DRAWING ELLIPSES IN PERSPECTIVE

by Derrick Clay

from Canadian Marquetry May 1994

Ellipses are circles viewed from other than straight on. If a circle is rotated it is foreshortened and we see an ellipse. At whatever angle an ellipse is viewed , one dimension remains constant with the circle. This one constant is the axis - the straight line through the circle and the ellipse upon which it rotates. (**fig. 1**). As can also be seen from this illustration that a number of ellipses at various angles all have a constant height.

Fig 2 shows how to build an ellipse using a circle as a guide. Start by placing a circle in a square. this gives us the edges that can be used for measurements. The circle is uniform in measurement and so is the square and together

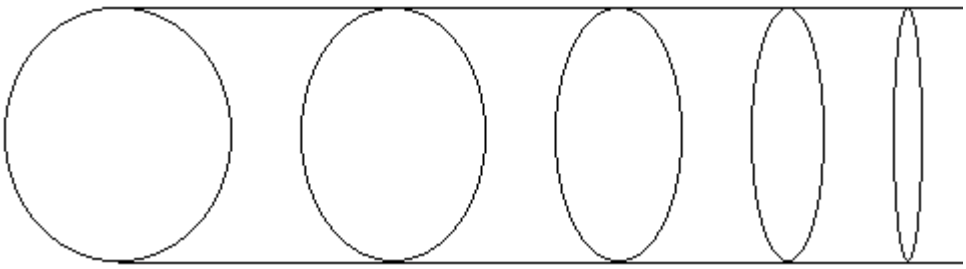
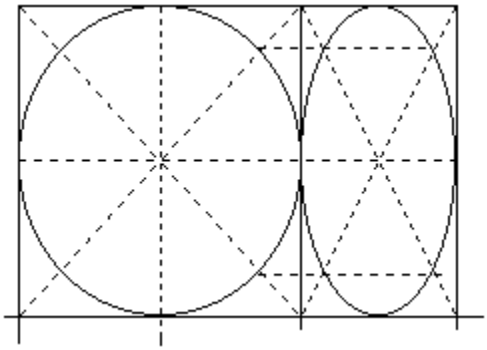


FIG.1

they are the perfect tool for building an ellipse. Start by dividing the square into eight equal segments as shown. Where these dividing lines cross the circle, place reference points. Next decide upon the width of the ellipse and draw a rectangle next to the square, (as shown). This width is related to the angle through which the circle has been rotated. Now divide the rectangle into eight equal parts as was done with the square. The reference points are extended across from the circle to the rectangle and the oval may now be drawn by joining these points and will be related to the amount of rotation of the circle.

FIG.2



To get the proper perspective on ellipses converging to a vanishing point, such as the wheels on an approaching train, we can use a similar method to that used in **fig. 2**, but since we are looking at a vanishing point, the ellipse must also look at this vanishing point. Referring to **fig.3** the rectangle drawn next to the circle in **fig.2** is replaced by a trapezium since we have now taken the vanishing point into consideration. The procedure used in building this converging ellipse is similar to that described in **fig.2** except that the reference points from the circle are transferred only to the vertical side of the square. These reference points must now extend to the vanishing point. If this was not done the ellipse would not be in perspective to the vanishing point. To obtain the proper height , or axis, for this ellipse diagonal lines must be drawn in the trapezium and where they intersect will be the proper height of the ellipse. Note that the two halves of the ellipse are unequal.

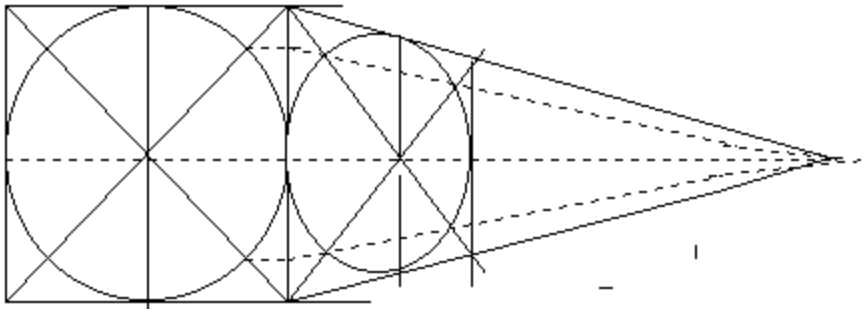
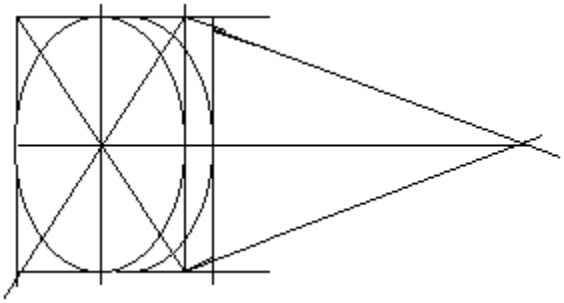


FIG.3

In **fig.4** a second vanishing point has been introduced and a second ellipse has been drawn to give depth to the original ellipse.

FIG 4



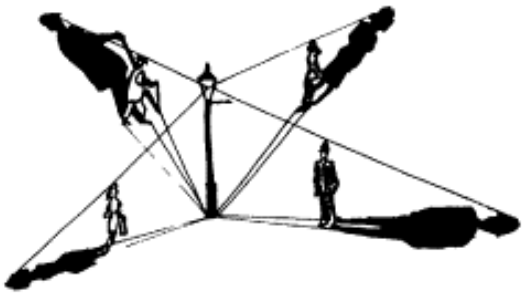
SHADOWS

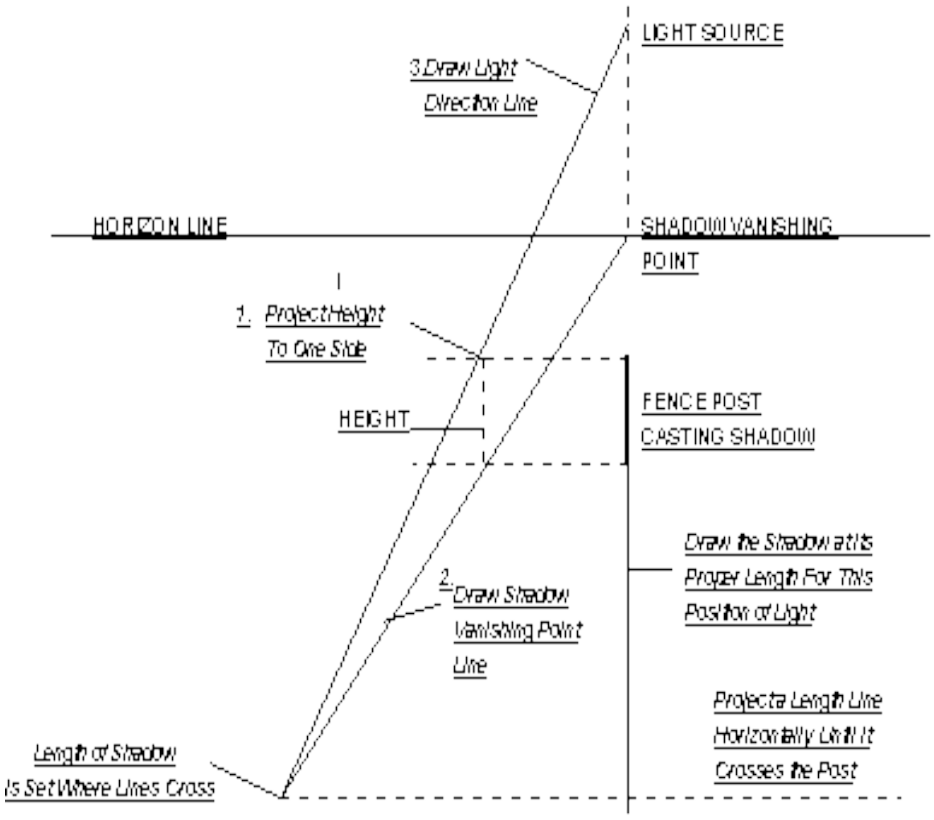
Light rays travel in straight lines and are blocked by any object in their way. The absence of light caused by the object will create a shadow peculiar to that object. Morning and afternoon shadows are longer and more dramatic than those cast in the middle of the day because of the low angle of the sun at these times. More detailed information on the geometry of shadows can be found on pages 247 - 249 of *The Marquetry Manual* by William A. Lincoln available in the Society library.

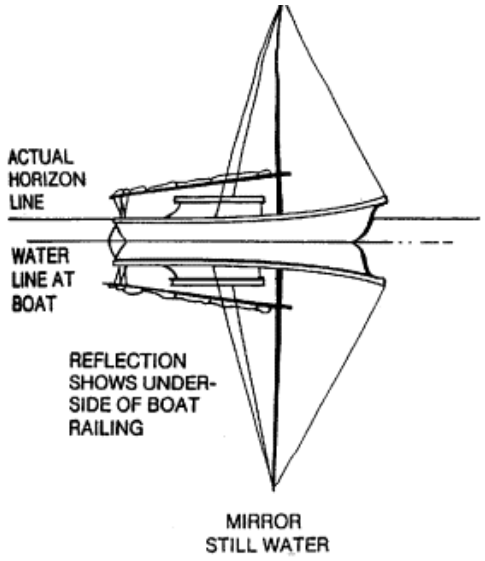
Referring to the following illustration reproduced from this source; if the policeman had been directly in front of the light, the length of the shadow would not be evident as the vanishing point of the shadow would have been covered by the policeman himself and the length of the shadow would not be evident. this would also apply to any person or object directly behind the light source.

SHADOWS IN PERSPECTIVE

If the light source happens to fall behind and directly in line with the object, like the fence post in the following illustration, the correct length of shadow can be determined by moving it to one side and by using the technique shown here move it back into place.




LIGHT SOURCE
3.Draw Light
Direction Line
HORIZON LINE
SHADOW VANISHING
POINT
1. Project Height
To One Side
HEIGHT
FENCE POST
CASTING SHADOW
Draw the Shadow at its
Proper Length For This
Position of Light
2. Draw Shadow
Vanishing Point
Line
Project a Length Line
Horizontally Until It
Crosses the Post
Length of Shadow
Is Set Where Lines Cross

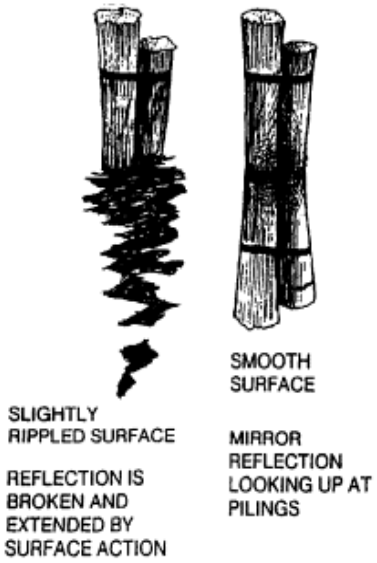


Example 1

Calm water will reflect an object in the same way as if a mirror was placed beneath it. If, however, the surface of the water is rippled or moving, the reflection will be broken up and extended. The depth of the water is of no consequence since reflections occur only at the surface. Reflections always advance towards the viewer and do not behave in the same way as shadows. A reflection is not just an upside down view but a different view altogether as shown in **Example 1**. where the reflection shows the underside of the boat rail. The closer the object is to eye level and the horizon line the more accurate will be the reflection of it. **Example 2** illustrates the effect of rippled water on the reflection of the piling

The photograph in **Example 3** shows that reflections always advance toward the viewer and do not behave the same as shadows in that they reflect colour whereas shadows do not. The photograph also illustrates that whereas the reflections of the large trees, by the golfer, advance towards the viewer the shadows are at right angles to the reflections and that only the tops of the trees located further back are reflected. It may also be noted that the reflection of the bridge advances towards the viewer whereas the shadow is directly under the bridge.

Example 2



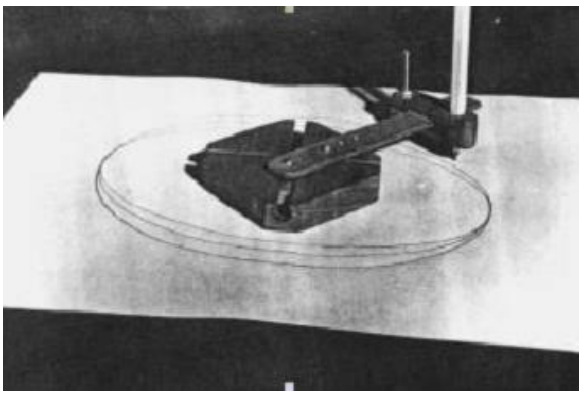
Example 3

The bridge over Rae's Creek to the 12th green: dangerous beauty

Further information on shadows and reflections can be found in *The Marquetry Manual.*

DRAWING ELLIPSES

Drawing an ellipse is not easy. There are various geometric ways of doing it but they all are messy and time consuming. An easy way to draw ellipses is with a little , simple to make a jig called an ovaler. It allows the drawing of ellipses of different heights and widths. Making it won't take long and it will draw ellipses as small as 5½" tall by 3-7/8" wide. If anything smaller than this is required it will be best achieved using a photocopying machine



Begin with a 3 x 3 x ¾ inch block of hardwood as shown in the diagram. On two edges of the block draw a line 3/8" from one face, i.e. the centre line. Make a mark at the centre of the block on this line and drill a 5/16" hole all the way through the block.

Draw two lines across the centre of each face of the block and make a saw cut 3/16" wide to open up the centre of the 5/16" holes. Now saw off the corners of the block leaving just 1/8" of wood beside the holes. This is to allow the drawing of the smaller ovals.

The travellers which allow the arm to pivot are made from 5/16" dowel, each 7/8" long. They must be sanded so that they slide easily along the track. This is best done before the pieces are cut to length. Next drill a 1/8" hole in the centre of the 7/8" pieces and fit a 7/8" length of 1/8" dowel into these holes.

The arm on, which the pencil rides, can be as long as you wish and sliding the pencil in and out changes the size of the oval. The three small holes, centred 3/8" apart change the length to width ratio. The hole at the end of the arm should be drilled 7/8" from the nearest ratio hole. A good length to start with is 4½" which will draw ovals as large as 9¼".