SECT. II.

How to meaſure Angles by the Chain.

TO this End provide Three round Station-Staves, four or five Foot long a-piece; and alſo take Care that the Ring in the Middle of the Chain, and alſo thoſe at each Tenth Link be at their due Diſtance from the Chain's End.

1. In order to meaſure the Angle *d*, *o*, *e*, *Fig.* 24, ſet one of your Station-Staves as upright as you can at *o*; and putting the Ring at one End of the Chain over it, let one of your Aſſiſtants take the other End in his Hand, and ſtretch out the Chain towards *d*, whilſt you ſtanding at *o*, direct him to move ſide-ways till the Station-Staff which he has in his Hand, be brought into one Right Line with *o*, *d*, as at *a*, and there let him leave the Staff.

Then let him, with the End of the Chain in his Hand, move towards *e*; and as before, direct him to plant the Third Staff upright in the Line *o*, *e*, at *b*.

Meaſure the Diſtance *a*, *b*, in Links and Tenth Parts, if leſs than one Chain, and enter 'em in the Field-Book 88 $\frac{1}{2}$.

When you plott this Angle, take with a Pair of Compaſſes from a large Scale, the Diſtance of one Chain; and having drawn a Right-Line *d*, *o*, ſet one Foot of the Compaſſes in *o*, and with the other deſcribe an Arch *a*, *c*; then from the ſame Scale take 88 $\frac{1}{2}$ Links; and ſetting one Foot of the Compaſſes at *a*, let the other fall in the Arch *a*, *c*, and make a Mark at *b*: Laſtly, through this Mark, from *o*, draw the Line *o*, *e*, conſtituting the Angle *d*, *o*, *e*.

Obſerve to plott your Angles by a large Scale,

as

as an Inch, or two Inches, and the Length of the Sides by a ſmaller, as a Quarter of Half an Inch: Alſo obſerve, that when the Length of the Chord *a*, *b*, is longer than one Chain, then 'tis beſt to lay out a Sextant, or two Sextants in the following Manner.

2. The Manner of meaſuring Angles with the Chain, by laying of Sextants, is deduced from this known Property of the Circle, *viz. The Radius of every Circle is equal to the Chord of One Sixth Part* (or a Sextant) *of its Periphery.*

Let it be required to meaſure an Angle *b*, *a*, *c*, *Fig.* 25: Firſt, ſet up a Staff at *a*, and lay the Chain ſtrait in the Direction of *a*, *b*, to *i*, and at 50 Links ſet down an Arrow at *o*; then let your Aſſiſtants hold the Ends of the Chain at *o*, and *a*, whilſt you with the Middle in your Hand, laying both Halves ſtrait, ſet down an Arrow at *e*, conſtituting the equilateral triangle *o*, *a*, *e*, a Sextant.

But if you have two Chains, you may (which is better) lay out the Sextants, ſo that each Side of the equilateral Triangle be one Chain.

Now the Chain's End ſtill held at *a*, ſtretch it through the Point *e* to *d*, where alſo ſet down an Arrow: Laſtly, meaſure the Diſtance from the Arrow at *d*, to a Staff ſet up one Chain's Length from *a* at *u*; ſo ſhall the Diſtance *d*, *u*, be 76 Links, and Four Tenths of a Link; Therefore enter in the Field-Book 1^{S}, 764^{P}, implying 1 Sextant and 764 Parts.

In order to plott this Angle, *b*, *a*, *c*, thus meaſured, chuſe ſome Line divided into 1000 Parts, and making this Line Radius, ſet one Foot of the Compaſſes in *a*, and with the other deſcribe the Arch, *i*, *z*; and the Compaſſes continuing at the ſame Extent, ſet one Foot in *i*, and with the other,

other, croſs the Arch at *d*, and there make a Mark.

Then take 764 Parts from the ſame Line, divided into 1000 Parts, which you made Radius; and ſet one Foot of the Compaſſes in the Mark at *d*, and let the other croſs the Arch at *u*, and there make a Mark: Laſtly, from *a*, draw a Line through the Mark at *u*, and you will conſtruct the Angle required.

If you have not a Line (which is beſt) actually divided into 1000 Parts, uſe the largeſt Diagonal Scale you have; ſo you may take off 76 Parts exactly; and the four Tenths you muſt gueſs at by moving the Compaſſes near half way in the Diagonal towards 77; alſo obſerve, the 10th of a Link is meaſured on the Land by the Offset-Staff, having a Link or two thereon, divided into Ten Parts.

3. If the Angle be more than Two Sextants, as in *Fig.* 26; then having, as before, laid off the Sextant *e*, *o*, *a*, let your Aſſiſtants hold the Ends of the Chain at *a* and *e*, while you with the Middle in your Hand, ſet down an Arrow at *x*, conſtituting another Sextant *e*, *a*, *x*.

Then the Chain being held at *a*, lay it thro' *x*, and at the other End *d*, ſet down an Arrow: Laſtly, meaſure *d*, *u*, which ſuppoſe to be 42 Links and 5 Tenths; therefore enter in the Field-Book 2^{S}, 425^{P}, ſignifying 2 Sextants and 425 Parts.

And if you would protract the Angle of *Fig.* 26, then with the Length of the Line divided into 1000 Parts, deſcribe the Arch *i*, *y*, and thereon lay *i*, *n*, and *n*, *d*, each equal to the Radius or divided Line; and afterwards lay 424 equal Parts from *d*, to *u*, and draw *a*, *u*; which gives the Angle, as required.

Obſerve,

Obſerve, if you were about to meaſure the Angle, *Fig.* 26, and had ſet up one of your three Staves where the Station-Lines meet in the angular Point *a*, another at *i*, and the other at *u*, in the Lines *a*, *b*, and *a*, *c*; before you proceed to meaſure the Angle *i*, *a*, *u*, you muſt be ſure that the Staves at *a*, and *i*, and the Mark at *b*, are exactly in the ſame Plane; and alſo the Staves at *a*, and *u*, and the Mark at *c*, in another Plane.

So when the Staff at *a*, is planted as nearly Perpendicular as you can, move yourſelf backwards, the farther the better, 'till you ſee the Staff at *a*, and that at *i*, in one ſtrait Line with the Mark at *b*; there ſtand, and direct your Aſſiſtant to place his Staff, ſo that the Staff at *a*, exactly cover that at *i*, from the Top to the Bottom.

SECT. III.

Obſervations on Working with the Chain.

IF you would continue a ſtrait Line, you may ſignify it, by entring in the Field-Book 3^{S}. ooo, that is, 3 Sextants.

If an Angle be external, and ſo contain more than 3 Sextants, as *b*, *a*, *e*, *Fig.* 27, put the Ring at one End of the Chain over the Staff at *a*; and taking the other End in your Hand, ſtretch out the Chain at Length towards *d*, and move Sideways, till you perceive yourſelf in a Right-Line with *a*, *b*, and there at the End of the Chain, ſet down an Arrow at *d*, ſo that *d*, *a*, *b*, are in the ſame Plane, and then ſet down the other Staff at *c*, at the End of one Chain alſo; ſo that the Staves at *a*, and *c*, be in the ſame Plane with the Mark at *e*. Now meaſure the Angle *d*, *a*, *c*, in the ſame Manner as aforeſaid, and to it add the Sextants,

ſo