NOTES ON MILITARY MAP READING.
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The following notes on military map reading formed the basis of a series of lectures delivered at the Royal Army Medical College, to the lieutenants on probation, Royal Army Medical Corps. It is hoped that they may be of some interest to a wider audience than that to which the lectures were given. A good knowledge of map reading is essential to all officers who may be called upon to work out problems in medical strategy and tactics, and senior officers must have found this to be so when they have been ordered to take part in staff rides or to evolve schemes for medical administration and organization in the field. No originality is claimed for the observations made in these notes. They are largely compiled from various official and non-official text-books, which have been collected with a view to meeting the requirements of military medical officers. The following remarks made in the introductory lecture will indicate the scope of the subsequent teaching. "In your future career you may be called upon to select sites for general military camps, for dressing stations, field ambulance camps, hospitals, &c. You may also be required to march men or move ambulance wagons from one point to another in a country which is not familiar to you, and to do so independently of other troops. Then, again, you should be in a position to tell from a map the routes (whether by road, rail or water) by which sick and wounded can be moved with the greatest convenience and with the most comfort to the patients. A knowledge of military map reading will assist you in all these cases, and will also help you to solve various other problems of a similar nature."

In the service one has to deal with: (1) military maps; (2) field sketches; and (3) panorama sketches.

(1) Military maps are the proper work of a trained surveyor, using special instruments and elaborate appliances, with unlimited time at his disposal and aiming at minute accuracy.

(2) A field sketch is a sketch of the ground, such as an officer or N.C.O. of average attainments ought to be able to make, working with such instruments and under such conditions regarding time, weather, &c., as generally exist in the field.

(3) A panorama sketch is a landscape sketch representing the country in elevation instead of in plan. It is useful to illustrate a report and may add considerably to its value and clearness.
Before reading a map, the scale of it should be carefully noted, and the space occupied by a mile should be observed:—

(1) In the United Kingdom, India and Canada scales on the map are usually expressed in words showing the relation between inches on the map and miles on the ground; thus, 1 inch to 1 mile, or $\frac{1}{2}$ inch to 1 mile.

(2) Foreign maps and maps of the British African Colonies and possessions are constructed on scales which bear the proportion of 1 to some multiple of 10, such as 1 to 250,000, or 1 to 1,000,000. The scale adopted for the military map of South Africa is 1 to 250,000.

These scales may be represented as fractions, thus, a scale of 1 inch to 1 mile may be represented by $\frac{63,360}{1}$ (there being 63,360 inches in a mile); or a scale of 1 : 100,000 (= 1 centimetre to 1 kilometre) may be shown as $\frac{1}{100,000}$. The fraction in each case is called the Representative Fraction or R.F., and means 1 unit in the map (numerator) represents a certain number of similar units on the ground (denominator). The numerator of a R.F. is always 1 unit.

Given the Representative Fraction, to construct a scale in miles:—

(1) If the scale is $\frac{63,360}{1}$ or larger (i.e., with a smaller number in the denominator), multiply the R.F. by 63,360. This gives the number of inches to the mile. Thus with a R.F. of $\frac{1}{100,000}$:

$$\frac{1}{100,000} \times 63,360 = 6.33\,\text{inches to 1 mile}.$$

(2) If the scale is smaller than $\frac{63,360}{1}$ (i.e., with a larger number in the denominator), divide the denominator of the R.F. by 63,360. This gives the number of miles on the ground represented by 1 inch on the map. Thus with R.F. of $\frac{1}{100,000}$:

$$\frac{63,360}{1} = 3.95\,\text{miles to 1 inch}.$$

The measure of length which a scale is to show, whether feet, yards or miles, is termed the Unit of Measure.

Maps for manoeuvre areas have generally been drawn to a scale of 1 mile to 1 inch. Recent regulations, however, state that in future the scales will usually be those employed in maps which would be issued on field service, that is to say:—

(a) At home $\frac{1}{4}$ inch to 1 mile ($\frac{1}{4}$ inch in Ireland).

(b) In the Colonies $\frac{1}{4}$ to $\frac{1}{4}$ inch to 1 mile. Maps of a larger scale (up to 6 inches to 1 mile) are used to show:—

(1) The details of camping grounds.
(2) The distribution of troops in billets.
(3) Siege operations.

Large scale field sketches are also employed to meet the above requirements, or to display the topography of a village or town necessary to provide for its attack or defence, or to represent the results of a reconnaissance of a road, river, defensive, or outpost position.

"Manoeuvre maps should be reproductions of the Ordnance survey, and should show the boundaries of the manoeuvre area, ground out of bounds and such other information as may be considered desirable. . . . The sites of available camping grounds and bivouac spaces may be indicated on manoeuvre maps by numbers enclosed in circles, or some other conventional sign allowing of easy reference. . . . Tracings from the Ordnance map on a scale of 6 inches to 1 mile of the camping ground or bivouac spaces should be made and issued to the commanders and staff concerned" (Training and Manoeuvre Regulations, pp. 53 and 58).

To Construct a Scale.—If no scale is shown on a map, a R.F. may be obtained if the distance between two points shown in the map is accurately known. Failing this knowledge, the distance between two points shown on the map should be measured, by pacing (a pace = 30 inches) or otherwise, and compared with the distance between the same two points on the map. Then the R.F. can be worked out by showing the distance on the map in inches as the numerator, and the distance on the ground in inches as the denominator, and reducing the fraction until the numerator is represented by 1 unit.

"Suppose we have a map in which R.F. is \( \frac{100,000}{x} \). Here the R.F. shows that 100,000 inches, or roughly 1\( \frac{1}{2} \) miles, are represented by 1 inch; therefore, evidently 9 miles will require a line about 6 inches long. The exact length is found in the usual manner, thus: 100,000 inches : 9\( \times \)1760\( \times \)3\( \times \)12 : : 1 inch : x inches whence \( x = \frac{57}{50} \) inches."

"Take a line 5\( \frac{7}{10} \) inches long from the protractor and divide it into nine equal parts, each part will be 1 mile. Divide the left part into eight equal parts, each will be 1 furlong" (see fig. 1).

"It may be observed that if the representative fraction is marked on a plan, the scale can be understood, and the plan, even though it be a foreign one, used by anyone. Without the R.F. it might be useless, unless the exact distance between any two points on the plan is known, or can be established by actual measurement on the ground, in which case the distance measured is represented
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by so many inches on the plan, whence the R.F. may be inferred and a suitable scale constructed’” (Notes on Map Reading for use in Army Schools”).

A ready method of dividing a straight line into any number of equal parts is demonstrated by the following example (see fig. 2).

It is required to divide the straight line AB into nine equal parts. From A draw a straight line AC, making an angle of about 20 degrees with AB. Set off on AC nine equal divisions, making each of them, by estimation, nearly equal to \( \frac{1}{9} \) of AB. Let D be the last point marked on AC. Join DB. Then from the other points marked on AC draw straight lines to AB parallel to DB. AB will be divided into nine equal parts. (See Euclid, 10th proposition, vi. book.) DB should meet AB as nearly as possible at a right angle.

The following measurements may be of use in map reading, and even in the construction of scales, if a protractor or an inch measure is not available:—

1. The diameter of a halfpenny is 1 inch.
2. The lines on a sheet of ruled official foolscap are \( \frac{1}{2} \) inch apart.
3. A man’s visiting card measures 3 inches by 1\( \frac{1}{2} \) inches.
4. If the last joint of the thumb is flexed to a right angle and placed, nail downwards, on a plane surface, the longitudinal distance covered varies from 1\( \frac{1}{4} \) to 1\( \frac{1}{2} \) inches in different individuals.

The advantage of a scale showing miles to an inch, or inches to a mile, is that the eye can easily recognise the length of an inch on paper, and thus rapidly estimate distances on the map, even without measurement.

It is good practice to compare maps of the same district, but of different scales, with the actual ground which those maps represent; so that afterwards, knowing the scale of a map, one can construct a mind-picture on the ground portrayed before one has an opportunity of inspecting it. A map should not be looked upon as a mere plan or diagram, but as a means of conveying to the mind an actual picture of the ground which it represents. One should see in one’s mind’s eye the hills and valleys, roads, watercourses, canals, railways, woods, parks; and other features of the country delineated.

(To be continued.)