



## Levelling

Levelling is a process of determining the relative heights of various features with the help of an instrument called a 'level'. Earlier in this chapter some of the levelling techniques have already been explained. Further details of some of them are given here.

There are different kinds of levels. The ones which are in common use in India are (1) Wye-Level (Fig.89), (2) Dumpy Level (Fig. 90), (3) Watt's High Way Level (Fig. 91) and (4) Watt's Self-Adjusting level. Wye-level has its telescope standing on two standards whereas the telescope of the Dumpy level stands on a pivot. Both are easy to operate. The Watt's selfadjusting level is a simple modern reversible level. It has reflecting prisms which show the bubble and an index line. There are two mirrors to reflect light through the level tube. In this instrument, the telescope can be reversed through  $180^\circ$  about its longitudinal axis so as to bring the bubble on the right of the instrument.

The Watt's Highway Level is a very delicate and precise instrument. Its operational procedure is given below. After screwing the level to the tripod, centre it at a convenient place somewhere between the turning points (first two stations). With the help of the foot screws bring the bubble of the circular spirit level in the centre. Thereafter bring the main bubble in the mid-run. Focus the eye piece as well as the object glass. Direct the telescope toward the staff and clamp it. With the help of the slow motion tangent screw bring the image of the staff on the hair of the diaphragm. While reading the graduations on the staff it should be kept in that readings at the intersection of the cross-wires indicate backsight (or +s) of the starting point. For horizontal distances read the stadia. Then focus the telescope on the staff fixed at the second point. This time the reading will give the fore-sight (or-s). Noting these reading in the field book, we get the results as given below:



Fig. 90. Dumpy Level

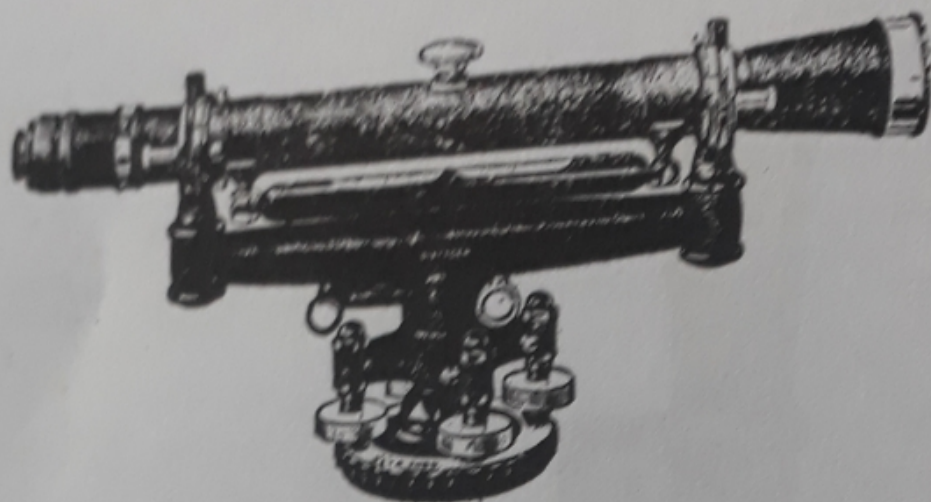
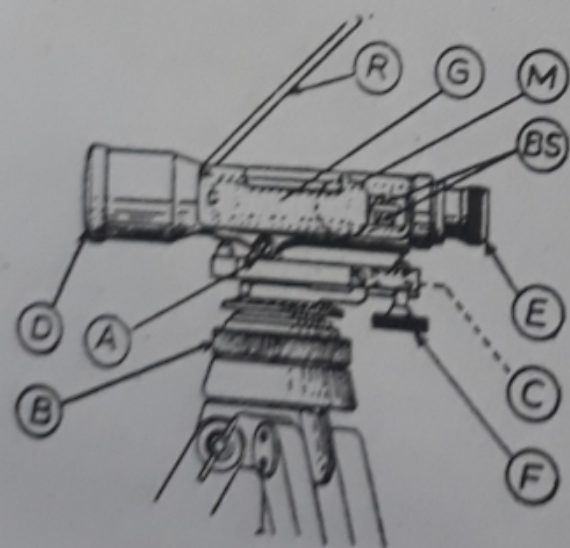
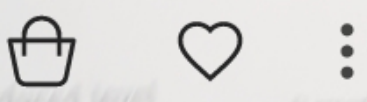


Fig. 91. Watt's Highway level



- A—Horizontal fulcrum about which the telescope and its attachments rotate.
- B—A bolt-and-socket jointed head used for primary levelling.
- C—Air bubble
- D—Ray shade
- E—Eyepiece
- F—Levelling screw
- G—Air bubble attached to telescope
- H—Copstan screws used for adjusting the air bubble
- R—Mirror reflecting the bubble.



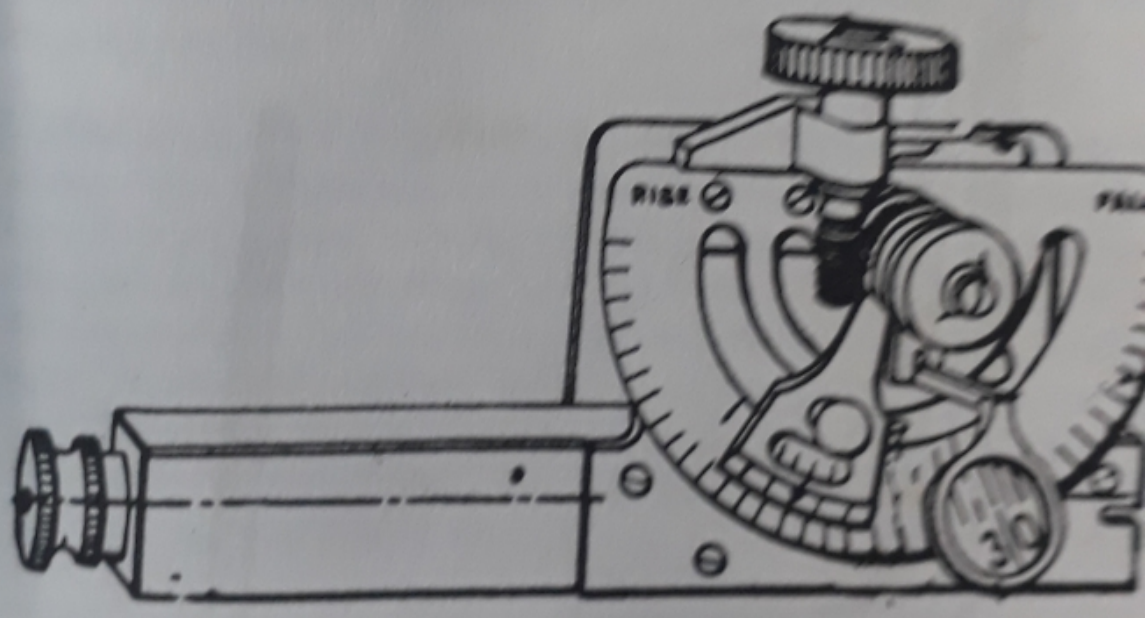


Point	Backsight (+S)	Foresight (-S)	Reduced level (R.L.)	Remarks
A	3 ft.	500 ft.		Point A has a known Mean spring height of 495 ft.
T.P. (B)	2 ft.	6 ft.	497 ft.	
T.P. (C)	4 ft.	5 ft.	494 ft.	
T.P. (D)	3 ft.	6 ft.	492 ft.	
E	-	5 ft.	490 ft.	
Arithmetical Check	12 ft.	22 ft.	16 ft.	

(Calculation of R.L.  $500 + 3 - 6 = 497$ )  
 $497 + 2 - 5 = 494$ ;  $494 + 4 - 6 = 492$ ;  $492 + 3 - 5 = 490$ .

The levelling instrument is placed in between the points for which elevation has to be determined. It is not placed on the station for which readings have to be taken. That is why seeing the first point is called the backsight reading and the next point the foresight reading.

Fig. 92. Aney Level



The other type of levellings such as differential levelling and profile levelling use similar methods with slight variations.

