Chapter 7
Perspective in Art: The Curved Canvas

We have covered a lot of territory since we left off with perspective drawing in chapter one. It's time now to incorporate those new ideas into that original subject.

We introduced the idea of angular distance in chapter two. Below we have a perspective drawing of some railroad tracks. Let's pick out one of the warped rectangles formed by the railroad tracks and two cross ties. Viewed directly from above, all the corners are at an equal distance from the observer and the angles between all four objects would be 90 degrees; in perspective, the nearer corners meet at a smaller angle than the further corners. Thus we see that angular distances change with perspective.

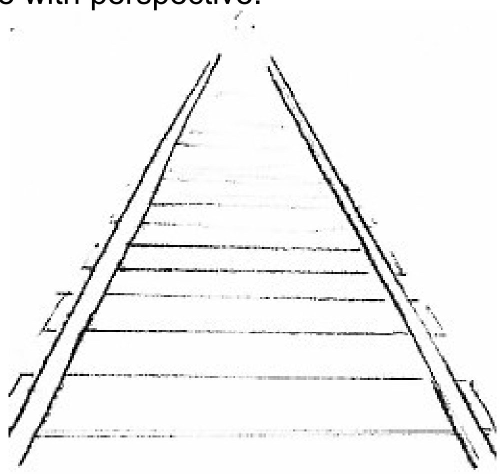

Figure 7-1.

I pointed out earlier that the angular width of the viewpoint that is being represented on paper or canvas is a central issue in perspective drawing. The reason things appear smaller as they get further away is that they fit in a smaller angle of our total view. This relates to the map-making problem in chapter four; the curved earth only looks flat at small angles. Our radial (or curved) visual perspective is difficult to represent on flat paper unless we only draw a narrow section of it. Otherwise, we see the “fisheye lens” effect. Another way of thinking about this problem is that the wider the angle of our view that we try to represent in our drawing, the closer together the vanishing points become. In Figure 7-2, the right side of the box vanishes toward a point on the right side of the drawing; the left side vanishes toward a point far off the left-hand side.

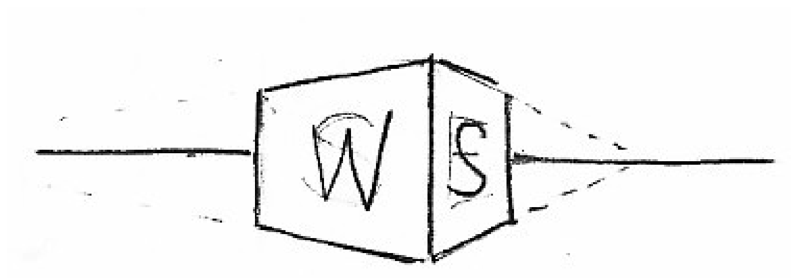

Figure 7-2.

The point and angle of the view looks like this:

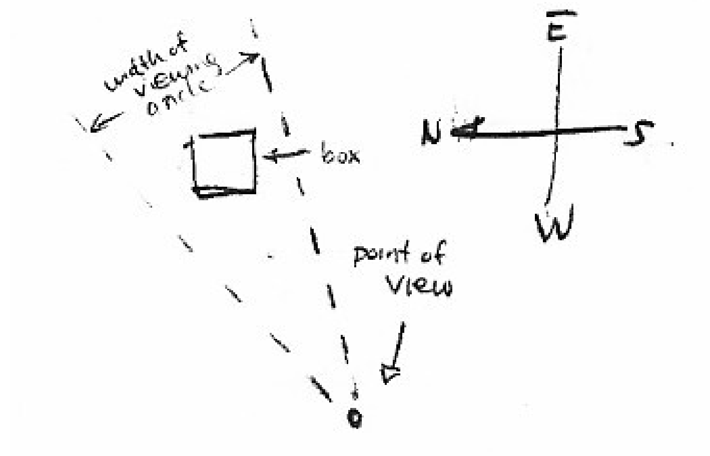

Figure 7-3.

If we widen the angle of the view, though, now both sides of the box vanish into a point within the drawing. Let's label the one on the right “north” and the one on the left “east.” The east and west sides of the box vanish into the north point, and the north and south sides vanish into the east point.

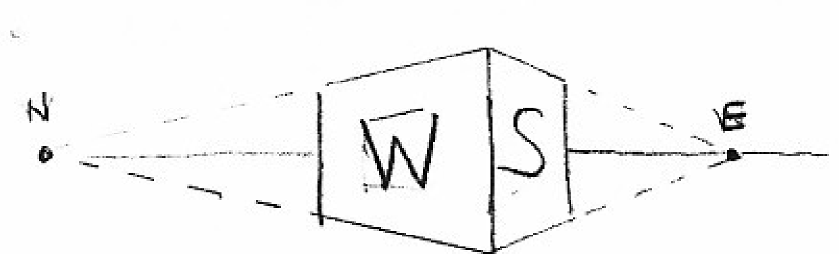

Figure 7-4.

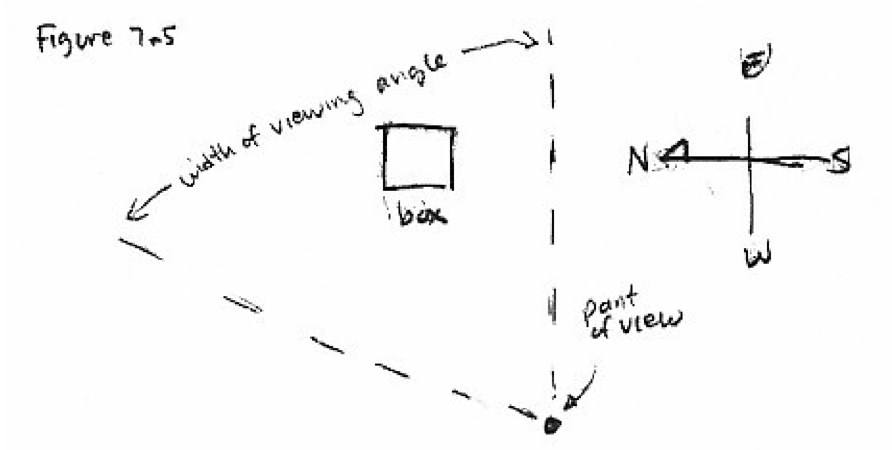

Figure 7-5.

If we widen the view even more to include our peripheral vision, we may see a second box:

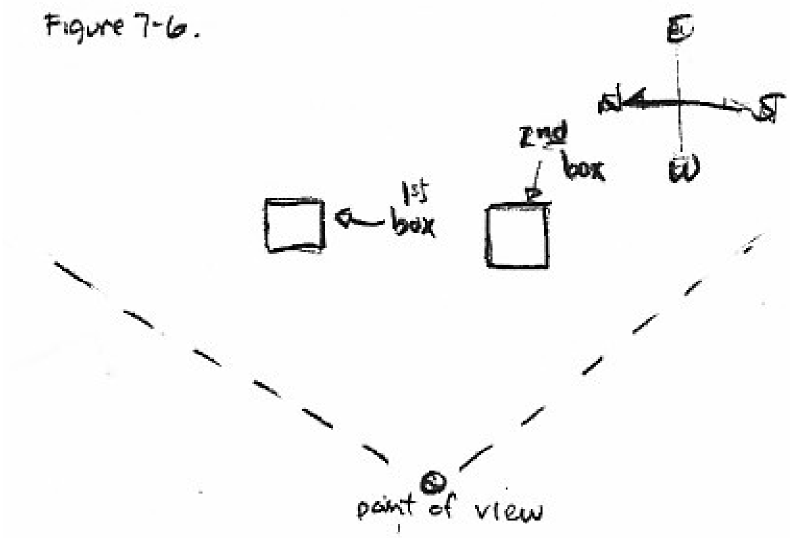

Figure 7-6.

Suppose that its sides are all parallel with the first box, so by the rules we established in chapter one, it must share the same vanishing points. The north and south sides of the second box are easy. They vanish into the east point shared by the first box. But the east and west sides of the second box vanish not into the east point, but a third point which we must label "south." But since they are parallel, shouldn't they both share the same vanishing points?

The answer to this apparent discrepancy comes when we draw in the lines joining the neighboring corners of the two boxes.

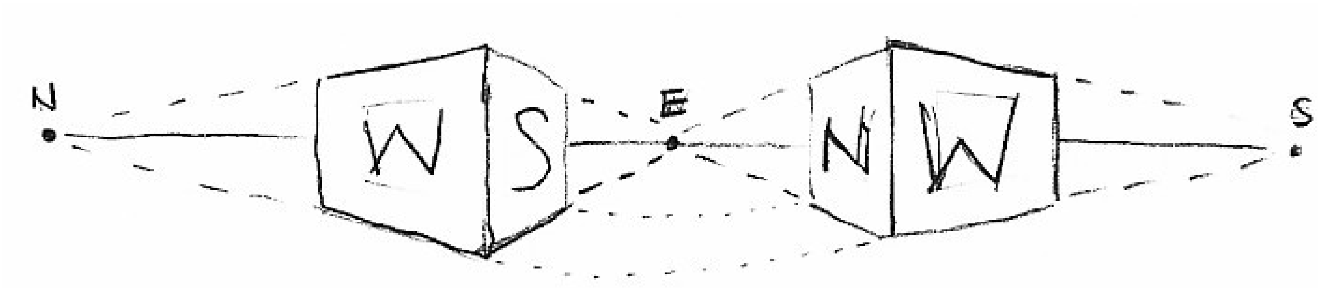

Figure 7-7.

These joining lines are quite obviously curved. This is the fisheye lens effect. And now we see that the vanishing lines are no longer straight. Our real-world point of view is somewhat between the boxes, so we see one box vanishing to the north and another to the south, which are opposite directions to us. But in the drawing, we have distorted the view so that both north and south appear in front of us. The east and west sides of the boxes vanish into both the north and south points, which both appear in the same drawing due to our wide perspective. Let's stack up several more parallel boxes so that the gap between the two is filled in and the stacks extend far above and below the horizon.

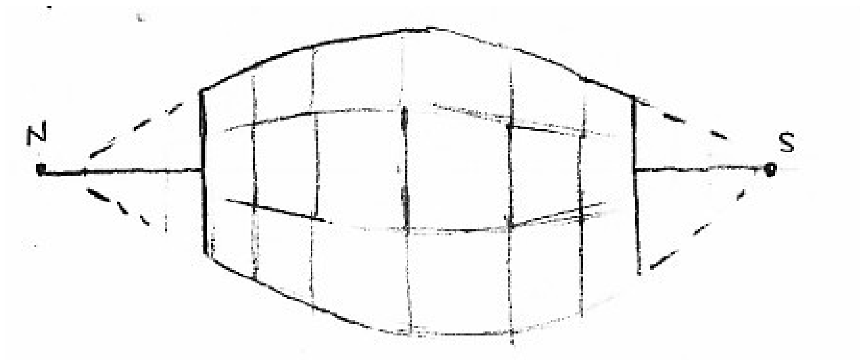

Figure 7-8.

Now our drawing resembles the lines of force in a diagram of two opposite electrical poles. Furthermore, it looks like lines of latitude and longitude on a globe. Notice that the north and south poles of the globe line up with our north and south vanishing points.

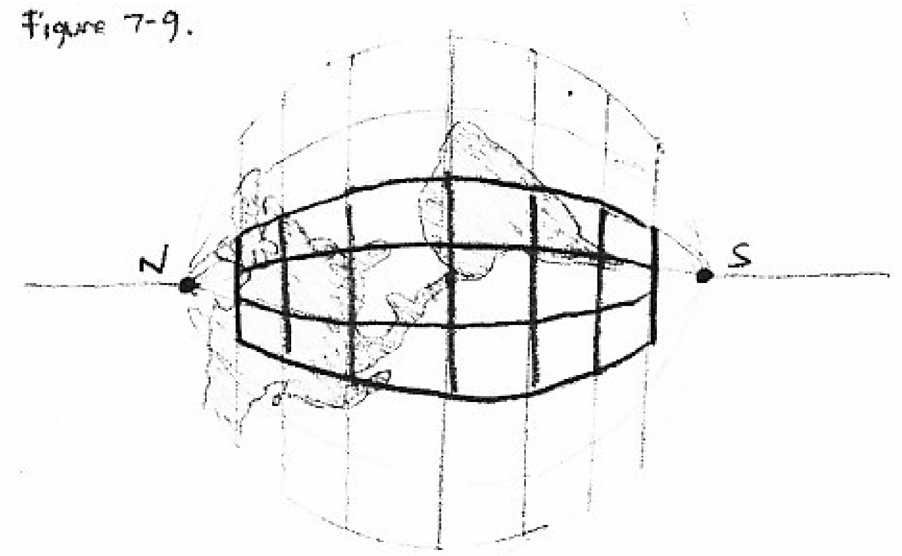

Figure 7-9.

There is also a similarity to lines of force around a magnet and the way iron filings will line up around a magnet:

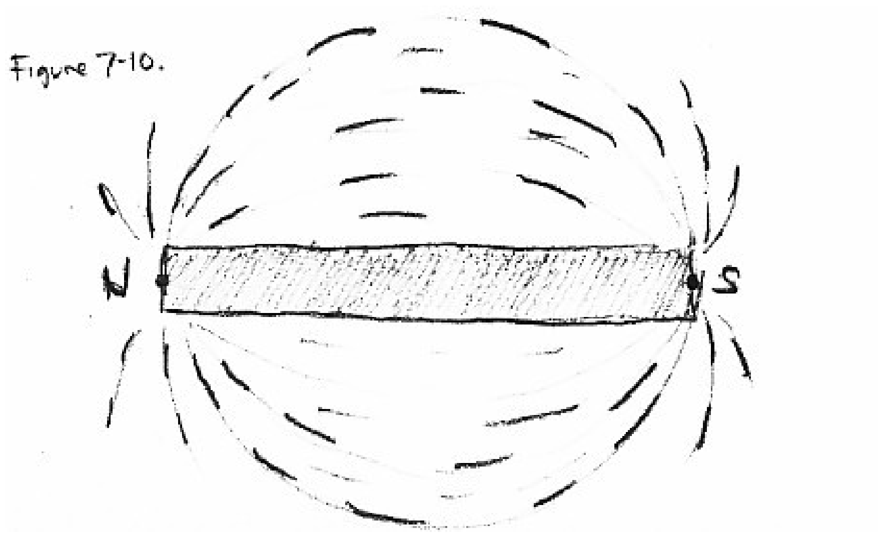

Figure 7-10.

So far we have changed the width of only our *horizontal* viewing angle. I warned you in chapter one that we would be throwing out the rule for vertical lines when we threw out the assumption of a narrow viewing angle. As you might have guessed by now, when our *vertical* viewing angle is wide, we have to include one or more *vertical* vanishing points as well, either on the drawing or at a theoretical distance off of the drawing.

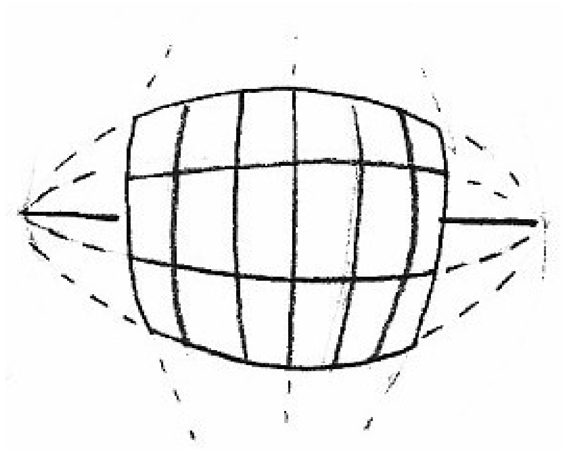

Figure 7-11.

Having changed the rules, now the edges of our boxes appear curved in all directions, perhaps like a globe viewed close up.

This distortion is an inherent problem of the flat drawing space. In the real world, the horizon forms a circle all around us. Only when we look at a small piece of it does it look like a straight line. To represent the wide-angle view without distortion, we need to draw on a curved surface. Let's imagine Figure 7-8 as drawn on a long sheet of metal, perhaps 30 feet long. If it is stiff enough, we can stand it up, and if it is flexible enough, we can bend it into a semicircle. If we stand at the center of the semicircle, the angle of our real-world viewpoint then represents the angle drawn on the metal sheet. It no longer appears distorted. The sides of the box vanish in opposite directions as they would from the real-world viewpoint shown in Figure 7-6.

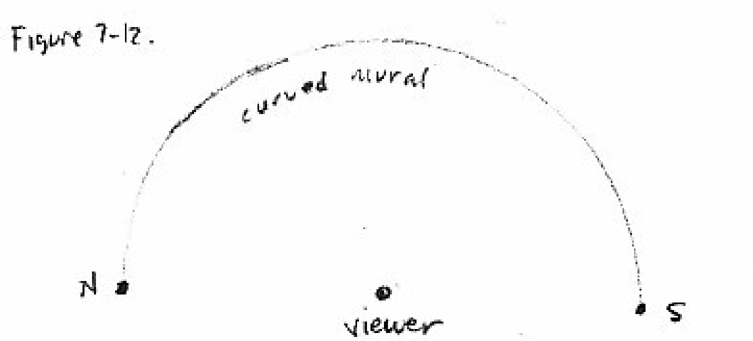

Figure 7-12.

If we extend the sides of the sheet metal to meet in a full circular loop, we can draw a full 360 degree view without distortion. But looped is not the same as curved. Remember the difference between a sphere and a cylinder: one is truly curved, the other is not. Look again at Figure 7-11, where the vertical view angle is widened. To draw this scene without distortion, we require a curved surface, a spherical or perhaps hemispherical one. This allows us to draw in true perspective. In the next chapter we'll see what happens when we bring our drawings to life.