons, so large a proportion of the exercises are taken from ornamental forms rather than from objects. The reason will be evident, if we remember that few objects can be intelligibly represented, unless drawn as the eye sees them; and this would necessitate a knowledge of perspective, which children in the primary or intermediate grades can hardly be expected to understand. Again: the aim of these first exercises is to cultivate the imitative faculty, and give an appreciation of beautiful curves. Few common objects have beautiful curves in their outline, whilst all good ornament displays such curves.

BLACKBOARD EXERCISES FOR PAGE 18 OF DRAWING-BOOK.

Conventional Design from the Vine.

Directions.— Before beginning to draw, divide the page into two equal parts vertically. The left half is to be for the design from the vine-leaf. Draw a central line, leaving a margin of half an inch above and below its extremities. Divide it into five equal parts. Through the first division from the bottom, draw a horizontal line equal to four-fifths of the central line, half on each side of it The front view of the vine-leaf occupies one-half of the central line. Draw it first, and then the compound curves which form the midribs of the side leaves, and next draw the leaves themselves. The grapes are circular, and the tendril at the centre is a spiral. Draw the different forms in the order named.

The teacher who is not an expert in drawing on the board had better draw one-half of the design on the board, and do it very carefully; and, when only one-half is drawn, it should be the left half. When the pupils have done this in their books, they may be required to add the right half of the pattern, whilst the teacher can devote the rest of the lesson to criticism of individual drawings. In this criticism, remember to be very merciful to inequality of thickness in the lines, and let all the corrections be in the shapes of the drawings. Try and get an appreciation of true form, and the beauty of line will take care of itself. At the same time, if the pupil is able to get the right shape of an example, and is very rude in the character of the line, the teacher may then wisely criticise the line and workmanship generally.

Conventional Flower-Form.

Directions. — The exercises on pages 18 and 19 of the drawing-book are intended to teach, by comparison, the difference between a plant conventionally treated and one drawn from Nature. Let the teacher compare them with the potato-plant on the opposite page, and point out the difference between natural and conventional forms to the pupils.

The design: Draw a central vertical line in the left-hand space extending to within three-quarters of an inch of the top and bottom edge of the paper. Divide this line into three parts, of which the two lower parts are equal, and the top part slightly shorter than the others. This gives the chief divisions; the upper being for the flower, and the lower for the leaf at the bottom and the point from which all the leaves, flower, and buds spring. Draw the flower on the upper third first, and then the heart-shaped leaf on the lower third. Next draw the midribs of the side leaves, and also of the half leaves tending upwards towards the flower. Complete these leaves, and then add the buds and tendrils. Be careful to keep the outer points of the design within an oval.

Direct the pupils' attention to the several features of a plant here represented; viz., front view of leaf, side view, flower, bud, tendrils. The leaf is heart-shaped, and the flower cruciform; that is, having four petals arranged in shape of a cross. The example is one capable of displaying delicacy of

ILLUSTRATION OF PAGE 18 OF DRAWING-BOOK.

curvature in the outlines of the leaves, and this should be pointed out to the pupils.

This is an arrangement which might be made a suitable one for the convolvulus, the leaves and flowers being not unlike these. Look out the details of the convolvulus from a work on botany, and draw them on the board for materials for a design, the pupils to copy them from the board, and produce an original design based on the above arrangement.

The arrangements on page 18 of the drawing-book illustrate the simplest form of design; viz., symmetrical treatment of a plant or foliage on a vertical axis, making that which is sometimes called a sprig, and used at various times as a surface decoration for walls. When not enclosed within lines geometrically arranged, the ornamentation would be called a *powdering*: if so enclosed, the pattern is called a diaper.

DRAWING-BOOK EXERCISE XX.

The Potato-Plant.

Directions. — The teacher should draw this exercise on the blackboard so as to show the order in which its several parts are to be copied by the pupils. Draw a rectangular form on the board, having the same proportion of width to height as the space in the book in which the example is to be copied, which is one-quarter of the width higher than the width. Suppose the teacher draws a base of three feet for the rectangle, the sides will be three feet nine inches high. Complete the rectangle. Then let the teacher draw the example in the space so marked out, the pupil following step by step. Explain to the pupils that the leaf is a compound leaf, consisting of several leaflets, or little leaves, ranged along the sides of the midrib, terminated by one at the extremity. The first line to draw in the leaf will be the stem, or midrib, including the stem itself, by one line only, irrespective of interruptions or breaks made by the leaflets, to get the length and direction of the leaf. Then draw a single line to obtain the position of the flower-stem, observing the angle it makes with the leaf-stem. Beginning at the top of the leaf, draw each pair of leaflets of the larger kind, and afterwards add the smaller ones. In the same way begin with the open flower, and draw it, noticing its five petals; then the side view of the flower and the pendent buds. Lastly, draw the balls, or berries, taking care to keep the stems delicate.

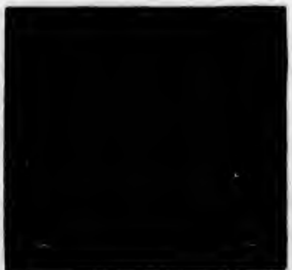
This copy is, perhaps, more elaborate than any other in the book. It is sometimes advisable to give pupils an opportunity to show what they have learned by practice, or whether they have learned any thing. The potato-plant will probably be but poorly copied; but it will look pretty well, whether done well or ill, — a peculiarity generally observed of almost all foliage drawn from Nature. A copy like this gives the children, who have learned to observe, a test worthy of their powers; and therefore, now and then, it is valuable to raise the standard of examples used for this reason.

It has been found in drawing, as in the whole field of general education, that variety in subject is healthier for the pupil, and more conducive to a general intelligence, than adhering to one subject only. A change of subject often begets fresh interest, besides affording an opportunity for those to whom one subject is distasteful, for success in another. Every individual will have preference for one sort of work above all others; and it takes some people a long time to find out what their predilections are. Variety of work in drawing given early will afford them an opportunity to find out their preferences before much time has been wasted.

Not that it is advisable, when a pupil has shown strength in one direction, that he should practise in that direction only; for this would deprive him of the opportunity of gaining strength in the weak points of his drawing. Better let him have the discipline of doing that which, perhaps, he may not like, rather than miss the opportunity of discovering a branch of drawing which he will be strong in.

DRAWING-BOOK EXERCISE XXI.

Type Forms of Three Styles of Ornament, Egyptian, Greek, and Roman.



Directions. — One of the three forms is to be drawn in the centre of the space, and is to be enlarged to three times the lineal measurement of the copy. It will be seen that a circle encloses the Egyptian form; an ellipse, the Greek; and an ovoid, the Roman. This enclosing form is the first to be drawn; the central line having been placed in the middle of the space, and being three times the length of that in the example selected. Begin by drawing the disc, or base, from which the members spring. In the cases of the Greek and Roman, the central member or leaf is to be first drawn, and afterwards those of the left side, beginning from the uppermost. Make points on the enclosing form (circle, ellipse, or oval), where each member touches the curve, and see that these are opposite to each other on the two sides. When the left side is complete, then draw the right side. **Sketch very faintly, and then finish firmly.**

It is conducive to a knowledge of various styles of ornament to see, side by side, typical modes of treating the same subject in different styles. It is not expected that young children will learn more than the names of either the styles or details of ornament, with the first glimmering of a notion of the difference between them, expressed by their own imperfect drawings, a fair measure of their perceptions.

In this page, three examples of an ornamental detail show how the same subject was treated in as many styles; the subject of the Egyptian being the papyrus; that of the Greek, from the honeysuckle; and the Roman is a treatment of the acanthus-leaf. From the illustrations, it will be seen that the first is simple in curve, and straight in line; the Greek very elaborate in curve, and subtle in line; whilst the Roman is enriched almost to the point of confusion, and loss of character. In this as in many other details of ornament in the three ancient styles, the golden mean is with Greek art; a greater degree of satisfying beauty being there displayed than in other styles, antecedent or subsequent to it.

QUESTIONS. — What lines are most frequently used in Moorish ornament? What is said of drawing by judgment of eye? Of pupils drawing their copies on the blackboard before drawing them in their books? Of criticising the work of children? Of half-tint? Of drawing ornamental forms instead of natural forms? Of Greek art as compared with Egyptian and Roman art?

CHAPTER V.

DECORATIVE ART.—EGYPTIAN, GREEK, ROMAN, MORESQUE STYLES.

It is impossible to draw a line, and say, All upon this side belongs to fine art; all upon that side, to decorative art. Certain things can be named as appropriate to decorative art, which do not belong to fine art at all, — the severely symmetrical treatment, and endless repetition of forms, for example. Again: decorative art, but not so fine art, is always employed for the purpose of beautifying objects created for some end independent of decoration. Therefore ornament, the product of purely decorative art, can have no independent existence, but must be subordinate to the object which it beautifies. On the other hand, a product of fine art, as a painting or statue, furnishes, in itself, a sufficient reason for its existence. It is, therefore, a thing of primary importance: it does not depend upon something else for its being.

Requirements of Manufactures.

Decorative art, but not fine art, has always to do with manufactures; and so decorative art is limited by the necessary conditions of manufactures, as previously stated, while fine art is limited only by its own conditions. The manufacturing conditions result from three things: —

1. *The material of which the object is to be made;* as, wood, stone, silver, iron, textile fibres. It is clear that all ornaments cannot be equally well wrought in these different materials.

2. *The manner in which the object is to be made;* as, by weaving, hammering, turning, carving, casting, sawing, sculpturing. It is self-evident that each mode of manufacture must impose certain conditions peculiar to itself upon decoration.

3. *The use to which the manufactured object is to be put.* The decoration should harmonize with this use. But use involves position: so decoration must give heed to that, since an ornament should always be seen the right way up. Thus it often happens that an ornament suitable for the wall of a room, where it can be viewed only in one way, will not answer for a carpet, where it will be viewed from all sides. Again: if an ornament is to occupy an elevated position, it needs to have more breadth, with less of minute detail, than if it is to occupy a position near the spectator. Intensity of light is also to be considered; delicate details will not show in gloom.

But this is not the place to set forth, with any degree of fulness, the particulars of applied decoration: that belongs to a more advanced stage in the learner's progress. It is believed, however, that what has just been said of the general features, together with the few matters now to be mentioned, can be readily comprehended by teachers generally, and that this knowledge will enable them to give a practical character to the instruction, even in quite elementary exercises.

The conditions of manufacture require that decoration should, as a rule, have a geometrical construction, —a basis of triangles, squares, pentagons, &c. Decorative art has, in the main, conformed to this.

The conditions of manufacture require that the forms employed for decoration should be simple, since the accurate reproduction of other forms is impossible by the processes of manufacture. Hence *good* decorative art makes no use of true natural forms. For the same reason, it has nothing to do with what is called *chiaro-scuro*, or the exact rendering of the effects of perspective, and of light and shade.

Derivation of Laws of Decorative Art.

The general laws of decorative art are derived from Nature, — mainly from the vegetable world. Natural forms are, as already shown, largely employed; as, leaves, flowers, buds, sprigs, vines. When such forms are employed, they are always, in good decorative art, conventionalized, and then arranged according to the laws of natural growth. While much of what is natural is omitted, no violence is done to Nature in what is represented. Conventionalization has been quite fully illustrated on the preceding pages.

First determine the general shape of the natural form as a whole, which is usually geometrical, and then the general shape of each part. This is the first step towards conventionalizing the form.

Nearly all natural forms are, as a whole, symmetrical. Thus, in the case of most leaves, and of the human form, the right side balances the left, — an illustration of symmetry. When we come to consider the parts, we find that a single feature, like the head, is symmetrical; while double features, like the arms, are unsymmetrical, if considered separately, but symmetrical, if considered together, the one balancing the other. Single flowers are usually symmetrical, their petals being regularly arranged about a centre; but in the case of clusters, of flower-umbels, each flower, separately considered, is often unsymmetrical. Where the natural form, as a whole, is symmetrical, the conventional form is made strictly so.

Arrangement of the Parts.

In three ways you can arrange the parts of a decorative form, and preserve its symmetry: —

1. You can arrange them about a centre, as of a circle, square, pentagon, or other geometrical figure. It is thus that the parts of snowflakes, of flowers, and many other things, are usually arranged.

2. You can balance the right and left sides, as Nature does in the case of so many leaves, animals, and other things.

3. You can arrange the parts so that they will radiate from a point, or stem, like a fan, as do horse-chestnut-leaves, palm-leaves, and the petals of most flowers when viewed sidewise.

4. There is one other kind of arrangement which is quite unlike the above: it is called continuous growth, and is illustrated by the vine. But, like the above, it possesses the great distinguishing

characteristic of decorative art: it is *rhythmical*, that is, at regular intervals the same features repeat themselves, as do leaves upon a natural vine.

It now remains to say a word of the repetition of these decorative forms; for they must be repeated in order to serve the purposes of manufactures.

1. For covering horizontal surfaces, they must be repeated in all directions.

2. For covering upright surfaces, they must be repeated horizontally, vertically, or obliquely.

Rhythmical repetition of decorative forms makes their effect more agreeable; not so in fine art.

Page of Mouldings.

On the opposite page are given several varieties of mouldings drawn in outline. They illustrate some of the principles of decorative art that have just been described. The forms are all highly conventional, and best adapted to the decoration of vertical surface, — the first four to be repeated right and left, the last three to be repeated up and down.

1. This is made from the leaf of the Irish shamrock, and from the flower of the Scotch thistle. Each form illustrates the balance of sides, right and left.

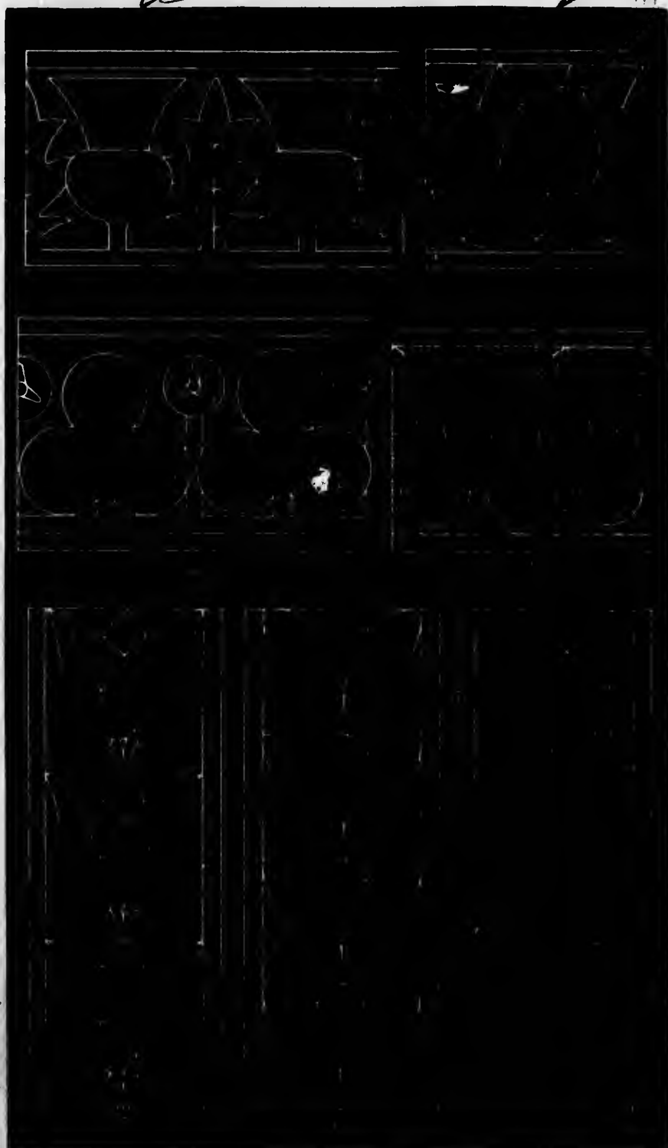
2. This is a moulding from a three-lobed leaf, — trefoil.

3. This is made from the flower and bud of the lily; highly conventional.

4. Another moulding, or border, from the flower and bud of the lily. As the flower is viewed in elevation, it illustrates radiation from a point. The form is Assyrian.

5, 6, 7. Observe, that, in these mouldings, the leaves, separately considered, are not symmetrical, but are symmetrical when taken in groups.

The construction of these mouldings is so evident, that no directions need be given for drawing them.



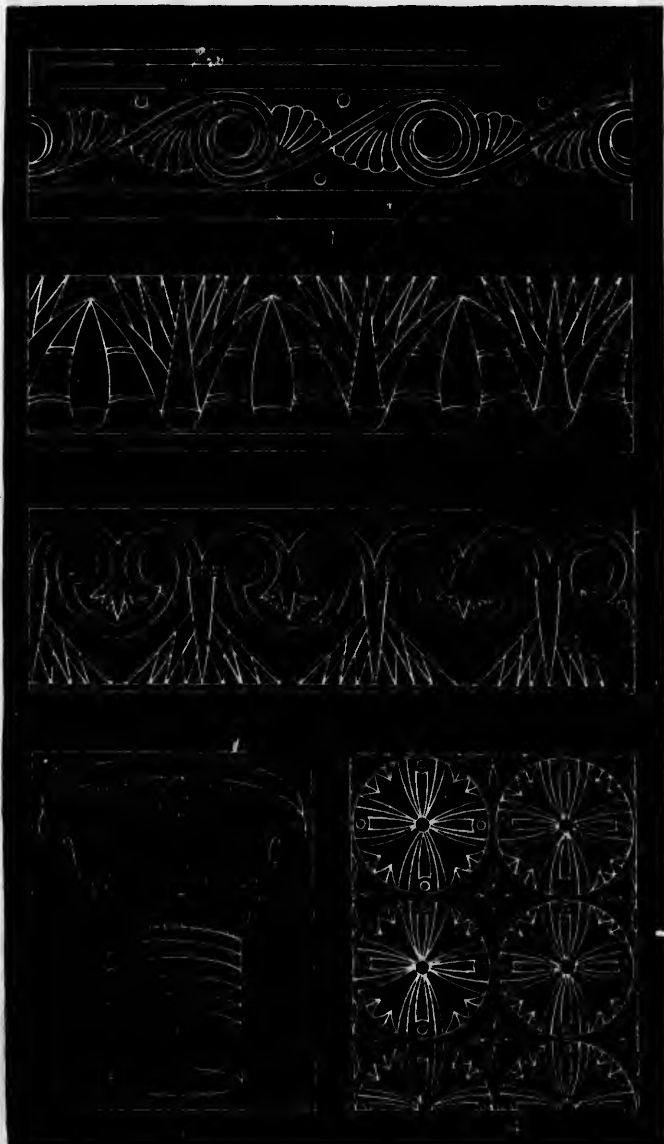
Style in Decorative Art.

In decorative art, what is called a style is a thing of gradual growth: one cannot say just where it begins, or just where it ends. It is easy enough, however, to distinguish two styles, when each has been fully developed. Full development is not attained until the same general characteristics mark the decoration of all objects at a given period.

Different decorative styles may be distinguished from one another (1) by their externals; (2) by their aims. Externals differ (1) in the motives, or elemental forms, as the acanthus, the lotus, &c., which the dissimilar styles employ; (2) in the manner of treatment, which may be more or less conventional, bold, timid, elaborate, &c. The aim may be (1) purely æsthetic, or the expression of beauty, strength, grandeur, for the sake of pleasing. Such are the Greek, Roman, Moresque styles. Or (2) the aim may be symbolic; that is, to instruct by an appeal to the sensibilities. Such are the Egyptian and Gothic styles, largely ecclesiastical. All good styles equally observe certain general principles in the construction and the application of ornament.

For various reasons, it is important that one should be able to distinguish readily between different decorative styles. They should not be combined in a design, as is frequently done by decorators.

The four pages of examples which follow will give an idea of the general character of the Egyptian, Greek, Roman, and Moresque styles. They are not to be used as drawing-exercises by the pupils, though



it may be well to allow some of the more expert pupils to put them on the blackboard. Such pupils will thus have an opportunity to show what they can do. They are given more especially for the purpose of showing the teacher the practical application of much the pupils have been learning to draw, and that the pupil may see to what their instruction tends.

Page of Egyptian Forms.

The Egyptians employed a variety of natural objects for decorative purposes. The lotus, or lily of the Nile, together with the papyrus, from which paper was made, were extensively used. The natural forms are highly conventionalized. The general treatment is severe, showing great firmness and rigidity of line. Every thing is colored. Egyptian art was at its best about three thousand years B.C. On the preceding page are given five specimens.

1. This is the wave scroll, symbolic of the waves of the Nile. The added detail is from the papyrus.

2. This is a moulding, or border, made from the flower and bud of the lotus, the Egyptian symbol of renewed life.

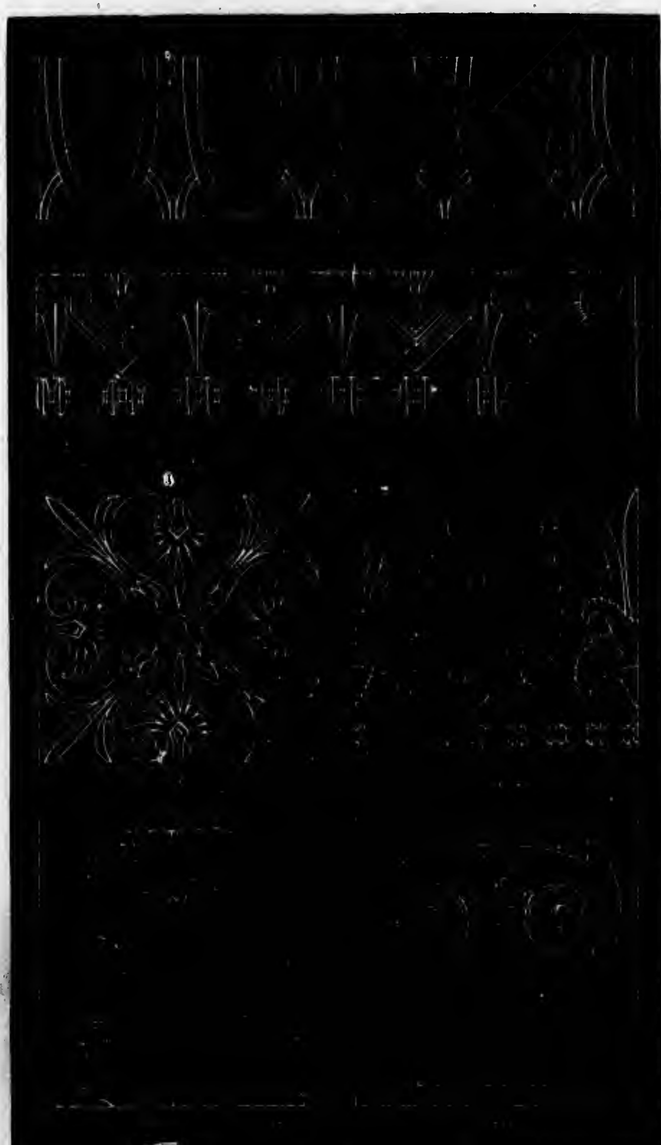
3. This is another variety of border, or moulding, made from the flower of the lotus.

4. This is a pattern for the covering of surface. It will be seen that it can be extended in all directions.

The four preceding specimens are from mummy cases and the walls of tombs, which were always profusely decorated.

5. This is an Egyptian capital, or top of a column, from a temple near Thebes. The papyrus-flower furnishes the motive. Compare it with the Greek and Roman capitals which follow.

In the high school these forms are to be drawn, and then done in color, just as they were done by



the Egyptians. For such work the publishers of this book have already prepared large colored plates, which are in use where sufficient preliminary progress has been made in drawing. Similar plates have been prepared for other great styles of decorative art. Thus the learner is enabled to contrast one style with another.

Page of Greek Forms.

On the preceding page are given six varieties of Greek ornament. A glance will show that the treatment is quite different from the Egyptian. Greek art was at its best about three hundred years B.C.

1. This is an echinus moulding, sometimes called the egg and dart. It was usually sculptured. The curves are elliptical and flat. Compare with the Roman.

2. This is part of a sculptured moulding from the Temple of Nemesis at Rhamnus. The lower part of the moulding is called the astragal, and sometimes the hucklebone series.

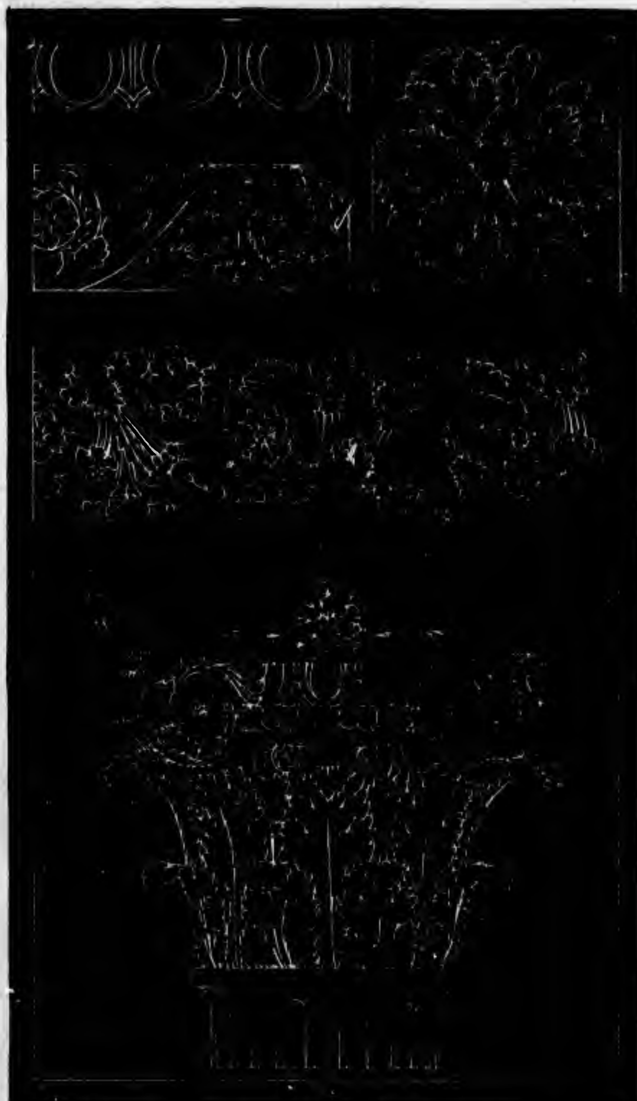
3. This anthemion (flower) rosette is from the Parthenon. It was done in colors. You will see that it is made from the honeysuckle-flower.

4. This is part of a sculptured moulding from the Temple of Erectheus at Athens. It gives us the honeysuckle-flower and astragal combined.

5. This is a sculptured acanthus-leaf from a capital of the Tower of the Winds. Observe that the lobes are more pointed than in the Roman specimens. The acanthus was not so extensively used by the Greeks as by the Romans.

6. This is an Ionic capital from the temple at Bassae. The Ionic capital, also the Doric, was more frequently used by the Greeks than the Corinthian. The latter was much used by the Romans. The acanthus-leaf formed the decoration of the latter.

The Greeks made less use of straight lines than did the Egyptians, and less use of circular curves



than did the Romans. Observe that their curves incline to the flat and elliptical, and that their decoration is exceedingly chaste and graceful.

Page of Roman Forms.

On the preceding page we have five specimens of Roman decorative art. The Romans employed much the same natural forms as did the Greeks, but treated them in a much more elaborate and luxuriant manner, as will be seen. Roman art was at its best about the time of the Christian era.

1. This is part of an echinus moulding. Observe that the curves are rounder than in the Greek.

2. This is part of a sculptured torus — a portion of a column. It is made from the acanthus-leaf, as indicated by the "eyes" and edging. It illustrates continuous growth.

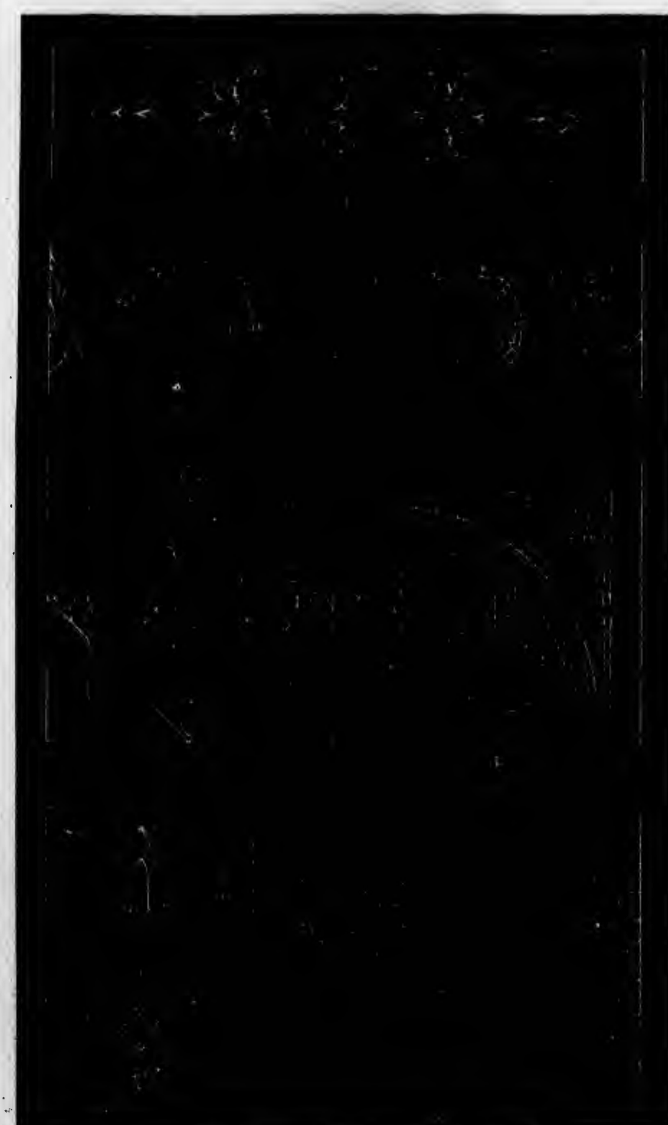
3. This is a sculptured rosette made from the acanthus leaf.

4. This is a sculptured moulding from the Temple of Peace at Rome. You see that it is made from the acanthus-leaf, and illustrates continuous growth.

5. This is a capital from the Arch of Titus, at Rome. It is of the composite order, employing the acanthus, the scroll, the echinus, and the astragal. It was invented by the Romans, and better represents their luxurious tastes than the more simple and chaste capitals which are the favorites of the Greeks. Compare the three capitals which have now been given, — the Egyptian, the Greek, and the Roman.

The acanthus was the favorite decorative ornament among the Romans, as the honeysuckle was among the Greeks, and the lotus among the Egyptians.

If one will use his eyes, he will almost everywhere discover applications of the historic decorative forms presented on these pages. The acanthus he will meet on all hands. When other motives are



used, he will find them treated according to the principles here illustrated. Again, when we desire to produce decoration wholly original, our success is promoted by a knowledge of what has been done by others.

Page of Moresque Forms.

The specimens of Moresque ornament given on the preceding page are from the royal palace, called the Alhambra, in Grenada, Spain. This palace was completed by the Moors in 1348, having been a hundred years in building. In Moresque ornament leaves, flowers, and other natural forms, appear only in a highly-disguised character when they appear at all. But, while there is no imitation of natural forms, curves are often grouped in a flower-like manner, and the general treatment harmonizes with Nature. Interlacing and straplike work abounds.

1, 2, 3, 5. Observe that the two same general forms are used in these ornaments, modified to suit each individual case. These two forms, leaf and bud, are seen in 5 : simple as they are, they constitute two of the main elements in the exceedingly rich and beautiful Moresque decoration. Note that there is no loop. Almost every thing is colored in Moresque decoration.

4, 6. These are two specimens of interlacing Moresque forms. They need color to set them off.

Enough has now been given to show, by contrast, what is meant by style in decorative art. Carefully compare the styles here given for illustration.

QUESTIONS. — What is said of the difference between decorative art and fine art? Of the conditions imposed by manufactures? Of the three ways to arrange symmetrically the parts of a decorative form? Of style in decorative art? Of Egyptian, Greek, Roman, and Moresque styles?

PART III.

INTERMEDIATE COURSE.

Model and Object Drawing.

ITS GENERAL FEATURES AND PRINCIPLES EXPLAINED.

None of the drawings given in this course thus far have represented more than two dimensions, length and breadth. It is true that objects of three dimensions have been occasionally drawn in outline; but only two dimensions were represented, though, in a few cases, thickness was necessarily indicated, as in the case of the silver cup, on p. 78, where the handle is drawn lapping over. There has been no attempt at perspective, at pictorial effects: indeed, the drawings might all be called diagrams. Many of the principles of design, as they apply both to the form and to the decoration of objects, have not only been explained in words, but have been as fully illustrated as it was deemed profitable at this stage of the pupil's progress. The applications of the kind of drawing which has thus far received our attention are mainly practical; but with no other kind of elementary drawing could the hand and eye have been so well trained, or the taste so well developed. Thus general culture and a knowledge of things directly useful have been acquired together.

Light and Shade. — Half-Tint.

Nothing has been done with light and shade, as, indeed, nothing could be without representing the three dimensions. Nothing has been done even with half-tint, which is often employed to produce an impression of solidity, or to indicate an irregular surface, as in sculptured ornament. Of course, half-tint can never represent color, though it appears that some teachers think otherwise, if we may judge from the way they permit their pupils to apply it. Half-tint gives variety to the drawings, and so tends to make the work more pleasing to the young learner. There is, however, serious objection to any thing more than a very limited use of half-tint by the young beginner. The value of the use of half-tint in design is that it enables the designer to give prominence to important parts of the design. Again, it enables us to distinguish the ornament from its background by a purely mechanical process, which it is easy to carry out. At the same time, without being exactly a lesson in shading, it prepares the pupil for shading or representing the three dimensions, in the best way. As the pupil progresses, instruction will be given in the practice; but the teacher is advised to resort to it only occasionally. Hence it has been deemed much the better way to attend to pure outline, and to secure variety and interest by executing a much larger number of drawings, and learning much more about the principles of design, than would have been possible if any thing elaborate had been attempted with half-tint.

In drawing, as in other studies, there is a best time, and a best place, for every thing.

Model and Object Drawing.

We now come to an entirely different department of drawing, — to Model and Object Drawing, to one of the modes of representing the three dimensions, that is, length, breadth, and thickness. Sometimes it is called "Freehand Perspective."

Freehand Perspective and Instrumental Perspective conform to the same laws of vision; but they are almost wholly different in their processes. Further along, the pupil should study both kinds of perspective. The Instrumental will help to a more accurate knowledge of the freehand; that is, of Model and Object Drawing.

Seeing in Space.

Model and Object Drawing trains one to "see in space," as it is technically called. Thus certain parts of the object to be drawn are invisible; and the mind must form a correct conception of these, before the visible parts can be properly represented. The latter must be drawn in their just relation to the former. The power which enables one to see, as it were, through a solid, and thus to determine the exact relation of the visible parts to the invisible, is a very valuable power, as one can readily see, for artist, designer, or workman. To give it is one of the special aims of Model and Object Drawing. Impress this fact upon your pupils, and omit nothing in the way of needful explanation and illustration. When they have once fairly acquired the power to see in space, together with a few simple principles of perspective, they will make rapid progress in drawing from "the solid," or "the round," as Model and Object Drawing is sometimes designated. It will be seen that there are various names for the same thing.

Light and Shade.

Model and Object Drawing may be divided into two parts: (1) the drawing of the form of the object; (2) the adding of light and shade to that form. The full result is the pictorial effect called *chiaroscuro.* Now, it too frequently happens, in drawing from the solid, that the main effort is, from the outset, concentrated upon light and shade; yet no amount of labor thus expended can compensate for defective outline rendering of general form. Especially should young learners make no attempt at rendering light and shade, until general form has been fairly mastered. Hence the exercises in drawing from the solid, which are given in this book, have nothing to do with light and shade.

But there is also another reason for such limitation. Very few of the schoolrooms in which this book will be used will be suitably arranged for work in light and shade. Such work requires that there be no cross-lights; and hence that the light be admitted from only one side of the room. It also requires that the light be steady; and hence that it be admitted only from the north or north-east. If admitted from the south, the light will change as the sun changes its position; and so the object upon which the pupil is engaged will present a new effect every few moments.

The Use of Flat Copies in Model and Object Drawing.

There is no genuine Model and Object Drawing, except drawing from the solid itself. Yet the use of flat copies, that is, printed copies, in connection with the solids, greatly facilitates the progress of the learner at the outset. Remember that the pupil is not to be confined to drawing from the flat copies alone: they are to be used simply as introductory aids to drawing from the objects themselves. Remember, also, that there is not a more stupid exercise, one more deadening to the faculties of the pupil, than the unthinking, mechanical reproduction of a perspective drawing from the flat: therefore see that the pupil understands the reason for every line. The forms to be drawn in the following exercises are so simple, and the principles of perspective involved are so readily explained and illustrated, that you can have no excuse for allowing a pupil to draw a single line in any of the given copies without knowing why it should be drawn as represented. If he understands the lines in the flat copies, he will be able to show it by making other and similar drawings from the solids themselves. The drawings from the solids may not be absolutely accurate; indeed, absolute accuracy is not possible in Model and Object Drawing; but they will plainly show whether or not the pupil understands the principles involved. And that is the thing of first importance. If the principles are understood, practice will soon lead to satisfactory execution: on the other hand, if the principles are not understood, no amount of practice will avail. Above all things, there must first be knowledge.

Geometrical Solids to be first Drawn.

When the learner began to draw forms having two dimensions, the first forms drawn were those of plane geometry; then followed others, based upon these geometrical forms. Now that he is to begin to draw forms that have the three dimensions, he should be first exercised upon regular geometrical solids. They are simple; they require but few lines to represent them; the mind can readily conceive of them in space. As the general form of nearly every object, whether manufactured, or found in Nature, is geometrical, and as the general form, or mass, must be correctly drawn first, otherwise the correct drawing of the details will be in vain; so it is illogical, is contrary to all sound teaching, to set the learner to drawing irregular objects, natural or artificial, with their great variety of detail, before he is able to draw geometrical solids, and simple objects based upon these solids. See the Introduction for more upon this point.

Meaning of Perspective.

Let us now consider a few matters of detail, without a knowledge of which it is impossible to make satisfactory progress in Model and Object Drawing.

You will find it well to devote the time of at least one or two lessons to explaining and illustrating these matters, before you set your class to drawing; and you will also find it well to revert to them as your class advance with their exercises. Unless they have a clear comprehension of these things, they must inevitably work in the dark.

In the first place, see that your pupils get a clear conception of what is meant by the word "perspective," as employed in drawing; for Model and Object Drawing is freehand perspective, as already stated. Etymologically the word means "seen through;" but this needs illustration.

Place an object, as a cube, before the pupil: between the object and the pupil place a piece of glass, or wire cloth, in a vertical position. Now, request the pupil to close one eye, and, with a soft crayon, to draw on the glass, or wire cloth, the object just as *seen through* the glass, or cloth. The position of the eye must not be changed during the progress of the drawing. Objects out of doors may be drawn in a similar manner on a pane of glass in the window. Each pupil should make such a drawing for himself; and you will find it well to have the exercise repeated, since various things essential to Model and Object Drawing can be learned in this better than in almost any other way.

An illustration of this kind will show clearly what is meant by a perspective drawing. It will show that the sheet of paper upon which the drawing is made really stands for a transparent vertical plane, and that the drawing represents the object as seen through the plane, and projected upon it. Any object, however intricate, may, so far as outlines are concerned, be readily drawn upon a transparent plane in the manner indicated; but it is quite a difficult thing to obtain a similar accurate result on paper.

Draw What You See, not What You Remember.

In Model and Object Drawing, the learner is often simply told to draw what he sees. This direction would seem very easy to follow; but the first attempt to draw even such a simple object as a cube will convince any one that something more explicit is required than this altogether general direction. The truth of the matter is, that, without some special training, we never understand what it is that we really do see. The accurate seeing which drawing requires is seeing not only with the eyes, but with the understanding.

When the pupil first undertakes to draw from the actual object, the chances are, that he will draw from memory, instead of drawing what he actually sees. For example, set a plate before a class so that they can look down upon it obliquely; then, without giving them any instruction, request them to draw what they see. Most of the class will, probably, make circular drawings of the plate. They know that plates are circular. They have been accustomed to look directly down upon them at their meals, and thus the picture impressed upon the eye was circular; and therefore they make their drawings circular, giving a representation of what they have in their memory, instead of making the drawings elliptical, which would give what they see at the moment. For the same reason, in drawing a chair viewed obliquely, they will be apt to make the seat too large, to make it of the remembered shape, instead of drawing what is actually seen. And so, if they are given a cube to draw, they will be apt, if they are familiar with the cube, to represent the edges all of the same length, though some may be viewed obliquely, and others not. Indeed, now and then one, remembering that a cube has six sides, will attempt to represent four, five, and even all six, though more than three sides can seldom be seen at once, and never, except in a distorted view.

Effect of Distance.

Another thing that must be duly considered is the effect of distance. Given to be drawn two objects of the same size, but at unequal distances from the eye, the more distant should be represented the smaller. And so, in the case of two equal parts of the same object, the drawing of the more distant part should be made the smaller. The beginner, knowing that both parts are equal, and drawing what he remembers, and not what he actually sees, will usually draw the two parts of the same size. The apparent size of an object (and it is the *apparent size* with which we must deal in Model and Object Drawing) depends upon the angle of vision. Suppose two equal straight lines, placed as *ab* and *cd* in Fig. 1, cut A, with the eye at *e*. The rays of light from the ends of the lines will enter the eye as indicated by the converging dotted lines. You perceive that the angle of vision *aeb* is considerably larger than the angle of vision *ced*, and that the apparent length of *cd*, as compared with *ab*, is only equal to *c′d′*, or about one-half of the apparent length of *ab*. This apparent difference in the length of the two lines is the same at whatever common point we take the measure of the two angles of vision, as at *vp*. Now, this apparent difference must be shown in the drawing.

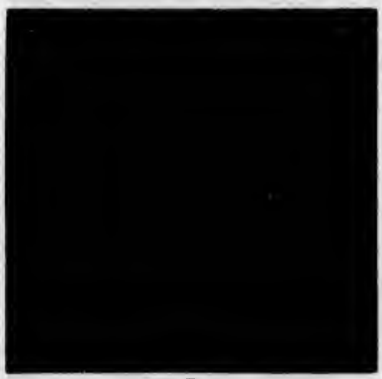
A

To make an application illustrating this effect of distance. In Fig. 2, the line *ab* is drawn of the same length as *ab* in Fig. 1, and the line *c′d′* is drawn of the same length as *c′d′* in Fig. 1, which is the apparent, or perspective, length of *cd* as compared with *ab*, the eye being at *e*. Now, by drawing straight lines connecting the points *a* and *c′*, and *b* and *d′*, we have the perspective representation of a horizontal rectangular plane, as a floor, for example. We will suppose the floor to be square. Then all the lines in Fig. 2 are in reality of the same length.

In Fig. 1, the eye is represented on a level with the lines *ab* and *cd:* consequently *cd*, when viewed from *e*, lies directly behind *ab*, and can only be represented as a part of *ab*, as shown by *c′d′*. But suppose the eye to be raised perpendicularly above *e*, and then to look obliquely down upon the floor, or square. The lines *ab* and *cd* will separate in appearance as they are separated in reality. The more the eye is elevated, the more they will appear to separate, with this limitation: since the floor is assumed to be square, and to be viewed obliquely, the lines at the right and left, that is, the converging lines, will never appear to be as long as *ab*. In Fig. 2 you perceive they have not been represented as long. They might have been represented somewhat longer than they are represented, or much shorter, since, for our present purpose, it is not necessary to regard the eye as at any particular elevation. The length of these lines will vary as the elevation of the eye varies.

To proceed: in Fig. 3 we have, first, what is shown in Fig. 2, — a perspective view of a square plane. Next, at the point *a*, the perpendicular line *ag* is drawn, of the same length as *ab;* and, at the point *c′*, the perpendicular line *c′h* is drawn, of the same length as *c′d′*. Drawing a straight line to connect points *g* and *h*, we have the perspective representation of a vertical rectangular plane, standing on the edge of the horizontal plane. As we called the horizontal plane a square, this must be a square; and, as we called the horizontal plane a floor, we will call this the side of a room. Observe the difference between the perspective representations of the two. Remember that every line given is a representation of the same length, or distance. And now observe that the converging lines, which are all horizontal, and which represent the horizontal edges of the plane retreating from the eye, and which are in reality parallel, upon being continued, meet in the common point *o*. This point shows the height of the eye.

By erecting other perpendicular lines at points *b* and *d'*, and connecting the upper ends of all the perpendiculars, as the lower ends are connected, we have the perspective representation, in mere outline, of the inside of a cubical room. This is, together with several other things, shown in cut B. Observe that all the converging lines, being in reality parallel,—those of the floor and windows, as well as main lines of the room,—would meet, if prolonged, as indicated by the dotted lines, at a common point, which is on a level with the eye of the spectator. Observe that the centre of the room is obtained by drawing the diagonals, and that the position of the window, which is in the centre of the side of the room, is thus determined.



B

Now for the things to be learned from these simple illustrations, and to be remembered. Observe that in Fig. 3, cut A, the line $c'd'$, which is really of the same length as ab, is represented shorter, because it is at a greater distance from the eye. For the same reason, the line $c'h$, which is really of the same length as ag, is, nevertheless, represented as shorter. Observe, further, that the vertical lines ag and $c'h$, which are really parallel, are so represented; that the horizontal lines ab and $c'd'$, which run directly right and left, and are really parallel, are so represented; but that the lines ac' and bd', which *retreat* from the eye, and are really horizontal and parallel, are not so represented, but as converging, or getting nearer together, the farther they proceed from the eye; and that the lines ac' and gh, which retreat from the eye, and are really horizontal and parallel, are not so represented, but as converging. Observe that the lines bd', ac', and gh, which are all parallel, and all retreat from the eye, would, if prolonged, meet in a common point, this point being on a level with the eye of the spectator. Hence, in Model and Object Drawing, we have, as the effect of distance, the following

Rules Applicable to Straight Lines.

1. *Lines which are vertical in the object, must be represented vertical, and consequently parallel.*

2. *If any two points in a horizontal line, or the line produced, are at equal distances from the eye, the line must be drawn horizontally.*

3. *Two equal lines, running in the same direction, but at unequal distances from the eye, will appear*

unequal in proportion to the difference in their distance from the eye. The more distant will appear the shorter, and should be so drawn.

4. *All lines which are parallel in an object, and retreat from the eye, must be represented as converging, and, if sufficiently prolonged, as meeting in a common point.*

5. *Hence, lines in an object which are horizontal, which are above the level of the eye, and which retreat from the eye, appear to point downwards; if they are below the level of the eye, they appear to point upwards. They must be so drawn.*

So much for those effects resulting from distance, which must be observed in the perspective representation of solids, and which you will be able, by a little effort in the way of illustration, to make plain to your pupils. A few more words explanatory of these effects and of their representation may be well.

In rules 1 and 2 it is stated that vertical lines, and horizontal lines running directly right and left, must not be represented as converging, though at no two points can the lines be at just the same distance from the eye. They are not to be represented as converging, however, because the amount of such lines which can be taken in by the eye at once, without a change of its position, is so small, that the convergence is not worth noticing. But not so when the lines retreat from the eye, and especially when they are horizontal, and retreat directly, that is, in a line parallel to the central ray of vision.

When the object to be drawn is at a great distance from the eye, the apparent convergence of lines, unless the object is of immense size, becomes too slight to be heeded. The distance of an object should be only a few times greater than its greatest diameter. A distance equal to three or four times this diameter will enable the eye to see the whole object at once. And it is this single general view, and not the view obtained where the object is so near that it must be looked at piecemeal, which the drawing is intended to represent. This distinction, however, is made between Model and Object Drawing, and Instrumental Perspective: in the former, if a group of objects is to be drawn, each object is treated independently; in the latter, the group is treated as a single figure.

It is only shown by the illustrations that horizontal lines retreating directly from the eye must, if sufficiently prolonged, be represented as meeting in a common point, which is often called the centre of vision. But from this necessarily follows all that is stated in rule 4. That common point must be where a line, drawn from the eye of the spectator, parallel to the actual line in the object, would terminate; for towards that, as may be easily shown by drawing on a transparent vertical plane as already described, all lines converge.

The Effect of Foreshortening.

The effects of distance having been studied, it is now necessary to consider foreshortening, the only other element in perspective. Something has already been said of this on pp. 91, 94, to which you are referred.

Divide a line *ab* into two equal parts, as shown in Fig. 1, cut C. Suppose this line to be viewed obliquely, with the eye at an infinite distance, as in orthographic projection.

C

The rays of light proceeding from the points *a*, *b*, and *c*, towards the eye, cannot converge in the slightest degree, since they must continue on towards the eye for an infinite distance. They must, therefore, be parallel, nowhere meeting. Draw the line *vp*, which you may imagine to represent a vertical plane, at right angles to the rays of light *rrr*. Where *vp* crosses the rays of light, we shall have the foreshortened length of *ac*, shown by *a′c′*, and of *cb*, shown by *c′b′*. It is easy to be seen that *a′c′* is less than *ac;* that *c′b′* is less than *cb;* and that, as *ac* is equal to *cb*, so *a′c′* is equal to *c′b′*. Such is always the effect of foreshortening in orthographic projection, upon which working-drawings are based. Equal parts of the same straight line are foreshortened alike, because distance is not regarded. The same, of course, is true of equal and similar portions of the same plane surface.

In Fig. 2, cut C, we have every thing just as in Fig. 1, except that the eye is supposed to be at a limited distance, at *e*, for example, as it must always be in perspective. Consequently the rays of light, indicated by the dotted lines, converge, and meet at *e*.

In this case, vp is drawn at right angles to the central line of vision, ce. Now, observe that $a'c'$ is less than $c'b'$, though ac and cb are equal. Hence in perspective equal parts of the same straight line are not foreshortened alike, the most distant parts being foreshortened the most. The same, of course, is true of equal and similar portions of the same plane surface. Thus, in perspective, the effects of distance are combined with the effects of oblique view, or foreshortening.

Orthographic Representation of a Circle viewed Obliquely.

Let us now consider the effect of foreshortening upon the orthographic representation of the circle, and of both distance and foreshortening upon its perspective representation. It will be well to contrast the one with the other.

It may be stated, in the outset, that perspective cannot deal directly with circles, or curves of any kind: it must treat them indirectly, by the help of straight lines.

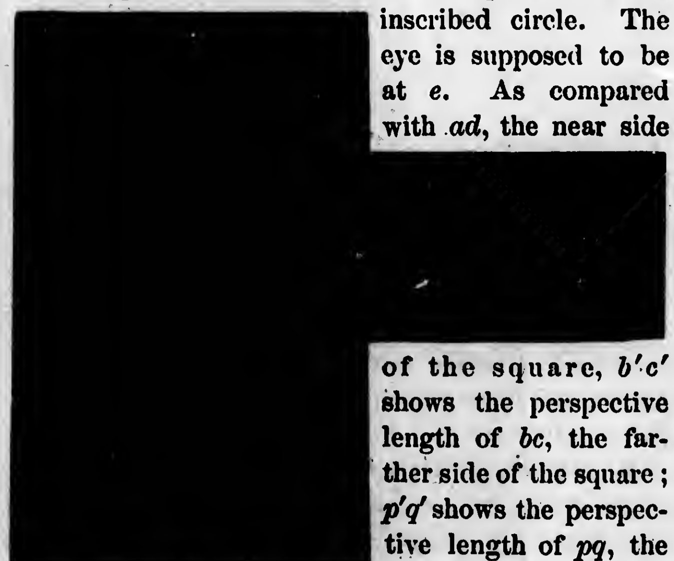
In Fig. 1, cut D, we have a circle inscribed in a square. Now, suppose the eye at an infinite distance in the direction indicated by the dotted lines tt, but elevated

D

somewhat, so as to look obliquely down upon the square and circle. The lines *ab*, *sr*, and *dc*, will be foreshortened; not only that, each half will be foreshortened alike. The appearance of the whole as thus viewed is shown at Fig. 2. The square becomes in appearance an oblong; and the circle, a perfect ellipse. Observe that the centre and diameter, *pq*, of the circle, coincide with the centre and diameter, *pq*, of the ellipse, and that each quarter of the circle becomes a quarter of the ellipse.

Perspective Representation of a Circle viewed Obliquely.

In Fig. 1, cut E, we have a square with an inscribed circle. The eye is supposed to be at *e*. As compared with *ad*, the near side of the square, *b′c′* shows the perspective length of *bc*, the farther side of the square; *p′q′* shows the perspective length of *pq*, the diameter of the circle; and *t′t′* shows the perspective length of *tt*, the line connecting the two points of the circle touched by



E

tangents drawn from *e*. It is thus seen, that, *apparently*, the longest straight line which can be drawn in the circle is not the diameter of the circle, *pq*, but the parallel line *tt*, which is nearer the eye. Remember this fact.

Now, suppose the eye to be raised for a short distance perpendicularly above *e*, so that the circle and square will be viewed obliquely, and you have in Fig. 2 what will then be seen. To obtain this, draw *ad* equal to *ad* in Fig. 1; *b′c′* equal to *b′c′* in Fig. 1. The distance between these two lines must, of course, be less than *ab*, as the square is viewed obliquely. Complete the figure. Draw the diagonals of the irregular quadrilateral thus obtained. Through the point *o*, the perspective centre of the square, draw the line *p′q′*, which will be found just equal to *p′q′* in Fig. 1. Through *g*, the centre of *rs*, draw the line *t′t′*, making it equal to *t′t′* in Fig. 1. Taking this line for the long diameter, and *rs* for the short diameter, of an ellipse, draw the ellipse; and it will touch the points *p′* and *q′*, as the perspective circumference of the circle should. Now observe (1), that, in drawing perspectively a circle viewed obliquely, it must be represented as a perfect ellipse; (2), that the centre and diameter of the circle do not become the centre and diameter of the ellipse; (3), that the quarters of the circle do not become quarters of the ellipse. Compare this perspective representation of the circle, which shows the effects of distance and foreshortening combined, with the orthographic representation of the circle, which shows only the effects of foreshortening. If carefully studied, this will prove a valuable lesson.

Usually, in the perspective representation of a circle viewed obliquely, the perspective centre and diameter of the circle do not differ so much in position from the centre and diameter of the ellipse, as in Fig. 2. The eye is represented, in the given illustration, as unduly near the circle: this produces a distorted view, though not inaccurate from the given point, and so makes more readily evident the thing it is desired to teach.

And so we conclude, that, in Model and Object Drawing, the effects of foreshortening and distance combined require the following

Rules to be Observed.

1. *Equal parts of the same straight line, and equal and similar parts of the same plane surface, must not be represented equal. The more distant must be represented the smaller.*

2. *A circle viewed obliquely must be represented as a perfect ellipse.*

3. *But the perspective centre and diameter of the circle, when it becomes necessary to draw them, must not be represented as coinciding with the centre and diameter of the ellipse.*

What has now been said about the effects of distance and foreshortening upon the appearance of objects, if understood, is quite sufficient to explain all the perspective features involved in the exercises which this book contains. Indeed, it is sufficient to explain nearly all matters relating to Model and

Object Drawing, so far as inherent form is concerned. Light and shade would, of course, present new features not thus to be explained.

Measurements.

In Model and Object Drawing, all measurements must be determined by the eye, since the exact shape, size, and distance of the object, or model, are not given. All available mechanical aids may be employed, however; but, after the best has been done, absolute precision cannot be secured.

A scale, or pencil, is the mechanical aid most commonly employed. The former is preferable, since it has inches and parts of inches marked upon it. The scale, or pencil, is always to be held at full arm's-length from the eye, and at right angles to the central ray of vision. If one line in the object covers two inches of the scale thus held, and another four inches, it is clear that the latter must be drawn twice as long as the former. If the former is drawn one inch, or four inches, long, then the latter must be increased in the same proportion, and be drawn two inches, or eight inches, long. All the lines must be increased or decreased alike. When these measurements are made, the eye must, of course, be kept at the same distance from the object, and in the same position for each line.

It is only the larger proportions, as the height and breadth of the object, which should be determined in this way. The minor features should be drawn by judgment of eye alone, for it is a waste of time to attempt to measure these. Require your pupils carefully to observe the comparative size of the different parts of the object to be drawn. The first direction given your class should be, "Compare the width of the object with its height; which is the greater?" With that accurately determined, the class can proceed with the minor features.

It will require some practice for your pupils to become expert in making the measurements. At first, they will often forget to extend the arm to the utmost, while they will be apt to hold the scale, or pencil, oblique to the central ray of vision. In this way they will get the proportions all wrong. Therefore look well after this matter.

A plumb-line may sometimes be used to advantage, since, by its help, you can readily determine whether or not one point in an object is directly above another.

Geometrical Solids Defined and Described.

Before your pupils begin Model and Object Drawing, they should be made familiar with certain geometrical solids. They should not only be able to recognize and name these solids, but able to give some rational account of their leading features. The definitions which follow grow out of the definitions previously given for plane geometrical figures. It is not essential that your pupils be able to repeat these definitions with mechanical accuracy; but it is essential that they have an intelligent comprehension of what the definitions involve.

SURFACE. — *Surface has two dimensions, — length* *and breadth. It is usually bounded by lines, but is sometimes endless.*

A SOLID. —*A solid has three dimensions,—length, breadth, and thickness. It is bounded by one or more surfaces.*

A SPHERE. — *The solid described by the revolution of a circle about its diameter is called a sphere.*

Illustrate by thus revolving a penny or a plate.

A sphere is bounded by one endless curved surface, that is, by a surface unlimited by lines. Every point of this surface is at the same distance from a point within called the centre of the sphere. A ball can be used for illustration.

A CONE. — *The solid described by revolving a right triangle about its perpendicular is called a cone.*

Illustrate by thus revolving a right triangle cut from a piece of cardboard.

The top of the cone is called the apex; the bottom, the base. A straight line from the centre of the base to the apex is called the axis of the cone.

A cone has two surfaces: 1. The plane, bounded by a circular curve, which forms its base; 2. The curved surface which forms its sides, bounded by the point called the apex, and by the circular curve of the base. Use the cone itself, and thus make it easy for your pupils to comprehend the instruction.

A CYLINDER. — *The solid described by revolving a rectangular plane about one of its long edges is called a cylinder.*

Illustrate by thus revolving a rectangular piece of cardboard. If a door could swing entirely around on its hinges, it would describe a cylinder. Of course the term "solid," as used in these definitions, has no reference to hardness, but simply to space, to volume.

A cylinder has three surfaces. Two of these are planes, bounded by circular curves, and form the ends of the cylinder. They are parallel. The third is a curved surface, bounded by the circular curves of the ends, and forms the sides of the cylinder. A straight line joining the centres of the ends is called the axis of the cylinder. Illustrate your teaching by the use of a cylinder.

A CUBE. — *A solid bounded by six square planes is called a cube.*

Thus a cube has six surfaces bounded by twelve edges, or lines of limitation. It has eight corners, being the points where the edges terminate. The junction of two straight lines forms an angle; of two planes, a dihedral angle; of three or more planes, a solid angle. So a cube has twenty-four angles produced by the lines which form its edges; twelve dihedral angles produced by its plane sides, or faces; and eight solid angles, or corners, each produced by the junction of three sides.

A PARALLELOPIPEDON. — *A solid bounded by four equal rectangular oblong planes, and by two equal square planes, is called a parallelopipedon.*

It will be seen that much of what was said of the cube can be said of this solid. Make use of the actual solids for illustration.

A SQUARE PLINTH. — *Any rectangular section of a cube is called a square plinth.*

The opposite sides will be parallel.

All the geometrical solids the pupil will have occasion to draw in this book have now been defined, and, in part, described.

Sight-Lessons.

You can make Model and Object Drawing much simpler and easier for your pupils by giving them a few preliminary sight or object lessons that will familiarize them with the general features of the solids which they are to draw. As these sight-lessons will prepare your pupils to see, comprehend, and describe in words, the objects placed before them, they will prove especially valuable in helping them to draw the same, and all similar objects. It has, indeed, been repeated again and again, that there can be no good drawing that is not preceded by definite knowledge. Hence these sight or object lessons, instead of consuming, will, in the end, save, much time.

You will find it best thus to acquaint your pupils with all the geometrical solids given in this book before they draw any one of them. Two or three lessons should be enough for this work, as but a few solids are given. This will afford your pupils an opportunity of comparing one solid with another; and it should be remembered that we learn with much greater ease, when we have a chance to observe wherein things agree or disagree. Indeed, where two or three things are related, it is frequently less trouble to learn them all together than to learn one of them alone. It is, also, an essential part of the teacher's business to develop in his pupils the power of comparison. After these general sight-lessons, each solid, or object, should be submitted to a preliminary analysis, after the manner described on p. 120, before the pupils begin to draw it.

The following will indicate, in a general way, how the sight-lessons should be conducted: —

1. Require your pupils to give descriptions of the solids as they *are*, then as they *appear* when you place them in different positions. The last will oblige them to observe carefully, and to distinguish between what they see and what they remember.

2. Require your pupils to place the solids in different positions, as you direct. As you proceed with the exercises, many things proper to be done will suggest themselves. Do not follow any mere mechanical routine.

To illustrate. Take a sphere: a ball or round apple will answer. By suitable questions obtain from your class that this solid has a single endless surface; that no one can see more than one-half of it at the same time; that if they were to draw a line, marking the separation of the visible from the invisible part, it would be a circle; and that a sphere drawn in outline can only be represented by a circle.

Again: if a cone is taken, the sight-lesson will show your pupils that the solid has two surfaces, — a plane surface and a curved surface. It will show that the plane surface, forming the base of the cone, is a circle; that the curved surface is limited by the circumference of the base, and by a point called the apex of the cone. It will show that the view of the cone in one position is a perfect circle; in another, an ellipse; in another, an isosceles triangle; and, in another, something quite different. Various other things, which need not be enumerated, can also be taught.

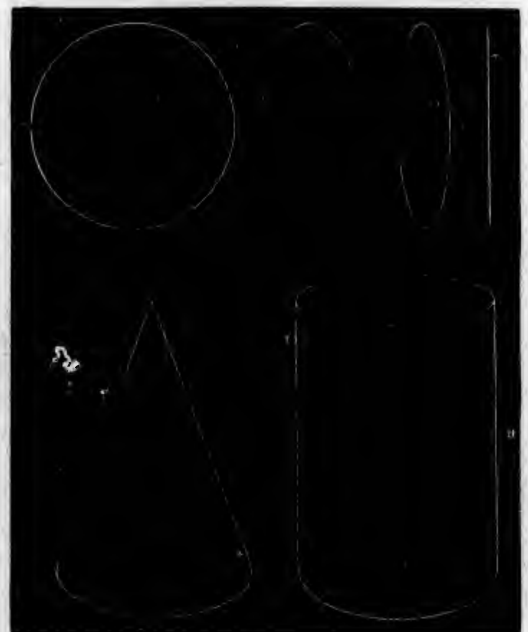
The little that has now been said should be enough to show the manner in which all the solids may be treated in the sight-lessons. Not only the simple solids, but any more complicated objects your pupils may have occasion to draw, should be thus analyzed and studied before their representation is attempted.

QUESTIONS. — What is said of the use of half-tint? Of seeing in space? Of light and shade? Of the use of flat copies in model and object drawing? Of the importance of understanding principles? What is meant by a perspective drawing? What is said of drawing what one sees? Describe the effect of distance. Of foreshortening. Name the derived rules to be observed. What is said of sight lessons? Of measuring the solid? Define a solid, a sphere, a cone, a cylinder, a cube, a parallelopipedon, a square plinth.

CHAPTER I.

EXERCISES IN MODEL AND OBJECT DRAWING.

DRAWING-BOOK EXERCISE I.



Circle and Ellipse. Cone and Cylinder: Figs. 1, 2.

DIRECTIONS FOR THE CIRCLE.—The appearance of the circle depends upon how it is viewed. If it be a full front-view, then the circle appears of its true shape. See 1. If it be an edge-view, then it appears as a straight line. See 2. If it be an oblique view, then it appears an ellipse. See 3 and 4. The more oblique the view, the flatter the ellipse.

First draw the diameters of the circle and ellipses, then add the curves.

DIRECTIONS FOR THE CONE. — Fig. 1. In the copy, the base of the cone is supposed to be horizontal: hence the apex of the cone is, in reality, directly above the centre of the base. The eye is supposed to be looking obliquely down upon the cone: hence the base, which is really a circle, appears to be an ellipse, the invisible part of which is indicated by the dotted line.

Draw the axis, *ab*; then, at right angles to the lower end of this line, draw the long diameter of the ellipse. Determine the breadth of the ellipse, and extend *ab* to correspond. Draw the ellipse, which will represent the base of the cone. From the apex, *a*, draw straight lines *tangent* to the ellipse: these will give the sides of the cone. Impress upon your class the importance of this tangential union of lines, by which it is meant that the straight line so joins the curve that the two lines, at their point of union, have the same direction, and the straight line nowhere does, or can, by extension, cut the curve. In drawing the ellipse, the pupil may, if he choose, use a slip of paper as described on page 112.

DIRECTIONS FOR THE CYLINDER. — Fig. 2. The cylinder is supposed to be vertical, with its ends, therefore, horizontal. The eye is supposed to be higher than the cylinder, and to be looking obliquely down upon it: hence the circular ends of the cylinder appear to be ellipses. The upper end being nearer to the level of the eye, and so viewed more obliquely than the lower end, is represented by a flatter ellipse. Here is an important principle in perspective drawing: *when two or more parallel circles, in horizontal planes, are viewed obliquely, they should be represented by broader and broader ellipses, the farther they recede from the level of the eye.*

Draw (1) the axis of the cylinder; (2) draw the long diameters of the ellipses perpendicular to the ends of the axis; (3) determine the breadth of the ellipses; (4) draw the ellipses; (5) draw the sides *tangent* to the ellipses. In this case, the ellipses are the same as 3 and 4.

Before your pupils begin to draw the cone and cylinder, show them the actual solids, and explain the features to be illustrated by the drawings.

DRAWING-BOOK EXERCISE II.

Cone and Cylinder Lying on their Sides: Figs. 3, 4.

Here we have the same solids to be drawn that were drawn in the last exercise. They occupy different positions, however.

DIRECTIONS FOR A CONE LYING ON ITS SIDE. — Fig. 3. The cone is supposed to be lying upon a horizontal plane, as a floor: hence the line *ad* is, in reality, horizontal, though its end *a* is drawn higher than its end *d*. But why is it represented higher? Because *ad* is a retreating horizontal line, and below the eye; and every line of that character appears to rise as it retreats from the eye, and must be so represented. It is the business of perspective drawing to represent things as they appear, and not as they are. See p. 249. The base of the cone is supposed to be visible, but turned partly away from the eye, and so it must be represented as an ellipse. Furthermore, as the cone lies upon its side, the base inclines, and the ellipse must be so drawn. Before your pupils begin to draw, explain these things by the aid of a cone.

Draw (1) the axis, *ab*; (2) draw *cd* perpendicular to *ab* at *b*; (3) make *bf* equal to *eb*; (4) draw an ellipse through *c*, *e*, *d*, *f*; (5) from *a*, draw tangents to the ellipse. Observe that *ef*, the conjugate or short diameter of the ellipse, lies in the same straight line with the axis of the cone; and that *cd*, the transverse or long diameter, is perpendicular to the axis at its end.

Directions for a Cylinder Lying on its Side. — Fig. 4. The cylinder is supposed to be lying in a horizontal position on its side: hence the lines *dd'* and *cc'* are, in reality, horizontal, while the circular ends of the cylinder are vertical. The end at the right is supposed to be visible, but partly turned away from the eye: hence the lines *dd'* and *cc'* are retreating lines; and, since the eye is supposed to be higher than the cylinder, they are represented rising as they retreat.

Draw (1) the axis, *ab*; (2) make *af* equal to *ae*; (3) draw *cd* perpendicular to *ab* at *a*, making *ca* and *ad* equal; (4) through the points *c*, *e*, *d*, *f*, draw an ellipse; (5) draw *c'd'* perpendicular to *ab* at *b*, making it less than *cd*; (6) make *e'f'* about the same as *ef*; (7) draw the farther end of the cylinder; (8) draw the lines *cc'* and *dd'* tangents to both ellipses.

Observe that the ellipse which represents the farther end of the cylinder is broader than the one which represents the near end. This greater breadth, as compared with the length of the ellipse, is secured by making *c'd'* shorter than *cd*, while *e'f'* is made about the same as *ef*, all of which is done agreeably to the laws of perspective; for *c'd'*, being actually of the same length as *cd*, parallel to *cd*, but farther from the eye, it should be drawn shorter. For the same reason, *e'f'* should be drawn shorter than *ef*, and would be so drawn, but for the effect of foreshortening, which counterbalances, in part at least, the effect of distance. The farther end of the cylinder is viewed less obliquely than the near end; consequently, the foreshortening being less, its comparative breadth appears greater.

DRAWING-BOOK EXERCISE III.

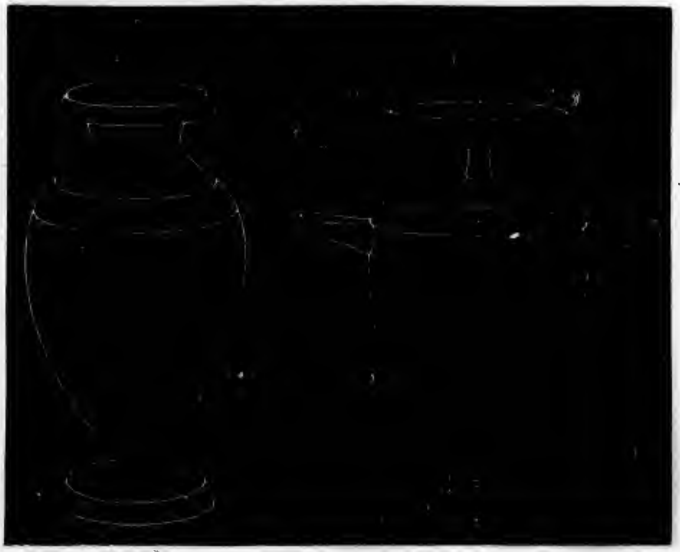
Model Drawing from the Solid.

Directions for drawing a Cone from the Solid. — On the left-hand half of p. 3 of the drawing-book, a cone is to be drawn from the solid. Place a cone in sight of all the pupils, above the level of their eyes, with both its base and side plainly visible. Draw the cone in the order that Fig. 1, p. 269, was drawn: (1) the axis; (2) the base; (3) the sides. If the base of the cone is horizontal, then the axis must be drawn vertical; but, if the former is oblique then the latter must be drawn oblique also.

Directions for drawing a Cylinder from the Solid. — The right half of the third page is to be filled with the drawing of a cylinder from the solid. Place a cylinder in sight of all the pupils, above the level of their eyes, and in a vertical position, as in Fig. 2. The lower end will then be visible; the upper, invisible. The latter, being viewed less obliquely than the former, should be represented by a broader ellipse, — just the reverse of what is seen in Fig. 2. Draw in the same order that Fig. 2 was drawn.

Each pupil must draw the cone just as he sees it. To one the base will appear more nearly round than to another, and so must be represented by a broader ellipse; while the axis, if oblique, will appear more oblique to one than to another, and must be so represented. Yet each can best draw what he sees by following the order indicated. See that each pupil, before he begins to draw, has a correct idea of what is required. Question, explain, refer to Fig. 1. If the pupils understood what they were really about when they copied Fig. 1, they will have little trouble with this. Much of this will apply to the drawing of the cylinder.

DRAWING-BOOK EXERCISE IV.



Objects to be Completed: Figs. 5, 6, 7.

DIRECTIONS FOR A GREEK VASE. — Fig. 5. Here the left half of the vase is drawn correctly: the pupil is to add the right half. Draw, first, the elliptical curves, beginning at the top, and working downwards; next, draw the contour, seeing that the contour and the two ellipses on the body of the vase unite tangentially. Observe how the lines representing the sides of the vase terminate in the pedestal. It will be seen that the eye is supposed to be higher than the top of the vase: hence all the ellipses gradually broaden from the top downwards.

DIRECTIONS FOR A GREEK TAZZA. — FIG. 6. The right half of the tazza is correctly drawn: the left is to be added, and made just like the right. Observe that the tazza is represented as lower than the level of the eye.

DIRECTIONS FOR A GREEK VASE. — Fig. 7. The right half of the vase being correctly drawn, the left is to be added by the pupil. Observe that the body and pedestal of this vase are not joined, as in Fig. 5, but that, in the present case, an elliptical curve indicates the junction. The distinction here made in the drawing of these two vases is worth noting and remembering.

If your school is not already provided with models representing the geometrical solids, you can, if you possess a little ingenuity, make some of paper, which will answer your purpose tolerably well. Remember, that if your pupils copy the drawings in their books, without understanding the principles of perspective which they illustrate, it will prove a very stupid and profitless exercise, — hardly any thing more so. Now, all the principles of perspective involved in the drawing of these Greek vases and tazza may be illustrated and explained by means of the cone and cylinder, those much simpler forms. The vases and tazza you may not be able to secure; but the geometrical solids any one can have in his school, if he will. With these solids children should be made as familiar as with common household objects.

It will be seen, that by giving the pupil forms to be completed, as in these figures, we graduate the difficulties of perspective, making the advancement of the pupil comparatively easy, provided he masters each difficulty in its order. Though the ascent be gradual, a high elevation is at last attained. Perspective simply needs the same rational treatment which is accorded to other school studies.

DRAWING-BOOK EXERCISE V.

Drawing from Objects.

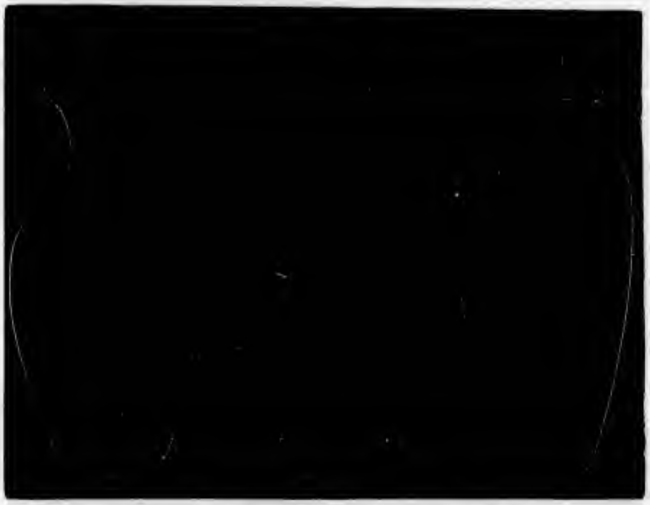
DIRECTIONS FOR FIRST OBJECT. — Place in view of the whole class a large white bowl, or other similar object, to be drawn on the left half of p. 5 of the drawing-book. Place the bowl so that all of the pupils can see into it slightly, which will cause the circular top to appear as a narrow ellipse. Sketch the general appearance of the object on the blackboard, showing the pupils the steps to be taken in drawing it. Erase the sketch, and let each pupil now draw the object just as he himself sees it. Remember that each is to draw what he himself sees, and not merely reproduce what you put on the blackboard.

DIRECTIONS FOR SECOND OBJECT. — For filling the right half of the page, provide a pitcher, with simple outlines, or a glass bottle. Put it in whatever position you please. This time, let the pupils draw without the help of a blackboard sketch. This will be genuine object and model drawing.

Call the attention of your pupils to the fact that the objects to be drawn on this page are symmetrical, and that they should begin the drawing of them with a central straight line, on which they can mark points indicating the breadth of the ellipses. Next, the long diameters of the ellipses are to be drawn. Proportions to be determined as described on p. 261.

You will find it well to have your pupils make several rough drawings of the objects, before they do them in their books. These drawings should be of different sizes, as the main purpose is to familiarize the pupils with making measurements with the pencil or scale.

DRAWING-BOOK EXERCISE VI.



Vases to be Completed: Figs. 8, 9, 10.

DIRECTIONS FOR FIGS. 8, 9, 10. — Here are the left halves of three vases perfectly drawn: the pupil is to add the right halves, making them exactly like the left, except that, in Fig. 10, the right ring will not be drawn. These figures will show that lines on vases and similar objects should be drawn *tangential to the contour*; also that concentric circles, when viewed obliquely, are *not* to be drawn as concentric ellipses, but as shown by the tops of vases 8 and 9. Call the particular attention of your pupils to these things.

Compare the drawing of these vases with the drawing of those on page 141. The latter are geometrical representations, as required by the manufacturer; while these are perspective, or pictorial representations.

DRAWING-BOOK EXERCISE VII.

Drawing from Objects.

DIRECTIONS. — Page 7 of the drawing-book is to be filled with drawings made from vases, or other similar symmetrical forms in glass or pottery. For this purpose require your pupils to divide the page vertically into two or three equal parts — into three, if the height of the objects to be drawn is greater than their breadth. Select such objects as will fill the spaces agreeably. If suitable objects cannot be obtained, then have your pupils execute from memory two vases previously drawn.

The pupils having already executed several vases from flat copies, they should have little trouble in making similar drawings from the objects themselves. Draw (1) the central construction line, (2) the diameters of the ellipses, (3) the ellipses, (4) profile of the object. As the accuracy of the final result must depend on the accuracy of the straight construction lines, see that your pupils have these right before they proceed to draw the curves.

Each object, before your pupils attempt to draw it, should be used for a sight-lesson, as described on p. 265. Require your pupils to describe the actual shape of the object, and to make some estimate of its leading proportions. Next, require them to describe the object as it appears, since it is the appearance, not the reality, which they are to represent in their drawings. Finally, require them to state the order in which the form should be drawn. You may call upon one pupil after another to answer your questions, while the others act as critics.

DRAWING-BOOK EXERCISE VIII.

A Glass Goblet: Fig. 11.

DIRECTIONS FOR FIG. 11. — Draw the construction lines in the order of the numerals. Make 3 1 and 3 4 equal; also 3 5 and 3 6. Observe the same equality with the other ellipses. As the goblet is supposed to be below the level of the eye, the ellipses must be drawn broader as they descend. Make the thickness of the rim at 4 somewhat greater than at 1, since the rim at 1 is not only farther from the eye than it is at 4, but is foreshortened more. Also make the rim at 5 and 6 considerably thicker than at 4. The pupils should not measure, without your permission, and then only to test their work.

IMAGE EVALUATION
TEST TARGET (MT-3)

1.0 2.8 2.5 3.2 2.2 3.6 4.0 2.0 1.1 1.8 1.25 1.4 1.6

6"

DRAWING-BOOK EXERCISE IX.

Egg and Egg-Cup: Fig. 12.

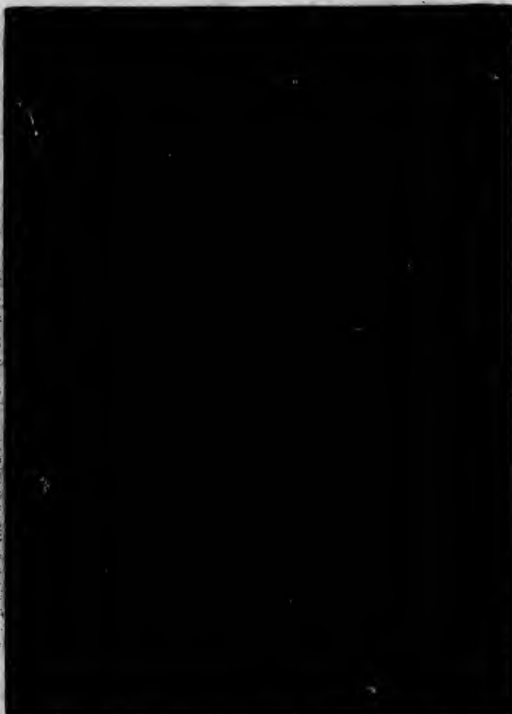
DIRECTIONS FOR FIG. 12. — The curve next in importance to the ellipse is the ovoid, or egg-shape. It is here shown by the outline of an egg, a part of which appears above the egg-cup, while the rest is indicated by a dotted line in the cup. Draw the central vertical line, and then the horizontal lines, following the order of the numerals. Notice that the ovoid form is symmetrical only on its long axis. The top and bottom of the cup must, of course, be represented as ellipses. Note how the stem of the cup is drawn, the lines vanishing in the base, and that, too, before they reach the line 9 0.

DRAWING-BOOK EXERCISE X.

Cubes and Parallelopipedon: Figs. 13, 14, 15.

DIRECTIONS FOR FIGS. 13, 14, AND 15. — The same directions will serve for drawing each of these figures. The solids are all supposed to rest upon a horizontal surface, and to be below the level of the eye. All lines which are vertical in the solids are to be drawn vertical; all retreating parallel lines are to be drawn converging. Due allowance is to be made for foreshortening. See pp. 255–260. Draw in the order of the numerals: 1 2 the nearest edge of the cube, 1 3 towards the right, and 1 5 towards the left; then 2 4 and 2 6 pointing upwards more than 1 3 and 1 5, so as to make 3 4 shorter than 1 2, though they are actually of the same length. You can show your pupils, that, if the retreating lines in these figures were continued far enough, they would meet in a common point. See p. 284.

DRAWING-BOOK EXERCISE XI.



Chair, Box, and Table: Figs. 16, 17, 18.

DIRECTIONS FOR FIGS. 16, 17, AND 18.—The cubes and parallelopipedon of the last exercises are converted into objects of utility. Draw the cubes somewhat smaller than they were drawn in the last exercise, but make the parallelopipedon of just the same size. This will be enough for one lesson. For the next lesson, beginning with the chair, draw the legs and back at the angles of the cube; then the rails and bars which join the legs and back. Follow the same order with the box and table. If the geometrical solids can be first correctly drawn, there will be little trouble in converting them into the required forms.

DRAWING-BOOK EXERCISE XII.

Ewer and Cube: Fig. 19.

Directions for Fig. 19. — The two objects here grouped illustrate the two principles always to be remembered in this kind of drawing: (1) that a circle viewed obliquely appears an ellipse; (2) that retreating parallel lines appear to converge as they go away from the eye. Make a sketch of the cube first, then of the ewer. When you have a satisfactory sketch of the group, line in. You will, of course, follow the directions previously given for drawing similar objects. Observe that the long diameters of the ellipses in the ewer are drawn horizontal. The cube is supposed to rest on a horizontal plane: consequently the cube and ewer are level, and the eye is supposed to be at a higher point than the top of the ewer, and to look obliquely down upon the objects.

DRAWING-BOOK EXERCISE XIII.

Drawing from Solid Models.

DIRECTIONS.—The left half of p. 18 of the drawing-book is to be filled with the representation of a cube. Place a cube in view of all the class. Make a few rapid sketches on the blackboard to illustrate different views of the cube. These sketches will serve as a guide to the class. Of course each pupil will get a somewhat different view of the cube; and each will draw what he sees, not the sketches on the blackboard. He will draw according to the principles which have been explained, and will obtain his proportions by the aid of his pencil, or a scale, held at arm's-length, and at right angles to the central ray of vision.

The right half of the page is to be filled with a representation of a parallopipedon, made from the solid, without the aid of blackboard sketches. Stand the oblong block on its square base, so that each pupil will get a view different from the view he had of the cube. Make certain that the pupils understand what they are to do before they begin to draw.

Do not permit your pupils to begin to draw the figures on p. 281 until they understand why they are drawn as represented. See that they understand the effects of distance and foreshortening. Make use of the actual solids for illustration and preliminary sight-lessons. A skeleton cube, or parallelopipedon, which can be quickly made of wire, will be of much assistance in showing how the invisible edges run. These skeleton forms will greatly help the learner in making his first drawings from the actual rectangular solids, as they will enable him to realize how the invisible lines run. After a little, his imagination will become sufficiently developed to stand in no need of such helps.

DRAWING-BOOK EXERCISE XIV.

Cone, Cylinder, and Square Plinth Combined: Fig. 20.

DIRECTIONS FOR FIG. 20.—Draw the cone and cylinder first, and then the square plinth on which the cylinder rests. Draw the straight lines in the order of the letters, and then the curves through the points indicated by the letters.

This exercise reviews all the principles which the preceding lessons illustrated. As it introduces no new features, special instructions should not be needed. Before your pupils begin to draw, question them on all the points involved.

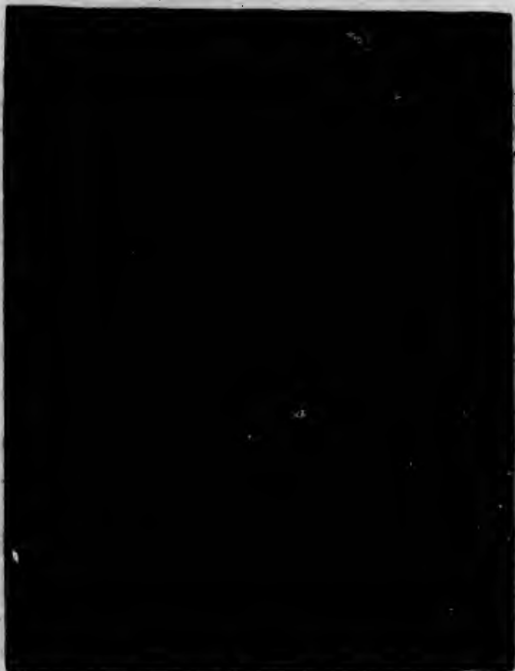
DRAWING-BOOK EXERCISE XV.

Drawing from Objects.

DIRECTIONS. — Request each pupil to bring to school an apple, to be drawn on the left half of p. 15 of the drawing-book, and an orange or lemon, to be drawn on the right half. Have the fruit placed on the desk, in front of each pupil, and drawn of the real size. The drawing of the apple should show the eye of the apple, and its stem if it has one. Draw the outline of the fruit first, then the eye and stem. Any marks on the surface of the fruit must be drawn *lighter* than the outline. For the apple, begin by drawing a circle, then change this to the required irregular outline. For the lemon, begin with an ellipse.

In these two exercises you have an illustration of what is meant when we say that geometrical forms should be made the basis of all drawing, even from Nature. If we regard the general outline of any natural object as seen from a given point, we usually find that it bears a near resemblance to some plane geometrical figure. We usually find the same to be true of its parts separately considered. Again: if we regard the solid form of the object, we usually find that it bears a near resemblance to some geometrical solid. Hence it happens that a prior knowledge of these geometrical figures, and of the right mode of drawing them, proves of the greatest service to one when he comes to draw from Nature. It is the logical order to proceed from simple universal forms to irregular specific forms.

DRAWING-BOOK EXERCISE XVI.



Earthenware Mug: Fig. 21.

DIRECTIONS FOR FIG. 21. — Draw the straight construction lines in the order of the numerals. Draw the ellipses on the body of the mug; make use of their long diameters, and draw the ellipses full, afterwards erasing the invisible parts. When the body of the mug and the ellipses on it are right, add the handle. Notice that where the handle joins the mug at 3 and 5, the straight outline of the mug is hidden, and the handle laps over somewhat.

Compare the drawing of the top of this mug with the drawing of the top of the pitcher in the next exercise, and note the difference.

DRAWING-BOOK EXERCISE XVII.

Earthenware Pitcher: Fig. 22.

Directions for Fig. 22. — This pitcher is to be drawn of the same size as the copy in the drawing-book. No special instructions are required; but the pupils will need to exercise much care. Make the two sides of the neck and body of the pitcher symmetrical first, and then add the spout and handle. As there are so many ellipses, they will afford an opportunity to show accurate and delicate drawing.

If you turn the drawing so as to view it sidewise, you will find it will help you in judging of the accuracy of the ellipses.

DRAWING-BOOK EXERCISE XVIII.

Silver Mug and Square Block: Fig. 23.

Directions for Fig. 23.—Draw first the body of the mug, then the square block on which it stands, lastly the handle of the mug. Better to give two lessons to this exercise, and thus have the handle well drawn. The handle, if carefully drawn, will be enough for one lesson.

By way of preliminary analysis, question your pupils about these forms before they begin to draw them. A score of questions can be readily asked, and should be readily answered, about the position of the objects, foreshortening, &c.

DRAWING-BOOK EXERCISE XIX.

Bowl, and Book with Clasp: Fig. 24.

DIRECTIONS FOR FIG. 24.—Draw the bowl first, with all its ellipses complete. Next draw the book as if it were a block, similar to the one in Ex. xiv. or xviii. When the block has been perfectly drawn, convert it into a book by adding the thickness of covers, and the clasp.

By learning to draw simple objects with accuracy, you will acquire the power to draw more elaborate ones in difficult positions, when you are required to do so.

DRAWING-BOOK EXERCISE XX.

Drawing from Objects.

To finish this course of lessons, place one or more groups of objects, as a teacup and saucer, on a book, so that each pupil can see one group without interruption. The book should be about twice the width of the saucer, and about half as thick as the teacup is high. The drawing should be on a scale large enough to fill the last page of the drawing-book. Require each one of your pupils to draw this group of objects without any help from yourself or any one else, and thus show what they have learned about Model and Object Drawing.

Exercises enough have now been given for a good beginning in the freehand representation of models and objects, so far as outline is concerned. The pupil who has advanced thus far, and has been taught the reason of what he has drawn, will henceforth look at all objects as he never did before. His eyes will have been opened, and he will have taken an important, though a short, step towards the pictorial representation of all objects whatever.

Questions. — How should the sides of a cone be drawn? How two or more parallel circles above one another? How should the farther end, as compared with the nearer end, of a horizontal cylinder, partly turned from the eye, be represented? What is said of using the actual solids before the pupils draw the flat copies? What is said of the use of skeleton solids? When a class are drawing from the solid, what should each pupil draw?

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AND

WM. SCOTT, B.A.,

Head Master Model School, Toronto.

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