Sketching Terrain from a Known Point

Edwin R. Stuart, 1918

Selected pages from Map reading and topographical sketching.

A field exercise in sighting landmarks, estimating distances and drawing the relief around a known position.

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CHAPTER XII

TOPOGRAPHICAL MAPPING—Continued

Sketching from a Located Point

Selection of Ground for Practice.

In many cases there will be difficulty in selecting a suitable plot of ground for instruction in contouring. It is not necessary, however, to reject a piece of ground full of horizontal detail if it has the necessary variety of slopes, valley, spur, and ridge forms. For instruction purposes, the horizontal detail may be disregarded entirely so long as the buildings or trees are not sufficiently numerous to prevent getting a good view of the area. The worst possible condition of affairs is a piece of ground covered with thick brush or woods, and it should not be considered for instruction purposes, because it is impossible to get any view of any extent and consequently impossible to point out satisfactorily or prove the students' errors. A wooded area may, however, be used late in the fall or early in the spring when there are no leaves on the trees.

With these considerations in mind, an area of ground conveniently located is sought, about 1 square mile in extent, and possessing the best available characteristic ground forms. Other smaller areas may be used for preliminary problems.

Scale and Vertical Interval.

It is best to carry out the preliminary instruction of a student in sketching on a scale of 6 inches = 1 mile. Some favor the use

of 12 inches = 1 mile for preliminary instruction, because of the smaller amount of generalization involved. It is thought, however, that the student might as well face this problem of generalization at the start. The 12 inches = 1 mile scale slows down the work too much. The 6 inches = 1 mile scale gives a far better idea of proper progress.

Control Traverse.

As a preliminary to the work of contouring, the student should run a control traverse through the area, closing and checking upon itself. This control traverse gives an excellent opportunity to show the student how much reliance can be placed upon the horizontal location of points. If the standard equipment is available, the plotted positions of the points of the traverse will be out of position by little more than the plotting error of the scale. The ground points located by this traverse should be remembered by the student. From what has been seen before, it is essential that the traverse shall furnish all the data for plotting the stream courses and drainage lines accurately. All is now ready for the delineation of the contour forms from the located points, and the student should be reminded that the only difference between what he has done and a formal survey lies in whatever inaccuracy there may be in his location of points, and that he now has the same opportunity to represent the ground faithfully from any given point as has the topographer in a formal survey.

Analyzing Ground Forms.

As a preliminary to the work of delineating the small area about a located point, the student should see accurately just what there is to be shown. If he is at the top of a summit, he must look for the beginnings of spurs and valleys, and note that the direction of these features is of importance. If in a valley, the character and degree of slope at the sides of the valley should be noted,

also the direction of any minor spur or drainage line which would affect the contour forms. If among the indistinct ground forms lying near the crests there are any features that may serve to mark or distinguish the point, such as the beginnings of valleys or spurs, they should be noted. In other words, at any point from which sketching is to be done, the student should ask himself what he would have a right to expect to find on a good map of the area immediately about him, and if there is any feature which belongs on such a good map, then the student must be prepared to show it in its correct form and position upon his own sketch.

Specific Example. Fig. 39 (1). In order to illustrate what is done at a single point, it is best to consider the procedure at a

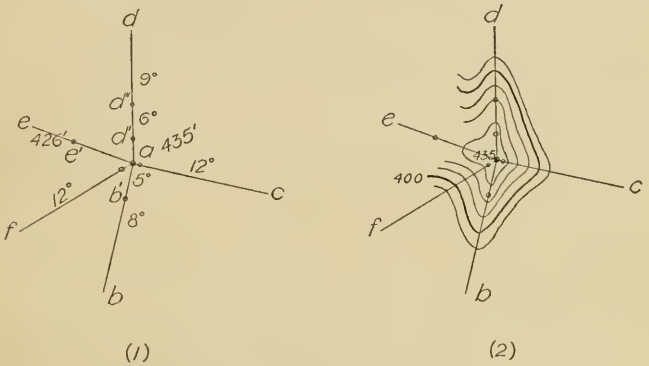

Fig. 39.—Sketching from a Point.

point marked by characteristic ground forms. Such a point is represented at *a*.

With the board set up and oriented at *a*, elevation 435 feet, inspection shows that there is a spur running in the direction of *b*, the crest of which is sharp, and that it changes slope at some point, as *b'*, not yet determined; that in the direction *c* there is just enough in the way of a spur that the contours between the lines *c* and *b* are concave rather than convex in plan; that in

the direction of *d*, the axis of the ridge is level to some point *d'*, and that the spur changes slope at some point *d''*, both points not yet determined; that in the direction *e*, this knoll at *a* is joined to other high ground by a saddle; that the contour forms between the lines *d* and *e* begin to show a valley; and that in the direction of *f* is a rounded depression such that the contours are nearly semi-circular in form. This analysis of the ground is made by walking around from *a*, as may be necessary, and the result is to come to a definite conclusion as to just what is to be shown about *a*.

Measurements from the Point. Fig. 39 (1). Having determined just what is to be represented, the necessary measurements are evident. First the lines *b*, *c*, *d*, *e*, and *f* are plotted. Refinement in making these pointings with the alidade is not necessary. In a general way, it is sufficient to point the alidade as accurately as possible without stooping down to the level of the board, since nothing depends on these shots but the plotted direction of the axes of the features. In the direction of *b* the slope is now read for the first part of the slope, and found to be 5 degrees. Pacing in the direction of *b*, the 5-degree slope ends at 30 strides at *b'*. Here the slope is read in the direction of *b*, and found to be 8 degrees, certainly as far down as the fourth contour below *b*. Returning now to *a*, after going 5 strides in the direction of *c*, the slope is measured and found to be 12 degrees, for at least four contour intervals. In the direction of *d* the axis of the ridge is level for a distance of 20 strides to *d'*. Then begins a slope of 6 degrees, to the point *d''*, 50 strides from *a*. At *d''* begins a 9-degree slope, extending down at least three contour intervals. In the direction of *e*, a slope of 2 degrees is read and the distance 52 strides paced to *e'*, which is the low point in this saddle. Its elevation is determined to be 426 feet. After striding 8 strides in the direction of *f*, a slope of 12 degrees is read and mental note made of the semi-circular form of the contours in this direction. The result of all of these measurements is a series of contour

points along each of the lines *b*, *c*, *d*, and *f*. It now remains to draw the contours through these points in such form as to follow faithfully the ground before us. The slopes between *b* and *c*, and *c* and *d*, are both concave in plan rather than convex. Drawing the contours according to what we have observed, the result is shown in Fig. 39 (2).

Checking Results.

After completing the delineation of the ground form, the result should be checked to see whether the representation is correct, showing the break in the slope in the directions of *b* and *d*, the very blunt spur in the direction of *c*, the saddle in the direction of *e*, the beginning of the valley between *d* and *e*, and the semi-circular form in the direction of *f*. If the representation answers all of these tests it is not likely to be the subject of criticism. The delineation above described is made to depend upon measurements, and a clearly marked hill form was selected to be delineated. It is not always possible to do the sketching in this way.

The Level of the Eye.

As soon as we begin to sketch by estimation, it becomes important to be able to select without instrumental aid a point on the ground at the level of the eye, and then by swinging the extended arm to describe a level line so that a satisfactory conception can be gotten of the trend upon the ground of a contour at the level of the eye. The ability to select, without instrumental aid, a point at the level of the eye is not a natural faculty but is one which must be carefully cultivated. Experience shows that with beginners in topography, if they are asked to point out a spot at the level of the eye, the average man will designate a point the actual reading on which is about plus 3 degrees. However, this tendency can be overcome by practice.

It is possible, with a little practice before the mirror, to extend

both arms in a horizontal position. If the body be swung upon the hips, eyes to the front, the hand will come into the line of vision on a level with the shoulder. If the thumb be turned up and fully extended, it will approximate to the level of the eye. Swinging the arms backward and forward in front of the eye in this position will give a good conception of the trace of the contour on the level of the eye. After considerable practice has been had, it is necessary to swing only one arm, and the result achieved will be quite satisfactory.

Sketching by Estimation.

Flat Hilltops. If instead of the clearly marked forms in Fig. 39, the hilltop had been comparatively flat, and the forms ill-defined, all we should have had to go on would have been an elevation of 435 feet at the location of the instrument, with nothing definite to read on in any direction. We will suppose that in a certain direction, after a distance of 50 strides, the ground begins to slope downward. We may plot that direction, and then, proceeding along that line, establish ourselves at a point such that the ground at the sketching board will be at the level of the eye. The clinometer might be used for this work, but it takes too much time. We are now standing on ground at 430 feet elevation. Mark this 430 point and proceed farther until the eye is on a level with it. Swinging the arm will now sweep the 430-foot contour on the ground. The total distance to the sketching case is known, having been paced in coming out, so that both the plotted position of the point occupied, and a direction line will be on the sketch to guide in drawing the contour. Its meanderings for 50 strides each side of the line with respect to the line to the sketching case should be noted for use in plotting the contour upon return to the sketching case. About three or four outward journeys like this may be necessary to get a satisfactory delineation of the 430-foot contour. The total time necessary is not over ten or fifteen minutes and is well spent,

because the correct working out of the form of the 430-foot contour will then form the basis for all the ground forms lying below.

Valleys. The valley contours lend themselves readily to the method of sketching by estimation. If we occupy a point on one side of the valley, we then judge the level on the other side of the valley to see whether the contour is symmetrical on the two sides of the stream, estimate or pace the distance to the stream, and thus establish two points on the contour. Swinging the arm at the level of the eye, the point is estimated at which the contour crosses the stream. This point is estimated in distance by comparison with the width of the opening across stream. As has been indicated, the beginner will be surprised at how close the contour is on the other side of the valley, and how far upstream it extends.

Hillsides. In sketching from a point located on the side of a hill, the slope up and down may usually be read, and the contour spacing and locations in these directions established. Trace the contour at the level of the eye to see the form which it follows, what indentations and other peculiarities there are in it. The form of this contour will guide the drawing of the map contours at the point. Always, before leaving a point, examine the sketch to see if any feature is omitted that should be shown; to see that every feature that is shown is in its proper direction from the traverse point; and in general, that the representation of the ground is as accurate and as detailed as it lies within your power to make it, subject to the limitation that it is no use to spend time making little sinuosities and indentations in the contours that do not give any definite and specific information about the slope of the ground and would merely be lost in the general use of the map. In this connection, it is well to remember that the slope of the ground at any point requires the contours both above and below it to completely show the character of the slope.