Chapter 1

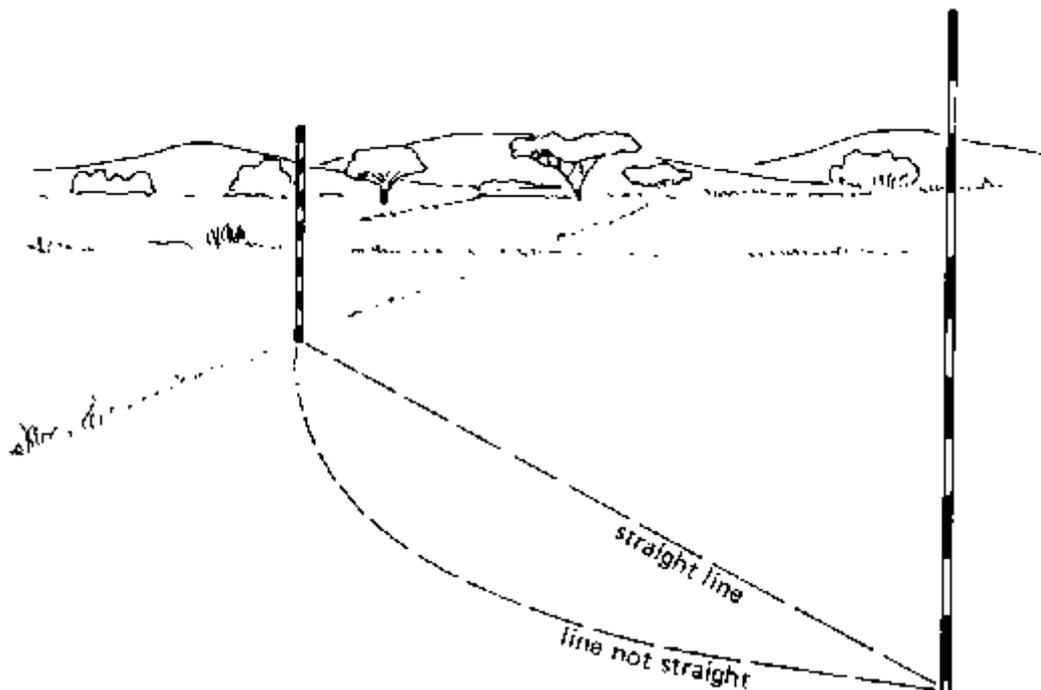# 2. SETTING OUT STRAIGHT LINES

2.1 Definition of a Straight Line

A straight line is the shortest distance between two points on a map or between two points on the field (see Fig, 9).
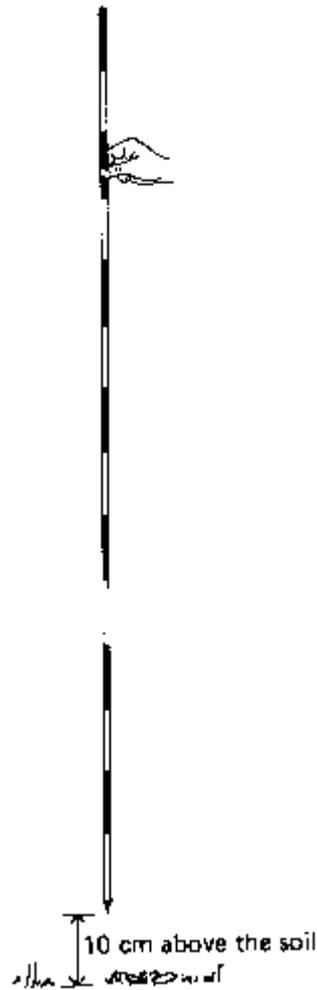
Fig. 9 A straight line

2.2 Placing of Ranging Poles

The correct way to hold a ranging pole is to keep it loosely between thumb and index finger, about 10 cm above the soil (see Fig. 10).

When the observer indicates that the ranging pole is in the right position, the assistant loosens the pole. The sharp bottom point of the ranging pole leaves a mark on the soil

exactly where the pole has to be placed. Once in place, it should be checked if the ranging pole is vertical, e.g. with a plumb bob, or a carpenter level (see Fig. 11).

Fig. 10 Holding a ranging pole

10 cm above the soil

Fig. 11 Placing a ranging pole

WRONG   RIGHT

plumb bob   plumb bob
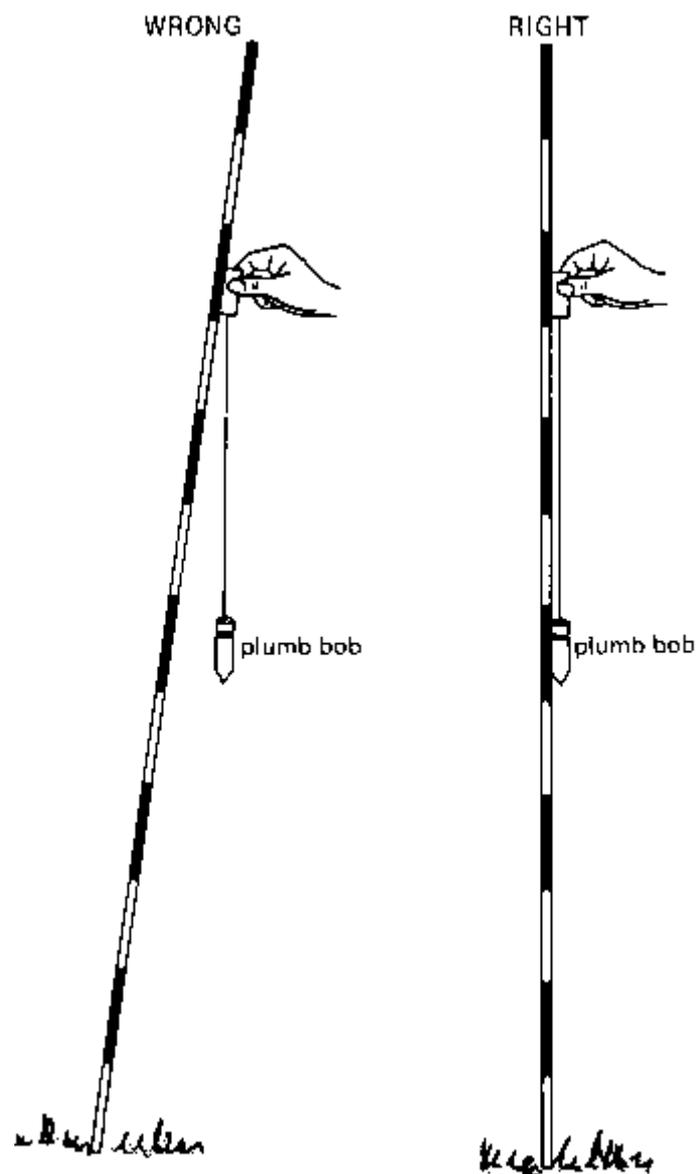
2.3 Setting out Straight Lines

This section indicates, step by step, how to set out straight lines over a short distance, over a long distance and over ridges or hills.

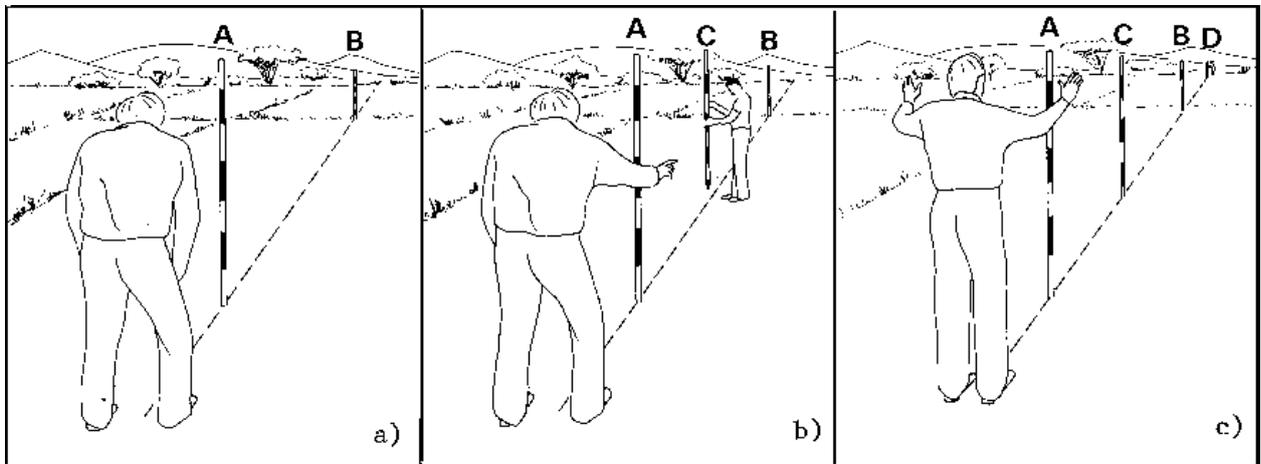### 2.3.1 Setting out straight lines over a short distance

Step 1

As shown in Figure 12a, pole (B) is clearly visible for the observer standing close to pole (A). The observer stands 1 or 2 meters behind pole (A), closes one eye, places himself in such a position that pole (B) is completely hidden behind pole (A) (see Fig. 12a).

Step 2

The observer remains in the same position and any pole (C in Fig. 12b) placed by the assistant in between (A) and (B), which is hidden behind pole (A), is on the straight line connecting (A) and (B) (see Fig. 12b).

<u>Step 3</u>

The observer remains in the same position and any pole (D in Fig. 12c) placed behind (B), which is hidden behind poles (A), (B) and (C), is on the extension of the straight line connecting (A) and (B) (see Fig. 12c).


In other words, poles (A), (B), (C) and (D) are in line if the observer, standing 1 or 2 meters behind pole (A), sees pole (A) only, while the other poles are hidden behind pole (A).

2.3.2 Setting out straight lines over a long distance

As shown in Fig. 13, ranging pole (B) is at quite a distance from pole (A) and it is hard to see pole (B) clearly. A flag is attached to ranging pole (B) to make it more visible.
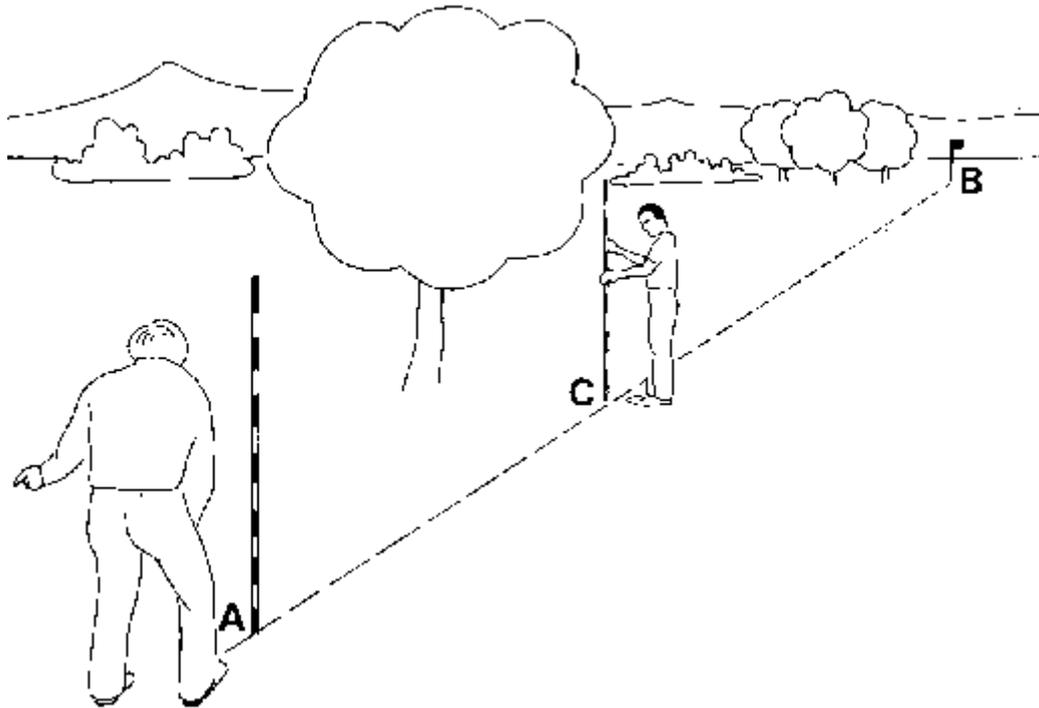
Fig. 13 Setting out a straight line over a long distance
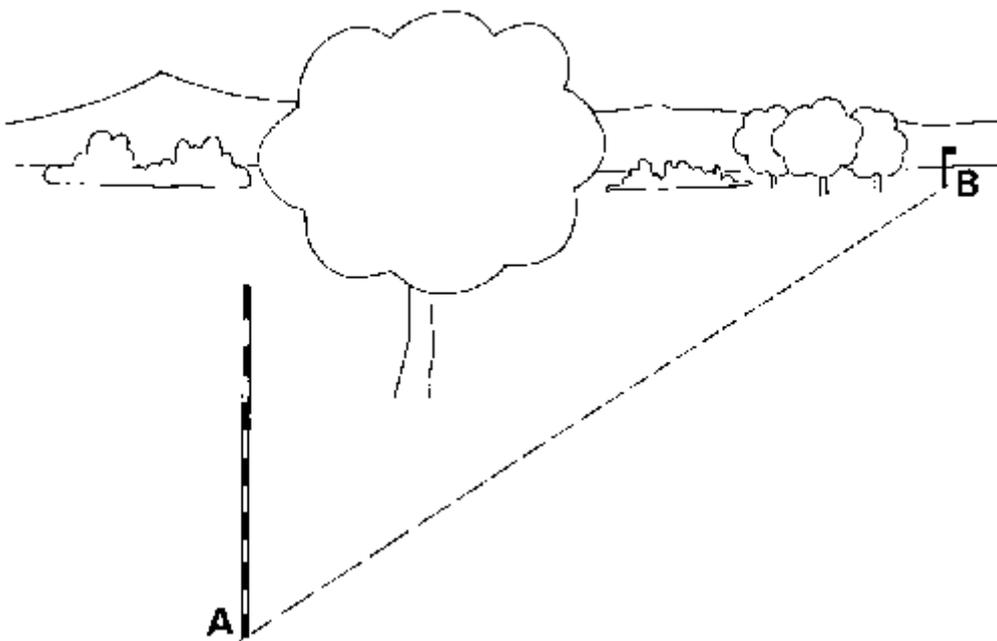
<u>Step 1</u>

Pole (C) is approximately set in line with (A) and (B) at about one third of the distance between (A) and (B), closer to (A) (see Fig. 13a).
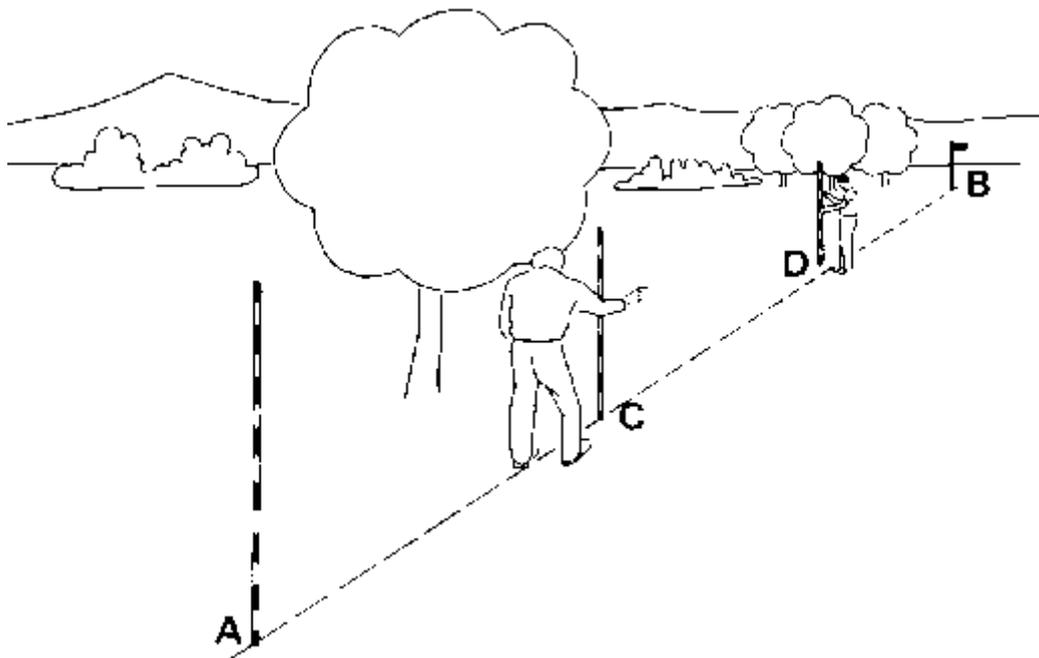
Fig. 13a Setting out a straight line over a long distance, Step 1

Step 2

The observer moves to pole (C) and pole (D) is set in line with (C) and (B) (see Fig. 13b).
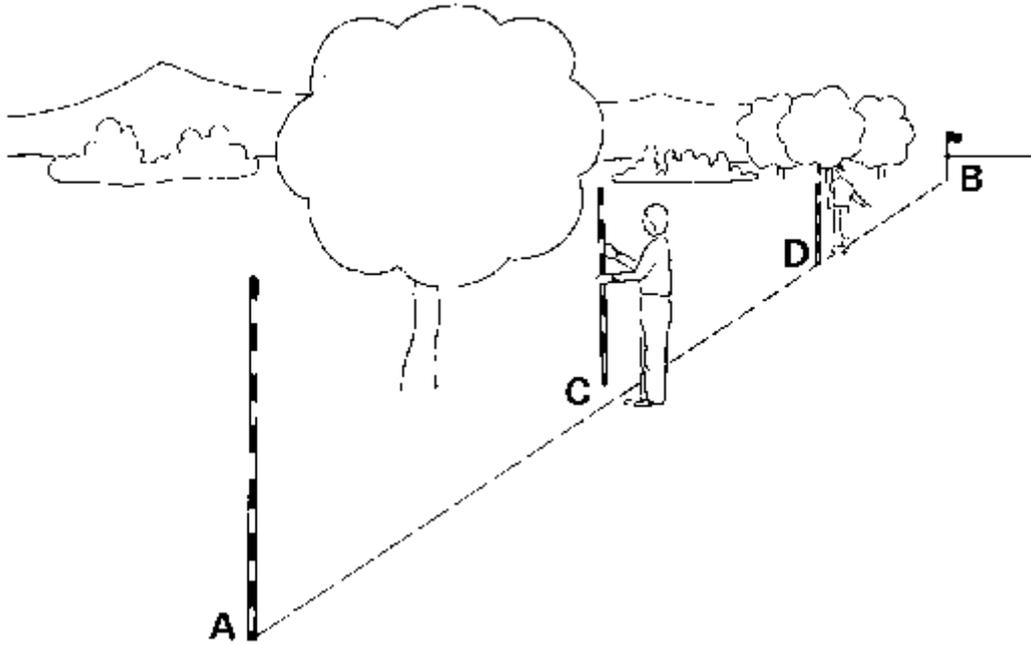
Fig. 13b Setting out a straight line over a long distance, Step 2

Step 3

The observer moves Co pole (D) and pole (C) is reset in line with (D) and (A) (see Fig. 13c).
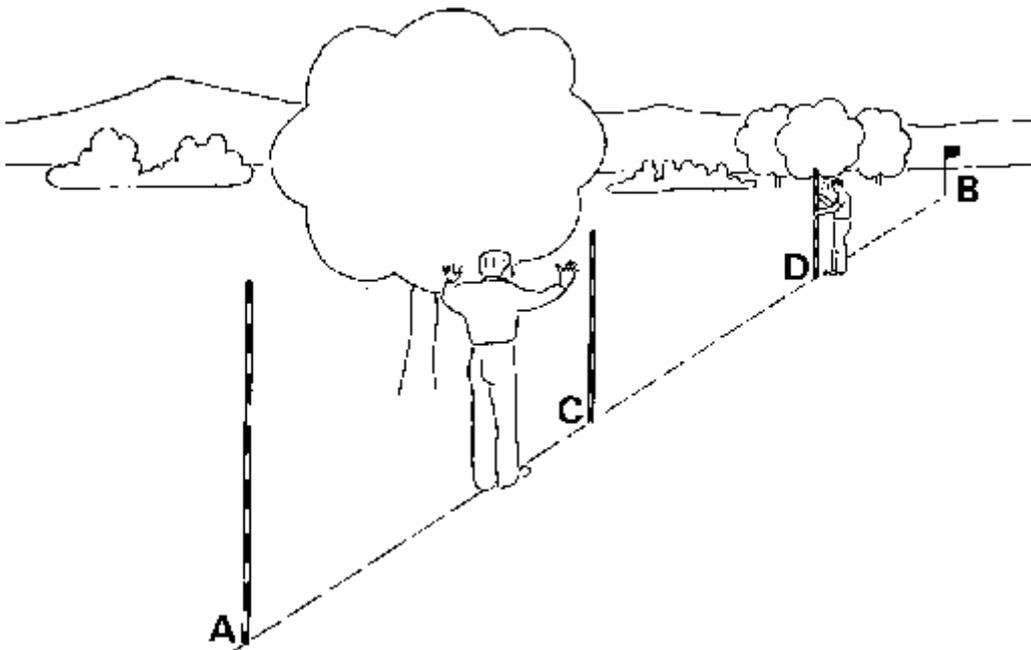
Fig. 13c Setting out a straight line over a long distance, Step 3

Step 4

The observer moves back to pole (C) and pole (D) is reset in line with (C) and (B) (see Fig. 13d).
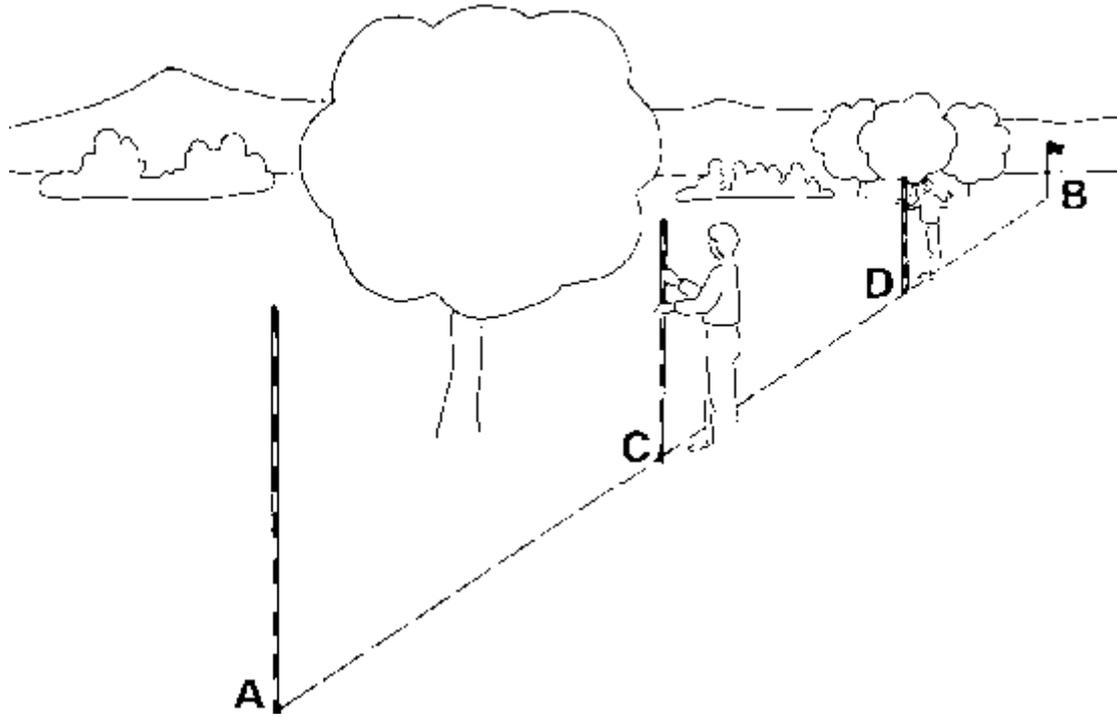
Fig. 13d Setting out a straight line over a long distance, Step 4

Step 5

Continue until poles (C) and (D) do not require resetting anymore, which means that all poles (A), (B), (C) and (D) are in line (see Fig. 13e).

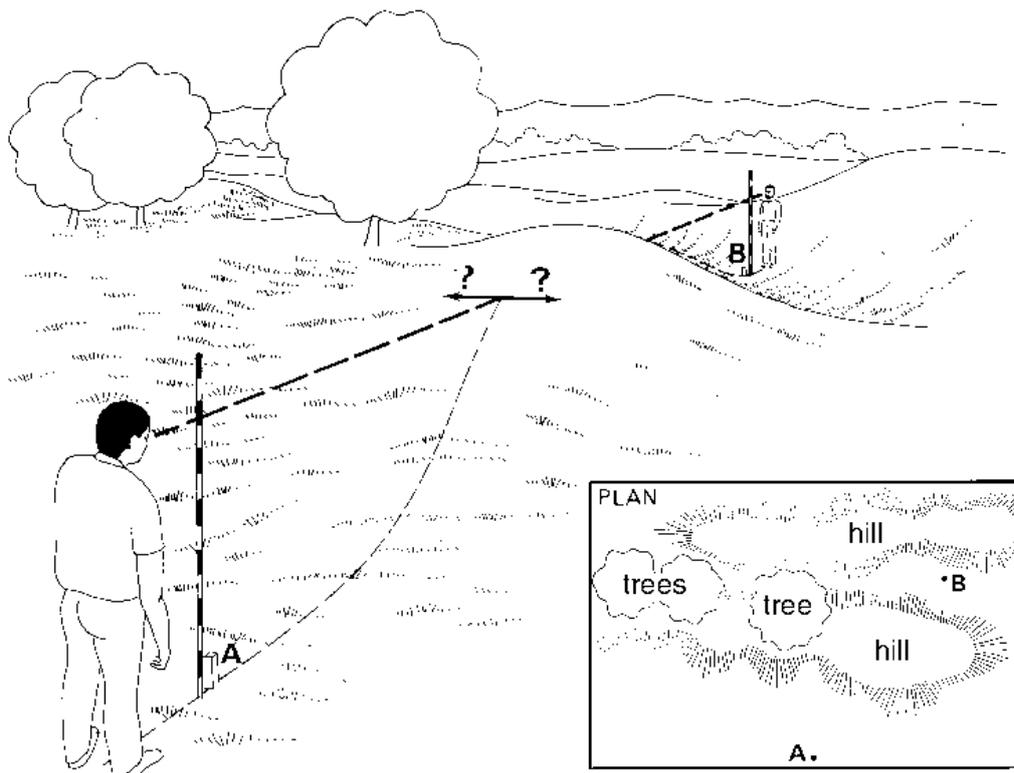**Fig. 13e Setting out a straight line over a long distance, Step 5**

Intermediate poles can now easily be set in line with (A) and (C), (C) and (D), or (D) and (B).

2.3.3 Setting out straight lines over a ridge or a hill

Sometimes, a straight line has to be set out between two points (A and B) which are one on each side of a hill, dyke or any other high obstacle (see Fig. 14); standing at point A it is impossible to see point B. A procedure by trial and error is used, which requires two observers and one, or preferably two, assistants.
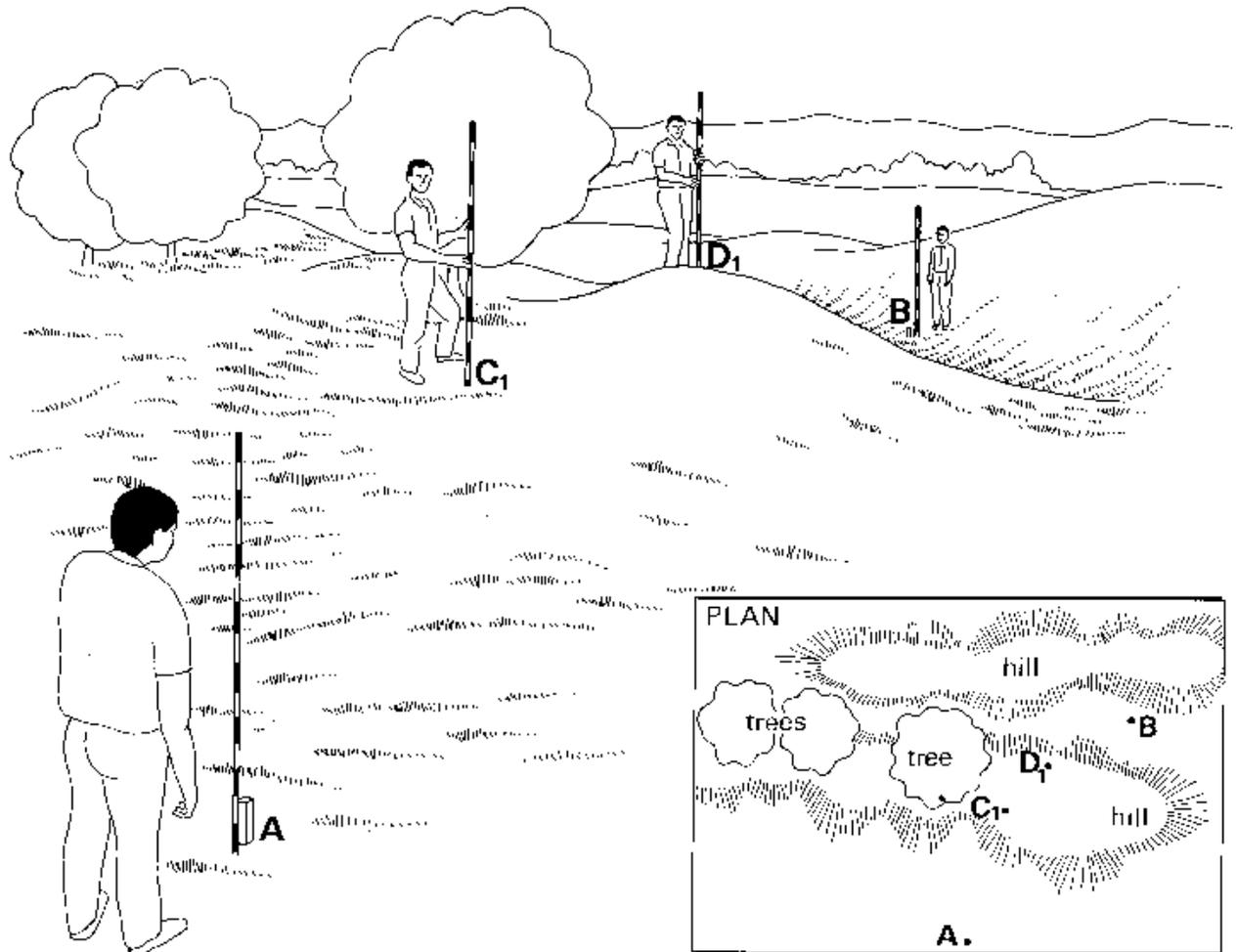
Fig. 14 Setting out a straight line over a hill

Step 1

First, poles (C) and (D) are placed on top of the hill, as accurately as possible in line with (A) and (B), and in such a way that both (C) and (D) can be seen by the observers standing near pole (A) and pole (B) (see Fig. 14a).
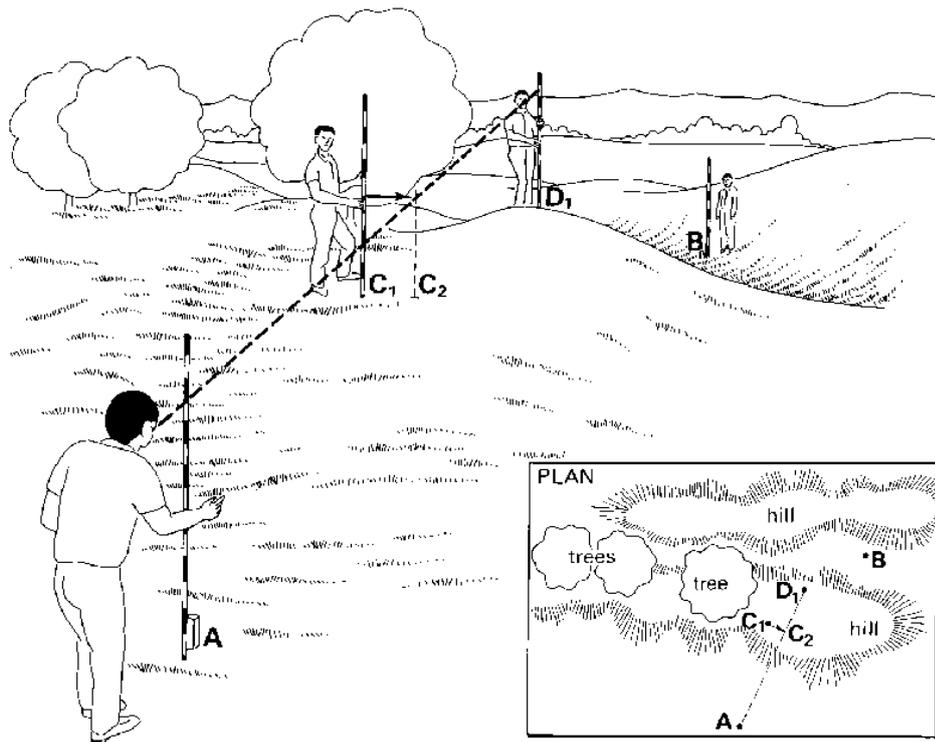
Fig. 14a Setting out a straight line over a hill, Step 1

Step 2

At the indication of the observer at pole (A), pole (C) is set in line with (A) and (D); in other words pole (C) is moved from position C, (the original position) to position *C2*(see Fig. 14b). [1]
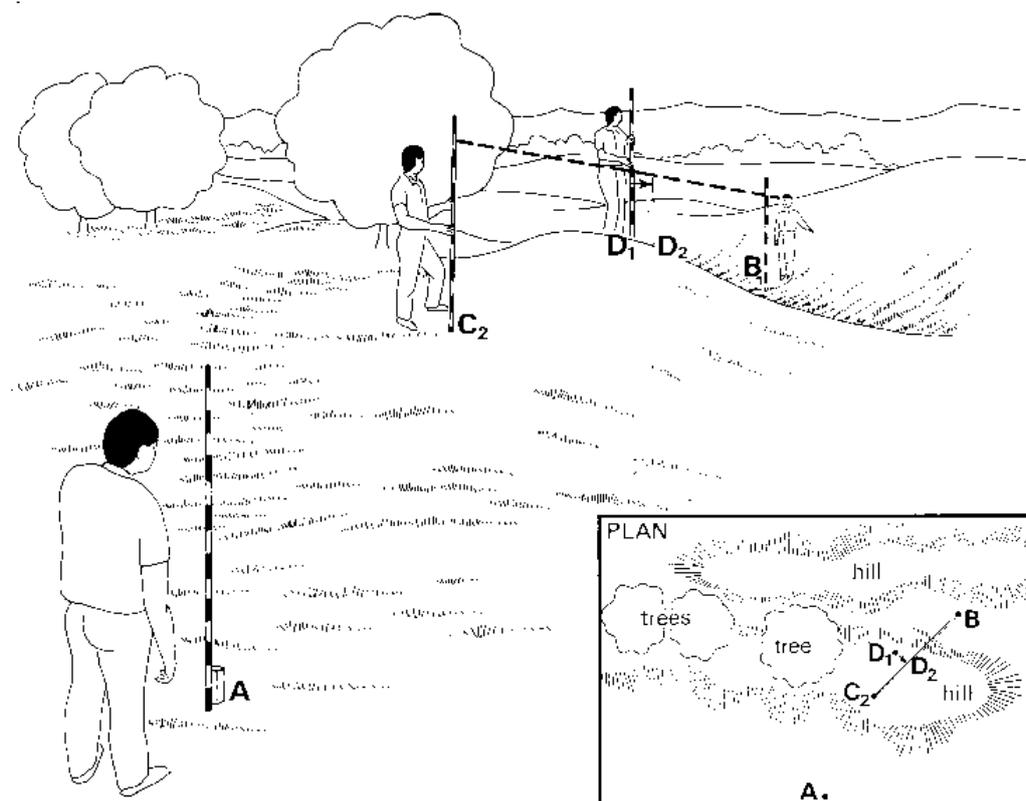
Fig. 14b Setting out a straight line over a hill, Step 2

Step 3

At the indication of the observer at pole (B), pole (D) is set in line with (B) and (C); in other words, pole (D) is moved from position D, (the original position) to position D.) (see Fig. 14c).
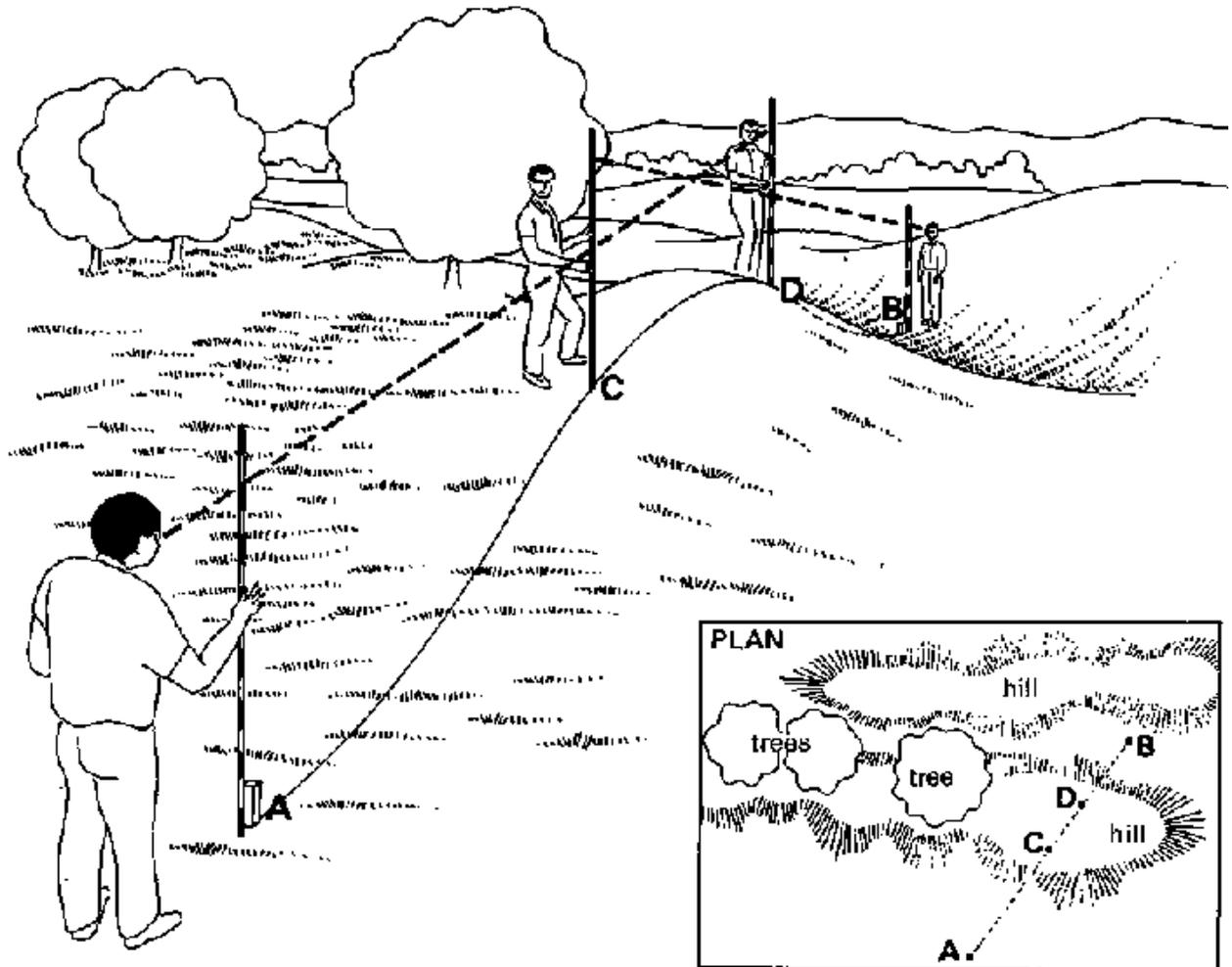
Fig. 14c Setting out a straight line over a hill, Step 3

Step 4

The procedure is repeated: pole (C) is reset in line with (A) and (D) and pole (D) is reset in line with (B) and (C). Continue until no more correction is required, which means that the four poles (A), (B), (C) and (D) are in line (see Fig. 14d).

Fig. 14d Setting out a straight line over a hill, Step 4

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