Scales on the Back of John Aspley's Plane Scale

Robin Stuart
2025

Although he did not invent the Plane Scale (Waters 1958, p. 446), John Aspley's comprehensive description of his version of it in *Speculum Nauticum* (Aspley 1647) was instrumental in its wide-spread adoption by mariners. An illustration of front side of Aspley's Plane Scale appears on page 10 of his work but there is no illustration of the two *Lines of Longitude* scales on the back. Aspley provides the following description

> I have likewiſe cauſed two other lines to be placed upon the back ſide of the Scale , which I doe call the firſt and ſecond Lines of Longitudes : the firſt is divided into 20 unequall parts, or leagues , which 20 Leagues are equall unto the Cord of 90. The uſe of this firſt Line of Longitude , is to ſhew how many Leagues and Miles in any Parallell, doe anſwere unto one degree of the Equinoctiall .

> The ſecond Line of Longitude is divided into 100 proportionable parts, or into 100 unequall Leagues; and every league is ſubdivided into miles , and halfe miles. The uſe of this Line is thus when you have found by the firſt Line of Longitudes , how many Leagues and Miles doe anſwere unto a degree of the Equinoctial in any latitude you deſire : this ſecond line number of will ſhew you how many degrees any leagues in that Parallell,will anſwere unto a degree in the Equinoctiall Circle.

This description leaves some doubt as to the exact form of the scales. Later in the text Aspley does provide a number of worked examples that explain how these scales are used in practice. From the descriptions above and these examples it is possible to reliably reconstruct what they must have looked like and to replicate his calculations.

The first Line of Longitude was a scale analogous to the *Miles of Longitude* (M LON) scale present in later versions of the Plane Scale (see https://navlist.net/imgx/ThePlainScalePrepPrint.pdf) but in units of leagues with one league being equal to 3 nautical miles (N.M.). Used in conjunction with the Chord scale, it returns the number of miles or leagues in a degree of longitude at a specified latitude.

The second Line of Longitude was a 2-cycle logarithmic scale. Later versions of the Plane Scale did not contain any logarithmic scales.

What follows is an extract from Aspley's 1947 edition. This a plane sailing problem and in modern terms

Initial latitude	L_0	56° 5′
Difference in Latitude		4° 9′
Distance	D.	100 leagues (300 N.M.)
Final latitude	L_1	51° 56′
Departure	Dep.	56 leagues (168 N.M.)

Aspley finds "the diſtance of the Meridian, from the Meridian whence you departed", i.e. the departure (Dep.), by graphical construction. As demonstrated below he then goes on to obtain the difference in longitude (D.Lon.) using three scales on the Plane Scale. The first is the Chord Scale. (This was most commonly used as a protractor for drawing and measuring angles.) The first and second Lines of Longitude follow in sequence. The description of the use of the second Line of Longitude is somewhat confusing as the numbers on the scale are referred to as both degrees and leagues as needed. The calculation being performed is D.Lon.= Dep./($20 \cos L_1$), where Dep. is in leagues, for which Aspley obtains 4° 33′. The correct result is 4° 31′ with the difference coming largely from rounding in intermediate stages of the calculation.

Chap. VIII

The distance of Latitude and Leagues ſayled being given to finde the distance Meridionall, and conſequently the difference of Longitude.

Sayling from the North Parallell of 56.deg.and 5.min. 100 Leagues betwixt South and Weſt, untill the Pole be depreſſed 4 deg.9 min. the difference of Longitude is demanded.

…

Then in regard you ſayled from the North Parallell of 56 deg. and 5 min. untill you had depreſſed the Pole 4deg. 5. min. Subſtract therefore 4 deg.9.min. from 56 deg. 5 min . and there remayneth 51 deg.56 min.which is the latitude of the place you are in, and in that Parallell have you departed the firſt Meridian 56 leagues. Then opening your Compaſſes unto 51 deg.56 min. of your Cord,
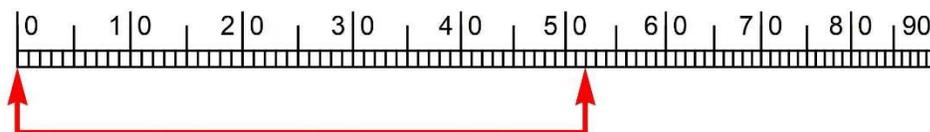

and apply it unto the firſt Line of Longitudes, and you ſhall finde that 12 leagues and one mile (in that Parallell) doe alter one degree of Longitude.
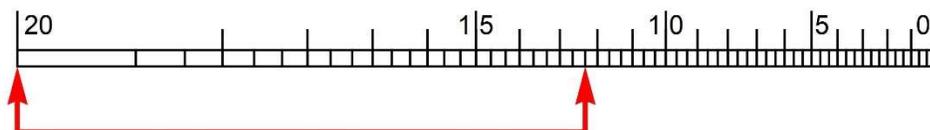
Then ſet one foote of your Compaſſes in the ſecond Line of Longitude, at 12 Leagues , one Mile, and extend the other unto one degree of that Line ;
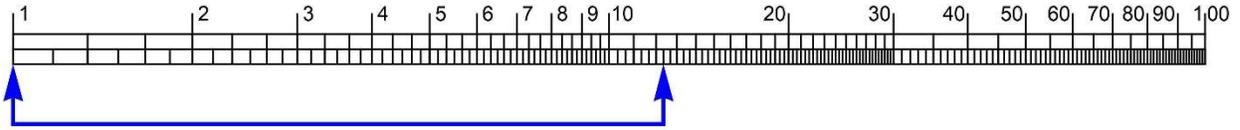
then with that diſtance ſet one foot of your Compaſſes in 56 leagues of the aforeſaid Line, and the other will extend unto 4 degrees 33 min, which is the diſtance Meridionall deſired.
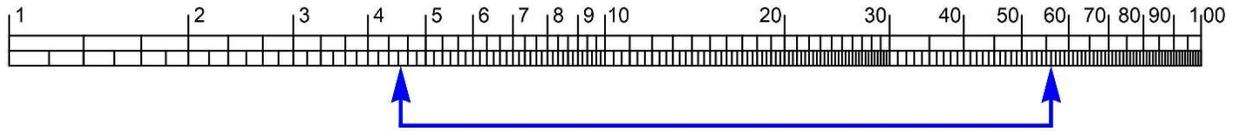
References

Aspley, J. (1647). *Speculum Nauticum. A Looking Glasse for Sea-Men*; London, Thomas Harper. Available at:
https://books.google.com/books/download/Speculum_nauticum_A_Looking_Glasse_for_S.pdf?id=qMxlAAAAcAAJ, https://quod.lib.umich.edu/e/eebo/A26045.0001.001?view=toc

Waters, D. W, (1958) .*The Art of Navigation in England in Elizabethan and Early Stuart Times*, London, Hollis and Carter. Available at: https://archive.org/details/in.ernet.dli.2015.51856