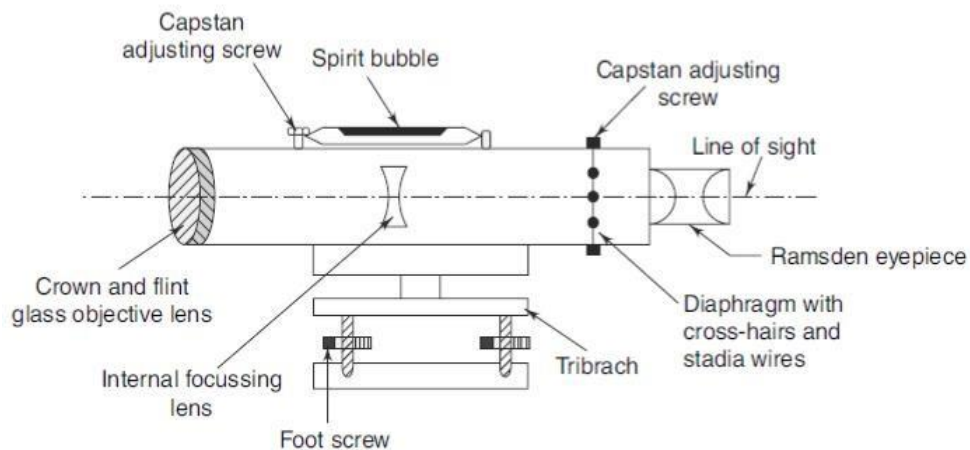


## 2.2 TYPES OF LEVEL

The various types of levels used in surveying are described below.

### Dumpy level

This is the most widely used direct levelling instrument. The essential features of the dumpy level are shown in Fig. 6.9. It consists of a telescope which is rigidly fixed to its support. It can neither be rotated about its longitudinal axis nor can it be removed from its support. It is very advantageous when several observations are to be made with one set up of the instrument.



**Dumpy level**

### WYE-LEVEL

This is similar to the dumpy level except that the telescope in this is supported by two Y-shaped uprights (Fig. 6.10) fixed to a horizontal bar and attached to the vertical spindle about which the instrument rotates. The telescope can be lifted clear of the Y-supports by releasing the two clamping collars which fit across the tops of the Y-supports. Wye-level has an advantage over dumpy level in that its adjustments can be tested rapidly. The disadvantage is that it carries many loose and open parts, which are liable to frictional wear.

### TILTING LEVEL

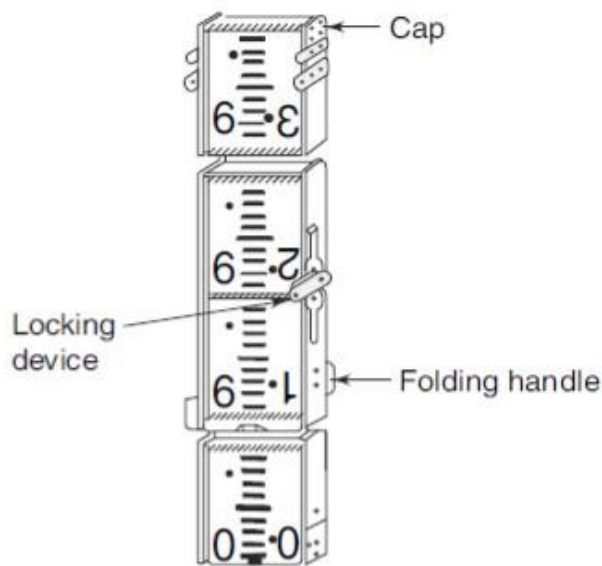
In this type of level the telescope can be rotated about a horizontal axis. It enables the

surveyor to quickly centre the bubble and thus bring the line of sight into the horizontal plane.

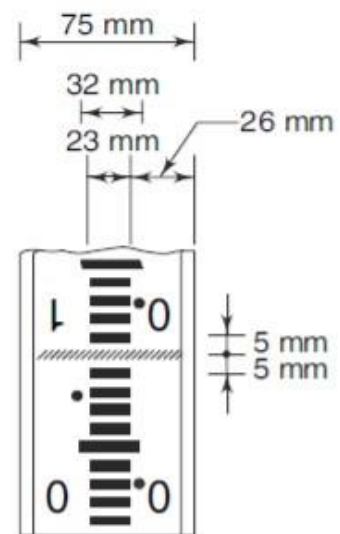
## LEVELLING STAFF

A levelling staff is a straight, rectangular, wooden rod graduated into metres and smaller divisions. The reading given by the line of sight on a levelling staff is the height of the line of collimation from the point on which the staff is held vertically. These may be 3 -5 m in length. A solid staff is usually 3 m long, whereas a folding staff is generally 4 m in length. The folding staff (Fig.) is made of two pieces each of 2 m length. The width and thickness of the staff is 75 mm and 18 mm, respectively. A folding joint is provided to connect the two pieces.

Each metre length of the staff is divided into 200 divisions of 5 mm each. The spaces indicating the decimetre reading are marked in red while all other spaces are marked alternately in black and white. The graduations are marked inverted (Fig.) so that they may appear erect when seen through the telescope.



**Levelling Staff (Folding Type)**



**Graduations of the staff**

## TEMPORARY ADJUSTMENTS

These consist of setting up, levelling, and elimination of parallax.

## Setting Up

Level is not to be set at any fixed point for making the observations as it is with other surveying instruments which are to be set up on station, the point of interest. Therefore, setting up of a level is much simple; centering is not required. While locating the level, the ground point should be so chosen that (a) the instrument is not too low or too high to facilitate reading on a bench mark, (b) the length of the back-sight should preferably be not more than 98.0 m, and (c) the back-sight distance and the foresight distance should be equal, and the foresight should be so

located that it advances the line of levels. Setting up includes fixing the instrument and approximate levelling by leg adjustment.

### Fixing the Instrument Over Tripod:

The clamp screw of the instrument is released. The level is held in the right hand. It is fixed on the tripod by turning round the lower part with the left hand and is firmly screwed over the tripod.

### Leg Adjustment:

The instrument is placed at a convenient height with the tripod legs spread well apart and so adjusted that the tripod head is as nearly horizontal as can be judged by the eye. Any two legs of the tripod are fixed firmly into the ground and the third leg is moved right or left in a circumferential direction until the main bubble is approximately in the centre. The third leg is then pushed into the ground.

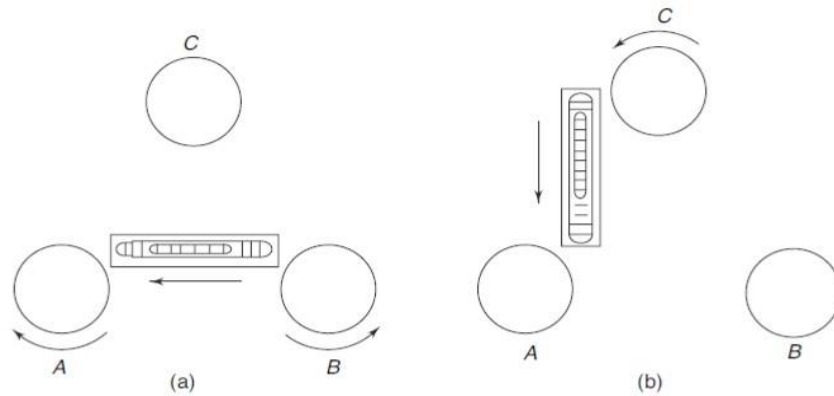
### Levelling:

The clamp is loosened and the upper plate is turned until the longitudinal axis of the plate level is parallel to a line joining any two levelling screws, say A and B.

2. The two-foot screws are turned uniformly towards each other or away from each other until the plate bubble is central (Fig.(a)).
3. The telescope is swing through  $90^\circ$  so that it lies over the third foot screw (Fig. 6.22 (b)).
4. The third screw is turned until the plate bubble is central.
5. The telescope is swing again through  $90^\circ$  to its original position and the above

procedure is repeated till the bubble remains central in both the positions.

6. The telescope is now swing through  $180^\circ$ . The bubble should remain central if the instrument is in proper adjustment.



### Levelling with three-foot screws

#### Elimination of Parallax

It consists of focussing the eyepiece and objective of the level.

#### Focussing the eye piece:

This operation is done to make the cross-hairs appear distinct and clearly visible. The following steps are involved:

1. The telescope is directed skywards or a sheet of white paper is held in front of the objective.
2. The eyepiece is moved in or out till the cross-hair appear distinct.

#### Focussing the Objective:

This operation is done to bring the image of the object in the plane of the cross-hairs. The following steps are involved:

1. The telescope is directed towards the staff.
2. The focussing screw is turned until the image appears clear and sharp.