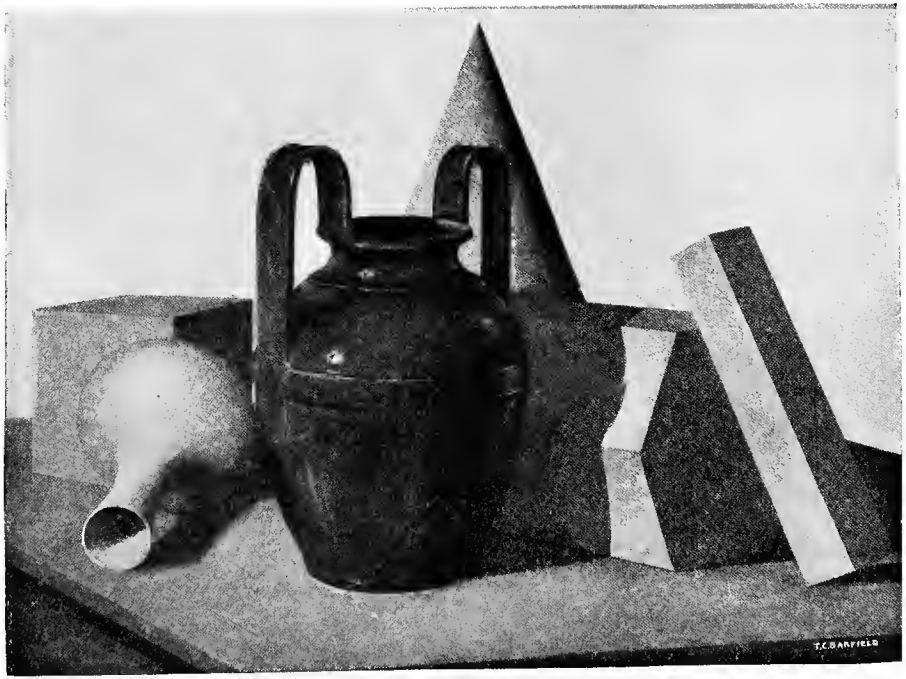
MODEL DRAWING & SHADING FROM CASTS

T.C.BARFIELD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MODEL DRAWING

AND

SHADING FROM CASTS

A COMPLETE GUIDE TO THE ELEMENTARY AND ADVANCED EXAMINATIONS IN THESE SUBJECTS.

BY

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WITH ILLUSTRATIONS BY THE AUTHOR.

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PREFACE.

In this book I have endeavoured, as far as possible, to avoid mixing up model drawing with geometry or perspective. The few geometrical terms which it has been necessary to use are all explained. These explanations may cause a smile to the average art student; but I have found that it is always safest to take nothing for granted, and my aim has been to provide a *complete* guide to the subject for every one, whether they have any previous knowledge of technical terms or not. Although the principles of perspective and model drawing are the same—and a *thorough* knowledge of perspective is a real help in drawing from objects; the superficial knowledge of it possessed by the average student of model drawing is often rather a hindrance than otherwise, and I have not unfrequently found students, who have obtained their certificate for perspective, quite unable to apply their knowledge to model drawing. I believe this is mainly due to the "Field of vision" not being

sufficiently explained, and its limitations insisted upon in teaching perspective. For while, as every student of perspective knows, horizontal lines parallel to the picture plane, will be represented by horizontal lines on that plane, no matter where they are with regard to the centre of vision, it is only when within the field of vision that these lines give the true aspect of those which they represent. One of the first facts taught in perspective is that the picture plane is *without limit.* How often is it pointed out that only a *very small portion of the picture plane is available for pictorial purposes?* So that students of perspective are frequently as much at a loss for some means of ascertaining when *parallel* perspective so called, is possible in model drawing, as those who have no knowledge of the subject. That I am not exaggerating this widespread ignorance will be seen by the following extract from the report of the examiners—James Clark and Paul F. Maitland—on the works on model drawing, subject 5*a*, submitted for certificates in 1894.

"The most serious defects prevalent in the work submitted on this occasion arise from imperfect or erroneous knowledge of laws of perspective, and the frequency with which identical errors are committed in drawings received from particular schools indicate in such cases that masters, as well as students, are responsible. Of these, one of the most objectionable is, *selection for the centre of vision of a point on the*

horizontal line at, or even beyond, the limits of the paper, so that the group of models is drawn in what is commonly termed 'parallel perspective.'"

These works, it must be remembered, are by persons presumably competent to teach model drawing.

If the limitation of vision were insisted upon at the beginning of lessons in perspective and model drawing, such a mistake as this would be impossible. To facilitate the understanding of this most important matter, some idea of the laws of vision must be given, so that the students may know what kind of difficulties they have to encounter, and it will be time well spent which is directed to this necessary but apparently little appreciated preparation for the subject. Students must be made to think in all art subjects, but this is most of all necessary in model drawing, and the power of analysis gained in the process will be of the greatest use in future studies. I have invented an apparatus to enable students to realize exactly what the field of vision is, and I venture to think that one of these instruments will clear up many of the initial difficulties, and save a great deal of valuable time in putting students into the proper way of looking at things; a habit which, once formed, makes future progress only a matter of time. Such an instrument would not, of course, be allowable at an examination, and its use should be dispensed with in most cases after the first half-dozen lessons or so. Mechanical aids of all kinds should be

gradually discontinued. But the difficulties which beset the student and the teacher at the outset are so many and of such a complicated nature that some assistance of this sort is almost indispensable. Although this book is complete in itself, and is amply illustrated, it will be found very useful as a hand-book to my Lessons in Model Drawing, published some years since, for I have seen no reason to alter the lines upon which these charts were designed, but since their publication, owing to new regulations for elementary education, a number of persons are now obliged to teach model drawing whose previous experience is not perhaps quite sufficient to enable them to make use of these sheets, which are primarily designed to save the time of teachers in schools of art.

In the second part of the book, dealing with light and shade, I have followed the same method, devoting a large proportion of space to the consideration of general principles, because I have found that, speaking generally, these are usually neglected.

If these are understood, and ordinary intelligence is applied to this kind of study, a great deal of time will be saved, and greater interest will be taken in the work, which, for lack of knowledge, is often very dreary and monotonous.

It is hoped that this little book will be sufficient to direct the studies of those who are working alone, for whom it is primarily intended, and, combined with

regular practice, will enable them to pass the elementary and advanced examination in model drawing, and shading from the cast, and that teachers will find in it information so arranged as will make it easier for them to teach this subject in an intelligent and interesting manner.

T. C. B.

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MODEL DRAWING

AND

SHADING FROM CASTS.

INTRODUCTION.

MODEL DRAWING is generally admitted to be the most difficult of the art subjects in which instruction has to be given in elementary schools. Most teachers will agree that it is the foundation of all sound art education.

Whether you are commencing this subject in order to qualify as a teacher, or whether you wish to study art in earnest—the two things are not necessarily distinct — the importance of Model Drawing is evident.

The explanations and directions here given are the result of many years' experience in teaching this subject. Over and over again I have proved their usefulness in my own classes. If you wish to thoroughly master the subject, it will not be safe to skip any part of the book, for nothing is inserted which is not necessary to this end.

It is usual to take this subject after having been

through a course of freehand drawing from flat copies. This is by no means necessary; if you can draw a fairly straight line in any direction, and a good curve, there is no reason why you should not commence to draw from objects, but without this much preparation your progress will be hampered.

The special difficulties of Model Drawing, as you will presently see, are not those of execution; but in this, as in all kinds of line drawing, the following rules will be very useful:—

1. *Draw deliberately.*

2. *Never draw two lines where one will do.*

3. *Avoid a sketchy, indefinite manner of work.* (*If you will believe it, it is as easy to put the right line in the right place at once, as to do so after futile scribblings.*)

4. *Think before you draw.*

5. *Take care that you know exactly what you want to do before you try to do it.*

6. *Do not rely too much on your indiarubber.* (*Many students use the indiarubber more than the pencil. Try to do without it altogether.*)

7. *Do not draw by a series of dots; no freedom can be obtained by this method.* Where dotted lines are used in the illustrations, it is only to *distinguish* the constructive lines.

No kind of manual dexterity can be attained without regular and persevering practice, but in model drawing this practice will be wasted, or all but wasted, if the mind is not at work too. It is necessary to insist very strongly upon this, for there exists a very widespread notion that drawing does not require much brain work. It is possible, too, that much of this practice may be wasted because the kind of difficulty to be overcome is not understood. *Do not suppose from this that you can do without the practice, but take care that you practise intelligently.*

Before I attempt to explain these difficulties, I

must make sure that certain technical terms which I shall have to use are thoroughly understood.

The word *straight* is used generally in a very loose way. When it is intended to describe an upright line or a horizontal line, to most people the word straight comes most readily to the tongue. Now, although it seems almost a truism, the fact must be stated that a straight line may be in any direction, the word straight simply meaning that the line lies evenly between its extreme points, or, in other words, that it is the shortest between those points. When a straight line is perfectly upright, *vertical* is the word used to describe its position. *It is very important to be able to judge correctly of the uprightness of a vertical line.*

The surface of still water is always level or *horizontal.* The top of an ordinary table will serve as an illustration of a horizontal surface or plane. It will be seen that any number of lines may be drawn upon this surface, or laid upon it, which will all be horizontal, although each of them may be in a different direction.

It is most important to realize that—

Horizontal lines may be in ever so many different directions, without losing their horizontal position.

If lines are neither vertical nor horizontal, they are called *oblique or inclined lines. Every straight line must be in one of these positions.*

The uninitiated have often some difficulty in realizing what is meant by an *angle.* It is simply the inclination of two straight lines which meet in a point, and do not, when united, make a straight line. If we suppose the circumference of a half circle to be divided into 180 equal parts or degrees, the inclination between any two lines which meet in the centre of that half circle can be measured by the number of degrees contained between the two lines where they

reach the circumference; so that it will be seen that two lines of the same length may contain a large angle or a small one. *The length of the lines does not determine the size of the angle;* for instance, the angle at B is much larger than the angle at A.

When the line from the centre to the circumference divides the semicircle equally, there will be 90° in the angles on either side of it. The angles are then called *right angles,* and the lines containing them are said to be at right angles to each other or *Perpendicular* to each other.

It must be understood that Perpendicular is a *relative*

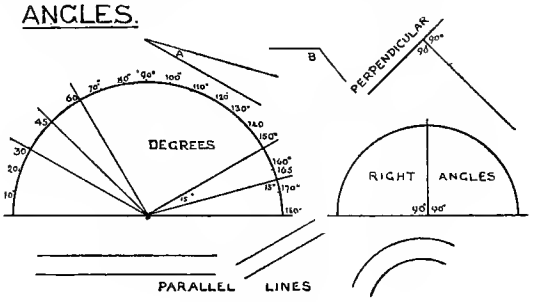


FIG. 1.

term, and that a line is not necessarily upright because it is perpendicular to another line. Two lines may be perpendicular to each other when both are horizontal. The adjacent edges of a table (which contain a right angle) are an illustration, or they may both be oblique like the two edges of this page of the book when it is held in a sloping position.

If two or more straight lines are in such a direction that if produced ever so far either way they would never meet, they are said to be *Parallel* lines. Parallel lines may be curved.

The foregoing are very elementary facts; but I have often found students seriously hindered in their progress by not understanding the meaning of these terms, and sometimes, not liking to acknowledge their ignorance, they fail to understand the teacher's instructions, to whom the terms are so familiar that the need of explanation never occurs to him.

LESSON I.

THE ACT OF SEEING.

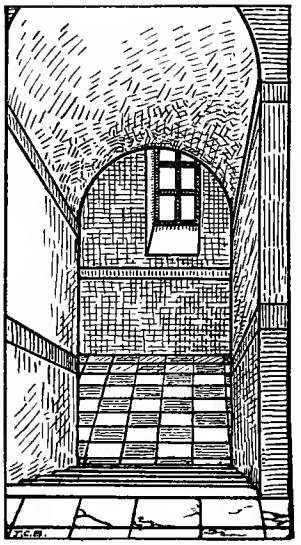


Fig. 2.

It is most important to realize that what we know about an object, although the knowledge may be derived entirely from sight, and what we actually see when looking at an object from a fixed point of view, are two distinct and often very different things.

This will be readily admitted, so readily that perhaps you will ask, Why state the fact? It happens that most of the phenomena which have to be considered in order to understand the act of seeing are those with which almost every one is in a general way familiar, and on that account there is some danger of their being overlooked. The following experiment will be a good illustration (Fig. 2).

Stand on the top of a flight of stairs, looking down the stairs. Hold a ruler horizontally in front of you

so that it appears to cover the edge of the stair or landing which you are standing upon. Keeping your eye steady, try to place the ruler over the edge of each descending step. You will find that you must raise it for each one, and that *the step which you know to be the lowest will appear to be the highest.*

This should convince you that in Model Drawing the difficulty is not so much to draw what we see as to see what we have to draw. We have to train our eyes to tell us truly and exactly what we see in one view of any object or group of objects, and this is so contrary to their ordinary work that constant vigilance will be required to keep them to this more restricted action. Experience has far more to do with our power of seeing than is commonly supposed. Previous impressions are stored up in some mysterious way in the brain and can be recalled or revived by the most accidental coincidence, so that the merest suggestion of any part of a previous impression calls up the whole of that impression. The eye is so wonderfully constructed, and so beautifully adapted to its ordinary use, that it conveys impressions to the brain so rapidly and with so little conscious effort, that we may say it acts involuntarily in its function of conveying to the brain as many pictures of the thing looked at as are sufficient to understand its form. When we add the fact that the right and left eye are conveying each its separate and different impression, and that the idea in the mind is formed by a combination of all these different pictures, it will be acknowledged that the act of seeing is very largely a mental process, and that it is a task of some difficulty to analyze any one of these several pictures, which is, nevertheless, what has to be done *before we can know what we have to draw.*

Let us try to understand what happens when we see anything. Make a small circular hole about $\frac{1}{8}$ inch in diameter in a piece of card or stout paper; hold this

quite close to one eye, closing the other. You will find that through this small hole you can see everything that you could see *properly* if the card were removed. Now hold the card only a little further from your eye, and you will find that you can see nothing but the card itself.

This experiment will prove three things.

First, it proves that the rays of light by which the

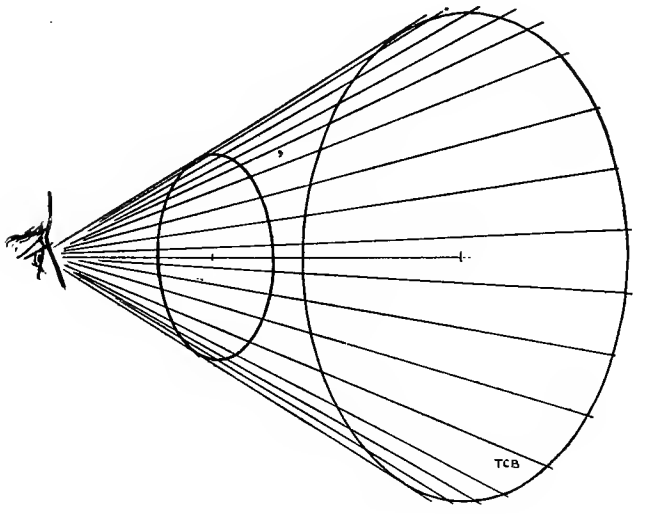


FIG. 3.

things looked at become visible must come to one point in the eye of the spectator, and that when your peep-hole was held in its first position, you were including in that little circle the whole bundle of rays needed to form the picture.

Second, it proves that you cannot possibly draw the models the same size as you see them, and that what

you thought you knew about their size must be the result of past experience.

Third, it will prove the limitation of vision; for although, when looking in the ordinary way, you may fancy that you see more than you could when looking through the peephole, this is not really the case; you are conscious of the presence of objects outside this circle, but if you had to describe them accurately you would have to turn your eyes to see them although

FIG. 4.

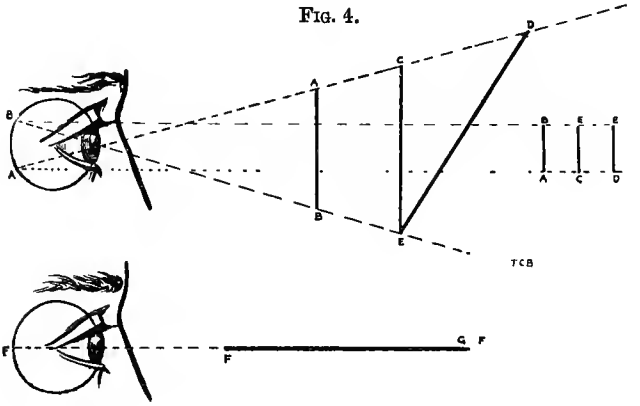


FIG. 5.

you might and probably would do so quite unconsciously. But before considering this most important matter—the limitation of vision—we must go back a little to complete the description of the act of seeing.

Objects become visible by means of rays of light, which, coming in straight lines from every point in the thing looked at to a point in the spectator's eye, there cross each other and produce on the retina (a

fine network at the back of the eye) a tiny inverted picture of the objects seen.*

Because the rays of light are perfectly straight, it follows that any point in a particular ray will cover every other. As an illustration, hold your pencil so that you can only see the end of it (Fig. 5). You cannot tell whether the pencil is half an inch or half a yard long. The end of the pencil is all that you can see. Make the following experiment. Decide upon some point high above you and in front of you —a corner of the ceiling will do. Hold up your pencil at arm's length so that one end of it appears to touch the point you are looking at. As soon as this happens the point and the end of the pencil are in the particular ray of light by which the point becomes visible. Now draw the pencil nearer to you and at the same time keep it (*apparently*) on the point; you will find that you have to keep it in a direct line from the point to your eye.

This accounts for five most important facts—

1. *The apparent size of objects is reduced by distance* (Fig. 4).

2. *Horizontal* surfaces *above the eye will appear to be descending surfaces.*

3. *Horizontal surfaces below the eye will appear to be ascending surfaces.*

4. *A horizontal surface exactly on the same level as the eye will become only a horizontal line.* Therefore—

* Some idea of the minuteness of these pictures will be obtained by the following calculations, which are to be found in an early volume of the "Illustrated Exhibitor and Magazine of Art," published in 1852 (Cassell and Co.). The figure of a man five feet ten inches high, seen at a distance of forty feet, produces an image on the retina the height of which is about $\frac{1}{14}$ of an inch. The face of such an image is enclosed in a circle whose diameter is about $\frac{1}{12}$ of the height, and is therefore $\frac{1}{168}$ of an inch in diameter, yet within this circle the eyes, nose, and mouth are distinctly seen; the diameter of the eye is about $\frac{1}{12}$ of the face, and therefore, though distinctly seen, occupies less than $\frac{1}{4000000}$ part of a square inch.

5. *At this line, called the horizon or horizontal line, the apparent descent or ascent of horizontal surfaces above or below the eye must cease.*

The practical importance of the position of the horizon will be seen from this diagram. ABDC is the drawing paper, EF is the horizon. Imagine AB to be the near edge of a horizontal plane above the eye, and CD to be the near edge of a horizontal plane below the eye. If these planes were extended indefinitely they would appear to meet in the horizon, and we may also suppose EF to be the near edge of a third horizontal plane exactly opposite to the eye. We can see no more of this plane than its edge which coincides with the horizon. If on the upper plane we want to show lines parallel to AB, but further off, we must draw GH and IJ lower down, while on the lower plane the same distances are obtained by drawing the lines higher up. Therefore—

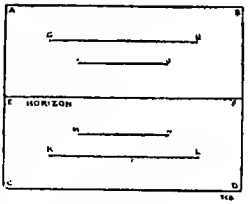


FIG. 6.

Below the horizon—Further off means higher up;
Above the horizon—Further off means lower down.

It is most important to remember this.

Whether it would appear upon the paper or not, the position of the horizon with regard to the models must never be lost sight of.

It will be seen from what has been said that all measurement in drawing from objects must be comparative, and that to measure the proper proportion, and the relative size of objects, it is absolutely necessary—

First, that the pencil, or whatever we measure with, should for each measurement be held at exactly the same distance from the eye, and

Second, that it should be held in the same vertical

plane. To insure the first condition, always hold out your pencil at arm's length. A reference to the illustration on page 9, Fig. 4, will show the necessity of this second condition for the sloping line ED, though really much longer than AB or CE, will only appear the same length as these lines; if, therefore, we fail to keep the pencil in this imaginary vertical plane a false measurement must be the result.

LESSON II.

THE FIELD OF VISION.

In the previous lesson passing reference was made to the limitation of vision. Unless this is taken account of, it is impossible to draw correctly, because it is impossible to determine what has to be drawn, and yet it is very often entirely ignored by teachers, and I believe it is very largely owing to this that many students, who have obtained certificates in Model Drawing and Perspective, are still unable to apply their knowledge to drawing from nature, especially if their proposed subject includes any buildings. It is not easy to convince people that they do not see all that is in front of them. The eye moves so easily and with so little conscious effort that practically, in the ordinary sense of the word, we can see all that is before us. But we must use the word in its more restricted sense if we are to *draw* what we see, for if we attempt to show more than one view of an object or group of objects in the same drawing, the difficulties are insurmountable. In this limited sense, it will be found that, looking steadily at a given point, what we can see round this point will be a proportionally very small area. It is usually supposed that a person looking in a certain direction sees a circle as large as would be made by a line revolving round this direction at an angle of 30° (Fig. 1,

page 4). In other words, the direction in which we are looking is the axis of an imaginary cone formed by rays of light—the section of which through the axis * would be an equilateral triangle. The apex * of this cone is in the eye of the spectator; the base of this cone is the field of vision. That is to say, whatever comes within this circle can be properly seen, while everything beyond it will be more or less distorted and indistinct. This distortion is not unfrequently seen in photographs and in perspective diagrams worked by mechanical means, which are made to include more than the field of vision. The only sure way of determining when lines which are really horizontal will appear horizontal in the drawing, is by comparing them with a horizontal line at right angles to the direction in which we are looking. Therefore, *this direction must be determined first of all*, but this cannot be determined without understanding *the field of vision!*

This difficulty is constantly arising. A number of students are sitting in a row at a long desk; opposite the centre of the desk and a few feet from it is a horizontal board with models upon it. I am not quoting an imaginary case when I say that these students, finding the edge of the board parallel to the desk at which they were sitting, would all draw this edge of the board as a horizontal line. It is possible that *three* students sitting in the middle might see it as such, but the others could not possibly do so, because those at either end if they looked in a direction at right angles to their desk, which is parallel to the board, could not possibly see the models at all, and if they looked at the models so as to include

* The axis of a solid is an imaginary line from the centre of the base and at right angles to it, passing through the solid to its point or apex in a cone or pyramid, and to the centre of the other base in prisms.

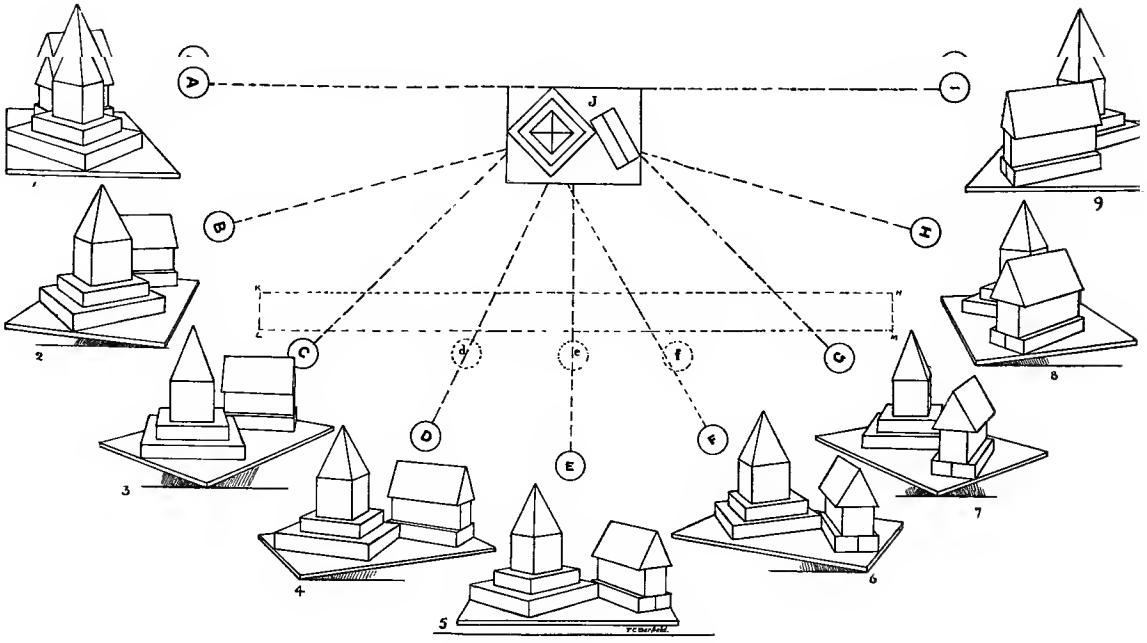


FIG. 7.

them in their field of vision and see them properly, no edge of the board would be horizontal, because no edge of the board would be at right angles to the direction in which they would be looking. It is perhaps easier to realize this when the pupils are sitting in a ring, or half ring round the model as shown in the illustration, where the exact view when looking from each position in the direction indicated is shown.

It will be seen that the Field of vision may be increased or reduced by the distance at which the spectator is placed in front of the things to be drawn; take care therefore that you do not get too close to the group; but sit so far from it that all you have to draw comes well within the Field of vision. Sometimes it happens that the artist is unable to get far enough from his subject to do this, as in the case of a lofty building which can only be seen from a narrow street or in making a picture of an interior which is too small to allow of a proper distance, and in such circumstances the artist must rely on his knowledge of perspective, of which this is one of the chief uses. Those who pretend that perspective is of no use, have either never experienced the difficulty, or are too ignorant to derive any help from this most useful science, which enables the artist to determine exactly what would be the direction of the retiring lines if he were at any sufficient distance from his subject. But at any rate for the present you are not likely to be encountering these difficulties, and we must keep to our lesson.

I have invented an apparatus which will, I think, be very useful in enabling beginners to realize how to determine their view of what they have to draw. The apparatus is called an *Opsimeter*, and is only intended to put the uninitiated in the way of ascertaining what they see. They should have plenty of experience in

using it; but sufficient practice with it will form a habit of regarding things artistically, which will put them in a position to dispense with any mechanical assistance.

FIG. 8.

The Opsimeter consists of three circles, one very small to look through, the second and third representing the Field of vision at different distances, but which

from the peep-hole are identical or nearly so. This is fixed in an upright stand, which allows the framework of the imaginary cone to be rotated so as to suit the direction in which the axis is required. Across the centre of the larger circle a horizontal line is fixed to give the position of the horizon, and a second horizontal line is so arranged that it can be raised or lowered to suit the position of the horizontal lines in the group, which it is required to test; other movable wires are arranged for ascertaining the actual angle made by retiring lines with the horizontal bars in the field of vision. The Opsimeter will also be very useful to show that when we are looking upwards or downwards, vertical lines, ceasing to be at right angles to the line of direction, become oblique or inclined lines, and follow the rules presently to be given for such lines, because the conical framework can be fitted upwards or downwards quite easily, and the height of it can be adjusted to suit the change of position; but this use of it will not be wanted at present. After using the Opsimeter a few times it will be easy to realize that *any* lines which are at right angles to the direction in which we are looking, that is, parallel to the surface of the field of vision, will be drawn as they are; so that as we *usually* look in a horizontal direction it may be taken as a rule that *vertical lines will always be vertical*, and that *horizontal lines at right angles to the direction in which we are looking must always be horizontal;* all other horizontal lines *excepting such as are immediately opposite to the eye* will appear to be more or less inclined.

Lines which are actually inclined will be treated of in another lesson.

In speaking of the act of seeing it will have been noticed that one eye only was thought of. The curious fact must be proved that the right and left eye get each its own distinct and slightly differing picture

of the thing looked at. This may be done in the following manner. Close one eye, and hold up a pencil in a vertical position, so that looking with the other eye only, it seems to exactly cover some vertical line which is seen beyond it, as the edge of a door or window-frame, a gas-pipe, etc. See that you get the two lines exactly indentical; keep your pencil steady, and change eyes. The fact that each eye conveys a slightly different impression to the brain accounts for the fact that we are hardly ever deceived by a picture, or fancy that we are looking at the things represented, because however true the pictures may be, being on a flat surface there is no corresponding difference in the two impressions conveyed to the brain, and so it is at once discovered to be only a "counterfeit presentment." The stereoscope illustrates this beautifully. Examine carefully a pair of stereoscopic pictures, you will find that they are not alike, they are just so far different as to cause the eyes to convey to the mind such slightly differing pictures as would be the result of looking, first with one eye, and then with the other, at the actual thing of which these are photographs. Hence the illusion—we seem to be looking at the real thing. Although we draw what we see with both eyes, it is often necessary, if we wish to take an accurate measurement, to do so with one eye closed; and if this fact is kept in mind, that the small space between the two eyes causes so perceptible a difference in the picture seen, the importance of keeping one point of view will be evident; yet I venture to predict that constant vigilance will be necessary in order to guard against habits, of the greatest use to us in an ordinary way, but fatal to success in model drawing, resulting from the natural instinct to see as much as we can. This is, of course, the merest sketch of the process commonly called seeing, but I think it is enough for our purpose,

and I do not think it is possible to be able to draw what we see without so much explanation of how we see it. Those who wish to pursue the subject further will obtain a great deal of valuable information conveyed in a most interesting manner in a remarkable little book by Professor W. K. Clifford.*

Having obtained some notion of the kind of difficulties we have to encounter, we will proceed to face them practically by attempting to draw some simple groups.

* "Seeing and Thinking," W. K. Clifford, F.R.S. "Nature Series," Macmillan and Co., 3*s.* 6*d.*

LESSON III.

TWO VIEWS OF A CUBE PLACED ON A DRAWING-BOARD.

If a number of people are drawing from the same objects, it is evident that each person will have a distinct and different view of them; any attempt to arrange the models so that they all get nearly the same view is not only so absurd in itself, but so contrary to the essence of proficiency in model drawing that I only notice it because I am told that some teachers, in a laudable desire to help their pupils, have attempted to do this so that one drawing on the blackboard would serve for the class. I propose to give very careful instructions and illustrations of how to draw this model from two points of view. The reader should place the models in as nearly the same position as the sketches, Fig. 9, as possible, and proceed to draw from the object themselves. The instructions here given are to be followed thoroughly for each succeeding exercise, although they will not be repeated. The drawing-board is about 30 inches by 22 inches; the cube is about 10 inches each way.

The board is about 18 inches above the floor; you are supposed to be sitting on an ordinary chair or bench; the cube is placed exactly in the centre of the board, the corners of the cube are each opposite to the centre of one edge of the board. In the first exercise you are sitting so that your left eye is exactly

opposite to the edge of the cube AB. Hold your pencil at arm's length and upright, so that one edge of it, when looking with your left * eye, covers the line

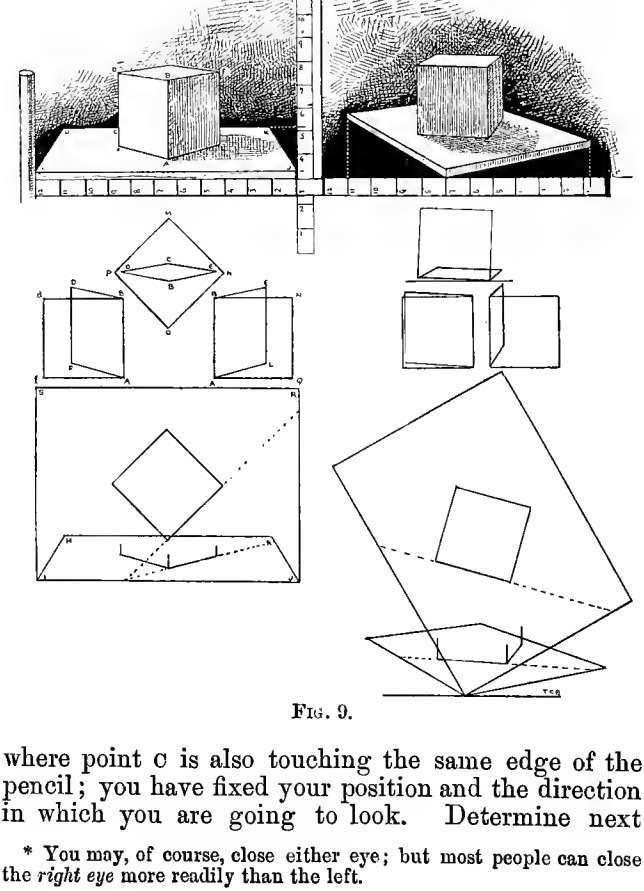


FIG. 9.

where point C is also touching the same edge of the pencil; you have fixed your position and the direction in which you are going to look. Determine next

* You may, of course, close either eye; but most people can close the *right eye* more readily than the left.

where your horizon ought to be. If you possess an Opsimeter, referred to at page 17, you can easily do this by the horizontal central bar, the distance from which to the nearest edge of the board must be compared with the length of the board. Another way to determine the horizon is to hold your board or book horizontally in front of you until you can only see its edge, then measure the distance as before. (If you are working on a piece of paper fixed on a board, it is very necessary to see that the paper is so pinned down that its edges are parallel to those of the board. Your paper should not be less than $\frac{1}{4}$ Imp. (about 15 inches × 11 inches). The drawing should always be large enough to fairly fill your paper. The strips at the side and bottom of the groups are divided into inches; they will give you some idea of the size of your drawing. Now consider carefully what you have to do. You know that of the lines forming the edges of the board and the cube, five are vertical, and eleven are horizontal in the first view. The two little lines bounding the thickness of the drawing board are upright—this is often overlooked by beginners. *Throughout your practice pay great attention to the little lines.*

The three upright edges of the cube and the two upright edges of the thickness of the board are to be vertical lines on your paper, the *length* of them is what you will have to think about. Of the eleven horizontal lines only three will be horizontal on your paper, HK, IJ, and the lower line parallel to IJ.

Draw IJ horizontally. You know that the real distance from IJ to HK is about two-thirds of the length, as shown in the lower figure where ISRJ gives the shape of the board. Remember *you have to draw only what you see.* Hold your pencil vertically at arm's length in front of you, so that the top of it corresponds to the line HK. Mark upon it with your

thumb the distance which you see between HK and IJ. Keep your pencil at the same distance from your eye and try how many times this distance will go into IJ. This is what you see, although you may think it is not nearly enough. Draw the line HK so far above IJ as this measurement requires. It is evident that the edge of the board HK will appear shorter than the edge IJ, because it must be further off. Holding your pencil vertically, first at the left corner and then at the right, but keeping your eyes in their original position, try to measure the angle which the retiring edges of the board make with the pencil, and do not be easily satisfied about this. You will find out two things from the completed drawing of the upper surface of the board.

First, that the distance from IJ to HK is indicated quite sufficiently by the difference in length of IJ and HK, and that if you had made the line HK as far above IJ as you were at first inclined to do, you would have been trying to draw a very extensive board indeed.

Second, that the two edges of the board IJ and JK which you know are actually parallel are in your drawing converging to a point, and if you drew them as far as the horizon they would meet in that line. This is a most important fact and should be learnt off by heart.

Parallel lines which retire from the spectator appear to converge or vanish in a point called the vanishing point, and if the retiring parallel lines are horizontal this vanishing point must be somewhere upon the horizon.

The thickness of the board should now be drawn. Draw the vertical lines from I and J, and draw a horizontal line parallel to IJ. Do not make the board too thin.

Now look at the third figure on the left. Compare what you have ascertained to be the appearance of

the board with its actual shape. It is evident that this extensive alteration must affect the shape of the base of the cube which you are to draw next. Try very hard to determine the position of A with regard to its distance between IJ and HK and the direction of AF and AL. *It will be useful to notice where* AF *and* AL *produced would appear to cut the edges of the board* IH, JK. When you have got the direction right, determine the length by comparing AF, AL, with AI, AJ. Remember that if a line which you know to be horizontal appears to be inclined, it must also be *foreshortened* and that *its length will be decreased according to the steepness of its apparent inclination.* Having fixed the direction and length of these lower edges, draw three perfectly upright lines from A, F, and L. Now look carefully at the space FG, and see that it is right; also the corresponding line on the right. It will help you to fix the height of these, if in addition to comparing them with AF and AL, you take note of the direction of the diagonals, AD, BF, and BL and AE. Form a habit of testing the accuracy of your work in as many ways as possible, comparing the angles FAB, and LAB with those on your paper. This model is a very simple one, but if you take sufficient pains to thoroughly master the method of drawing it, your further progress will be comparatively easy.

Do not forget that AF and BD are horizontal parallel lines, therefore the vanishing point will be where AF produced would meet the horizon. The vanishing point will not come upon your paper, but keep the fact in mind, it will afford additional help in determining the angle which BD makes with AB, while the relative length of FD and AB will also be a guide. Repeat this process for the other side. The top of the cube you know to be square, what you see is a lozenge shape. Remember that DC is

parallel to BE and EC to BD, and that they ought to be drawn so that they would ultimately reach their respective vanishing points. Compare the length CB carefully with BD. A little reflection will convince you that it must be your previous experience which, when you were seeing a shape like DCEB made you know that you were looking at a square, PMNO, and that caused a shape like IHKJ to make you think of a rectangle like ISRJ. Study the actual and apparent shapes of the three sides of the cube and of the drawing-board in both these diagrams, and then try to see the apparent shapes in the model. If you convince yourself of these things it will give you confidence, and you will be ready to encounter fresh difficulties. I would strongly advise you to see that each line that you draw is a good one, as good as you can make it, *before you leave it;* but if you have not quite succeeded in this, you should now complete the drawing by erasing all unnecessary lines and perfecting the others.

The second group is more difficult because *all* the horizontal edges appear to be inclined lines. You will have to determine the inclination of the edges of the board by holding your pencil horizontally at arm's length at right angles to the direction in which you are looking, or by *using the opsimeter.* Endeavour to decide about the shape of each angle before you try to draw it. You may not be able to draw exactly what you want to even then, but what chance have you of success, if you have not made up your mind what you have to do? When you have drawn the edges of the board, criticise your drawing very carefully; small mistakes in the direction of the edges, which may have escaped your notice in taking the lines singly will now be more apparent. *If the board is not right it is useless to proceed with the objects upon it.* Try the direction of a line from corner to corner across

the board, compare the distance from back to front with the distance across the board as in the last exercise. The instructions given for that should be fully carried out for this, and you should draw the cube and board in several different positions. Then the square prism may be added, and the small cube placed horizontally or vertically upon the board. It is most important to have plenty of practice in drawing retiring horizontal lines.

Always make your drawings as large as your paper will allow.

Always begin by drawing the lower lines, not forgetting to calculate the relative height and width of the group, and to consider the size of your paper.

It will help you to retain your point of view if you can fix the positions by deciding where some point or line beyond the group comes in apparent contact with some point in the group.

Do not forget that you alter the height of your horizon if you at one time stoop over your work, and at another sit upright. *Take all your measurements sitting quite upright.*

The picture on the next page, Fig. 10, is intended to illustrate the rule about parallel retiring lines given on page 24. In the small diagram the lines which are actually parallel are carried out to their proper vanishing points, which are, in this case, all upon the horizon, because the retiring lines are all horizontal. It is not often possible to show more than one vanishiug point on the drawing-paper, but it is most helpful to keep them in mind when testing the apparent inclination of retiring lines, and it is easier to judge of the tendency of the converging lines if you draw rather more of them than is actually required for your picture, as suggested in Fig. 10. *

* It will be found that two *adjacent* edges of a *horizontal* rectangle should never ascend or descend in the same direction. If two edges

Notice in this picture how useful the common diagonal of the ends of the three steps is. If you draw the retiring lines at the proper distances apart, this line marks the length of each succeeding step. The diagonals of the end of the square prism also give the centre line for the triangle. In the small diagram the retiring lines are carried out to their respective vanishing points.

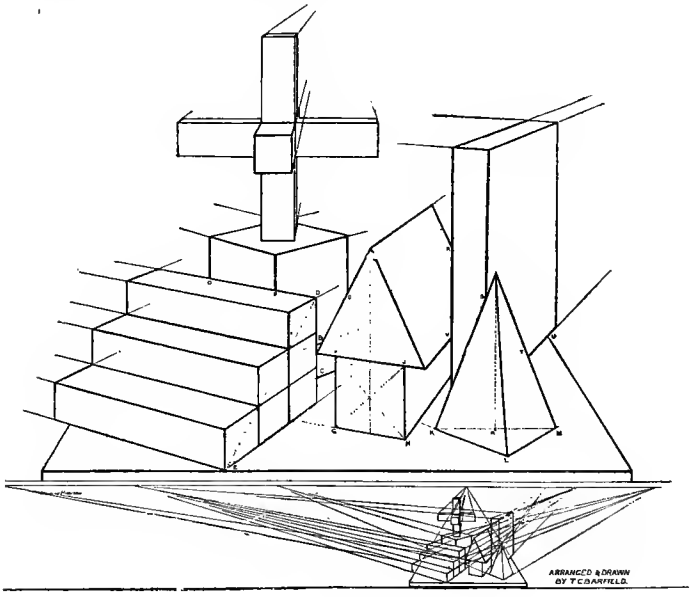


FIG. 10.

of such a rectangle are horizontal on the paper, one of the retiring edges may be upright, and, if so, it is evident that it must be immediately opposite to the eye and exactly in the direction in which you are looking, therefore, in this case, two of the edges must be horizontal. When all the edges are apparently inclined, if one pair of lines converge to the right, the other pair *must* converge to the left.

LESSON IV.

INCLINED SURFACES.

OBLIQUE or inclined surfaces of which the nearest end is the lowest are ascending surfaces. Those which have the nearest end the highest are descending surfaces. The student will have become quite familiar with the apparent reductions which distance makes in the size of objects. If we place a drawing-board in an ascending position, it is evident that the higher edge being further off than the lower one will be apparently smaller, the lines which join the upper and lower edges together will converge to a point which will be above the horizon. Now place the board in a descending position, and the point of convergence to which the descending lines are inclined will be below the horizon. Any parallel lines drawn on the surface of the board, would therefore converge to some point, in the first case, *above*, in the second case *below* the horizon.

Ascending parallel lines converge upwards.

Descending parallel lines converge downwards.

In the small sketch at the left of the illustration on the next page, the ascending and descending parallel lines are shown carried out to their vanishing points. It is clear that the steepness of the ascent or descent determines the distance above or below the horizon of the vanishing point, and that the distance of this point determines the difference between the

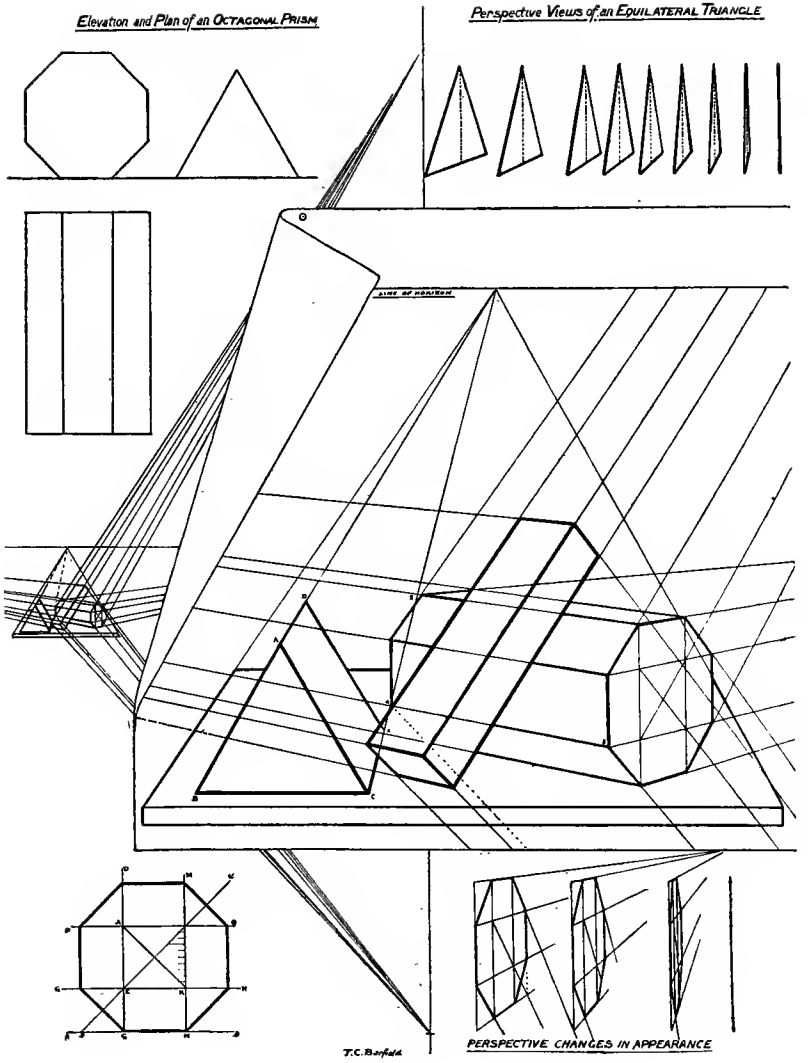

Elevation and Plan of an Octagonal Prism
Perspective Views of an Equilateral Triangle
LINE OF HORIZON
T.C. Banfield
PERSPECTIVE CHANGES IN APPEARANCE

FIG. 11.

length of the near and far edges, the difference increasing as the surfaces become flatter. It is not often that these points can be shown upon the paper, but it will be found most useful to keep them in mind; and it is also a good plan to draw rather more of the ascending and descending lines than is actually required for the picture. The next illustrations show four views of a group consisting of two cubes resting on square prisms, and four views of two square prisms resting on cubes. If the student will draw similar views *from the actual models* in the order shown, the difficulties of ascending and descending surfaces will soon be overcome; if only one of each kind of model is available, make the exercise with one cube and one prism, but the greater number of parallel lines will afford more practice and increase the difficulties. Work exactly in the same way as indicated for the last lesson, and do not leave this exercise until you feel you can draw a cube or a square prism in any position. Notice in the picture how useful the diagonal lines on the surface of the cube are, the position of these will, of course, vary with the slope of the model, but these imaginary lines are of the greatest use in determining the inclinations. Test all the sloping lines by comparing them with the pencil held vertically. In the last four exercises where the edges of the board all retire, be careful to copy the angle—made black in the pictures—which the two near edges of the board make with your pencil held in a horizontal position at right-angles to the direction in which you are looking.

The octagonal prism is rather too difficult to be attempted yet, it is not now included in the syllabus for the examinations, but some hints on the method of drawing it will be found in the lesson on polygonal models. It is given here as a good illustration of the convergence of ascending and descending lines.

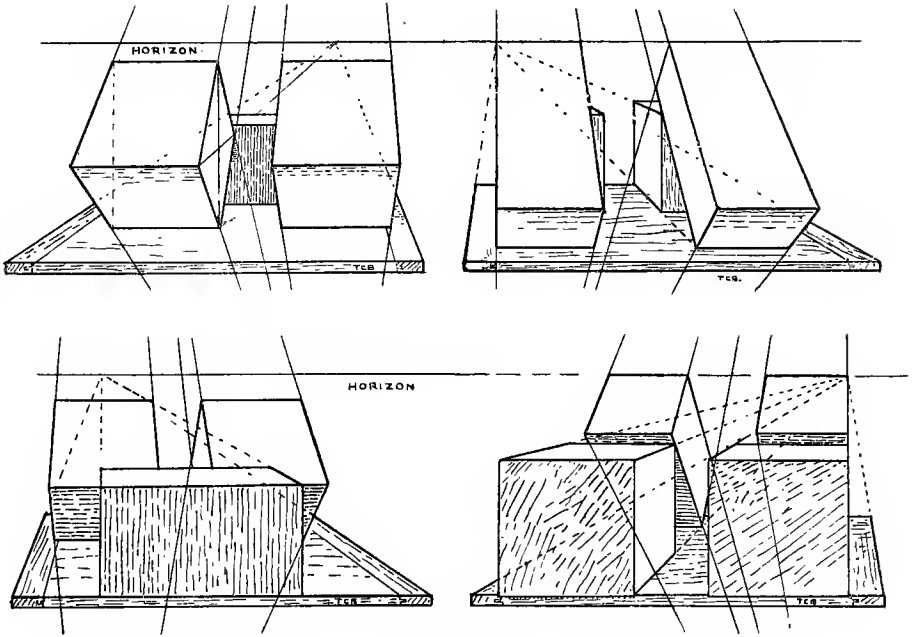


FIG. 12.

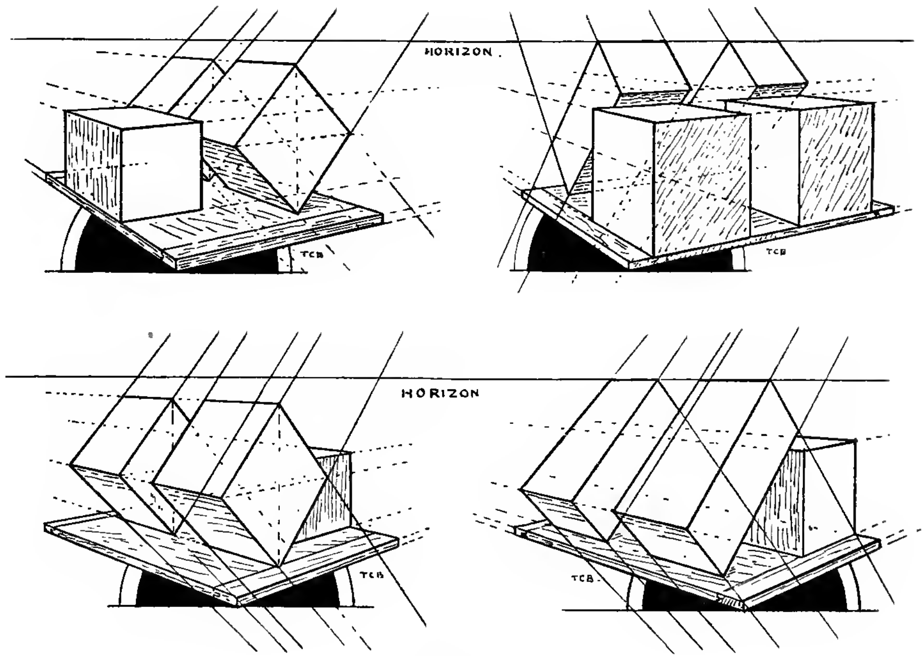


Fig. 13.

LESSON V.

THE SQUARE PYRAMID AND TRIANGULAR PRISM.

THE square pyramid and the triangular prism have already been shown in a number of varying horizontal positions in the illustration on page 15. The accompanying picture shows the method of drawing these important models. A common mistake in drawing the square pyramid is to make the apex vertically over the centre of the near side. Remember that the apex is over the centre of the square base, and that the *axis* of the model is at right angles to the base; therefore, *draw the base first and find the centre of it by the diagonals.* In the first figure on the top row the pyramid lies point towards us on one of the triangular faces, in that case the base is a descending surface; in the figure immediately under this, the base is an ascending surface—remember to apply the rules for such. When the axis of the model is upright, it is generally sufficient to draw the two visible sides of the base, and to draw the diagonal joining the extreme points, the centre of which is the centre of the base. The lines which are dotted in these pictures should be *drawn lightly as continuous lines*; they are only dotted to distinguish them from the lines which are to remain. *Never draw with a dotted line.* The triangular prism when standing vertically presents no special difficulties, but in every

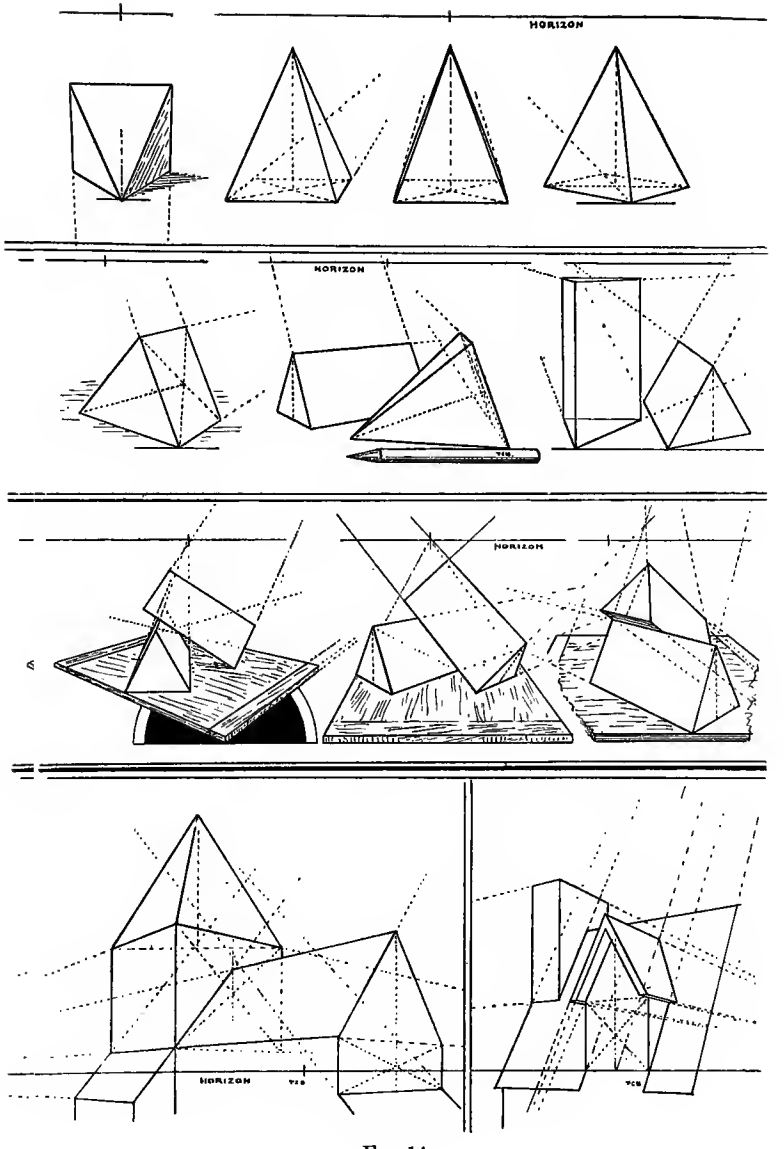


FIG. 14.

other position the triangular ends will require a great deal of care; if the model is horizontal, the centre line of the triangle must *always be quite vertical.* Be careful to show the perspective difference in the two halves of the base of the triangle. If the model is inclined, this centre line must also be inclined, so as to represent a line perpendicular to this inclination. All those lines should be most carefully tested by the pencil held vertically; the slope is often quite in the opposite direction to that which you would imagine it to be.

At the bottom of the page are two sketches, to show how the practice in drawing the models already described may be applied to drawing buildings. You will find that the habit of thinking how you would set about drawing any buildings, or, in fact, any object with which you are familiar, will help to train your eyes, and at the same time make your practice more interesting. The drawings given on the next page illustrate the method of drawing a very useful model called the double cross, not included in the syllabus for the examination, but affording capital practice in the drawing of ascending and descending surfaces, and showing how useful the diagonals are in fixing the various points. A line should first be drawn through A and H in the first figure, and from these two points, A and H, vertical lines should be set up, A, B, H, K. These should be divided into four equal parts, A, B at C, D, and E, and H, K at J, I, and F, and lines converging with the line through AH should be drawn through these points. Next draw AM, and through M draw a vertical line, which, crossing CJ, will give point L. Join LB. It is an ascending line, therefore draw it upwards a little beyond B, and draw MK. See that these two lines have the right amount of convergence. Draw a line from B to the point where MK cuts CJ, and produce

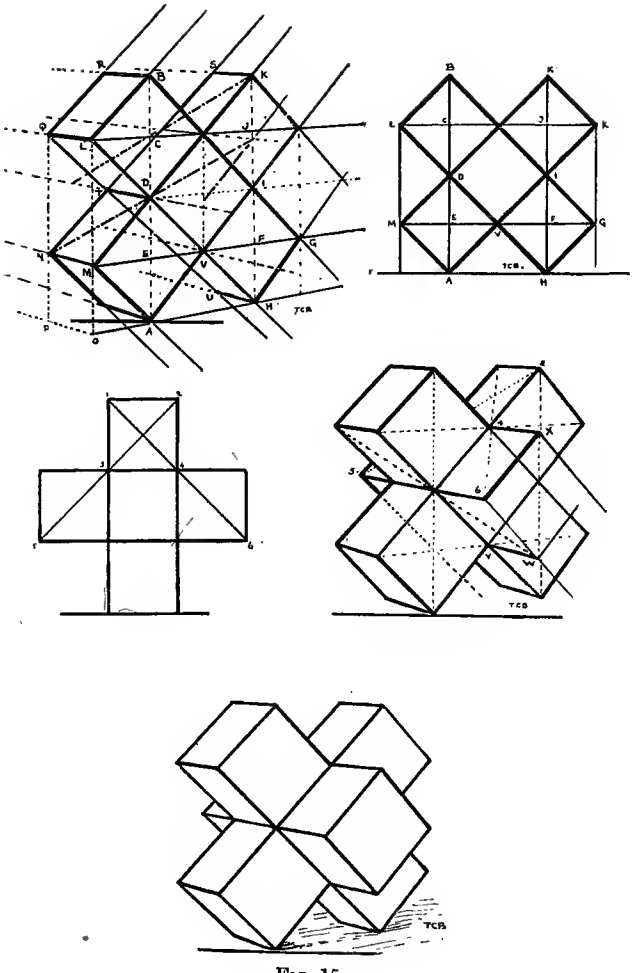


FIG. 15.

it downwards. This should pass through point I, and will give point G on line EF. Join GH, and draw a vertical line through G to reach EJ. Join this last point to K. Now draw from L to H, and draw from A through I to meet the line CJ. One face of the cross is now complete. Lines should now be drawn from K and M towards the left, and points S and N marked upon them. A line must be drawn from N to S, converging upwards with MK. A line is next drawn from D and from the top corner of the inner square, converging with KS and MN. We have now three squares in perspective on the side of the cross SKMN. In the upper square draw the diagonal from K, and produce it to meet the line drawn through D. This will give point 5, and if the other diagonal be drawn through S, point 6 will be obtained. From 5 and 6, ascending lines converging with MK should be drawn (that from 5 will only show a very little; *take care that this small bit is in the right direction*); that from 6, meeting the upper line of the second square produced, will give the top corner of the arm of the cross projecting towards us. From 6 draw a descending line converging with LH, and upon this point W will afterwards be found, when this process has been repeated on the surface RLUH from W an ascending line will complete the nearest square, and the last diagram will show how to finish the exercises.

LESSON VI.

FRAMED MODELS.

With the exception of the hollow cube and the ring, there are no "frame" models included in the syllabus for examination issued by the Science and Art Department; but these models afford capital practice, and should not be neglected. Illustrations are given in Fig. 16 of a square and an equilateral triangular frame, and on page 45 will be found the method to be employed in drawing a pentagonal, or five-sided frame. The chief thing to be noticed is that the mitres—the joints, that is, of the frame—must always be in a straight line to the centre of the figure, and that the inner edges of the model are *parallel* to the outer edges. The little squares which are hatched in the picture indicate the ends of the rails, and by means of these the lines showing the thickness of the rails will be readily obtained. In drawing the square frame in an upright position, the width of the horizontal rails can be marked off on the near vertical edge in their proper proportion. Lines should then be drawn converging with the upper and lower edges, from these points and these lines crossing the diagonals will indicate the width of the upright rails showing their proper reduction by perspective. This model will be a good preparation for drawing the hollow

cube, which is on any other method a very troublesome model to draw. These pictures (Fig. 17) show how to set about it. *Draw it as a solid cube first. Draw the*

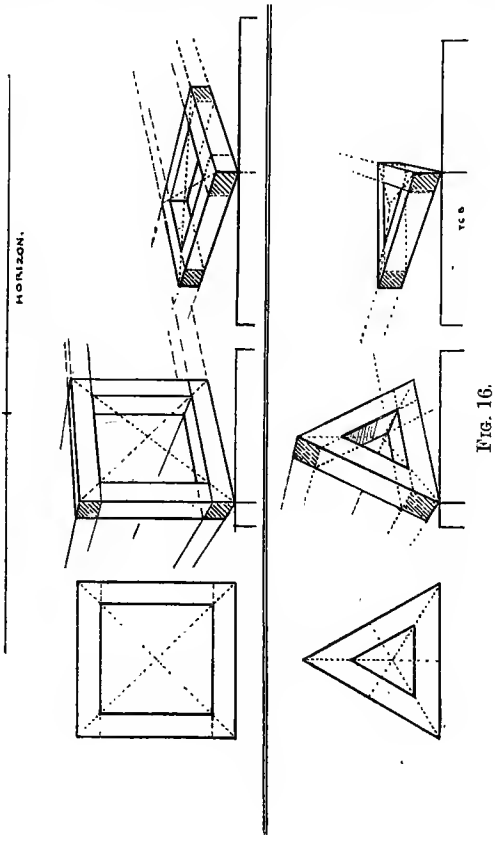


Fig. 16.

diagonals on each of the visible surfaces. Mark the width of the horizontal edges on the near upright

edge, draw converging lines to right and left from these points, and obtain the width of the upright rails. Then carry converging lines over the top surface, obtaining the inner square, and the little squares

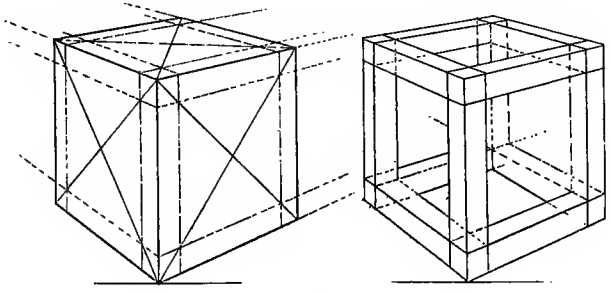


FIG. 17.

which represent the tops of the rails. These squares, with those already obtained on the upright surfaces, will enable you to complete the model.

LESSON VII.

REGULAR POLYGONAL MODELS.

THE hexagonal or six-sided prism is the only polygonal model which is likely to be set for examination, and in some respects it is the easiest of this kind of solids, but it will require a great deal of practice before you can draw it quickly and correctly. On the opposite page you will notice on the left a regular hexagon, with its sides elongated. This is to emphasize the fact that two of the sides are in each case parallel to one of the diagonals, that the diagonals divide the hexagou into six equilateral triangles of the same size, and that the horizontal diagonal is divided by the vertical lines and the oblique diagonals into four exactly equal parts. These facts should be made use of in drawing the model. After carefully determining the edges of the board AB and AC, decide upon point E, and draw the line upon which you will afterwards mark off EF and GH. Try to get these spaces exactly right; test the position of E by a vertical line through A, and consider carefully the relative distance from E to F, F to G, G to H, and from H to the end of the board. Having satisfied yourself that these points are in their right places, draw EI, being careful to notice that IC must converge with AB. Next draw vertical lines from I, E, F, G, and H. It will be best now to complete the horizontal model;

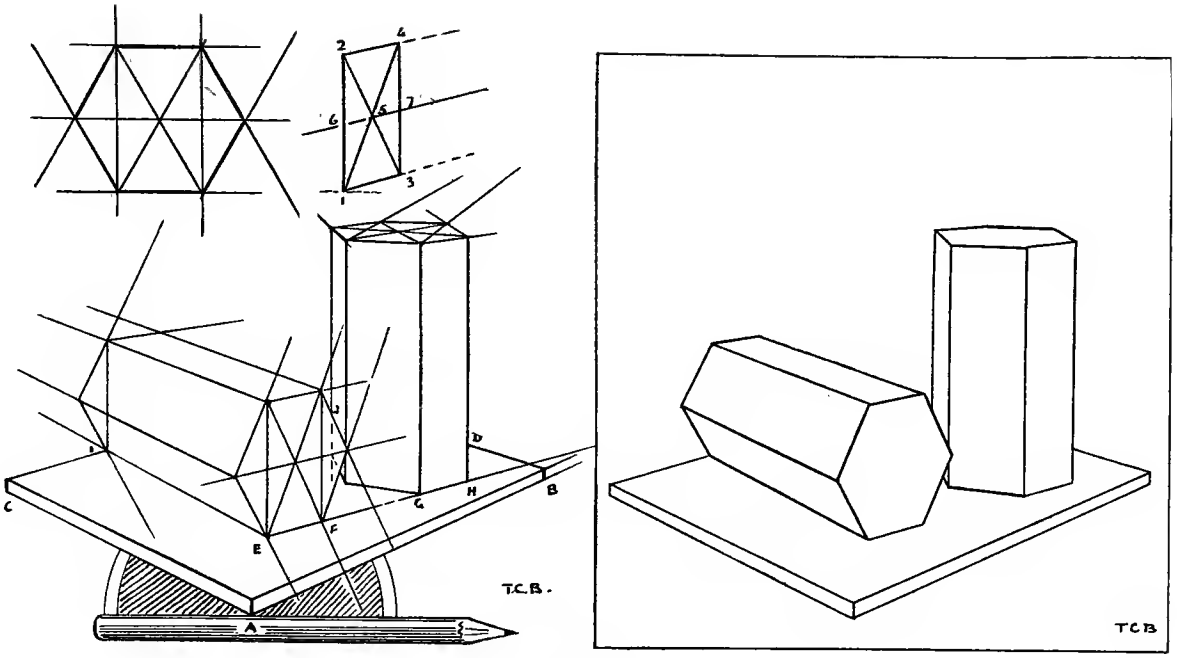


FIG. 18.

the little diagram on the right of that already referred to will show how to do this. Points 1 and 3 correspond to E and F. On the vertical line from F mark point 2, noting the relative length of 2 1 and 1 3; draw the line 2 3, and test the direction of this line. Next draw a line from 2, converging with 1 3, which will cut the vertical line on F in point 4; draw the diagonal 4 1, obtaining 5 where the diagonals intersect. A line should be drawn through 5, converging with the upper and lower edges; and if this is correctly drawn, points 6 and 7 will be exactly in the middle of 2 1 and 4 3. See that these points are right. The sides which are parallel to 1 4 will be ascending lines, and their point of convergence will therefore be above the horizon; but in such a view as we have here, it is practically sufficient to draw the sides parallel to the diagonals, and these lines, where they cross the line 6 7, will determine the outer angles of the front of the model. See that the four divisions on line 6 7 *represent equal spaces*, the nearest being a little the largest, and so on. Now draw three lines converging with EI; that from 2, crossing the vertical drawn from 1, will give another point in the model. Notice that these points must *always be vertically over the corresponding lower corners* when the model is in a horizontal position; one line drawn from this, converging with 2 4, will complete top of the model, and a second line from the same point, converging with the diagonal 4 1 (upwards), will give the last point, a line drawn from which to 1 should converge with the diagonal 2 3 (downwards).

In drawing the upright prism, it will be well to begin with point J, which marks where the left upright edge of the model appears to touch the model already completed. Then notice where the next upright comes with regard to the right outer corner of the hexagon. Test the relative width of these three upright surfaces,

and draw the retiring line from G, being careful about the angle made by it with GE. A very small portion only of the next edge will be visible. Be careful to draw this in the proper direction. The diagram

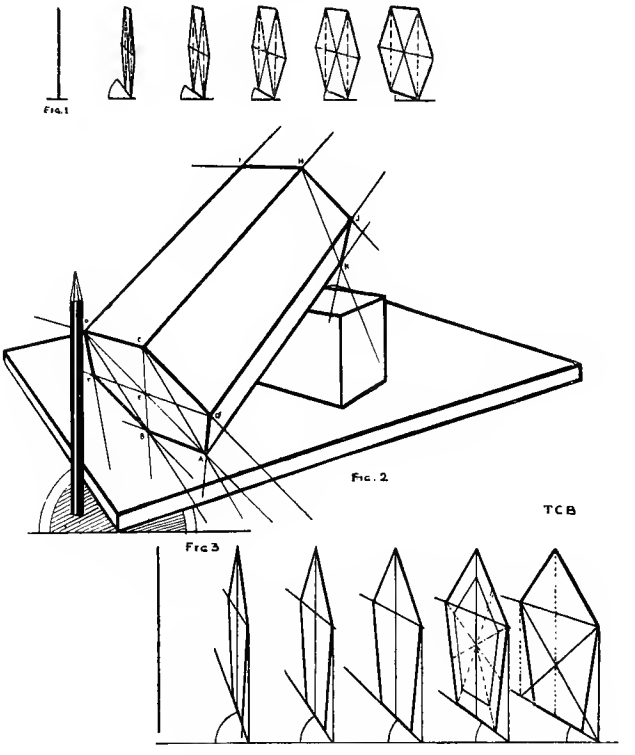
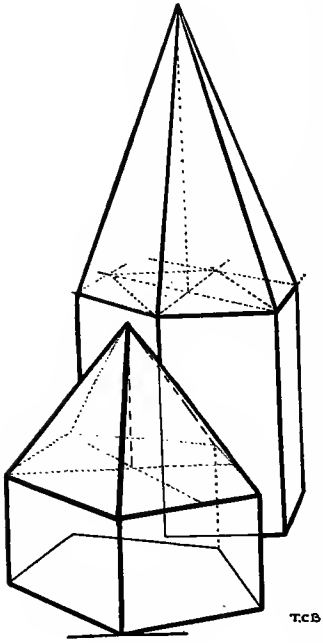


FIG. 19.

explains how to apply the same method as has already been used for the vertical hexagon to one that is horizontal. Be careful not to exaggerate the distance

from back to front, and to see that the upper and lower edges, which are parallel, converge to the same points. In finishing the board, see that point D comes in its right place with regard to the vertical line on H.

In Fig. 19 (page 45) the model is shown in an inclined position, and the pencil is placed where it is to show the necessity of testing the apparent direction of the edges of the model, which are usually very deceptive, and often quite the reverse of what you would expect them to be. The rows of hexagons and pentagons will explain themselves. Remember that *any figure, whatever its actual shape, may appear to be a straight line, but that it would be impossible for both ends of a prism to be seen as a straight line at onee.*



T.C.B.

FIG. 20.

The sketch of pentagonal and hexagonal prisms and pyramids in Fig. 20, besides affording an additional illustration of the methods of drawing these solids, is intended to remind the student that, when drawing several models in a group so that only a portion of one of the models is seen, it is very necessary to draw the whole of the base of the nearer model, to avoid the very common error of not leaving room upon the board for this to be completed without interfering

with the model behind. As a general principle, you should copy exactly what you see, and only that. Of course, neither of the bases of these prisms would be seen, only two edges of the pentagon, and one edge and a very little bit of another of the hexagon; but you will observe how easy it would have been, had not the lower pentagon been drawn, to have brought the base of the hexagon a little too low down without noticing it. Of course the point where the little bit of the base of the hexagon cuts the upright edge of the pentagonal prism would not then have been in its right place, but this would easily have escaped notice. In this and similar cases it is quite worth the trouble of drawing lines which you can't see, and which will have to be erased before your drawing is finished, at any rate in the earlier stages of your study. The necessity of giving special attention to this matter is proved by the following extract from the report of the examiners on the works in Model Drawing—*advanced*—submitted in 1894 for certificates. These drawings are presumably executed by persons competent to teach the subject, and desiring a certificate to enable them to earn grants by doing so.

"Of faults of drawing, the worst, perhaps, is the representation of models in impossible relation with one another and with the board on which they rest: as, for instance, when the more distant object is drawn touching the ground nearer the spectator than the other, or *when a solid object is shown cutting into a second one.*"

The *regular octagon,* which means a polygon with eight equal sides, does not allow of such a convenient method as that given for drawing the six-sided figure; for although the sides are all equal, it will be seen, on referring to the drawing of this figure on page 30, that the figure is divided into a square (of the same length as the sides)—four right-angled isosceles

triangles—of which the hypothenuse * forms in each case a side of the octagon, and four oblongs, of which the long edges are the same length as the sides of the octagon. The vertical and horizontal lines used to dissect the figure are therefore divided into three portions, of which the centre one is larger than the two outside pieces, which are equal to each other. A very common error in drawing the octagon is to divide these lines into three *equal* parts, with the result that four of the sides which are parallel to the diagonals of the centre square are much longer than the other four. If we suppose the larger of the three divisions to be divided into ten equal parts, the shorter divisions would be equal to seven of these parts; but we cannot measure accurately enough in freehand work to be able to make much use of this fact, only the knowledge of it may save you from the mistake already referred to. The following method, I think, will be found useful in drawing the octagon, when, because the surface is at right angles to the direction in which you are looking, the true shape of it is seen.

Draw the horizontal line AB. Let C be one corner of the octagon. Draw a vertical line CQ of indefinite length.

On this, mark off CE—which must be the height of the next angle above C—and on AB, mark off CF equal to CE. Draw a straight line from F through E indefinitely. Now mark off CH on AB—keeping in mind the proportion of seven and ten between these two spaces—and draw a vertical line from H, which crossing the line EK will give the opposite corner to E of the inner square. Through this point and through E draw horizontal lines. From each corner of the square on these lines and on the vertical lines above mark off a distance equal to CE, and so obtain the

* The hypothenuse of a right-angled triangle is the side opposite to the right angle.

points of the octagon. Of course it is not intended that you should use any mechanical means to measure these various distances, but only that you should mark the points as well as you can before you try to draw the lines.

If the octagon is in perspective, it will be best to begin with the line AB, taking care to give it the proper amount of inclination, and then to draw the two uprights, marking off the three spaces on the nearer one, and drawing converging lines from each point. Then you will have obtained the square in the middle, and the diagonals of that will indicate the direction of the inclined sides of the octagon—two upwards and two downwards. The lines forming the edges of the rectangular faces of the prism are horizontal, and follow the rules given for retiring parallel lines converging to some point on the horizon. The point cannot be seen in the diagram, and it will seldom be possible to show it upon your drawing; but keep the fact in mind that the lines which are actually parallel should vanish in the same point. If you turn the picture about, the diagram on the right at the bottom of the page will show you how to draw horizontal octagons in perspective when, of course, the rectangular faces will be upright.

The same method should be applied, if you have to draw the model in a sloping position. In this case, be very careful to get the end nearest to you *quite* correctly drawn, testing the direction of the lines in every possible way and comparing the height with the width, before attempting the long edges and the other end.

LESSON VIII.

CIRCULAR MODELS.

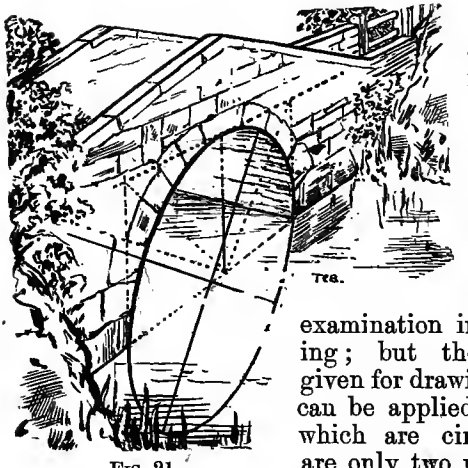


FIG. 21.

THE cone, the cylinder, the ring, and the sphere are the four circular models included in the syllabus of the Science and Art Department for the examination in model drawing; but the instructions given for drawing these solids can be applied to all objects which are circular. There are only two possible shapes which a circle may assume besides the perfect circle. It will only show its true circular shape when it is well within the field of vision, and at right angles to the direction in which the spectator is looking, in which position it will be remembered that all figures retain their true shape, the only change being in size. If the circle is edgeways in

a direct line from the eye, a perfectly straight line is all that can be seen. In any other position a circle will appear to be an ellipse. This figure will be familiar to students who have been through a course of geometry.

The three figures here given will show that ellipses may be of very varied proportions, but that in each case the curve is perfectly smooth and continuous.

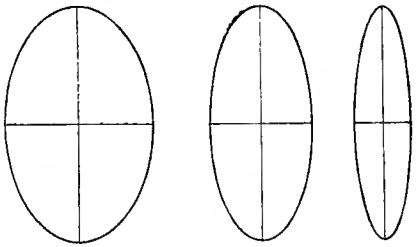


FIG. 22.

In drawing circles which are foreshortened this characteristic of the ellipse must be constantly kept in mind, for however much a circle may be reduced in width by perspective, the curve must *always* be *quite continuous*, and anything like a corner at the extremities must be most carefully avoided. It will be very good practice to draw a number of ellipses of different proportions and in varying positions. Generally it is necessary to draw the two diameters, which should always be at right angles to each other. A line passing through a solid model from the centre of one end to the centre of the other, or in the case of the cone from the centre of the base to the apex or point, is called the *axis*. In drawing circular models, *first ascertain the direction of the axis, and always draw the long diameter of the ellipse which represents the circle at right angles to the axis.* If the model

is standing vertically on the board or on another model, the axis will be upright, and therefore the long diameter on which the ellipse must be drawn will be horizontal, no matter what the direction of the retiring edges of the board or model may be (providing always that the model is within the field of vision).

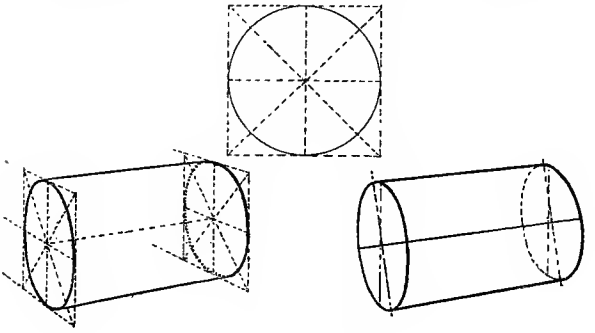


FIG. 23.

In the annexed figure this principle is applied to a cylinder lying upon the board so that its circular faces are upright. It will easily be understood that in this position the near half of the circle would appear larger than the far half, therefore it is evident that the centre of the ellipse is not the centre of the circle. It will also be seen that if a vertical line be drawn through the actual centre of the circle it will not divide the figure which represents the circle in perspective at all equally, therefore for practical purposes such a line is of no use, for it will not help us to draw the ellipse symmetrically, while a line at right angles to the axis will divide the ellipse so nearly into two equal parts that, for the purpose of model drawing, we may assume that it is exact. The small diagram, Fig. 12, in the picture at the end of

the lesson shows what is very likely to be the result of drawing the ellipse on an upright diameter. This illustration shows the same method applied to the semi-cyclindrical model, included in the syllabus for drawing in elementary schools.

The fact that the long diameter of the ellipse is not a diameter of the circle will not cause any difficulty in drawing the cylinder or the cone; but in drawing the ring and any figures in which concentric circles occur it must be taken account of, and if the drawing is on a large scale it will be necessary to draw a new diameter for each ellipse that is required.

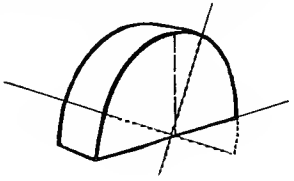


FIG. 24.

It has been pointed out that a circle seen edgeways exactly opposite to the eye appears to be a straight line, whether it is placed vertically, horizontally, or obliquely. If you will hold a thin circular disc of card, or a penny, in each of these several positions and gradually remove it, higher up, lower down, or further to the right or left hand, you will find that the further it is removed from the eye the rounder it will appear. Then if we suppose a cylinder, a few inches below your eye, it is evident that the lower circular surface is further from your eye than the top one, so it will be rounder, and the same result will be obtained if we suppose the cylinder raised so that the bottom of it is above the horizon, only now it

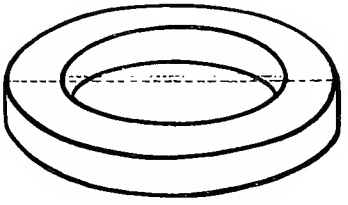


FIG. 25.

is the top curve which is further off and consequently the roundest. Make the experiment with the cylinder placed horizontally but obliquely, and you will find that *although the farther end of the model is relatively smaller, it is also proportionately rounder*, hence we may say, *that the hidden curve of all circular figures is rounder than that of which the whole ellipse is seen.* This does not, of course, apply to circles which show their true shape.

In drawing circular models, it is always safest to draw the whole of the ellipse which is partially hidden to avoid the risk of the error illustrated in this drawing of a cone, where it will be seen that if the curve BC were reversed, a corner would occur at B and C. The dotted line shows the completed ellipse of which BC is a part, and consequently ABC is really a drawing of a *section* of the cone. When the circular end of a model appears as a straight line, then, and *then only*, can the side lines make angles with it. In *every other case the straight lines must be tangential to the curve.* If the distance BC is the proper width for the base of the cone, then a different curve must be drawn, for the existing one could only be properly completed by the dotted line shown. It is not easy, especially for the beginner, to realize this rather subtle but most important difference unless the whole ellipse is drawn, and if it is lightly drawn, that part of it can be quite easily erased, which is not seen. Two additional views of the ring are given here to show how the surface of the ring must be foreshortened. The smaller the space between the near and far edge,

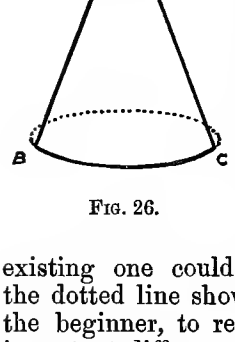


FIG. 26.

the greater the difference will be between the width of this surface at the ends and in the middle, for the diameters of the circle are in reality the *same* length, so if one of them is foreshortened, any measurement on that line must also be foreshortened in the same ratio.

The heading of this lesson shows how this method of representing the circle by an ellipse may be adapted to the drawing of semicircular arches, or as a means of testing the accuracy of such. Students who have not been through a course of freehand drawing will need a great deal of practice with these curves; but by this time the difficulty should be entirely one of execution, because the eye should now have acquired the power of accurate judgment of space and size and proportion. The sphere is chiefly used as an exercise in shading; it will, therefore, be described in a future lesson.

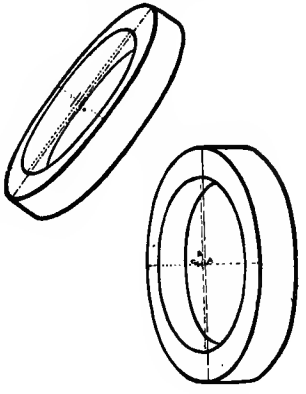


FIG. 27.

Fig. 28, page 56, shows at a glance all the chief facts about circular models. Figs. 3, 8, and 10 are edge views. Fig. 1 shows the shape to be most carefully avoided, and Fig. 12 shows what is very likely to happen if we attempt to draw the perspective view of a circular model using an upright diameter, the drawing suggesting that the side view of the model represented would not be rectangular as it should be, but like the shape shown above it, technically called a rhomboid.

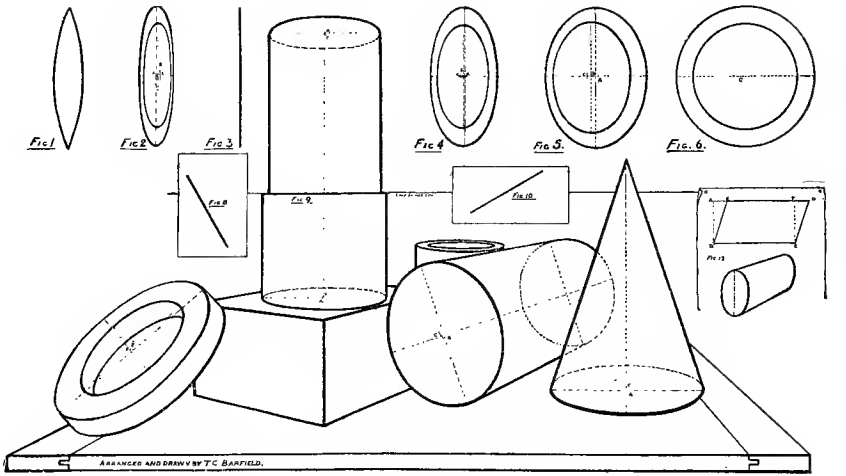


Fig 1
Fig 2
Fig 3
Fig 4
Fig 5.
Fig. 6.
Fig 8
Fig 9
Fig 10
Fig 13
ARRANGED AND DRAWN BY T.C. BARFIELD.

FIG. 28.

LESSON IX.

VASES.

THE three examples of vase forms selected for examination purposes present almost all the difficulties which the student is likely to encounter in drawing this kind of model. A careful consideration of these typical forms will enable him to successfully copy more complicated shapes. Proficiency in freehand drawing will, of course, be necessary; but, although the facilities gained by practice from flat examples will be very useful, *combined with an intelligent understanding of the lessons already given*, there are very serious errors which those who can draw very well from flat copies are liable to fall into unless the previous lessons on circular objects are understood. And this is certainly a point in favour of commencing with model drawing; for the scope of freehand, technically so-called, is very limited, unless vases or similar forms are included, and it is hardly possible for these to be *well* drawn except by the experience gained in drawing from the real things. The differences are so slight between a good rendering and a bad one as to be quite overlooked by the uninitiated, and yet to the eye which has once been taught to see correctly, they are most offensive blots on an otherwise good drawing.

In drawing vase forms in outline there are three chief difficulties :

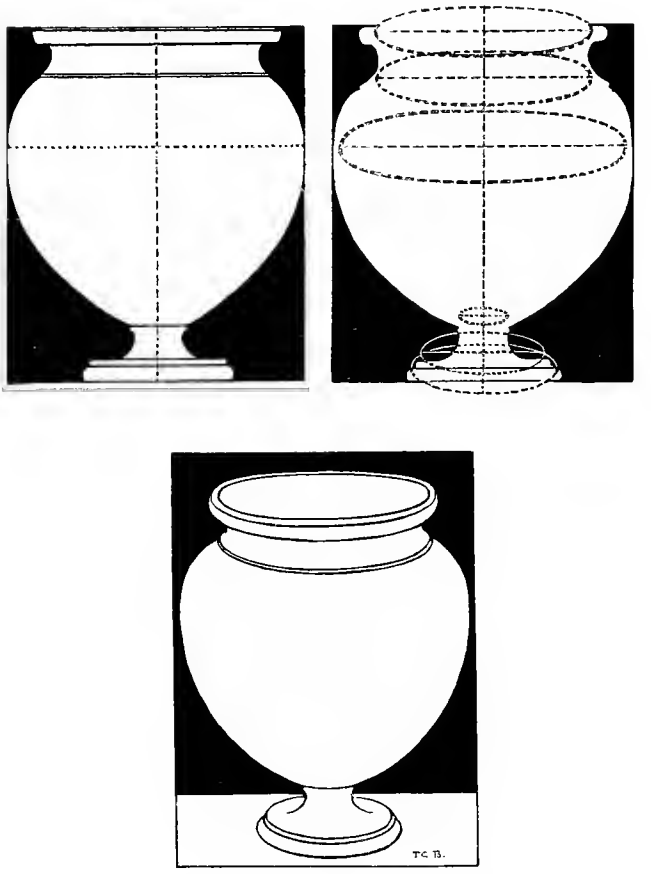


FIG. 29.

(*a*) The proper appreciation of the contour or profile of the vase.

(*b*) The balancing exactly of the two sides.
(*c*) The perspective changes in the circular forms.

To overcome the first two difficulties it will be necessary to draw a centre line, and to consider each part of the outline in regard to this line, but it will be very helpful to suppose another line parallel to the centre line, which touches that part of the contour which is furthest from it, and to regard the shape contained between the profile of the vase and this line, which may be represented by the pencil placed in the proper position—in the illustration this space is blackened. This method gives you two chances of discovering errors in the outline. A change in the way of looking at things is always an advantage, for the eye soon becomes tired, and this unexpected change in the mental effort acts as a gentle stimulus, and doing its work in consequence more efficiently, the eye detects errors which would otherwise have escaped detection. For the same reason it is a very good plan to look at your drawing and the model in a looking-glass, as the whole thing being reversed, a new set of facts are presented, to which the eye has not got accustomed. Find out everything you can about the vase you have to draw, the proportion, length as compared with the width, where the widest part occurs in relation to its height, etc.

In the first diagram of Fig. 30, the long-necked vase is carefully analyzed, and this analysis of the form should be mentally gone through for each vase or jar you may have to draw. When the actual shape of the vase has been understood, and can be readily drawn in profile or elevation, the perspective difficulties have to be considered. If you reflect that any horizontal line drawn on the profile of the vase becomes an ellipse in any ordinary view of the jar, you will easily understand that the contour of the jar which you see in the ordinary way does not

correspond to the shape as you know it to be in reality. Here we are coming back to the initial difficulty in model drawing; but in the case of a

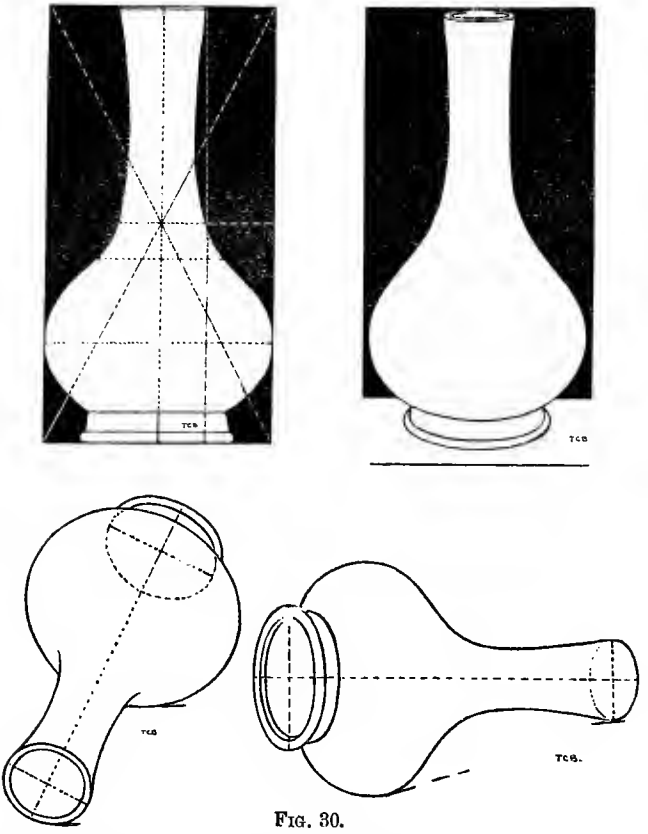


FIG. 30.

curved form, although it is useful to keep in mind the cause of the change, you must rely chiefly on

the outline *as you see it*, as the drawing of ellipses for any horizontal lines which might be chosen would

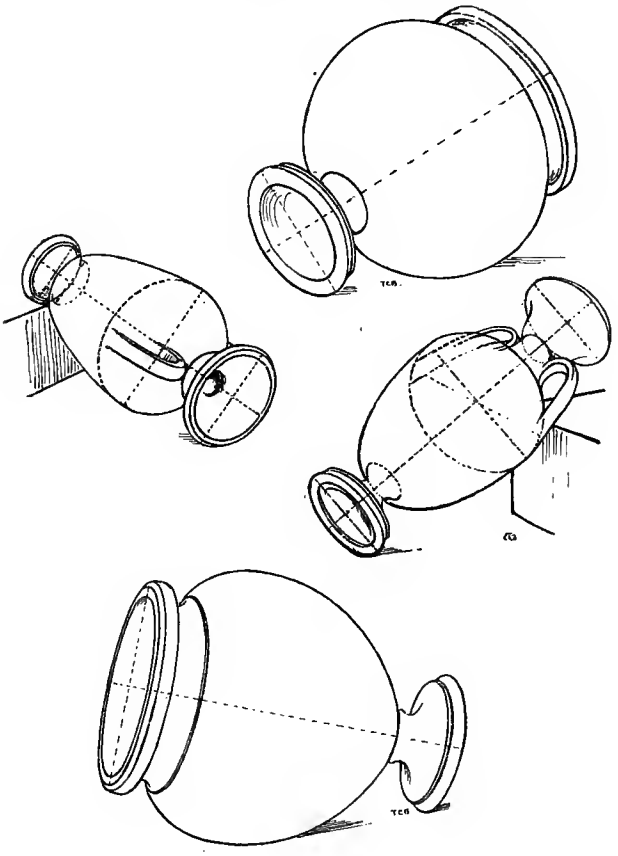


FIG. 31.

make the work almost too mechanical, besides involving a great amount of unnecessary drawing which

would afterwards have to be erased; but in drawing the pedestal part of the vases, where there are actually lines showing, it is quite worth while to draw the complete ellipses for them. And in drawing the red terra cotta vase, or similar forms, it is also advisable to draw the whole of the ellipses for these lines near the shoulder of the jar, when the top of it is below the eye, because the outline *must include* a view of the top of the shoulder. If this is necessary when the vases are in an upright position, it is infinitely more so if they are in a horizontal or an inclined position, but it will be best to gain as much facility as you can in drawing them in a vertical position, before you attempt the horizontal or inclined, when you can dispense with all construction lines, except the centre line, and perhaps a diameter at the top and another at the bottom, for it must not be forgotten that your object should be to draw with as few lines as possible, and that these construction lines are only intended as a sort of go-cart until you are able to go alone. When you can do this the further difficulties which, after all, are no new difficulties, but only an exaggeration of those previously encountered, will not be insurmountable. A few examples are given of vases in various inclined positions. We have now come to the end of the single models, and the chief difficulty now for the elementary stage of the subject is the drawing of them in groups, preserving the proper proportion between the separate models, and between the models and the board. Careful practice is necessary to secure this, but it is practice on the same lines as those already laid down.

Only one hour is allowed for the examination in the elementary stage, and generally there are three models to be drawn, with the board on which they are placed. Usually one of the models is a vase, one of those here illustrated; but there is generally a choice of groups

allowed, and this year one of the groups consisted of the square prism resting on the board; on the top of this was the square pyramid, and the ring was placed on the pyramid at an angle of 30°. The board ought to be eighteen inches above the floor. It is evident that speed must be cultivated if you are to pass the examination; there will not be much time for alterations, and probably none at all for *lining in*. If you have profited by the direction here given, very little of either will be needed. If you have not much time to devote to the subject, it will, of course, be best to keep entirely to practice from the models which have been described, from which the examination group will be selected, and to have the models placed about eighteen inches from the floor. But if you can spare more time, get as much experience as you can in drawing these models in other positions, placing them sometimes above the horizon, and also in drawing other objects than those included in the syllabus—a window, and what you can see through it, an open door, a chair, a table, fireplace, the corner of a room, a pair of common house steps, a wheelbarrow—and many other things which will suggest themselves. This wider range of subjects will probably give increased interest to your work, and will certainly increase your facility in drawing, and lead up to sketching from nature.

The following extracts from the Science and Art Directory will be useful to those who are preparing for examination in model drawing.

MODEL DRAWING.

ELEMENTARY STAGE (SUBJECT 3A).*

(1 *hour is allowed for this Examination*).

Candidates are required to make an outline drawing in pencil

* These examinations nearly correspond with the former 2nd Grade Examinations in these subjects.

only from a group of three or more of the geometrical models and simple vases shown in Fig. 32.

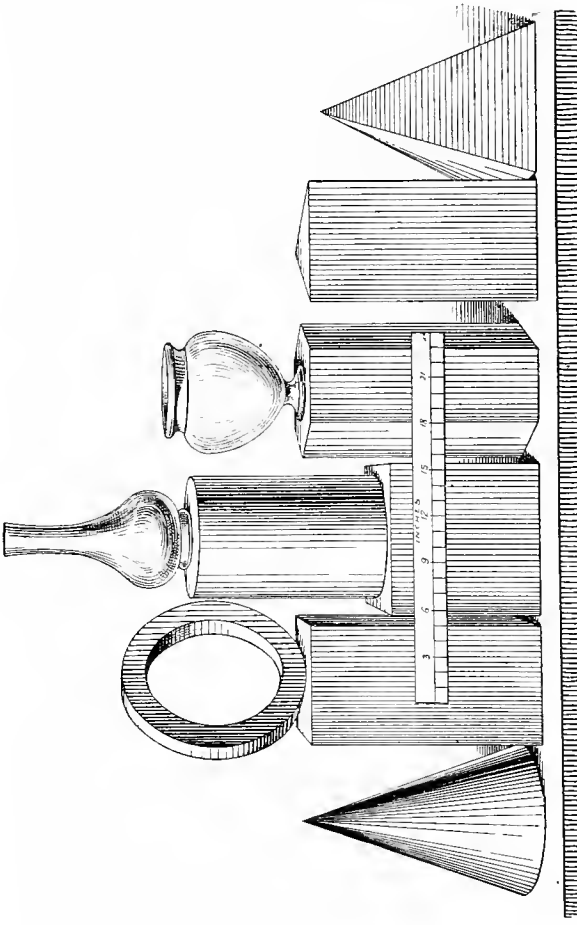


FIG. 32.—(1) Cone; (2) Ring; (3) Square Prism; (4) Long-necked White Vase; (5) Cylinder; (6) Cube; (7) Terra Cotta Jar; (8) Hexagonal Prism; (9) Triangular Prism; (10) Square Pyramid.

The drawing must fairly fill the quarter imperial sheet of drawing paper supplied to the candidate sitting for examination.

ADVANCED STAGE (SUBJECT 5A).

(2½ *hours are allowed for this Examination.*)

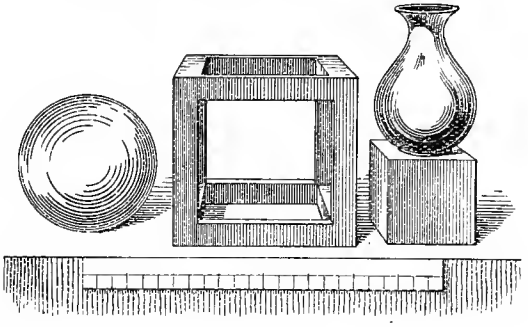


FIG. 33.

Candidates are required to make a shaded drawing from a group of three or more of the geometrical models and simple vases shown in Figs. 32 and 33.

The drawing must be made on a scale so that it shall fairly fill a half-sheet of imperial paper.

ELEMENTARY AND ADVANCED STAGES.

(SUBJECTS 3A AND 5A.)

In both stages each candidate is required to draw the objects placed before him, including the drawing board on which they stand, as they appear from the point of view in which he may be seated, and his drawing is expected to show a knowledge of the effect of perspective in modifying the appearance of the models.

No ruling, measuring, or use of instruments is allowed; but the pencil may be held between the eye and the objects for the purpose of estimating their apparent relative size.

N.B.—Models and vases must be of the sizes indicated in the accompanying figures (32 and 33).

LESSON X.

LIGHT AND SHADE.

ALTHOUGH it is almost universal for every one to commence learning to draw by working in outline, and although there is very much to be said in favour of the practice, it is evident that it is a very conventional way of representing solid objects, since the lines which we draw to indicate the forms do not exist, and are used as boundaries of the various patches of different colours by which the impression of those forms is conveyed to the mind. Scientists tell us that colour has no separate existence, that it is merely caused by light acting upon the different textures of the various objects illuminated, which absorb varying quantities of the rays of light. These parts of an object which are not illuminated would therefore be colourless, black, if it were not for the atmosphere and for light reflected from other surfaces.

In the same way that our art studies commence with one conventionality—outline—it is usual to employ a second conventionality before attempting to represent the things as they are visible to us in their various colours. We agree to leave out colour, and to represent whatever we draw in one colour, using various tones of this to represent the values of the different colours actually seen; to do, in fact, what

the camera does for us mechanically. And this is generally known as light and shade, or monochrome work, a most important stage in art education.

By many people, shading is considered a sort of fancy amusement. Drawing in outline is the real work, they imagine, success in which marks progress and improvement, but shading is hardly taken seriously. This is probably owing to the kind of work which used to be so largely carried on a few years ago in schools—copying lithographs in soft crayons, very often on toned paper, which allowed the lights to be afterwards erased—the pleasure of doing which and of having it admired by one's friends when done was certainly greater than the amount of art knowledge obtained in the process. This prejudice is no doubt giving way as schools of art increase, and the proper way of studying art becomes popularized; but as this book is intended to be of use to those who are studying art under difficulties, it is perhaps as well to point out how foolish such a notion is. A little reflection will convince any one of the great importance of light and shade in explaining form and position. To illustrate this, a number of pictures are given in which the same outline is made to represent different ideas by means of the shadow. Nos. 1, 2, 5, and 6 are exactly the same size and shape. By means of the shadows we see that No. 1 is a rectangular *projecting* surface, No. 2 a rectangular recess, No. 5 is a semicircular projection and No. 6 a semicircular recess.

Nos. 7 and 8 illustrate the way in which the shadow indicates the position of an object; the two circles are exactly the same size, their centres are in the same horizontal line, but it is evident that No. 7 is resting upon the ground, while No. 8 is above it. In No. 10 the fact that we are looking at a ring is made out by the shadow on the ground and by the shading on the *almost* rectangular surface—of which the right

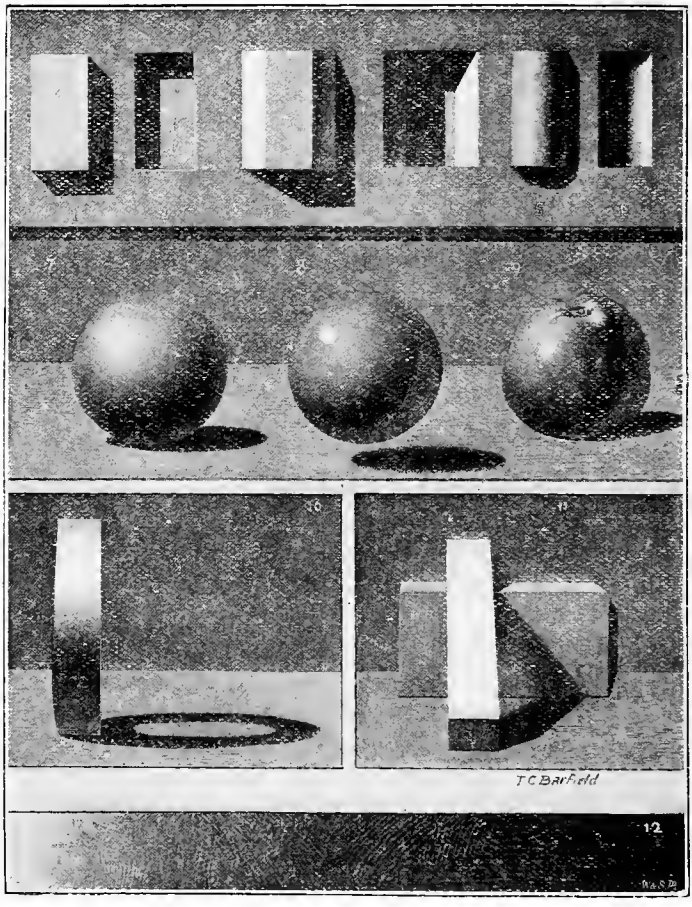


FIG. 31.

edge is absolutely straight—which gives the outline of the ring. In No. 11 the slight difference between the horizontal edge of the top of the leaning prism and its near edge is the only indication which the outline gives of its inclined position, yet with the shadow and the shading, no one can have any doubt as to what is intended. These diagrams should be carefully studied; they are much too small to be copied, but are intended to point out what is to be looked for. It will be evident that the shading has a very important part to play in expressing the facts which we have to show.

There is a reason for the shape and colour of every shadow. They must, therefore, be most carefully copied, and it will be easier to do this if the reason is understood. What is called shadow is simply absence of light. It has been explained in the first part of this book that the rays of light are perfectly straight. The sun being at such an immense distance from the earth, the rays of light from the sun are regarded as parallel; but in dealing with artificial light, it must be remembered that the rays diverge from the source of light in all directions.

This makes a very great difference between daylight studies and studies made by artificial light, while there is another difference between studies made out of doors and those made in a room where usually the daylight comes through a comparatively small opening.

In the first row of figures in the illustration, Fig. 35, we see three square pieces of cardboard in sunlight, the sun at an altitude of 45° and in a direction at right angles to the surface of the cards. It is evident that the cards being opaque will prevent the rays of light from reaching a portion of the horizontal surface on which they are standing. In the first figure, MGHN is the shadow, and the rays BH and AG explain how it is

determined. We may say that GH is the shadow of AB. The dotted continuations of AB and GH show that they would meet in the same vanishing point. Therefore *remember that if the line casting the shadow* (or obstructing the light) *is parallel to the surface on which the shadow falls* (or from which the light is

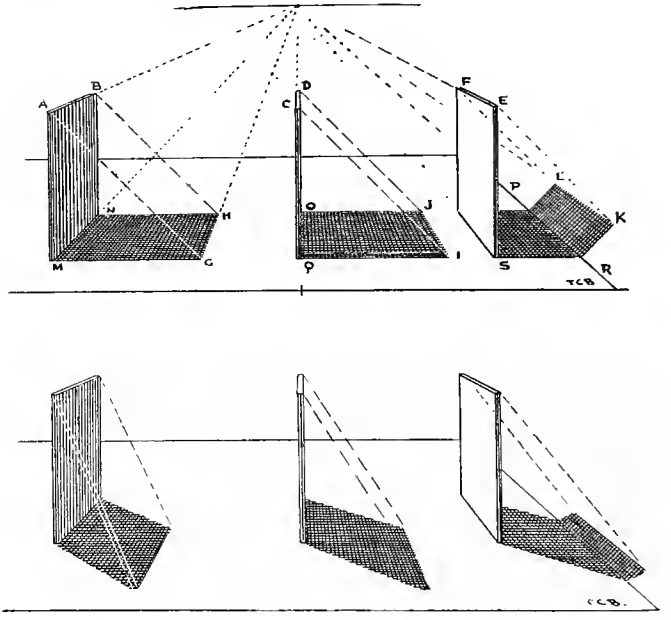


FIG. 35.

excluded) *the shadow will be parallel to the line.* We may further say that MG is the shadow of AM. Notice that *the shadow of a vertical line will always tell us the direction and altitude of the sun. The shadow of vertical lines will therefore always be parallel to each other if the surface on which they fall is level.* Parallel *retiring*

shadows will of course follow the rule given for parallel retiring lines. This will be seen in the second row of figures when the rays meet the cards obliquely. It follows then that any deviation from this direction will indicate some change in the position of the line, or some undulations in the surface on which the shadow falls. This is illustrated in the third figure on the top row, when the shape of the shadow tells us that the line PR is the edge of a surface sloping upwards. The surface ABNM is said to be in *shade*, while the shape MNHG is called the *cast shadow*. When the rays of light come in contact with a surface, light is reflected, thus indirectly illuminating the surrounding space. Some surfaces have much greater reflecting powers than others, as the mischievous schoolboy with his little mirror has long ago discovered; but, as a rule, reflected light is never so brilliant as direct light. But we must remember that a cast shadow presupposes a surface for it to fall upon, which is more or less of a reflector, therefore we may safely say that *the cast shadow will usually be darker than the shade*. Now we must consider a little the question of darks which are usually represented with black chalk. It will be well to realize that as soon as we attempt to represent objects in light and shade, every touch of the crayon or stump must be considered as a dark and ought to be helping on the general effect. We have done with outline as such. Never give way to the suggestion, when your work doesn't seem to be coming right, that you can make it more real or cause it to look more finished by outlining the parts you are in a difficulty with. Of course you will have to sketch the outline before you begin to shade; but, once you have secured this, remember that a *dark* line may only be used in these places, when, after careful consideration, you are *quite* sure you can see such a line in the thing you are copying.

At the bottom of page 68, Fig. 34, there is a graduated strip shaded from white to black. It will be a very good plan to provide yourself with such a strip, for your eyes will want a good deal of careful training to make them tell you what amount of dark is necessary to represent any particular shade or shadow, and this "tone scale" held up against your copy will help you. At first you will probably have a tendency to make your drawings too dark. A few experiments will prepare you for the kind of deception you are to guard against.

You have probably noticed how dark the shadows are which in sunlight the houses throw across a street. If there are some gaps in the row of houses, the shadows will seem still darker in contrast with the strong sunlight on the illuminated portions. The sun is momentarily obscured by a cloud, the surface of the street is now all one colour, or nearly so! What is it that has happened? Have the shadows got lighter? The whole street is now the colour which the shadows were, but the strong sunlight being withdrawn we have a different scale of comparison, and the normal colour of the street seems lighter. This is the reason that most of the photographs of out-of-door subjects are so much darker than we think they ought to be. They, of course, register mechanically the different degrees of light, and if the paper is many degrees darker than the brightest part of the picture ought to be, it follows naturally that everything which is darker than that will be proportionately too dark. We must recognize that we have nothing white enough for these brilliant effects of light. *If we analyze and carefully copy the colour of the shadow we shall get as nearly the true effect as it is possible to obtain.*

Working on this method, it is not often that you will find it necessary to use the full depth of which

your chalk is capable. But do not forget that the *first* marks that you put upon your paper will appear much blacker than they really are, in contrast with the whiteness of the paper. *It is a safe rule to begin by putting down first the darkest thing in your study as nearly as you can of exactly the right colour.* You have then got the light and dark extremes of your scale, and you will be able to compare the succeeding darks (which should be put on in the order of their importance—*i.e.* of their depth of colour)—with the strongest darks, while all shades on the light half of the scale should be compared with the paper, as the highest light must be of that colour. In dealing with shadows, and especially with reflections, it must be remembered that the eye has the power of adapting itself to what is required of it, that is to say, that the more intently you regard a shadow, the more reflected light you will be able to see in it. If you go suddenly into a dark cellar, you find that, while at first you seem only conscious of the darkness, the longer you remain in it, the more clearly you will be able to make out its contents. And this is what happens when you are trying very hard to see the detail in a shadow. The best way to correct this is to periodically put your drawing by the side of the group or cast you are copying, and regard both from a distance or with your eyes partly closed. On page 19 it has been shown why a drawing or painting can never seem exactly like the real thing when looked at in the ordinary way with both eyes, but if you look at your work and the copy steadily with one eye closed, the other eye should give you exactly the same impression from both, except, perhaps, that your lights will not be quite so bright. If it doesn't, there is something wrong. Try to find out what is the fault. Remember that mere smoothness of surface is not finish. When you have expressed all the facts you can see, it is

time to leave that study and commence another. A lot of time is often wasted in endeavouring to acquire finish. That finish which is real completeness can only be obtained by experience. It is, of course, quite worth while to get proficient in handling your tools before you begin to copy from a cast; but, having done that, if you make a real effort to carry each study a little further than the last, you will soon acquire the power of *completing* your work.

In shading circular forms, the careful gradation of the colour is very important. It will have been noticed that the rays of light will most brilliantly illuminate those surfaces to which they are perpendicular. Whatever direction the rays of light may be in, if we are copying a sphere or ball, we may suppose that one ray of light would be in a right line to the centre of the sphere. The surface near the point where this ray meets it will be the brightest. In ordinary light a number of these rays would, as far as the eye can distinguish, be equally bright; but gradually, as the surface presents less of a right angle to the rays, it must be less brilliantly illuminated, until we arrive at the part where the rays are tangential to the curve. Beyond this there can be no direct light, and here the shadow begins; but because of its circular form, it will receive a certain amount of reflection, so that *the darkest part of a circular model is never at the edge.*

In shading a sphere it is best to suppose a number of concentric circles, struck on the surface of the sphere from the point where the light is brightest, gradually getting darker as they increase in size. In most cases these rings will appear as ellipses. This sketch will illustrate the idea. Try to get the proper tone for these rings, and their edges will easily be softened together, as seen in No. 7, page 68. No. 8, on the same picture, shows a sphere of a smoother

surface. It will always be found that a glazed or polished surface has the light concentrated, generally an exact reflection of the source of light. Notice the same effect on the apple, Fig. 34, which suggests the smoothness and shininess of the skin. Observe the same effect on metal, glass, glazed earthenware, etc. The two jars in the frontispiece afford a good illustration of this difference in the way the light is diffused. Notice the reflected light on the board round the edge of the glazed jar, which helps very much to show that the jar is glazed.

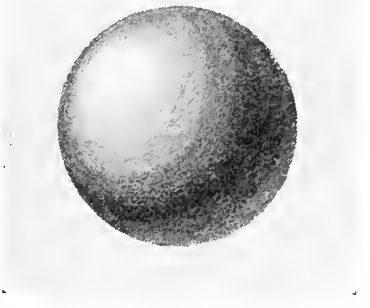


FIG. 36.

This shaded drawing of a cylinder shows how the same idea is to be carried out in shading other circular models. The bright line along the cylinder shows where rays of light in a straight line to the axis would touch the surface, and the darkest part shows where the rays become tangential to the curve. Notice how the shape of the shadow is determined by the shape of the model and the direction in which the light meets it. The board in this drawing is quite sufficiently finished, but the model itself is purposely left rather rough, so that the process of finishing may be better explained. A careful examination of the picture will show that while the various tones are in their right places, there is a want of *subtle gradation;* this would, of course, be more apparent in a larger drawing. A good deal of time is often

wasted in aimlessly going over a drawing which is felt to be unsatisfactory. Spend more time in trying to find out what is wrong, and so save this useless labour. If you can carefully fill in a little patch of just the right colour and just the right shape, whenever there is an unintentional or unnecessary space of lighter colour, and carefully remove these bits which are too dark, your work will soon be complete; but this

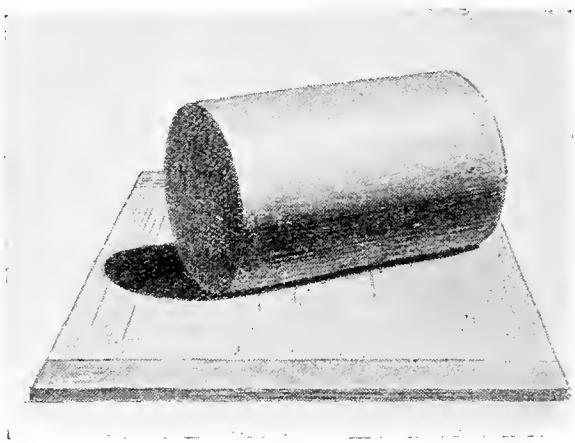


FIG. 37.

requires care. Practice enables one to do it very quickly, so much so, that I fancy students sometimes think, when the teacher is showing them how to finish, that his work is quite haphazard, and they wonder how it is that they cannot get the same effect.

The method of shading requires a little explanation. Twenty years ago, in almost all schools of art in this country, the shading was done with a pointed crayon, and in the manner here indicated—a number of regular

strokes crossing each other in different directions, and the small spaces between them filled in by little dots. Very beautiful drawings could be made in this way, but too much time had to be spent upon them, and there was also the danger of thinking too much of the manner of work, some students even going so far as to pride themselves on making their strokes so regularly as to produce geometrical patterns. This, of course, had no compensating advantage in their future studies; in fact, if they were in water-colour,

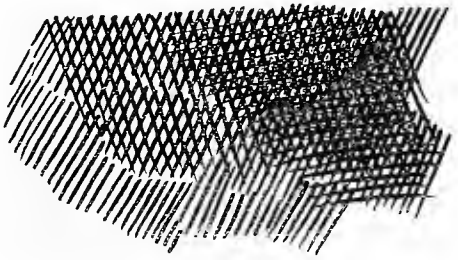


Fig. 38.

facility in this kind of work was rather a drawback, while probably they had not gained so much knowledge of light and shadow, and of how to express form by its means, as a broader and bolder method would have given them. The pointed crayons are now very little used; the chalk is prepared in a fine powder, and applied to the paper with leather or paper stumps. Paper of a slightly rough surface, like Whatman's "Not" surface, is perhaps the best, but several other makers have produced very good substitutes for this. Boxes filled with all requisites for shading, and having a washleather palette fitted in the lid, are prepared by most artists' colourmen, and are fairly convenient; but the great drawback to most of them is, that when

the box is shut, the stumping-chalk is apt to get over the contents of the box, making everything very dirty. I think the best and most economical arrangement is to glue a piece of washleather on to the bottom of a small cardboard box, such as pen-nibs are sold in. A drawing-pin stuck through this will keep it on the drawing-board, and the dust will not scatter over the drawing. Of course, keep the lid on when not in use. Unless you are careful, you will probably get quite as much stumping-chalk on your clothes and on those parts of the paper where you don't want it, as in its proper place.

The large paper stumps are not of much use; nice soft washleather ones are best for big work, and the small paper ones for finishing. Some amount of practice will be necessary before you can manage these tools properly. Take care not to bear too heavily upon the stumps, as this will soon spoil the surface of the paper as well as the stump itself. The powder should be free from lumps, and sometimes it is necessary to grind it a little if it is clogged together. The stump with which you put in the darks should be well filled with perfectly smooth powder and applied to the paper with just enough pressure to make the chalk adhere to the surface. It will be well to have several stumps of each size so that you may keep one for the very dark, one for the half dark, and so on, keeping also a clean stump in reserve for softening down edges. Decision and definite form are of more value than softness, but the latter is also necessary. In shading from models a sharpened Conté crayon is sometimes useful for drawing the lines which the edges of the objects make when they come in contact with the board or with other models, but even for this purpose it should be used sparingly. Distinctness without hardness must be your watchword. It will be a good plan to divide a sheet

of paper into spaces of about three inches square, and try to fill these with colours of different degrees of blackness as evenly as possible; you will probably find it much harder to keep the lighter shades even, than the darker ones.

When you can be sure of putting on, quite evenly, just the colour you want, it will be time to begin to work from the models. Begin with the cube. Although, in preparing your drawing for shading, it is advisable to draw in outline the shape of every shadow, and in shading from a vase or cast even to hatch lightly lines over the spaces which are afterwards to be shaded, remember that once you have commenced to shade your work, however difficult it may be to get the edges of the shadows to make out the form, you must in no case *draw a line* unless you are quite sure that you can see one in the copy. The triangular prism should be taken first. In shading these two models, all the difficulties which the straight line models present will be encountered, and the circular models may be attempted by way of a change, the cone first, then the cylinder, and last of all the sphere; in the cone it will be found that the high light is triangular in form, in other respects it is similar to the cylinder, which has been already illustrated as has also the sphere. The vases will require special attention and practice. The three vases are illustrated on page 80. You will notice how the actual colour—technically called the local colour—and texture of each jar modifies the light and shade.

In order to make your drawing of a group of models as true as possible, you must take advantage of everything which will help the illusion. A sharp contrast of black and white naturally arrests the attention. When objects are illuminated by artificial light, these parts will be the brightest which are nearest to the source of light and the shadows will

Fig 39.

appear darker by contrast. Allowance of course has to be made for difference of texture. The lights of those which are further off being less brilliant, the contrast of light and dark will be less violent. (It is taken for granted that your study is lighted by only one light.) Here, then, is one means of giving their relative position to objects almost as important as the perspective changes in size. The same kind of effect will be observed if you are working indoors by daylight, when of course the light should be from one window only; but out-of-doors the effect of distance is rendered rather by an alteration in the colour of the shadow, for in comparison with the immense distance of all objects from the sun, they may be considered as all equally near to it. In this, as in the elementary stage of the subject, the great thing is to see correctly, and these rules will help you to do so, but if you find something in your study which does not fit in with the rules, try to ascertain the reason of it; sometimes a false light is accidentally interfering with your subject, or it may be that the object is discoloured or dusty. If you cannot find out any solution to the difficulty, copy what you see. This will be especially necessary in working from the cast, for the changes in form together with the whiteness of the plaster often cause quite unexpected effects of light and shade, which can, of course, be accounted for when all the circumstances are taken account of; but this accounting for them presupposes more knowledge and experience on the part of the student than it is reasonable to expect at this stage of his or her progress. For instance, one would imagine that the projecting parts of a cast would certainly be the brightest, because they are nearest to the light; yet it will often be found that they are not so bright as the hollows which are not only directly illuminated, but also

receive reflected light from the surrounding white surfaces which are also in direct light. At the same time, it should be remembered that the projecting surfaces are the soonest discoloured by dust and exposure, and a feather brush will often remove a puzzling half tone.

The three drawings here given, Figs. 40 and 41, show three stages in the progress of a copy of the cast set this year for the elementary examination in shading

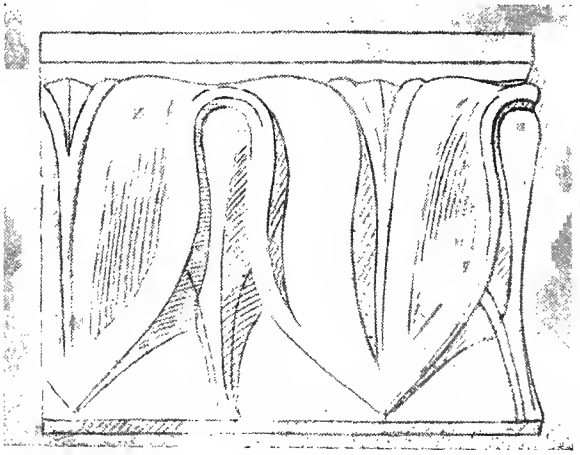


FIG. 40.

from the cast. It is hoped that these drawings, with what has been said, will sufficiently illustrate the method of work. Three hours are allowed for this examination. An illustration is also given, Fig. 42, of the cast set for the advanced examination, together with a small diagram of construction, Fig. 43. The outer circle has first to be divided into ten equal parts. Observe that one of the centre lines of the quatre-foil in the middle is part of one of the diameters which divide

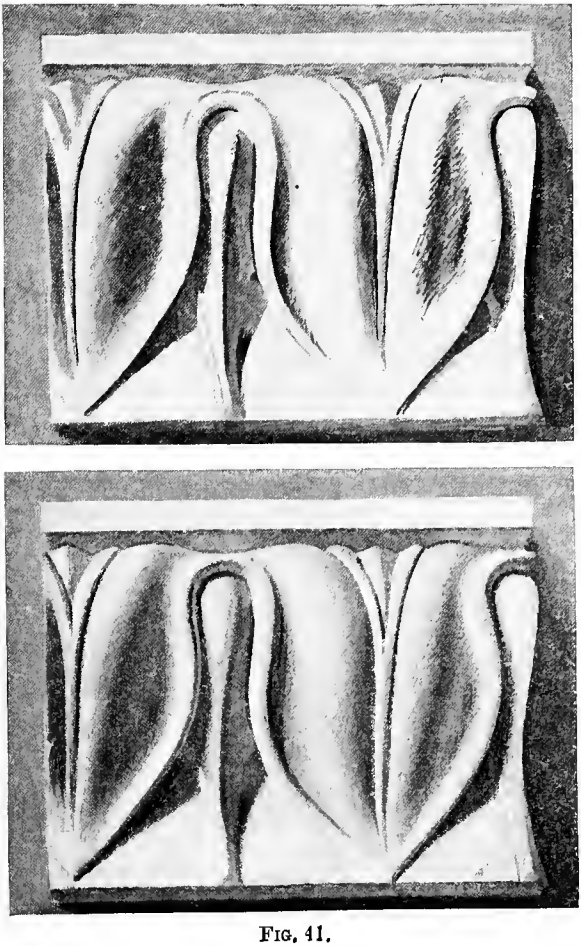


FIG. 41.

the circle into five parts, and that the other centre line is at right angles to it. Both of these casts would have to be drawn on a much larger scale for the examination. One of the instructions to the candidates in both these examinations is that the drawings are to be *lightly shaded*, and when your

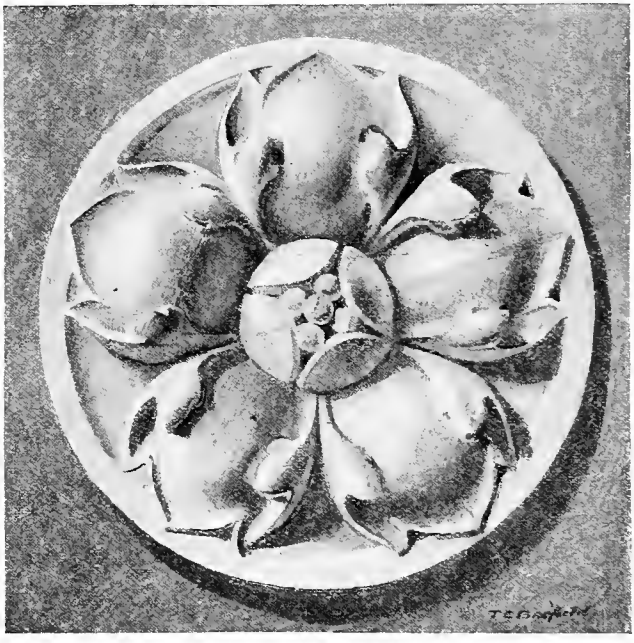


FIG. 42.

drawing is finished it should suggest a *white* cast. If there is time for it, the toning of the rest of the paper, as suggested in the three illustrations, will greatly assist this effect; but at an examination—for in the advanced stage four hours is the limit—there

is not often time for this, although, with a little practice, a tone can be quickly laid on with a piece of washleather. Two pieces of pointed india-rubber, one as hard as ink-eraser, will be required for removing the chalk; these will effect the purpose quite as well as stale bread, and are much more convenient. The above instructions are for working on white paper,

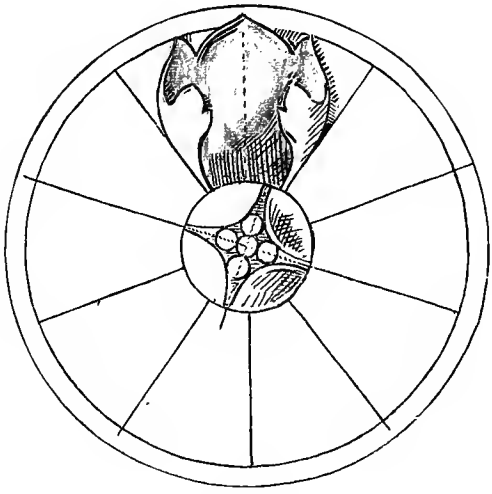


Fig. 43.

but it is very good practice to work on grey paper, making use of the colour of the paper for the half tone or middle tint, and rubbing out the high lights with the india-rubber. The paper* can be obtained ready tinted, and will be found very useful for advanced students; but beginners will have to do too much rubbing out before their outline is complete,

* Copnall's paper.

which will of course disturb the colour, to make the prepared paper quite suitable for them. It will be better to complete the drawing on white paper, and then, having made the lines rather firmer than would otherwise be advisable, cover the whole surface as evenly as possible with a light tone of chalk rubbed in with washleather, or with a stump specially prepared for laying on flat tones.* Working alternately with your stump and your india-rubber, you will find you can obtain very good effects very rapidly. Another method is to work on ordinary brown paper or on French grey paper, and put on the lights with white chalk or with Chinese white applied with a brush, but the processes are rather more complicated, and unless very carefully applied the lights are likely to appear detached. All drawings executed in chalk are very easily smeared and spoilt. As soon as completed they should be fixed with fixative or milk applied with a spray diffuser.

The last picture, Fig. 44, shows a reduced copy of a drawing, accepted for the art teacher's certificate, which is, of course, expected to be more completely finished, than the personal examination allows time for. For this purpose some cast in bold relief should be selected, not necessarily this particular cast, but one of about the same size and difficulty. If your drawing is submitted through a school of art or art class, the master of the class will give you all particulars about it; but if you send it direct to South Kensington yourself it must be mouuted on an imperial sheet of cardboard and have upon the mount a label stating that it is submitted for the art class teacher's certificate, which can be obtained on application to the Secretary, Science and Art Department. Works are received up to and including April 1st in each year.

The following extracts from the Science and Art

* Harding's stumps.

FIG. 44.

Directory, 1895, will be useful to those who are desirous of qualifying as teachers. They will be found on page 67.

11. The requirements for the ELEMENTARY DRAWING CERTIFICATE (First Class) are a First Class in the Elementary Stage of:—

(*a.*) Freehand Drawing (Subject 2*b*);

(*b.*) Model Drawing (Subject 3*a*);

(*c.*) *Drawing in Light and Shade from a Cast* (*Subject* 5*b*); and

(*d.*) A Pass in the Elementary Stage of Science Subject I.

Candidates who before the 1st January, 1893, have obtained—

(i.) A pass in Geometrical Drawing, Section 1, Science Subject I., or a pass in 2nd Grade Geometry, and also a 1st Class in 2nd Grade Examination in Linear Perspective; or

(ii.) A pass in Geometrical Drawing, Section 1, Science Subject I., or a pass in the 2nd Grade Examination in Geometry, and now take a 2nd Class in the Elementary Stage of the new Examination in Perspective; or

(iii.) A 1st Class in the 2nd Grade Examination in Perspective, and now take a pass in *Geometrical Drawing* (*Art*),

will not be required to pass in the Elementary Stage of Science Subject I. to obtain the new Elementary Drawing Certificate.

(iv.) A pass in Model Drawing with chalk on the blackboard taken before 1st January, 1893, will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Model Drawing (Subject 3*a*).

(v.) A pass taken before 1st January in Light and Shade will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Shading from Casts (Subject 5*b*).

(vi.) A 1st Class taken before 1st January, 1893, in the 2nd Grade Examination in Freehand will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Freehand Drawing of Ornament (Subject 2b).

(vii.) A 1st Class taken before 1st January, 1893, in the 2nd Grade Examination in Model Drawing will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Model Drawing (Subject 3*a*).

12. The requirements for the ELEMENTARY DRAWING CERTIFICATE (Second Class) are—

(*a*) a pass in the Elementary Stage of Science Subject I.;

(*b*) a 2nd Class in the 2nd Grade Examination in, or the Elementary Stage of, Model Drawing (Subject 3*a*; and

(*c.*) a 2nd Class in the 2nd Grade Examination in, or the Elementary Stage of, Freehand Drawing (Subject 2*b*).

13. For the ART CLASS TEACHER'S CERTIFICATE:

The satisfactory execution of the following works:—*

(*a.*) Subject 1*a*. Six or eight geometrical problems worked in ink with instruments; the problems being stated in writing. (On an imperial sheet.)

(*b.*) Subject 3*b*. An outline in pencil of ornament in low relief from the cast from the Madeleine or Louis XII. pilasters, or any large ornamental scroll. (On an imperial sheet.) Drawings from casts in relief of the same size as the originals may not be submitted for examination.

(*c.*) Subject 5*a*. A drawing from a group of models which should include vases such as those produced by Wedgwood or Minton, or similar objects placed upon a drawing board, drawn without background, and shaded in chalk or pencil. † (On an imperial sheet.) Enough of the board must be drawn to show that the Perspective is accurate. The horizon must be kept within the sheet of paper on which the models are drawn.

(*d.*) Subject 5*b*. A shaded drawing in chalk or pencil from a piece of ornament in high relief, or from casts of fruit. (On an imperial sheet.) Drawings from casts in relief of the same size as the originals may not be submitted for examination.

and a First Class in the:—

(*e.*) Elementary Stage of Perspective (Subject 1*c*).

(*f.*) Advanced Stage of Drawing in Outline from the Cast (Subject 3b).

(*g.*) Advanced stage of Shading from Models (Subject 5*a*).

(*h.*) " " Drawing in Light and Shade from a Cast (Subject 5*b*), and

(*i.*) A Pass in the Elementary Stage of Science Subject I ‡

14. For the ART MASTER'S CERTIFICATES:

These Certificates are only issued to Candidates who have

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* See Supplement to Directory for illustrations of the character of these works.

† Instead of work in chalk or pencil, drawing in sepia may be submitted and will be accepted for the certificate, the marks being awarded for correct drawing only and not for merit in water-colour washing.

‡ Privileges (i) to (iii) in par. 11, p. 67, are applicable to candidates who have obtained successes towards the Art Class Teacher's Certificate.

obtained the Art Class Teacher's Certificate. The requirements for the Certificate, Group 1.—(Elementary Drawing, Colouring, and Design) are—

The satisfactory execution of the following works:— *

(*a.*) Subject 1*c*. *One* Perspective problem stated in words and *clearly* worked in ink to *fill* an imperial sheet.

(*b.*) Subject 1*d*. A sheet of the classic orders of architecture carefully inked in, and not less than three mouldings shaded in Indian ink or sepia. The orders must be named and the authority for each drawing given with a reference to the building from which it is derived. (On an imperial sheet.)

(*c.*) Subject 2*b*. A sheet of diagrams derived from Dyce's Drawing Book, Albertolli's Ornament, Jacobsthal's Grammatik der Ornamente, and instruction in the School, showing the application of the principles on which Foliated Design is constructed. Under each diagram must be stated the principle it illustrates. Copies of examples merely blocked in are not sufficient. (On an imperial sheet.)

(*d.*) Subject 8*a*. An outline of the Figure from the cast. (On an imperial sheet.) The drawing should be a careful and accurate rendering of the contour of the figure and of such of the forms within the contour as can be rendered, or in some measure expressed, by a line. *Shaded drawings without back-grounds, if sufficiently accurate in form, will be accepted from candidates who prefer to work in that manner.*

(*e.*) Subject 10*a*. A sheet of Foliage drawn in outline from a freely growing plant. (On an imperial sheet.)

(*f.*) Subjects 14 and 22. A study, in colour, of a growing plant from nature, not pictorially represented (*i.e.* with accidents of light and shade), but simply and directly drawn, with details (separately if required) selected by the student as being characteristic of its growth and suggestive of ornament, together with three designs based upon the plant. These designs must occupy, in a decorative way, a square, a circle, and an oblong. One of them must be in monochrome, one in two colours, and one in polychrome. In each case the plant must be, not merely composed into the given space, but treated in accordance with decorative conditions. (On an imperial sheet.)

(*g.*) Subject 22*b*. A design in outline embodying the principles

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* See Art Supplement to Directory (price 2*s*. 6*d*.) for illustrations of the character of these works.

learnt in Subject 2*b*. (On an imperial sheet.) It is necessary that the ground be tinted with a wash of colour. The outline, which should be part of the design, must be executed with a broad pen or a brush.

and a First Class in—

(*h*.) Architecture; and

(*i*.) Principles of Ornament (Elementary Stage).

Female Candidates are not required to submit a work in Subject 1*d*, nor to sit for the Examination in Architecture.

15. Certificates for the other Groups (II. to VI.) of subjects of Art instruction are also granted on passing the Examinations, the details of which are given at page 287.

DRAWING IN LIGHT AND SHADE FROM A CAST.

ELEMENTARY AND ADVANCED STAGES.

(Subject 5b.)

Elementary Stage.

(3 *hours are allowed for the Examination in this stage.*)

Candidates are required to make a shaded drawing from a cast of ornament similar to those shown below (*see* Figs. 1 to 5). But the Department will supply the examples for use at the Examination. The drawing must fairly fill a quarter imperial sheet of paper and must be slightly larger in size than the cast.

Advanced Stage.

(4 *hours are allowed for the Examination in this stage, Fig.* 42.)

Candidates are required to make a shaded drawing, which must be slightly enlarged, from a cast of fruit or foliage, or from a rosette, centre of a scroll, or other cast of ornament in high relief, similar to those shown below (*see* Figs. 6 to 8). But the Department will supply the examples for use at the examination. The drawing must fairly fill a half imperial sheet of drawing paper.

N.B.—In respect of both stages the casts selected for use should be hung before the candidates in such a way that each of them is lighted by only one light. The size of the casts should be in fair proportion to the size of the drawing paper upon which the candidate is required to do his work.

I bring my task to an end with these particulars

of the examination in light and shade taken from the Science and Art directory, page 264 and following, which with the details of the certificate already given will, it is hoped, render the book a complete guide to model drawing and shading from casts.

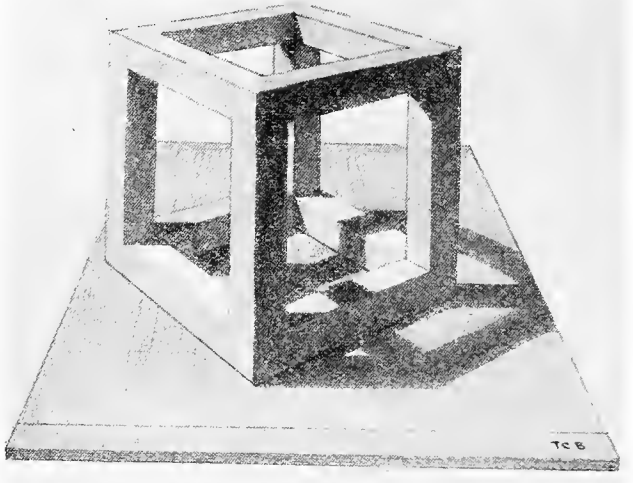

FIG. 45.

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CHARTS FOR MODEL DRAWING,

By T. C. BARFIELD.

10 *Imperial Sheets*, 8*s*. *Mounted on rollers, varnished*, 18*s*.; *on linen only*, 17*s*.

Sheets 1 and 2 are occupied with illustrations of some of the principles necessary to be understood in order to draw intelligently. With notes upon them for the teacher's use. Several important rules are also given.

No. 3 is a group of models to show the convergence of all horizontal lines in the Horizon; a small perspective diagram of the same group shows all the retiring lines actually carried out to their respective vanishing points.

In No. 4, the convergence of inclined lines is demonstrated by the same method.

Special methods for drawing several models are given in Lessons 5, 6, and 7, with notes of the perspective of pentagons and hexagons.

No. 8 is an important lesson, illustrating the perspective of circles in various positions, and the method of drawing them.

In No. 9, the actual shape of several vases is carefully compared with their usual appearance by means of separate diagrams. The concluding lesson shows the plan of a simple group of models, with the positions of nine separate points of view, and the picture obtained from each place is shown.

These lessons are the outcome of many years' practical experience, and will prove a safe guide to this interesting subject. They will be found specially adapted for preparing students for the Second Grade Examination.

NEW APPARATUS FOR MODEL DRAWING.

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Designed by T. C. BARFIELD, Author of "Charts for Model Drawing."

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A special feature both of the Charts for Model Drawing and of this newer work is the importance given to "The Field of Vision." The reports of both examiners and inspectors point to the very general neglect of this important matter.

The Opsimeter is a wire framework representing the cone of rays, the apex being removed for the spectator to look through. The circle at the base represents the Field of Vision, and is of the size generally agreed upon as representing the normal limitation of sight; it can be very easily rotated, so as to make the field of vision include what is required to be drawn. The axis of the cone corresponds to the direction in which the spectator is looking, and thus affords a concrete illustration of that most important but apparently little regarded line; and as the Field of Vision is *fixed* at right angles to this, the horizontal wires upon this outer circle give a safe means of comparing the direction of lines which are known to be horizontal in reality. *The models cannot be seen at all until they are in such a position as it is possible to represent properly*, and by the use of this apparatus the initial difficulties of model drawing may be overcome without once naming the Picture Plane, which is very often a source of great difficulty in this subject, alike to those who understand Perspective and to those who do not. The Opsimeter can also be directed upwards or downwards, thus facilitating experiments proving the convergence of vertical lines under these conditions.

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(12) SKELETON CUBE.
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