A METHOD FOR THE RAPID CONSTRUCTION OF SEXTANT ANGLE GRAPHS

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Sextant angle graphs are widely used by hydrographic surveyors for plotting on large scale surveys; the principles governing their geometrical construction and use need not, therefore, be discussed here, and it will be assumed that the reader is familiar with the usual methods of preparing such graphs.

In certain cases, particularly when very large scales are chosen for a survey, the straightforward method of drawing up circles by beam compass cannot be used because of the large plotting distances involved. Normally in such cases points along the arcs of circles are computed, plotted and the arcs drawn with splines or railway curves. There are several methods of computing and constructing graphs in this manner, but all involve a certain amount of laborious calculation and plotting as a preliminary to the actual drawing of the arcs of constant angle.

It was felt, therefore, that a need for a rapid, yet accurate method of preparing sextant angle graphs exists, and for this reason the following idea in which standard radial sheets are used came into being.

Construction of standard radial sheets

Each sheet is constructed as shown in diagram 1 on a transparent, stable, plastic material. The radial lines from a common centre are drawn for each degree, half and quarter degree according to the distance from the point of origin for the particular sheet. It is considered that, for normal requirements, two copies of each of four sheets covering a total range of 500 centimetres from the point or origin should suffice.

On each sheet the central radial line is marked at 10 cm intervals : sheet 1 — 100 cm to 200 cm; sheet 2 — 200 cm to 300 cm, etc. If a millimetric grid is available these standard sheets can be drawn quite quickly, the product of the tangent for each angle and the distance in centimetres for the extremities of each sheet gives the distance either side of the central line along the lines AB and XY on diagram 1 where each radial line intersects. The interconnection of these points completes the standard radial sheet.

STANDARD RADIAL SHEET 1.

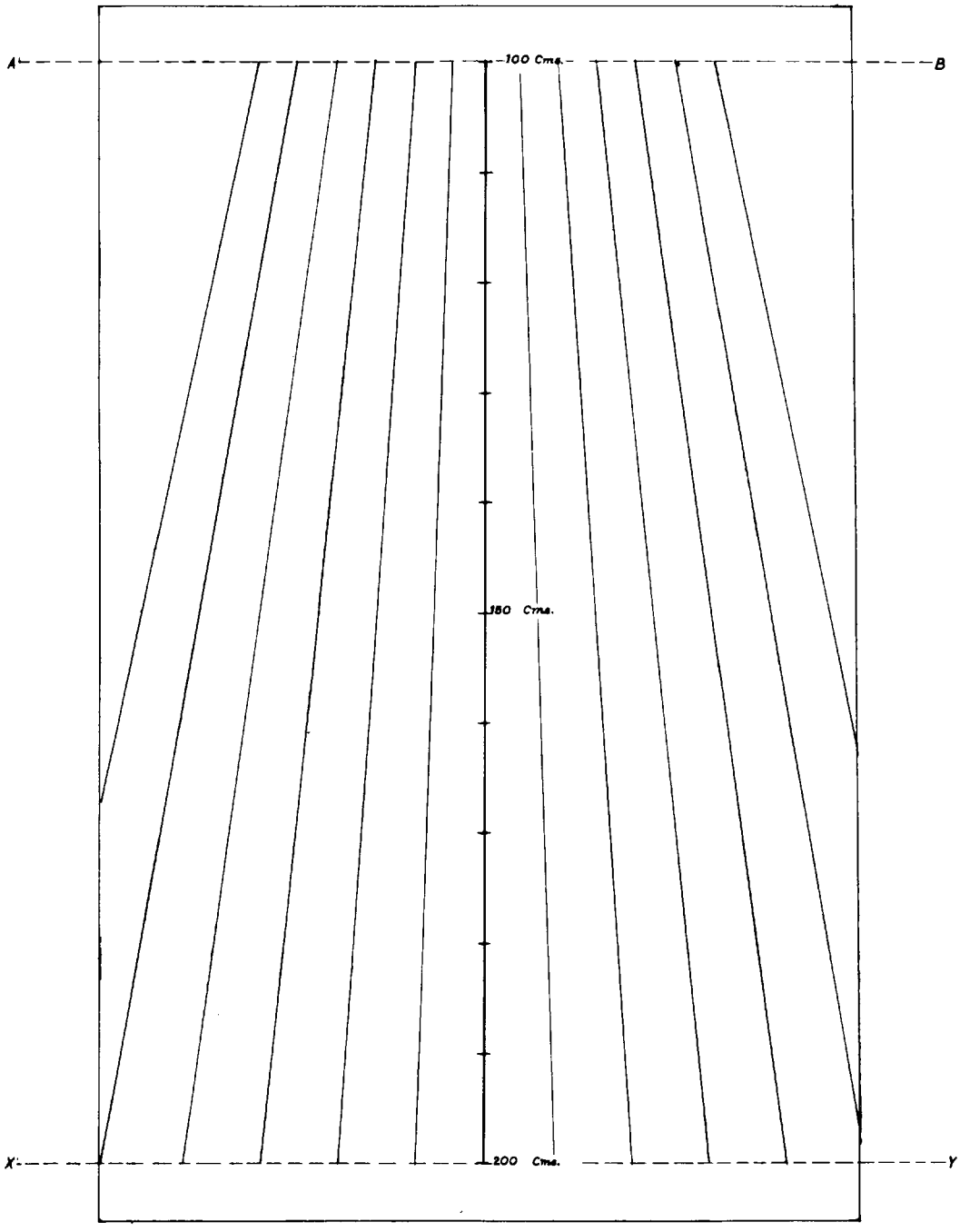

Diagram 1.

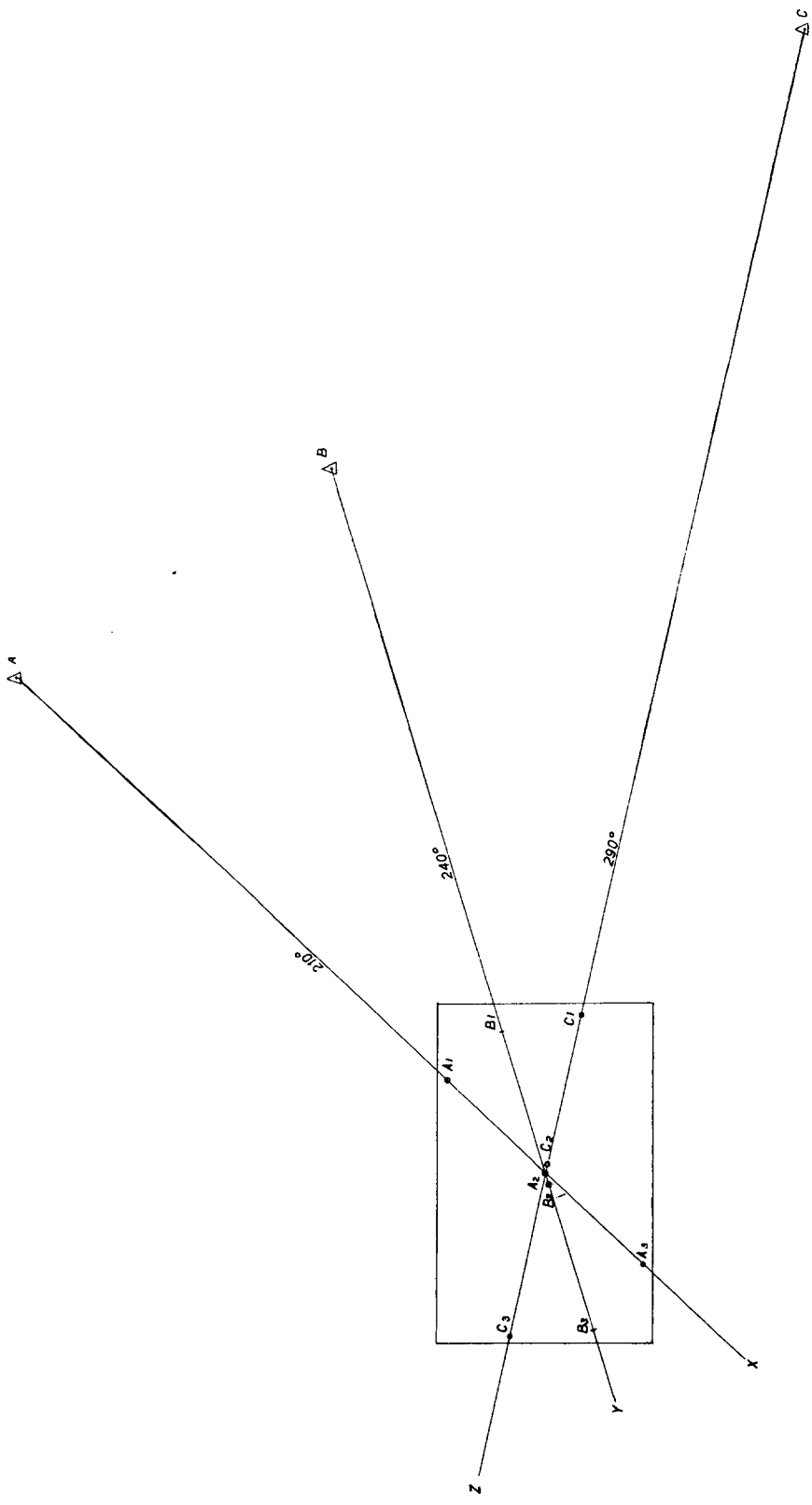

DIAGRAM 2

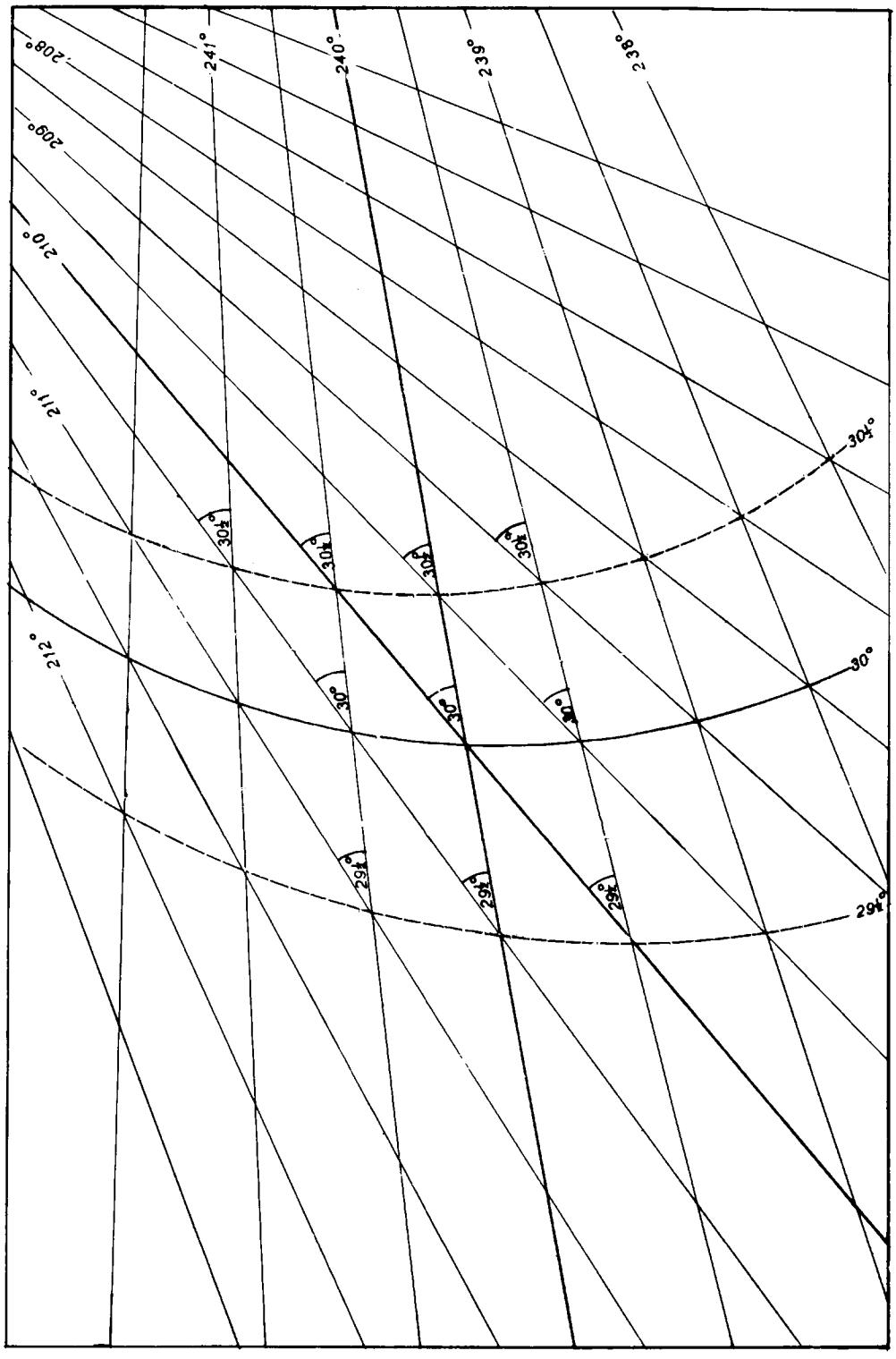

DIAGRAM 3.

Instructions for use

The example in diagram 2 shows three fixing marks and a rectangle enclosing the area to be covered by arcs af constant angle. From a suitable reference chart lay off the lines AX, BY and CZ, choosing a convenient bearing to the nearest whole degree so that each line passes approximately through the centre of the area.

Again from the reference chart select three points on each line, here designated A_1, A_2, A_3, etc. and, allowing for the scale of the survey, select suitable distances, AA_1, AA_2, AA_3 etc. to the nearest 10 cm *on paper.* Compute the coordinates of each of the nine points and plot these on to a millimetric grid or plotting sheet.

The first standard radial sheet can now be positioned so that its central radial line coincides with the three plotted points at their computed distances. This provides sufficient check on the accuracy of computations and plotting.

A similar procedure is carried out with the second standard radial sheet along the line BY and both sheets secured by weighting or taping to avoid slip. Arcs of constant angle between the marks A and B can now be drawn on to a transparent plastic material or tracing paper placed over the arranged sheets as follows :

In diagram 3 the two central radials shown in thick line cross at an angle of 30°. By laying a spline along this intersection and the remaining intersections for the same angle the arc of constant angle for 30° will be produced. This is repeated for the remaining range of angles required.

To complete the graph, a similar procedure to the above is carried out using lines BY and CZ.

Conclusions

In surveying ships or departments where the need for sextant angle graphs arises frequently, the time and labour involved in drawing up standard radial sheets will eventually pay dividends later on, probably with the first graph so constructed. The above method can, however, be employed even if no standard radial sheets are available by plotting each radial line directly on to the plotting sheet.