

forming the top step is either tongued and grooved or splay jointed to the adjacent floor board(s); see G, Fig. 32.

HANDRAIL.—A handrail should be of suitable size and shape in order that it may be readily grasped by the hand, and it should be fixed at a convenient height; sharp arrises on a moulded handrail must be avoided to prevent injury to a person's hand, especially during a rapid descent of a stair. Two forms of handrail are shown at C and these are detailed at H and J. The former is a very common wall handrail and is securely plugged to the wall; it is usually of pitch pine or a hardwood. That shown at J is of hardwood, circular in section, and is screwed to a continuous stainless steel bar which is set-screwed to metal brackets, secured at approximately 4-ft. intervals to plugs. As this latter handrail projects at least 3-in. from the plaster, it is not a suitable form for narrow stairs (see p. 93). As shown at C, the height from the line of nosings to the top of the handrail is 2-ft. 7½-in.

HEADROOM.—Adequate headroom is most important, and it is an essential which is occasionally overlooked. As stated on p. 80, it should be at least 6-ft. 6-in. In this example the upper floor is continued over the "lobby" (see A) and the space thus available is utilized to provide a cupboard or fixed wardrobe to each of the bedrooms Nos. 1 and 2 (see B). Such provision does not encroach upon the headroom, which is 6-ft. 9-in. (see C). As shown, the partition across the stair is a stoothing consisting of 4-in. by 2-in. vertical studs, secured to the floor and ceiling joists, and lathed and plastered both sides (see p. 42); the partition between the cupboards is a similar stoothing, but the studs need only be 3-in. by 2-in. at 15-in. centres.

CUPBOARD UNDER STAIR.—It is usual to utilize the space under the stair by providing useful storage accommodation as shown at A, C and D. The door, of course, opens outwards. The lintel above it is shown supporting brickwork; alternatively, four 4-in. by 2-in. short vertical studs may be used, nailed to the lintel and wall plate. A low stoothed partition consisting of three 3-in. by 2-in. studs is fixed to block out a corner which would be otherwise difficult to keep clean and a portion of the floor which would serve no useful purpose. Floor boards between this partition and the bottom of the stair may be omitted to provide ventilation to the stair timber. A suitable finish is afforded by plastering the interior or by fixing wall boards (see pp. 48 and 49) to the walls, partition and soffit.

Setting Out on Paper.—In setting out the stair on paper the student should first draw the plan, the nosings (or faces of risers) being spaced by the accurate application of the scale. The longitudinal section is then developed from the plan. The height shown in this section can be expeditiously divided into the requisite number of steps in the following manner: Draw a line representing the landing level at 8-ft. 9-in. above the ground floor. Using any convenient scale, place it at an angle on the paper with the zero division intersecting the landing (or ground floor) and the fourteenth division coinciding with the ground floor level (or landing, depending upon the end from which the scale reads), and carefully tick off the intermediate divisions 1 to 13 inclusive. Horizontal lines drawn through these points give the treads, and when connected with the vertical lines developed from the divisions on

the plan the required fourteen steps are set out. It is advisable to number each step on plan as shown and also on the section during its development. The direction "up" should be indicated on the plan at the foot of the stairs; this removes ambiguity and facilitates the reading of a drawing, especially when a stair consists of several flights. The rest of the details can be completed without much difficulty, an adjustable set square being useful for drawing the string, line of nosings (to check for accuracy) and handrail. The importance of ensuring adequate headroom is again emphasized.

Setting Out and Construction in Workshop.—The fixing and trimming (if any) of the floor joists will have been completed and the floor boards laid before the construction of the stairs is commenced. As there is usually some discrepancy between the dimensions taken from a plan and those of the building, it is necessary to obtain the exact total rise and going of a stair from the actual building. A storey rod (see p. 80) is used for this purpose. To obtain the correct height from floor to floor, the rod, resting on the ground floor, is held vertically (a plumb-bob being used to ensure this) against the end of one of the wall landing joists. The height of the upper floor boards is carefully marked on the rod and the word "rise" is written below it; the point where the suspended bob touches the floor is marked. This height is checked by taking a measurement near to the opposite wall.

The position of the face of the bottom riser is marked on the ground floor (or wall) and the horizontal distance between this and the "bob" point previously marked is measured and marked on another face of the storey rod, and the word "going" is written on it. On being taken to the shop, the "rise" face of the rod is divided by compasses into fourteen equal parts, being the number of risers required. The distance that the face of the top riser is to be from the edge of the landing is marked from one end of the "going" face of the rod, and the net going is then divided into thirteen equal parts. The subsequent operations depend upon whether the strings are to be trenched or housed by (a) hand or by (b) machine.

(a) **Hand Trenching.**—A pitch-board, a tread templet and a riser templet are required for setting out a string for the trenchings or housings. One form of pitch-board is shown at E, Fig. 31. It consists of a thin wood set square having a rise and going equal to the dimensions taken from the storey rod; this is tongued into a thicker board of width equal to the required margin and this is housed to a wood base at right angles. A tread templet is shown at F, it is shaped to the required nosing and of a tapered width equal to the thickness of a tread and wedge. Similarly, the riser templet G is equal in width to the combined thickness of a riser and wedge. The length of the strings should be slightly in excess of the *pitch edge* (see E) multiplied by the number of steps, together with the portions required to meet the top and bottom skirtings; the ends of the strings are afterwards trimmed off to accurate length on the job and the skirtings fitted to them.

A brief description of the setting out is given at H, Fig. 31. After the string has been dressed the nosing line is pencil marked at the required distance from the upper edge. The compasses are set to the length of the pitch edge and fourteen divisions are pricked off along this line. Commencing at one end, and with the base of the pitch-board pressed against this edge of the string, the outside of the first riser and going is *knife* marked along the "rise" and "going" edges. Still maintaining the board in this position, the riser templet is placed against it with the corner of end A coinciding with *b'* marked on the board, and the back or wedge-line is marked; the tread templet is then placed as shown against the board with its mark *a* at the *a'* point of the pitch-board, and the nosing and underside or tread wedge-line marked. The pitch-board is then slid along the string and the housing for the next step is marked off in a similar manner.

Three or four holes are sunk with a brace and bit near the nosing of each step and tangential to the outer faces, and the wood between is chiselled out; this permits of the use of the tenon saw for forming cuts along the marked lines, after which the remaining core is removed by a chisel and the bottom of the trenchings finally levelled with a router plane to give a ½-in. sinking (see G, Fig. 30). The second string is then set out and the housings formed as described.

(b) **Machine Trenching.**—Simple appliances are now available for the rapid setting out and complete trenching of straight strings. Machines, called *stair trenchers*, are