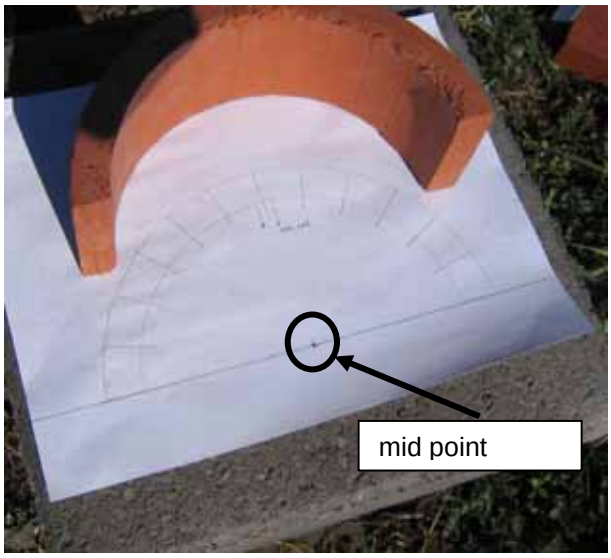
CASE STUDY ARMILLARY

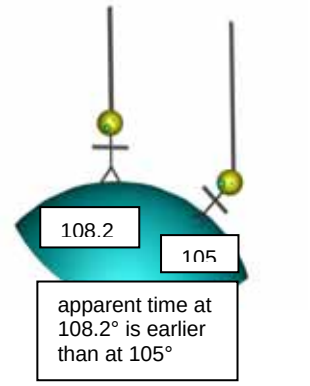
This dial will be for Silver City, NM, whose coordinates are:

location lat:	32.75° N
location long:	108.2° W
magnetic declination:	10.6° E



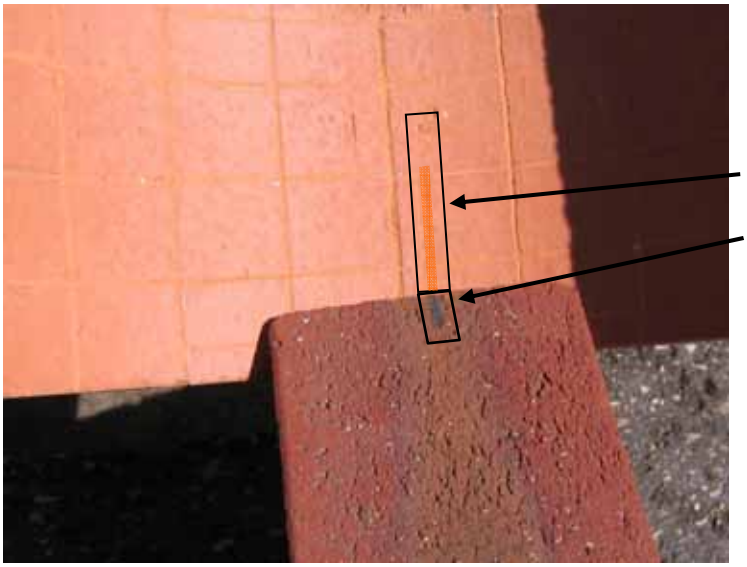
A clay flue liner from a building supply store was acquired and cut into circles one of which was cut into two semicircles, one of which became the dial plate. It wasn't a pure circle, however it was outlined onto a sheet of paper and the mid point of the two ends identified, and from thence were drawn 15 degree arcs.

Another line was drawn which was the longitudinal offset from the dial's location and the legal time meridian. This was offset by 3.2 degrees, being the dial's location (108.2) minus the legal time zone's meridian (105).



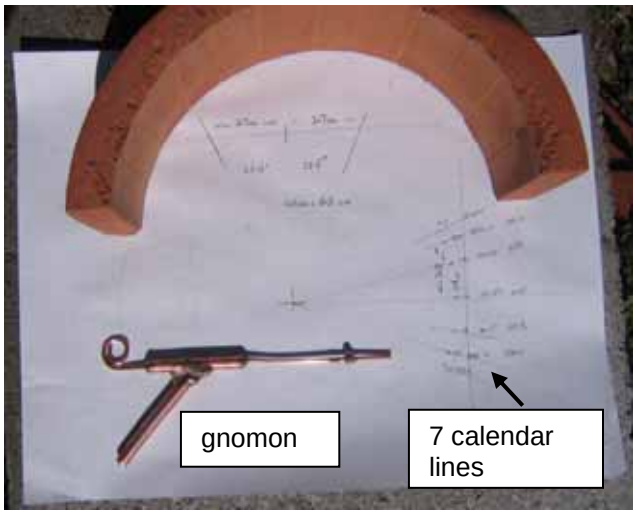
Being west of the legal meridian, the dial would show earlier times than the legal time, so the dial plate is rotated to show a later time, in this case by 3.2 degrees. Were the dial east of that legal time zone meridian then the dial would show a later time, and would be rotated to display an earlier time.

The hour lines were scribed and so was the longitude correction line, a Dremel engraver was used.



longitude correction line and its mate on the brick that would hold this armillary dial plate.

The armillary and equatorial dials are simplicity itself when designing the calendar lines. Everything is linear, they are straight lines and not hyperbolic curves.



There are 7 angles of interest, what you use is what suits you best.

+ 23.5	June solstice
+ 20	May and July
+12	August and April
0	September and March equinox
– 12	October and February
– 20	November and January
– 23.5	December solstice

The radius, or in this case approximate radius was found so the 7 angular lines are drawn. From this come distances. That is the geometric approach. The trigonometric approach would be to observe that

$$\tan(23.5) = \frac{\text{linear distance from 0 to the June solstice}}{\text{radius of the semi-circle}}$$

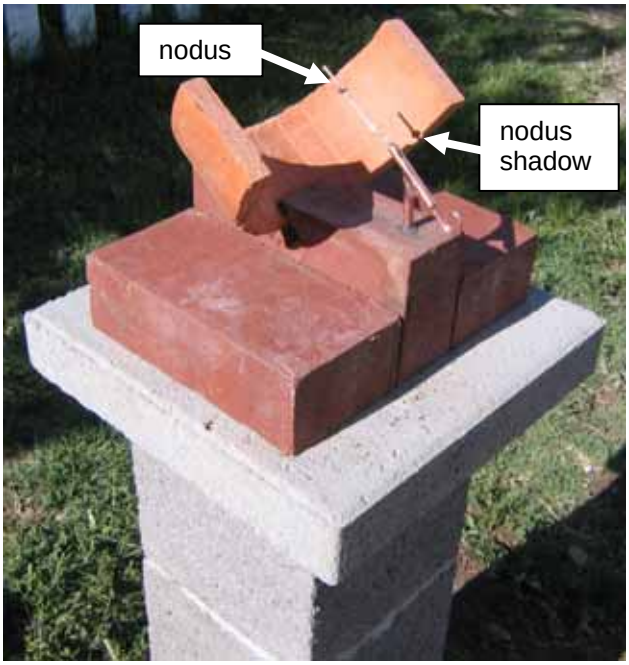
or linear distance from 0 to the June solstice = tan (23.5) * radius of semi-circle

The tangent of	23.5	is	0.4348	or	0.44
	20	is	0.3640	or	0.36
	12	is	0.2126	or	0.21

Whereas the equatorial dial can never show the equinox dates since the sun's rays parallel the dial plate, the armillary can easily show all the calendar lines.

The dial plate selected here has the solstices as the extremes of the dial plate, the equinox line is in the center, and the May/July line next to the equinox line, the April/August line between that and the dial plate edge which displays the solstices.

The nodus can be seen in the shadow as just removed from the summer solstice.



The gnomon is made from 1/4 inch copper tubing commonly found in hardware stores, soldered to establish the latitude, and a 12 gauge copper wire soldered into that. This was inserted into a hole drilled into the brick with a masonry bit. Grid powered electric drills are better for this sort of work than the portable battery drills because portable drills tend to go at slower speeds.

The gnomon support shaft was coated with epoxy and inserted in the hole after carefully verifying the level and angular sections.

Then the copper wire was displaced with two small bends to accurately align it, this corrects any errors when its support was stabilized with epoxy. The copper wire then received a blob of solder after accurately determining the correct place, one 90 degrees or perpendicular from the equinox line on the dial plate. The whole was copper plated with a mix of water and copper sulfate.

The dial plate was not truly circular, this means that those calendar lines would not in a pure world be straight lines, however for a garden dial they are close enough.

The dial plate was fixed with epoxy into a slice cut from the brick with a circular masonry cutting blade. After a number of days the dial was mortared into place and mortar used to fill the gaps where needed.

The final resting place for the dial was on one of three columns of a large garden analemmatic dial.