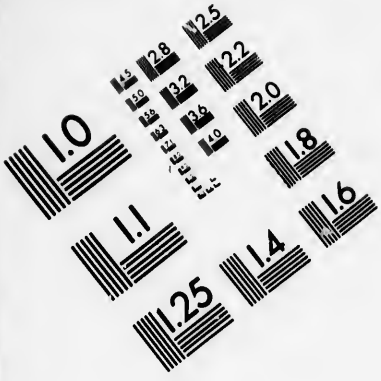

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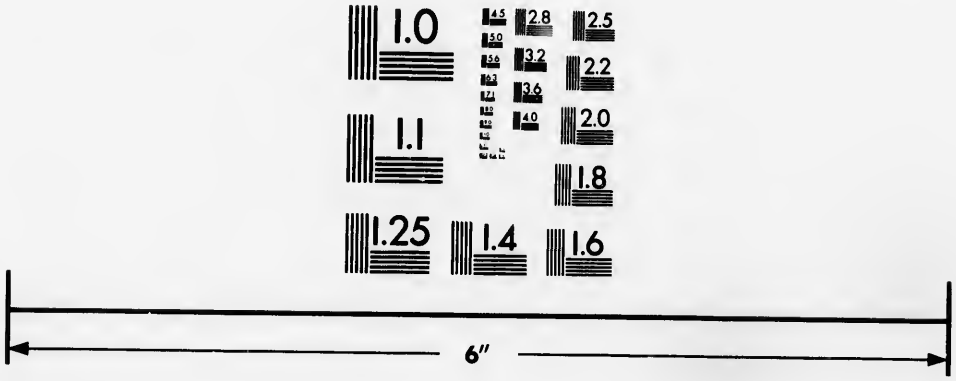

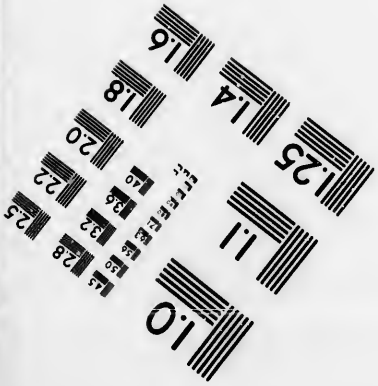

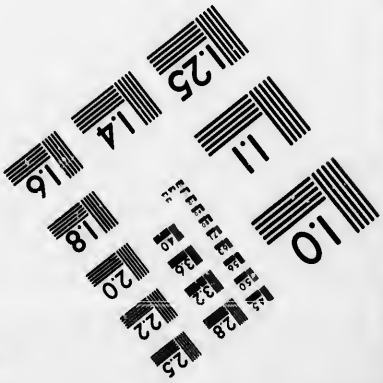

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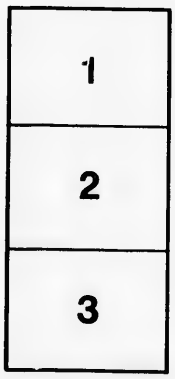

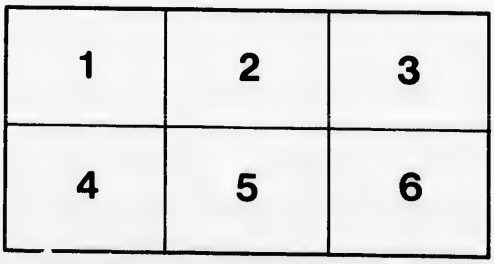

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INTRODUCTORY REMARKS.

OBJECT DRAWING may be appropriately called freehand perspective, or memory drawing. Either one of these three names partially describes its character and the three together indicate what it really consists of. It may appear to some that the subject is not of any great importance, as compared with freehand, geometry or perspective, these three being of such practical utility to the artisan and artist, apart from their value as educative mediums. But when it is considered that object drawing embraces these three other subjects, and is the practical application of them, it must be treated as being equally, if not more important than either of them. The power to represent objects with facility is not the greatest benefit to be derived from it by the majority of those studying it, in fact this should be looked upon as a mere secondary consideration, even by those who study it as forming part of an art education.

In order to properly prosecute the study of object drawing it is necessary to become familiar with the forms and construction of common objects, and this, of course, presupposes that these objects have been examined, not carelessly, but critically, until the facts of their forms are indelibly impressed upon the memory. The close observation of things is one of the most useful habits which a person can form, and the student is earnestly advised to cultivate it. It is the tendency to lead to the cultivation of observation which makes object drawing such an important subject, and in order to reap all the benefits to be derived from it, it should be studied honestly and assiduously on the lines indicated in this little book.

In object drawing no instruments other than pencils and rubber should be used. The pencils recommended for freehand, viz., H and HB are suitable for object drawing and should be kept well sharpened.

The outline of an object should be drawn as lightly and carefully as possible, and afterwards "lined in" with a firm, decided stroke. For the first sketch the H pencil should be used, and the HB pencil used for "lining in."

The student should strive earnestly to avoid the habit that very many fall into of drawing their lines almost at random, and if not correct, patching them with short strokes, making their work look untidy in the extreme. The lines should not be "painted" or "dotted" in but drawn without hesitation, firmly and carefully. A good plan to adopt is to first decide in what direction a line is to run and mark two points, judging their position so that they will indicate not only the direction of the line but its length also, and draw the line from point to point without stopping, unless it is a very long one. In the case of a curved line several points may be used, but they should not in any case be placed less than half an inch apart. These points should form part of the line when it is drawn and so unless they are selected with great care they might better be omitted altogether.

The geometric outline of every object should be drawn first, no matter how expert the student is with his pencil, and how familiar he is with the mode of representing an object. Attention to this will save many disappointments and much annoyance.

It is not expected that the vanishing lines in an object shall be drawn by means of a ruler, to a vanishing point selected and marked on the paper. All vanishing points should have an *imaginary* existence to the student but their position should be selected with care, and the lines vanishing in them be drawn freehand towards them as nearly as possible, and not any longer than is judged necessary. Mathematical accuracy in the freehand drawing of an object should not be looked for. It should be considered quite satisfactory if it represents with a certain amount of truth the facts of the form of the object, more especially its proportions, for if they are right the details are almost certain to be right too.

Sometimes, through not being perfectly familiar with the form of an object, it may be difficult to decide just where or how to commence a drawing of it. Unfortunately even the most common objects around us have not been examined by us as they should be, and many will no doubt find this out. In such a case, the best and in fact the only wise thing to do is to find the object in question, examine it carefully, making notes of the form, size, and relative position of its parts, if necessary to impress them on the memory, and not till then to attempt to draw it, and to draw it without referring again to the object itself, unless for the purpose of criticizing the drawing and correcting errors. If the working of the exercises is carried on in concert in a school it would be well for the teacher to have the object required present before the pupils if possible, give them an opportunity to examine it and then analyse it before them, making constructive drawings of its various parts on the blackboard. After this the pupils might commence to draw.

In every case the drawings should be made as large as the space allotted to them will allow.

In the last two illustrations a little shading is used for the purpose of adding interest to them, but the student should not look upon this as an example for him to follow. He should confine his whole attention to form, and let light and shade alone until he is expert in drawing correct outlines, and even then not to meddle with it until he has had some instruction in representing shades of different tones by means of a pen or pencil.

HIGH SCHOOL DRAWING COURSE.

OBJECT DRAWING.

Object Drawing, as distinguished from Model Drawing, is the drawing of objects from memory, or from the knowledge of their construction possessed by the student, and when in the exercises a drawing of a table or a chair is asked for, it is supposed, not that he has a table or a chair before him to copy, but that he knows the shape of the different parts of a table or a chair, and how they are put together, and is so familiar with the manner of representing lines of different kinds in different positions, that he can without hesitation draw the different parts of a table or chair in any position that may be required.

The necessity of possessing this knowledge of the shape and construction of familiar objects does not present any serious difficulty, as it requires only that the student shall use his eyes.

Object drawing is in reality the combination of three other branches of elementary drawing treated of in this series, viz.: Freehand, Geometry and Perspective Drawing, and is the end towards which all instruction in elementary drawing should be directed. Though somewhat similar, as regards its results, to model drawing it is as much in advance as model drawing is in advance of drawing from flat copies, inasmuch as it is almost purely a mental process. Model drawing is copying what is seen; object drawing is drawing what is imagined. In the one the eyes supply the necessary information; in the other it is supplied by the memory and imagination.

The principles of perspective govern the representation of objects in object drawing as in model drawing, and thus no new facts or rules have to be learned. But these principles have to be applied practically, and this is apt to puzzle the student unless he is thoughtful. He must be prepared to apply them to the representation of objects placed in any and all positions. It may be well, therefore, to simplify them as much as possible.

It is patent to everybody that objects appear to decrease in size as they are removed away from the eye. Hence, starting with this fact, if two parallel lines of equal length, one being more distant than the other, be represented in perspective, the more distant one will appear to be the shorter, and if lines be drawn joining their extremities, they will, if produced, meet. Thus it is seen that the principle of converging lines is dependent upon the fact thus stated, in fact, all or nearly all the principles of perspective can be traced back to it.

The great majority of objects, especially those made by man, can be analysed, or resolved into the elements which enter into the composition of their forms. These elements may be considered to be the simple geometric planes and solids, and it may be necessary at times to further resolve the solids into planes and the planes into lines. As an illustration, a barrel may be said to be based upon the cylinder, a pail upon the frustum of the cone, a table upon the parallelopiped, a house upon a parallelopiped and a triangular prism, or a parallelopiped and a pyramid, etc.

As a matter of fact it may be said, that if a student possesses the ability to represent properly any of the geometric planes and solids in any position, he can draw any manufactured object that can be mentioned.

The manner of representing geometric planes will be considered first.

Commencing with the square:—It will need but a moment's thought to convince any one that if a square be in a plane which is perpendicular to the picture plane and which contains the

centre of vision, it will be represented by a line; and that as it is removed away from this plane it will appear to become wider, as shown in figs. 1, 2, and 3. These illustrations need no explanation. After the lessons in perspective given in book number three of this series, the student will understand them.

Fig. 1. shows a square in various positions when its plane is vertical and perpendicular to the picture plane.

Fig. 2 shows a square in a number of positions when its plane is horizontal, and Fig. 3 shows a square in several positions when its plane is perpendicular to the picture plane but at different angles with the ground plane. In all of these squares two sides are represented as being parallel to the picture plane.

A very little observation and thought will serve to impress these facts of appearance upon the mind so that when the position of a square is given it can be drawn without any hesitation.

If, instead of a square, an oblong be required, it can be drawn by using a square as a basis and lengthening two opposite sides in the same direction and joining their extremities by a line drawn

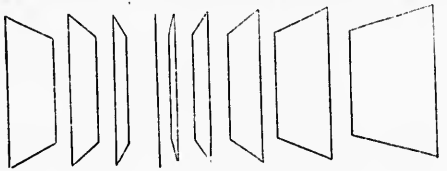


FIG. 1.

towards the vanishing point of the other sides. This is shown in Fig. 4, where *a b c d* represents a square in different positions, and *a b e f* an oblong.

Sometimes it may be required to draw an oblong the length of which is twice its width. In this case draw a square, as *a b c d* Fig. 5, draw its diagonals to find the centre, and through the centre draw a line towards the vanishing point of either pair of sides according to circumstances. Then the oblong *a b e f* will be the one required. An oblong of any proportions may be obtained by drawing a square with its diagonals, drawing a horizontal line through the centre, dividing this horizontal line into the proper number of parts, and drawing lines through the points of division towards the vanishing point of the sides cut by the horizontal line. Thus if an oblong be required its sides to bear the ratio of 4 to 5, construct a square the sides of which will represent 5, divide the horizontal line into five equal parts and draw a line through the fourth division as shown in Fig. 6, where *a b c d* is the oblong required. Fig. 6 shows also an oblong the

sides of which bear the ratio of 3 to 7. In case the long sides of the oblong are required to be parallel to the picture plane, proceed as before, and through the point (*e*) where the line corresponding to *b c*, Fig. 6, intersects the diagonal of the square, draw a line towards the vanishing point of the sides cut by *b c*.

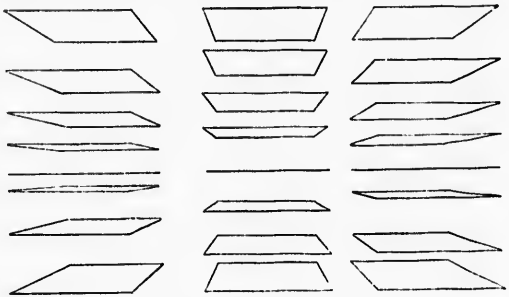


FIG. 2.

The square may be used as the basis of the equilateral and other triangles, and several of the polygons, so that the pupil will do well to make himself perfectly familiar with the manner of representing it. For the present, however, it will be necessary to leave the representation of the square when none of its sides are parallel to the picture plane, as the student would not understand it thoroughly until after the perspective appearance of the circle is understood.

FIG. 3.

The perspective appearance of the circle follows the same rule as the appearance of the square, that is, when in a plane perpendicular to the picture plane and which contains the centre of vision, it is represented by a line, and its apparent width varies according

EXERCISE 1.—Draw three squares, their planes being vertical and perpendicular to the picture plane. Show one as being opposite to the eye, another as being to the right of the first, and the third as being to the left of the first. Make the apparent longest side of each about two and a half inches long, and two sides of each parallel to the picture plane.

EXERCISE 2.—Show the appearance of squares in the following positions:—

(1) Two sides perpendicular to picture plane, plane horizontal, on a level with the eye and to the left.

(2) Two sides parallel to picture plane, plane horizontal below the eye and to the right.

(3) Two sides parallel to picture plane, plane inclined upwards towards the right, above the eye and to the left.

(4) Two sides perpendicular to picture plane, plane inclined downwards towards the right, below the eye and to the left.

EXERCISE 3.—Draw three squares, their planes being vertical, two sides of each parallel to picture plane, one to the left and the others to the right, either above or below the eye. Convert each square into an oblong.

EXERCISE 4.—Draw in freehand perspective the following oblongs:—

(1) Plane horizontal, long sides parallel to picture plane and twice the length of the short sides, below the eye and to the right. Also show this oblong when its short sides are parallel to the picture plan[illegible]s plane is horizontal, and it is above the eye and to the right.

(2) Plane vertica[illegible], to the left of the eye, short sides one-third the length of the long sides and perpendicular to the picture plane, the lower one of the short sides on a level with the eye.

to its distance from this plane. But one new fact in connection with the circle is, that the transverse axis of the ellipse representing it is *always* perpendicular to the apparent direction of the axis of the circle, that is a line passing through the centre perpendicular to its plane. Hence when the plane of a circle is horizontal, in which position the axis is represented by a vertical line, the transverse axis of the ellipse representing it is horizontal.

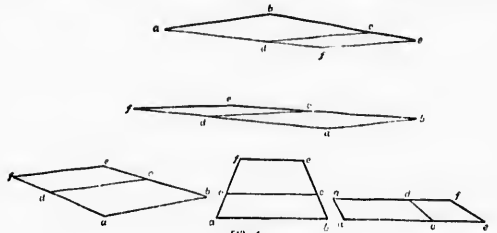


FIG. 4.

This appears to be a contradiction of the results obtained in some of the problems and exercises in the book on Linear Perspective of this series, and to a certain extent it is. In illustration Fig. 32, Book 3, the transverse axis of the ellipse representing a circle having its plane horizontal, is not horizontal, and the student may with some show of reason say that either the principles of perspective as laid down and explained are incorrect, or that the statement made in the last paragraph is false.

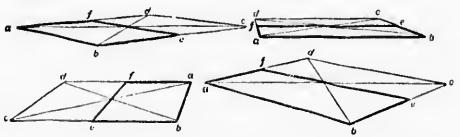


FIG. 5.

If the student refers back to the book on Linear Perspective and reads the fourth paragraph of page 3, he may perhaps be able to account for the apparent discrepancy. When any one is making a drawing of an object, his eye is fixed upon different parts of it as his work proceeds, and as the direction of his gaze is represented by the line of direction, the line of direction is being constantly changed, as is also the picture plane which is always perpendicular to the line of direction. From this it is evident that the only rays of light which render objects visible for the purposes of drawing correspond to the line of direction. A rule to be deduced from this is *that all visual rays must pass through the picture plane at right angles to it*, hence a drawing of an object will require the use of perhaps a dozen or more picture planes, each one of which will contain the representation of some particular part of the object.

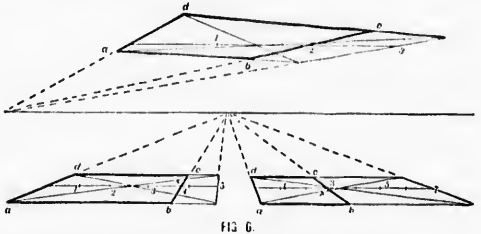


FIG 6.

Strict attention to this fact, however, would complicate most terribly a perspective problem, and for this reason it is assumed that there is only one picture plane, that the centre of vision is fixed, and that any object lying within the field of vision can be seen distinctly and be properly depicted upon the picture plane.

About the only way out of the difficulty is to consider the picture plane to be a curved surface, that is, the interior surface of

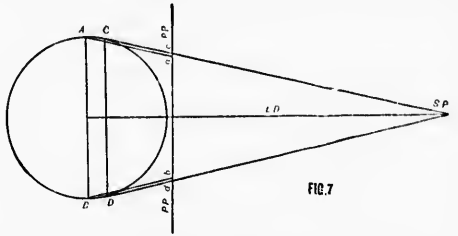


FIG.7

a sphere the centre of which is the spectator's eye, and the radius of which is equal to the length of the line of direction.

In model or object drawing, in order to prevent distortion, the object drawn is supposed to be always directly in front of the spectator, and if it is not in this position, he is supposed to, if he

EXERCISE 5.—Show the appearance of the following oblongs:

(1) Sides as 2 to 3, two shorter ones parallel to picture plane, plane horizontal, above the eye to the right.

(2) Sides as 4 to 6, two shorter ones perpendicular to picture plane, plane vertical, below the eye and to the left.

(3) Sides as 2 to 7, longer ones vertical, plane inclined away from the eye towards the left, centre on a level with the eye and to the right.

EXERCISE 6.—Show the difference in appearance between a square and an oblong the sides of which are as 3 to 5, the shorter ones being equal in length to the sides of the square. The planes of both are vertical and two sides of each are parallel to the picture plane. The square is to the left and the oblong to the right of the eye, its long sides being perpendicular to the picture plane, and both square and oblong are below the horizon.

EXERCISE 7.—In the space below draw oblongs the sides of which will be as 2 to 3, 4 to 7, 3 to 8, 5 to 6, 6 to 2, and 1 to 4, making the plane of each perpendicular to the picture plane and either horizontal, vertical or oblique at pleasure. Show two sides of each parallel to the picture plane, and arrange them in different positions either above or below or to the right or left of the eye. Make the drawings as large as convenient.

actually does not turn his body and drawing materials until his line of direction passes through some conspicuous part of the object, even if this causes the line of direction to be other than horizontal. It will, perhaps, be evident to the student from this, that there is nothing about the drawing of an object taken by itself, to indicate its position with regard to anything but the picture plane. Our idea of the size and position of objects is formed by comparing them with one another and with certain things which are fixed, as the surface of the earth and the horizon, or, in other words, with a horizontal plane.

It is evident that a circle cannot be placed so that one of its diameters is not parallel with the picture plane, and that the diameter, which is parallel to the picture plane, suffers no change of direction or diminution in length by foreshortening, but only by reason of its distance from the picture plane. This diameter, however, is not represented by the transverse axis of the ellipse representing the circle. Reference to Fig. 7 will make it plain that the apparent widest part of a circle or a sphere is a little nearer to the eye than the centre, and it is this apparent longest line (*C D*, Fig. 7) which is parallel to the picture plane that is represented by the transverse axis of the ellipse. It will be seen that the relative lengths on the picture plane of *A B* and *C D* are *a b* and *c d*, the diameter *A B* appearing the shorter.

The fact that the transverse axis of an ellipse does not correspond to a diameter of the circle it represents, can be proved by drawing a square containing a circle and representing both in perspective. The perspective centre of the circle, found by drawing the diagonals of the square, is above or below the transverse axis of the ellipse according as the circle is represented as being below or above the level of the eye, the transverse axis of the ellipse being in the centre of the ellipse, bisecting the conjugate axis.

This, together with the relative foreshortening of the diameters of the circle, is shown in Fig. 8, which illustrates the appearance of concentric circles. The diameter *A B*, of the largest circle is divided into eight equal parts, and other circles are drawn with the same centre, their circumferences passing through the points of division. If these circles be horizontal one diameter of each will be horizontal, and they will be in the same line. Suppose this line to be *C D*, then *C D* will contain the apparent longest diameter of the circles and *A B* the shortest diameters. The line

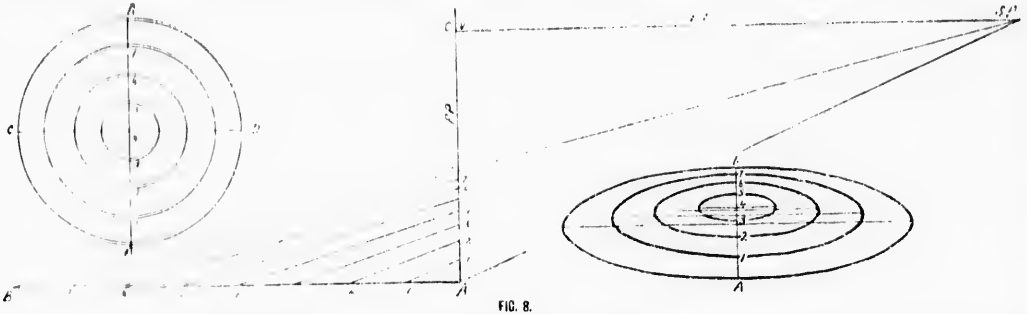


FIG. 8.

A B will be divided into eight parts all unequal, while the divisions of *C D* will be equal.

Let S P represent the position of the eye of the spectator, P P the picture plane, L D the line of direction, and *A B* with the divisions 1, 2, 3, 4, 5, 6 and 7, the diameter, *A B*, of the largest circle perpendicular to the picture plane. The rays of light passing from the points 1, 2, 3, 4, etc., in *A B* to S P, cut the picture plane in the points 1, 2, 3, 4, 5, 6, 7, *b* which give the perspective positions of these points as compared with *A*. The divisions of *A B* decrease in size as they approach *b*. The point 4 indicates the position of the centre of the circles as compared with *A* and *b*. As stated before, the transverse axis of an ellipse bisects the conjugate axis. Thus the transverse axes of the four ellipses in question will be midway between *A* and *b*, 1 and 7, 2 and 6, and

EXERCISE 8.—Show the appearance of a circle touching the picture plane below the eye, its plane being horizontal. Make its apparent longest diameter about three inches long.

EXERCISE 9.—Two circles of the same size standing upright with their planes perpendicular to the picture plane, one touches the picture plane, and the centre of the other is twice the length of the diameter away from the centre of the nearer circle, in a line perpendicular to the picture plane. Both circles are to the right with their centres on a level with the eye. Find their relative sizes and positions, supposing their diameters to be two inches long.

EXERCISE 10.—Draw in perspective a circle above the eye and to the left, its plane being perpendicular to the picture plane and inclined upwards towards the right. Make the transverse axis of the ellipse at least three inches long, and show by a point the position of the centre of the circle.

EXERCISE 11.—A circle has its plane at an angle of 45° to the line of direction and vertical, its centre is below the eye to the right. Show its appearance, and in it draw two concentric circles.

3 and 5 respectively. It will be seen, therefore, that the transverse axes of the different ellipses will not be in the same line as might be supposed, but are separate from one another, the axis of the smallest ellipse approaching nearest to the perspective centre of the circles.

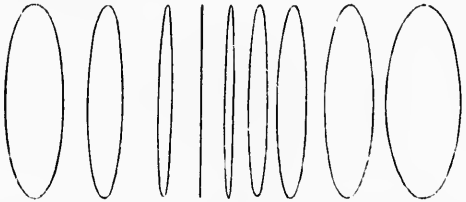


FIG. 9

Fig. 9 shows a number of circles when their planes are vertical, and Fig. 10 shows a number of circles when their planes are horizontal.

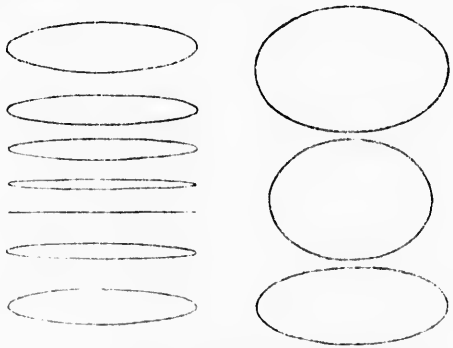
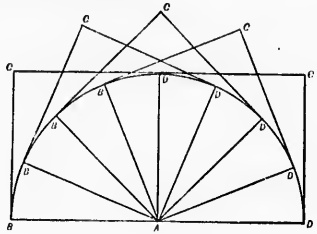


FIG. 10.

In drawing the ellipse it is well to commence with the transverse and conjugate axes at right angles to one another, and on them set off from the centre, half of the apparent length and width of the ellipse. The curve can then be drawn through the four points thus obtained, taking care that the ends are neither too sharp nor yet too much rounded.



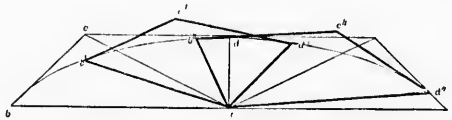


FIG. 11.

Now that the circle has been dealt with, the student is in a position to understand the manner of representing the square when the sides form angles other than 90° with the picture plane.

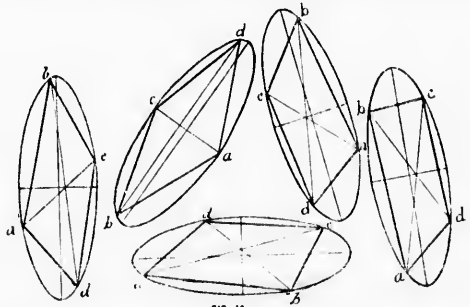


FIG. 12.

Suppose a square to be placed in front of the eye its

EXERCISE 12.—Show the perspective appearance of a square two sides of which form angles of about 40° with the picture plane and all four sides of which are horizontal. Its centre is in front of spectator and below the eye.

EXERCISE 13.—The sides of an oblong are as 4 to 6, the longer ones retiring towards the right at an angle of about 60° to the line of direction, it is in front of and above the eye, its plane being horizontal. Show its appearance.

EXERCISE 14.—Represent the oblong of Exercise 13 when its plane is vertical and perpendicular to the picture plane, its shorter sides are horizontal, forming angles of 45° with the picture plane, and it is to the left of the eye with its centre below the horizon.

EXERCISE 15.—A square is below the eye and to the right; its plane is perpendicular to picture plane and inclined upwards towards the right, and two sides form angles of about 35° with the picture plane. Show its appearance.

plane horizontal, two sides parallel to the picture plane, and one side in a vertical plane containing the line of direction, as *A B C D* in Fig. 11. Imagine it now to be turned about the point *A* so that its sides shall occupy the different positions indicated by the letters *A B C* and *D*. The side *A B* is in the picture plane in the first position, and is perpendicular to it in the last position, while the side *A D* which is perpendicular to the picture plane in the first position is in it in the last position. The sides *A B* and *A D* being rotated, each trace a quadrant, and these quadrants form a semicircle, the radius of which is equal to the side of the square.

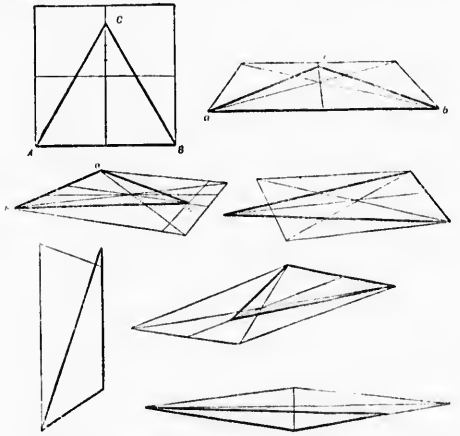


FIG. 13.

If this semicircle were represented in perspective it would appear as shown in Fig. 11, and the ends of two of the sides of each square would be in its circumference. In its circumference select any point, as *b'* or *b''*, noting whether it is above or below the diagonal *a c*, and if it is below, as *b'*, mark a point on the other side of the semicircle above the diagonal, as *d'*. If the point corresponding to *b'* is in the diagonal on the one side, the point corresponding to *d'* on the other side must be in the diagonal also. Having obtained two sides of the square, the others can easily be found by lines drawn towards the proper vanishing points. Fig. 12 shows a number of squares in different positions

drawn by means of this rule slightly modified, that is to say, the square is supposed to be enclosed in a circle. This circle is drawn first and its centre marked a little to one side of the transverse axis of the ellipse, according to the position of the circle. In the curve of the ellipse select any point, as *a*, and from it draw a line through the perspective centre of the circle. This line will be one diagonal of the square required. Next notice whether this point, *a*, is nearer to the transverse or conjugate axis of the ellipse. If nearer to the transverse axis, then mark a point, *b*, nearer to the conjugate axis on the corresponding side, and from *b* draw a line through the perspective centre of the circle to cut the curve of the ellipse in *d*. Join *a b*, *b c*, *c d* and *d a*.

In order to make use of the square as a basis for the representation of the isosceles or equilateral triangle, the centre of the

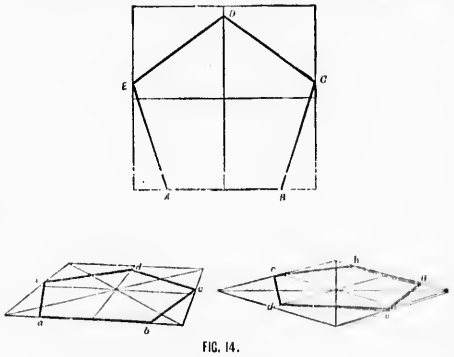


FIG. 14.

square must be found by means of the diagonals and through the centre a diameter drawn from the side corresponding to the base of the triangle. Of course it is necessary first to place the square in such a position that one of its sides corresponds to the direction of the base of the triangle. On the diameter drawn, mark a point inside the square, or beyond it on the diameter produced, which will correspond to the vertex of the triangle, and join this point to the extremities of the base. It will be well sometimes to draw both square and triangle geometrically, as in the case of the equilateral triangle, in order to find the position of the vertex with regard to the side of the square. It will be found by experiment that the altitude of the equilateral triangle is about $\frac{7}{8}$ of the base, and in drawing it the diameter of the square may

EXERCISE 16.—Spectator stands looking at a wall, the proportions of which are: height 3, length 7, thickness 1. One corner of the wall is in front of spectator and it retires towards the left at an angle of about 30° to the picture plane. Spectator's height is one-half of the height of the wall. Represent in the face of the wall a rectangular door and two circular windows. Make the drawing about seven inches in length.

EXERCISE 17.—In the roof of a shed inclined upwards to the left at an angle of about 45° with the ground, and the horizontal edges of which form an angle of about 45° with the picture plane, is a circular opening. The roof is square and to the left. The eye of spectator is supposed to be a little distance below the lower edge of the roof. Show the roof and opening.

EXERCISE. 18.—Four posts are set upright in the ground so as to enclose an oblong, the sides of which are as 5 to 8. The length of the posts above ground is two-fifths of the length of the short sides of the oblong. The long sides of the oblong are at an angle of 40° to the picture plane inclined away towards the right. One corner of the oblong is opposite to the eye and the eye is one-half the length of the posts above them. Show the position and appearance of the posts.

be divided into eight parts, as explained in connection with the drawing of the oblong, and the seventh division joined to the extremities of the base. In the case of the right-angled triangle, join one of the sides, produced if necessary, to the extremity of the adjacent side. A scalene triangle will not often be required. Fig. 13 shows the method of drawing triangles of different kinds in different positions.

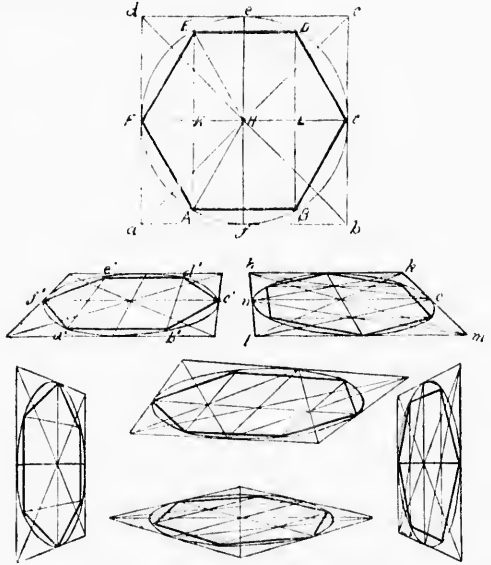


FIG. 15.

It is necessary to draw the polygons geometrically, enclosed in squares, before proceeding to represent them perspectively, so that the positions of their corners as compared with the corners and sides of the square can be determined. In the case of the pentagon, Fig. 14, it is seen that two angles are in the base of the square, one in each of the right and left hand sides, and one in the vertical diameter a little distance from the upper extremity.

In the perspective representation, unless it is obtained by the rules of perspective worked out as explained in the book on Linear Perspective of this course, it is not supposed to be mathematically correct, as the points must be determined by judgment of the eye alone. Too exact rules for finding them would only unnecessarily hamper the student in his work. Illustration Fig. 14 shows how the pentagon would be represented, and where the points corresponding to *A B C D* and *E* would be placed when the pentagon is in different positions.

In the case of the hexagon enclosed in a square it will be seen that its centre coincides with the centre of the square, and that

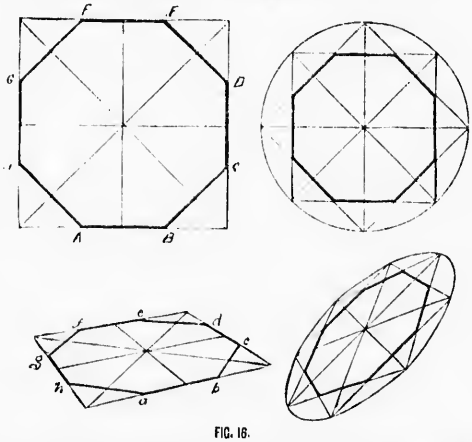


FIG. 16.

two of its angles, *F* and *C* (Fig. 15), coincide with the extremities of one of the diameters of the square. If the hexagon be enclosed in a circle the circumference of which will touch each of its angles, and each of the sides of the square, and if *E* and *A* be joined to the centre, *H*, of the hexagon and *E* and *A* be also joined, then *E A* will bisect *F H* in *K*, and similarly *D B* will bisect *H C* in *L*, and *F C* will be divided into four equal parts, and the points *K* and *L* will be the centres of the oblongs *a d e f* and *b c e f* respectively.

This geometric construction will make it easy to obtain the perspective appearance of the hexagon in any position. First

EXERCISE 19.—Draw in perspective an equilateral triangle, one side of which is parallel to the picture plane, its plane being horizontal and below the eye and its vertical angle to the left.

EXERCISE 20.—Show the same triangle when its plane is vertical perpendicular to the picture plane and to the right of the eye; one side being perpendicular to the picture plane and its vertical angle being above the level of the eye.

EXERCISE 21.—An isosceles triangle the base of which is one-fourth of the altitude lies on the ground with its base inclined towards the left at an angle of 40° to the picture plane. The triangle is opposite to the eye. Show its appearance.

EXERCISE 22.—Show the appearance of a right-angled triangle its plane being horizontal, above the level of and in front of the eye; its hypothenuse parallel to the picture plane and its sides as 3, 4 and 5.

the square with its diagonals and the diameter corresponding to $F'C$, and the enclosed circle must be represented in the proper position. Then, if two sides of the hexagon are parallel to the picture plane, divide the diameter $f c$ into four equal parts and through the points of division draw lines towards the vanishing point of $a\,d$ and $b\,c$ to cut the curve of the ellipse in $a'\,b'\,d'$ and e', and draw lines joining the six points thus obtained as shown in Fig. 15.

If two sides of the hexagon are not parallel to the picture plane, having drawn the square and circle in the proper position as explained, draw the diameter corresponding to $n\,o$. (Fig. 15.)

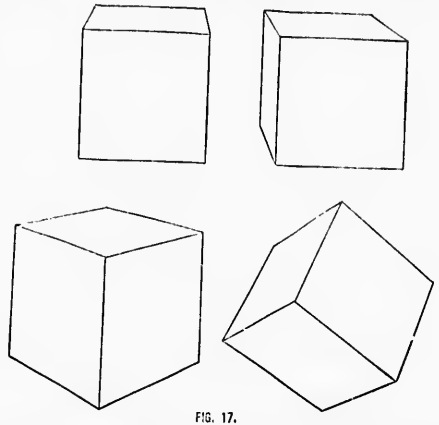


FIG. 17.

Next draw the diagonals of the oblongs $n\,h\,k\,o$ and $l\,n\,o\,m$ to find their centres, and through their centres draw lines towards the vanishing points of $h\,k$ and $l\,m$ to cut the curve of the ellipse. The positions of the six angles of the hexagon will thus be obtained, no matter in what position it may be placed. Fig. 15 shows the hexagon in positions other than those referred to.

The octagon may be treated in two ways, as shown in Fig. 16. It may be enclosed in a square, or two equal squares, so placed that the diameters of each are in the diagonals of the other, may be enclosed in a circle. The portions of the sides of the squares lying between the points of intersection of their sides form an

octagon. In using the first method the positions of the points a, b, c, d, etc., are determined as in the case of the pentagon, that is by judgment of the eye, hence the result is, perhaps, not so exact as that obtained by using the second method, by means of which a somewhat exact result can be arrived at. The best way of proceeding is to draw in the proper position a square, the diameter of which will correspond to the diameter of the octagon required, and enclose it in a circle. Next draw the diameters of the square, producing them to touch the curve of the ellipse and join the points thus obtained.

It is not considered necessary to deal with the manner of representing any of the other polygons, as they will very seldom

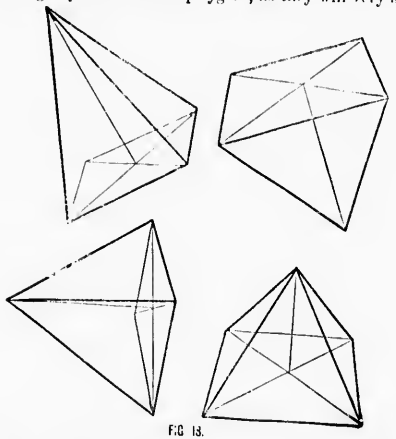


FIG 18.

be needed, and if they are the student will, no doubt, be able to modify some of the methods already explained to suit any case that may present itself; or he may exercise his ingenuity and originate a method of his own.

The next step will be to use the geometric planes mentioned in the preceding pages, and convert them into geometric solids.

Commencing with the square: we may be supposed to have a combination of six squares to form a cube, or of squares and oblongs to form a parallelopiped, of squares and triangles to form a prism, or of a square and triangles to form a pyramid. These most common combinations in which the square is present will

EXERCISE 23.—Draw in freehand perspective an isosceles triangle, its altitude being three times the length of the base, its plane being perpendicular to the picture plane and inclined upwards towards the left at an angle of about 60° to the ground. Its base is in the ground plane below the eye and to the left.

EXERCISE 24.—Show the appearance of a right-angled triangle, the sides containing the right angle being as 2 to 4, its plane being vertical and at an angle of about 45° to the picture plane, one corner of base opposite to and below the eye.

EXERCISE 25.—Draw in perspective a regular pentagon, one side of which is parallel to both picture plane and ground plane to the right of and slightly above the eye. The plane of the pentagon is horizontal.

EXERCISE 26.—Show the appearance of the pentagon of last problem when its plane is perpendicular to the picture plane and inclined upwards to the right at an angle of about 45° to the ground plane, one of its sides being parallel to the picture plane.

present no difficulty to the student if he has made himself familiar with the representation of the square in all positions, and he will

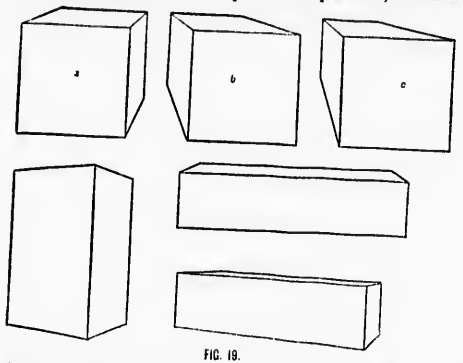


FIG. 19.

readily understand the drawings in Fig. 17, which represent four cubes in different positions.

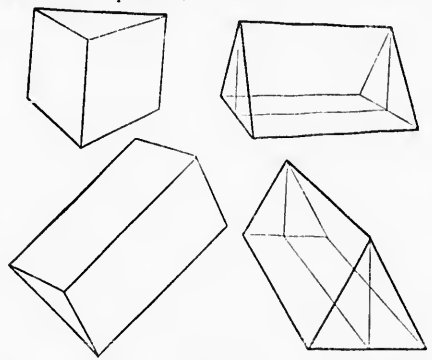


FIG 20.

Illustration Fig. 18 represents a square pyramid in four positions. The only thing in connection with it that may appear

difficult is the position of the axis. It should always be perpendicular to the transverse axis of the ellipse which would represent a circle containing the base.

In Fig. 19 are shown a number of parallelopipeds. It may, perhaps, occur to the student that a cube and a parallelopiped having square ends, may be placed in such positions that the apparent width of their sides will be the same, and he may wonder

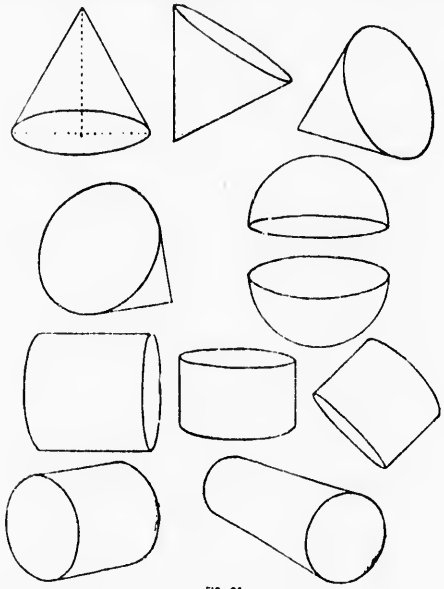


FIG. 21.

if there will be any difference in their representations. The only difference will be due to the fact that the far end of one is nearer to the eye than the far end of the other, and will appear larger; therefore the edges of the far end of the parallelopided must be made smaller proportionally than the corresponding edges of the cube, or, in other words, the retiring edges of the parallelopiped

EXERCISE 27.—A hexagon lies on the ground with one of its sides parallel to the picture plane. Its centre is in front of spectator. Show its appearance.

EXERCISE 28.—Show a regular hexagon, when its plane is inclined downwards from spectator, two sides being parallel to the picture plane, its centre being above the eye and to the right.

EXERCISE 29.—Draw in freehand perspective a regular octagon, its plane being vertical and at an angle of 45° to the picture plane. Two sides of octagon are parallel to the picture plane and its centre is in the centre of vision.

EXERCISE 30.—Show an octagon when its plane is inclined upwards from spectator at an angle of about 30° to the ground. One corner of octagon is resting on the ground in front of spectator, and the diagonal from this corner is in a plane perpendicular to the picture plane.

must converge more abruptly than those of the cube. Illustrations *a* and *b* (Fig. 19) make this clear. Experiment will satisfy the student that the greater the difference in length between the edges of the near and far end of a parallelopiped the greater will be its apparent length. (See *b* and *c*, Fig. 19.)

A triangular prism in four positions is shown in Fig. 20.

In Fig. 21 are shown the different geometric forms in which the circle is present. They are the sphere, cylinder and cone. In drawing the cylinder or cone it is necessary to remember what has been said concerning the relative positions of the axis of a circle and the transverse axis of the ellipse which represents it, and also that the transverse axis of the ellipse does not contain

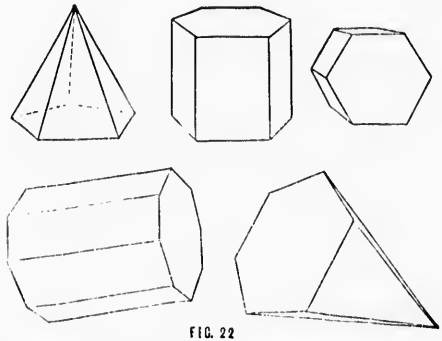


FIG. 22

the centre of the circle. The axis of the circle is represented by the axis of the cylinder or cone.

The principal combinations of polygons are the pyramids and prisms. In Fig. 22 are shown a pentagonal pyramid, a hexagonal pyramid and prism, and an octagonal prism. The manner of drawing them is apparent.

What has been done thus far is but a course of preparation for the real work of object drawing, which is the transformation of the geometric planes and solids into the forms of familiar objects. This course of preparation is as necessary to the student of drawing as the practice of scales is to the student of the pianoforte, and he need not hope for any great amount of success in his work if he does not thoroughly understand the explanations made in connection with the representations of lines and planes.

In the practical application of the knowledge of this subject that the student is now supposed to have gained, he may omit the construction lines shown in the foregoing engravings according to his familiarity with the representation of the forms introduced. They are only guide lines and may be dispensed with as soon as the student finds he does not need them.

One of the most useful points to remember in the drawing of objects is the manner of using the cylinder in the representations of inclined planes such as the lids of boxes, the covers of hooks,

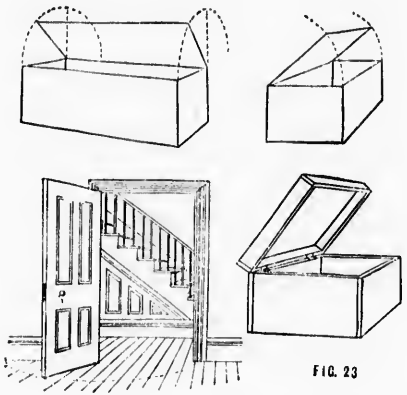


FIG. 23

doors, etc. Suppose we are required to draw a box with its lid partially raised. It will be seen at once that the lid in turning upon its hinges generates a portion of a cylinder, the outer corners of the ends of the lid being in the circumferences of the ends of the cylinder, thus the box may be said to be composed of a cube or parallelopiped and a cylinder. Fig. 23 shows clearly how a box may be drawn in outline and finished, and also how a drawing of a door may be finished. In all such objects it is necessary to show the edge which swings as converging in the same point as the edge in which are the hinges and also to allow for the thickness of the material of which the box or other object is made when drawing the inside edges.

EXERCISE 31.—Make a drawing that will represent a cube standing on the ground in front of the eye, with four of its edges vertical and four of its faces at an angle of 45° to the picture plane.

EXERCISE 32.—Show the appearance of a parallelopiped, its ends being square and its length twice its height, resting with one of its oblong faces in a horizontal plane and its vertical faces at an angle of 45° to the picture plane. Its top face is below the eye and its long edges retire towards the left.

EXERCISE 33.—A square pyramid is lying with one of its triangular faces in a horizontal plane and the vertical plane containing its axis retiring towards the right at an angle of about 30° to the picture plane. Show its appearance when the top edge of its base is below the eye and also when the lower edge of the base is on a level with the eye.

EXERCISE 34.—Draw in freehand perspective a sphere, its centre being in the line of direction, and show the line of contact of the surface of the sphere with a vertical plane passing through its centre and retiring towards the right at an angle of 45° to the picture plane.

In Fig. 24 is shown how a parallelopiped may be converted into a bureau. Fig. 25 shows how a parallelopiped and triangular prism may be converted into a house. The peak of the small gable in front is found by ascertaining the centre of the ridge and the centre of the front of the house, and drawing a vertical line from the latter point to cut a line from the centre of the

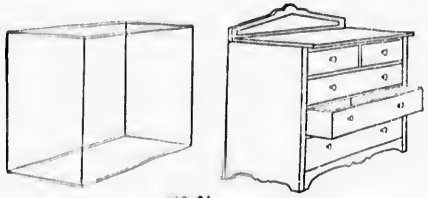


FIG. 24

ridge drawn towards the vanishing point of the horizontal lines in the sides of the house. The width of the gable is marked off on the line of the eaves, and lines drawn from the points where it springs from the eaves to the point of intersection of the ridge of the small gable with the main roof. Doors, windows, etc., may be added at pleasure.

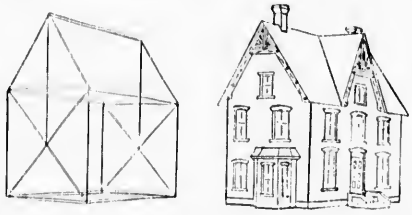


FIG. 25

In Fig. 26 the manner of drawing what may be supposed to be a primitive chair, is shown, as also the manner of drawing a common pine table. The construction of the corners of the framework on which the top rests is drawn on a larger scale to enable the student to understand more clearly the smaller drawing which is on too small a scale to show the true positi and

appearance of all the lines that would be visible with the table in the position indicated by the drawing.

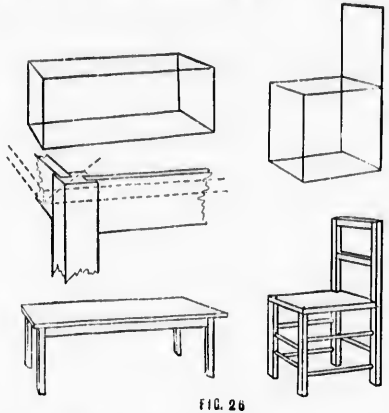


FIG. 26

A common step-ladder is illustrated in Fig. 27. No explanation of the manner of drawing it is necessary. If the student

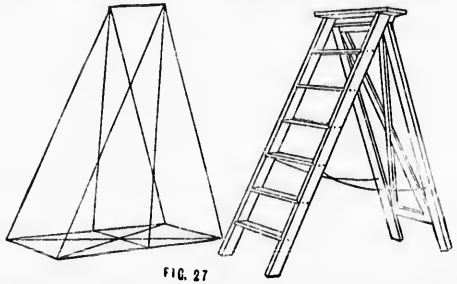


FIG. 27

understands its construction he will find no difficulty in representing it correctly.

EXERCISE 35.—Show the appearance of a triangular prism, its ends being vertical and one of its faces horizontal, and its axis inclined towards the left at an angle of 45° to the picture plane. The eye is two thirds of the altitude of the ends above the horizontal surface.

EXERCISE 36.—Draw in freehand perspective an inverted cone, having its axis vertical and its base below the level of the eye.

EXERCISE 37.—Make a drawing of a cubical box standing on the ground with its vertical sides at an angle of 45° to the picture plane and with its lid hinged on the far left hand top edge, and opened at an angle of about 30° with the top of the box. Add details at pleasure.

EXERCISE 38.—Draw a bureau with five drawers, showing the front, top and right hand end, and the bottom drawer and left hand upper drawer partially open.

In the drawing of a barrel the cylinder is the most convenient geometric form to use, as is seen in Fig. 28. It will be noticed that the staves appear to become narrower as they approach the

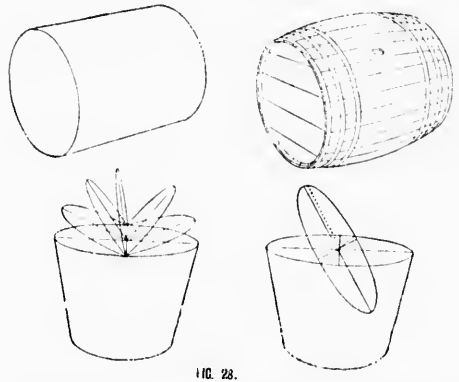


FIG. 28.

sides, and that their curves are more nearly parallel to the outline of the sides, while the lines of those staves in front of the eye ap-

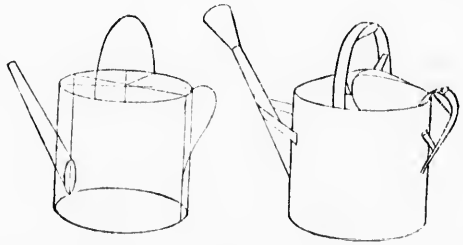


FIG. 29.

pear to be almost straight. Care must be exercised in the drawing of the hoops. Their curves are not the same as they would be if they were cylindrical; they are in reality portions of cones and consequently their curves approach one another more abruptly towards the ends of the ellipses. Their true appearance can be seen and studied by examining any barrel having iron hoops.

The principle involved in the representation of the handles of pails, etc., is shown in Fig. 28. The left hand drawing shows the appearance of the handle when perpendicular to the picture plane and at different inclinations to the plane of the top of the pail, and the right hand drawing when it is at an angle other than 90° to both planes. The handle is attached at opposite sides of the top, therefore a straight line drawn through the centre of the top will cut its circumference in the points of attachment of the handle. The centre of the ellipse that will represent the handle

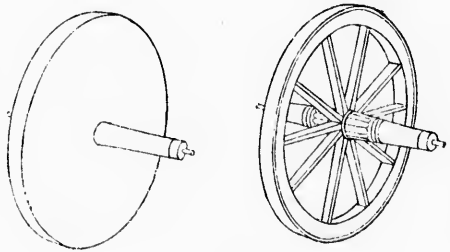


FIG. 30.

is where the line across the top of the pail intersects the transverse axis of the ellipse representing the top, and a line drawn through this point of intersection at right angles to the apparent direction of the axis of the handle will contain the transverse axis of the ellipse representing the handle.

A watering can, as illustrated in Fig. 29, is a good example of the combination of cylinders and cones and will give some good practice in drawing. If it is remembered that the small handle and the spout are in a plane perpendicular to the plane containing the large handle, no difficulty need be found in getting the correct form of the object when in any position.

The wheelbarrow wheel, Fig. 30, introduces concentric circles as well as the cylinder and cone. It will be evident that its construction must be understood before it can be drawn.

EXERCISE 39.—Draw a common square table with a chair close to it, observing the proper proportions between the two objects. Position and details at pleasure.

EXERCISE 40.—Draw a parallelopiped supporting a triangular prism, and use it as the geometric basis of a school house. Show a bell-tower in front, door, windows and other suitable details.

EXERCISE 41.—Show a portion of a staircase ascending towards the right and at an angle with the picture plane. Finish the balustrade, balusters and newel post to suit the taste.

In Fig. 31 are shown a number of objects, the forms of which are based upon the cone.

Fig. 32 shows how the simple straight-backed chair illustrated before may be converted into one with a curved back. It will be found that the seat of a common chair is usually midway between the top of the back and the bottom of the legs. The supports for the back form also the two back legs, and besides being curved are farther apart at the top than at the bottom. The unfinished

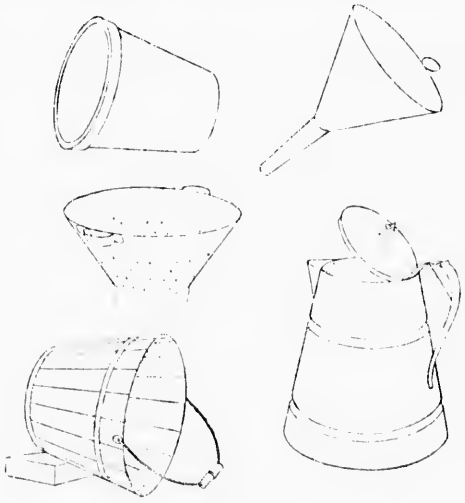


FIG 31.

outline of a common round wooden arm-chair shown in Fig. 32 will be a useful exercise in drawing objects fashioned in a lathe. The patterns of the different parts of the chair are given and should be imitated as nearly as possible. A portion of a leg of a chair is drawn in geometric outline, and in perspective showing how slight a change is necessary. The difference is that in one the lines representing the divisions between the members of the turning are straight and in the other curved according to their position above or below the eye. One of the legs of the arm-chair is finished to show their shape. The

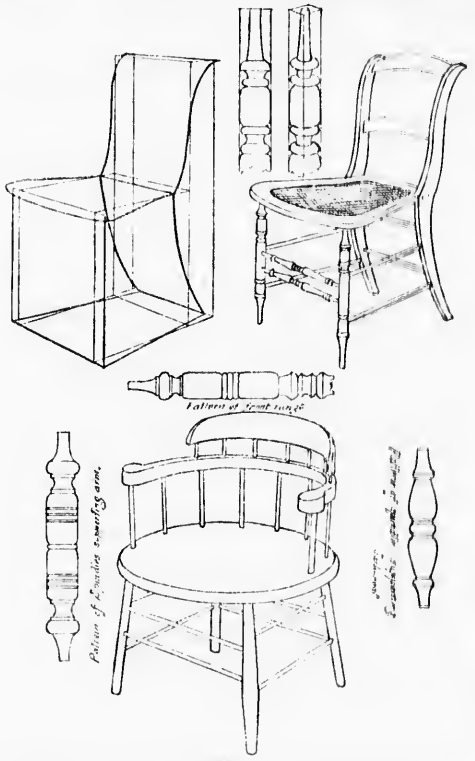


FIG. 32.

front support of the arm on each side should be made larger than the others.

EXERCISE 42.—Draw a barrel showing it standing on end with its top below the level of the eye.

EXERCISE 43.—Make a drawing to represent a common tin pail when below the eye with its handle in an upright position.

EXERCISE 44.—Make a drawing of a wheelbarrow wheel with four spokes, its axis being horizontal and below the eye.

EXERCISE 45.—Draw a wooden arm chair in a different position to that shown in Fig. 32, filling in details according to the patterns given.

The wheelbarrow illustrated in Fig. 33 is an interesting object and is a good subject for practice. It should be drawn in different positions. From the details shown, it will be seen that the handles are closer to the ground and closer to one another where the wheel is attached than at the other end, hence they will have different vanishing points and their vanishing points will be below the horizontal line. The sides are movable, being held in position in front by a band of iron fastened to the front board and the handle, and at the back by a wooden cleat which fits into an iron socket fastened to the handle near the leg. The bearings of the wheel are formed of two pieces of hard wood, one being fastened on the end of each handle and having a hole drilled through it for the reception of the iron pin in the end of the hub. The front board is wider at the top than at the bottom, and is rounded slightly at the top, and it and the legs are supported by iron braces, the positions of which are indicated. The perspective outline given will be useful to the student as it shows how a drawing of a wheelbarrow should be commenced, and indicates the position of the one asked for in Exercise 48

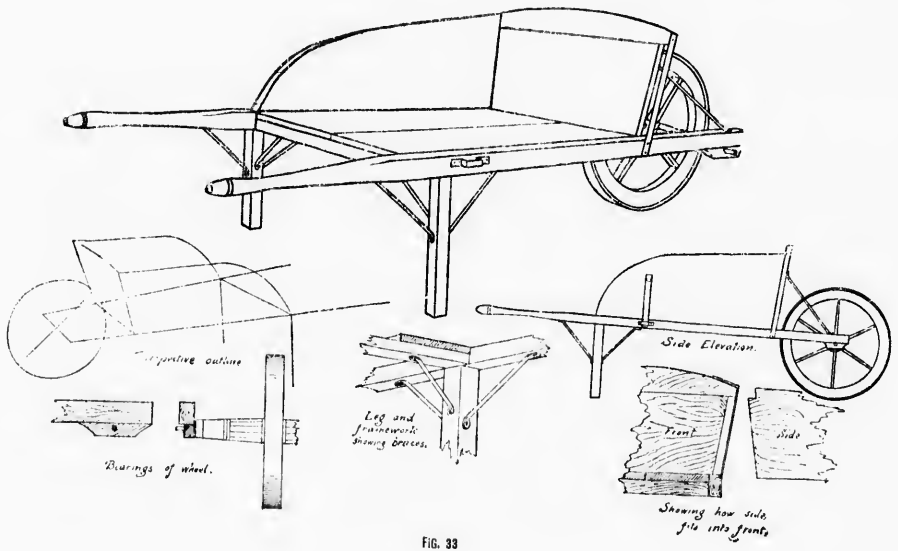


FIG. 33

EXERCISE 46.—Draw a common wooden pail when standing on a horizontal surface with its top below the eye. Show the handle in any position.

EXERCISE 47.—Draw a flower-pot in an inverted position, its axis being vertical.

EXERCISE 48.—Draw a wheelbarrow, using the perspective outline and details of construction given in Fig. 33. Make the drawing as large as possible.

The objects illustrated in Figs. 34 and 35 are all familiar ones and serve to show a few of the innumerable combinations of the geometric solids. All of those in Fig. 34, and parts of the lamp in Fig. 35, introduce the cone; the saucer, umbrella, clock and

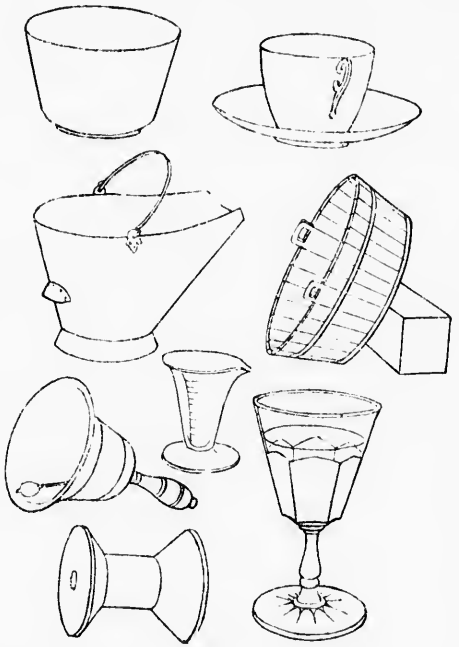


FIG 34.

bottle introduce the sphere; and the lamp, bottle and clock the cylinder. Nothing definite need be said of the manner of drawing any of them. The student will find them all easy if he pays attention to their geometric construction; thus the spool is

formed by two cones and a cylinder; the ribs of the umbrella are circular and will be represented by portions of ellipses. The lamp represented is one spun in a lathe, and, after its outline is

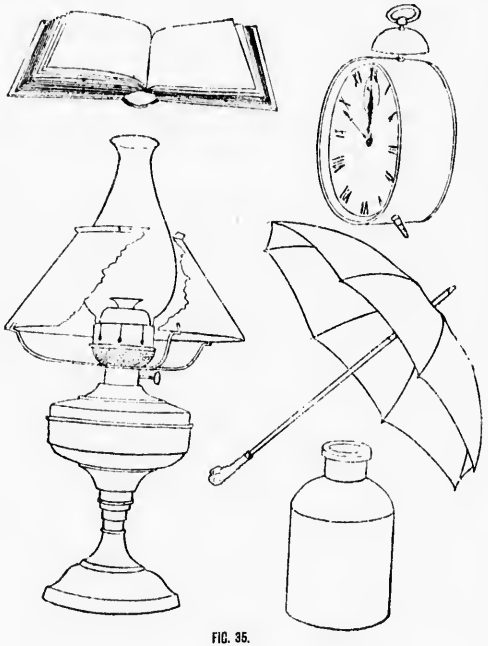


FIG. 35.

drawn, may be treated in the same way as the turned work in the chairs shown in Fig. 32. It may be represented either with or without the porcelain shade. The illustration shows the form of the burner and chimney.

umbrella are
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EXERCISE 49.—Draw, from memory, a common coal oil lamp.

EXERCISE 50.—Draw a cup and saucer.

EXERCISE 51.—Draw a book showing it as standing on end and partially open, its top being below the eye.

EXERCISE 52.—Draw an open umbrella in a position different from that of the one shown in Fig. 35.

Besides the representation of objects singly, according to instructions given in the foregoing pages, the student should practise grouping them. This is the most interesting part of the work of object drawing and is the first step towards the composition of pictures. It would be absurd to attempt to discuss the subject here, as it is broad enough to fill a book ten times the size of this one, and yet even such an elementary work as this, leading as it does from mathematical to artistic drawing, would be incomplete without at least a reference to it and a few hints concerning it, and so a few hints will be given, enough to enable the student to continue his practice until he is in a position to prosecute his study within the domain of art proper.

The first thing to be considered is appropriateness of grouping, that is, objects used in connection with one another may be

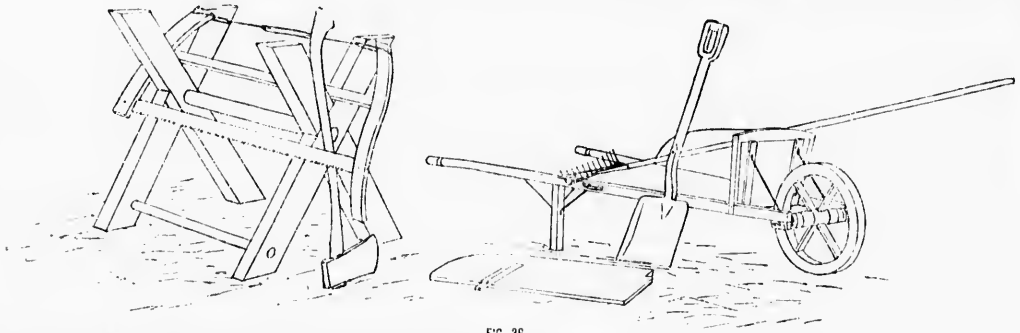

FIG 36.

grouped, such as the sawhorse, saw and axe, and the wheelbarrow, shovel and rake illustrated in Fig. 36. It would not be well to group such objects as a wheelbarrow lamp and clock, or sawhorse, bell and umbrella. The objects are so dissimilar as to their uses that there would be no relation existing between them excepting as to position.

Objects should be grouped in what may be called a suggestive manner, that is, so that they suggest the fact that they have been used together, and cause the mind to supply a train of thought regarding them. Thus the first group in Fig. 36 suggests the thought that someone has been sawing and splitting wood and that the work is finished. If some pieces of wood were shown lying on the ground, and a pile of wood in the background,

the result would be a picture. In the same way a group of a chair, table, paper, ink bottle, lamp and pens will, if the lamp be lighted, convey the idea that someone has been writing and has been called away, and at once there is a speculation as to the probable cause of the interruption. The cause may be suggested by the arrangement of the objects. If the lamp be not lighted, papers lying in confusion on the table and floor, the ink bottle upset and the ink spilled, the writing stopped in the middle of a page, and a spider spinning its web between table and chair, the thought that death is the interrupter will be suggested. No random grouping should be attempted unless to carry out the idea of "confusion," when it would be quite appropriate. The student would do well to fix upon some sentiment and then try to group suitable objects in such a way as to express it, even to one who is not cognizant of the feeling underlying it. The group in such a case becomes a picture, and a picture may be said to be a poem in a tangible shape.

The two points spoken of in connection with grouping or composition refer only to the sentiment expressed by it, and have nothing to do with the artistic form of a composition. It is a difficult matter to state in a few words just what to seek for and what to avoid as regards form, as an uninteresting object may be viewed so as to appear well, and vice versa. In such a case its appearance depends upon the relation which its principal lines appear to bear to one another, and no fixed rules can be given for the guidance of the student, especially as the nature of the composition requires a special arrangement of its lines. As

EXERCISE 53.—Draw a group composed of a tea-pot, cup and saucer, sugar-bowl, cream jug and spoons, arranging them in a suitable manner.

EXERCISE 54.—Draw a group composed of a step-ladder, pail and window brush; or of flower-pots, watering-can, pail and spade. The student may add such accessories as he considers suitable.

a general thing, however, there should be a variety of lines, both as to length and direction, and none of them should be unduly conspicuous unless for the purpose of leading the eye from one part of a picture to another. Long unbroken lines should be avoided. They may be broken by other objects overlying them, the lines of which run in an opposite or nearly opposite direction. When the lines of a drawing are arranged so as to balance one another, that, is the effect produced by one line or set of lines running in a certain direction is counteracted by a line or set of lines equal in quantity running in an opposite direction, the result is repose, as distinguished from excitement.

As a rule, in a group one object should be more conspicuous than the others, and the others made accessories to it. In this way the interest is centred in this object and the result is more satisfactory than when three or four objects are equally conspicuous and it is impossible to decide which one gives the picture its character.

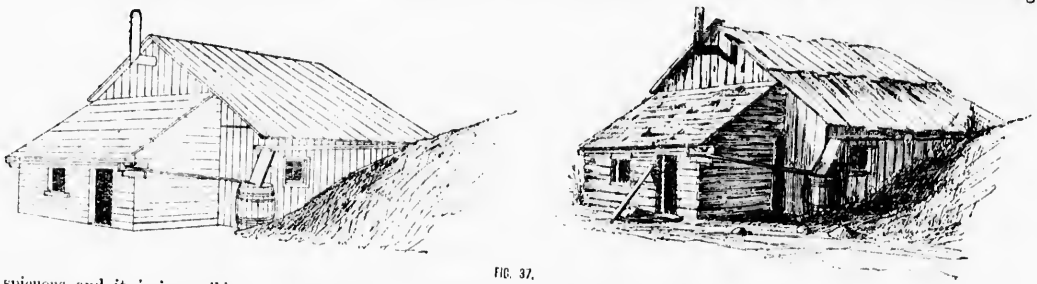

FIG. 37.

To sum up the hints given, we have appropriateness, suggestiveness, balance of lines, and concentration of interest, and these will be sufficient for the purposes of this book.

It has perhaps been noticed by many of the students into whose hands this book may have come, that drawings of objects made in accordance with the principles explained in the foregoing pages, no matter how correct they may be as to outline, are not perfectly satisfactory, inasmuch as they are stiff and inelegant and are not what may be called pictures of the objects they represent. They possess little or none of the quality of picturesqueness which should be embodied in all pictures.

Just what constitutes picturesqueness in an object or a group of objects could not be properly explained in the small space available here, yet a few remarks bearing upon it may be made, which will serve to enable the student to select his objects with regard to their pleasing forms, and also to treat them in such a way as to make them appear on paper to the best advantage.

It may be stated in the first place that an old object is more picturesque than a new one of the same kind, be it a rock, tree, fence, house, animal or man. Nature if allowed to operate upon an object will make it picturesque even if its form is not pleasing, though an object whose form is pleasing will become picturesque sooner, and in a given time will become more picturesque than one whose form is not pleasing. Nature's work is to break up long straight lines and broad masses of color, to round off sharp corners, and generally to undo the work of man and thus bring it into harmony with her own productions. There is no such thing as lack of harmony in Nature, and all her forces seem to be brought to bear upon outside objects to make them equally harmonious as to form and color. Broadly stated, Nature's work is a process of decay, and it will be instructive to look more closely into the matter and see how this work of decay makes an object, such as a building, picturesque.

One of the parts of a building to yield first to the work of decay is the ridge of the roof. It will probably after a number of years commence to sink in the middle if it is unsupported there, and, the rafters remaining rigid, the walls are forced out of perpendicular. It may be that one of the ends of the building will give way first and allow the ridge to sink in that part, forcing the walls farther apart and forming a triangular opening at each side of the end wall. This forcible separation of the walls at the corners will be likely to make irregular gaps and cracks in the walls if they are made of brick or stone, and if they are of wood,

the framing timbers will be exposed. The openings thus formed require to be filled up, and this filling up is done probably with material different from that of which the building is made. The walls now present a broken, cracked, patched and weather-beaten appearance, paint has disappeared, windows are broken, the

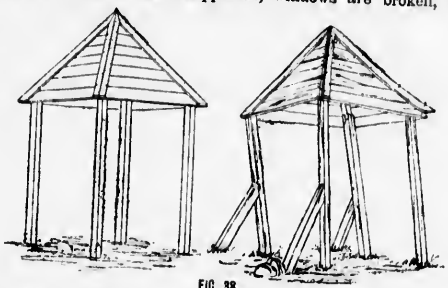

FIG. 38.

shingles are broken, some of them are torn off, the roof is covered with moss, tufts of grass are growing in the eave-troughs, the plaster falls from the walls, the doors fall from their hinges, and as time elapses, the roof and walls give way and nothing is left but a heap of rubbish to be in turn covered by grass and creepers until it is hidden from view. No one will dispute the fact that the patched and weather-beaten old house is picturesque, surrounded almost by a halo of romance. A tattered and patched garment is more picturesque than a new or a whole one. There is nothing picturesque about the elegant clothes displayed upon a tailor's dummy, but the ragged little urchin, old in experience, who looks longingly at them is picturesque. Instances might be multiplied of the effect of age on objects. Contrast a man old and poor, having all the marks of age and poverty upon him, with a man young and well dressed; an old worn out horse, with a colt; a broken down waggon, with one fresh from the shop.

Age seems to invest an object with interest, if not in every case with beauty, and it with poverty does very much towards supplying the poetical sentiments expressed by every true picture.

No explicit instructions will be needed as to how to alter the lines of a drawing in order to change its character. The student, knowing the changes that are taking place in an object, can imitate them by a judicious change of the direction or length of the proper lines in the drawing of the geometric solids employed.

The accompanying illustrations will no doubt help to make the matter clear if there is still any doubt or difficulty. Fig. 37 shows how breaking up the outline and adding shading will improve a drawing, and Figs. 38 and 39 show how a drawing may be still further improved by breaking up the outline, changing the direction of some of the principal lines in order to express certain facts, and the addition of details rendered necessary by the changes mentioned, such as the braces to the supports in Fig. 38. Were it not for these last the object would have a very unpleasant appearance. The supports being out of the perpendicular make it look as if about to fall over, and the question is suggested: "Why does it not fall? What keeps it up?" If there is nothing visible to counteract this falling tendency, the drawing possesses a lack of repose, and this lack of repose becomes greater as the inclination of the supports from a vertical position is increased.

The effect of this on the mind is a restlessness, an uneasiness, a sense of unsatisfaction which causes the eyes to wander about the drawing in search of something which does not exist in it and which cannot, perhaps, be specified. There is a feeling that there is something wanting. This something may be supplied by adding a man, or group of men pulling on a rope attached to the object, for the purpose of bringing it to the ground. This would account for the falling tendency and be satisfactory to the eye, but would

FIG. 39.

produce a slight feeling of excitement. It is necessary in some subjects to destroy repose for the purpose of expressing excitement or motion, as in a galloping horse, running water, etc. The extent of the excitement or idea of motion is proportionate to the loss of repose.