

*Stairway* is the opening or space occupied by the stair.

*Step*.—As applied here, it consists of a tread and riser<sup>1</sup> supported by strings. The following are the types of step employed: *Bull-nosed step* (see D, Fig. 29 and B, C, H and J, Fig. 39) is situated at the bottom of a flight, projects beyond the face of a newel or newels and has one or both ends rounded. A *commode step* (see step "1" at F and L, Fig. 29) has a curved riser and tread nosing. A *curtail, round or scroll step* (see F, Fig. 29, and C, K, L and M, Fig. 39) has one or both ends which are semicircular or spiral on plan. *Dancing or balancing steps* are winders (see below) which do not radiate from a common centre—two of this type are shown by broken lines at J', Fig. 29. *Fliers* are those which are chiefly employed; they are of uniform width and are rectangular on plan, i.e., all of those shown in Fig. 30; *diminished fliers* are those immediately adjacent to dancing steps, the width tapering towards the outer string (see J', Fig. 29). A *splayed step* has one or both ends splayed as shown at A, Fig. 39. *Winders* are tapering steps, such as those which radiate from a point usually situated at the centre of a newel (see Fig. 38) and those which comprise a geometrical stair of the type shown at G and L, Fig. 29; because of its shape the central of three winders is called a *kite winder* (see also E, Fig. 29).

*Storey Rod, Post or Lath* is a dressed piece of wood, of approximately 1½-in. square, or 2-in. by ¾-in. scantling, sufficiently long to extend from floor to floor, on which is marked the exact floor to floor height of the part of the building which is to receive the stair; this rod is accurately and equally divided into the requisite number of steps and is then used in their setting out (see p. 84).

*Strings or Stringers* are the inclined members which support the steps. The following are some of the various forms: A *close or housed string* has both top and bottom edges parallel and the treads and risers are housed into it (see A, B, C, E, H and J, Fig. 29, and Figs. 30, 31, etc.). A *cut or open string* or *notch board* has its lower edge parallel to the pitch of the stair and its upper edge is cut or notched to receive the ends of the treads and risers (see D, F, G, K and L, Fig. 29 and N, Fig. 39). A *rough string* is a carriage-piece or bearer. Those fixed to walls are called *wall or inner strings* and are usually close strings; those on the outside are known as *outer strings* and may be of either the close or open type.

*Tread* is the horizontal member which forms the upper surface of a step (see F, Fig. 30, etc.).

*Walking Line* represents the average line of travel taken by a person when ascending or descending a stair, and is usually taken to be 1-ft. 6-in. from the centre of the handrail or newel (see D, Fig. 38).

*Well or Well-hole* is the space between the outer strings of the several flights of a stair (see C, J, K and L, Fig. 29 and E, Fig. 36) known as an *open well stair*.

*Winders*.—See "Steps."

Several of the above definitions will be amplified on the following pages.

<sup>1</sup> There have been several recent examples of principal stairs, constructed in office, etc., buildings, which resemble ladders in so far as risers have been omitted and the wood treads have been connected direct to steel strings.

ESSENTIAL REQUIREMENTS.—A well-designed stair should comply with the following requirements:—

1. It should be constructed of sound materials and workmanship, the treads and risers being properly tongued and grooved together, wedged, glue blocked and adequately supported. The strings should be well secured to walls, newels, trimmers, etc. A bearer or carriage, of sufficient size, should be provided if the stair is 3-ft. wide, with an additional bearer for every 15-in. in width, otherwise excessive deflection will occur and the stair will creak.

2. Its ascent should be relatively easy, and the proportions of treads and risers should conform to the rules stated on p. 82. The pitch must not exceed 45° if undue fatigue is to be avoided, and it should not be less than 25° in order to prevent a tedious ascent and the occupation of excessive space.

3. The whole of the risers must be of the same height, and the treads<sup>1</sup> should be of uniform width if accidents are to be avoided.

4. It should be well lighted, especially at turnings. A solid balustraded stair (see Figs. 35 and 37) requires a larger window than one with balusters, as the former offers a greater obstruction to light. When electricity is available, two-way switches (which enable a light to be controlled from two points) should be provided at the head and foot of the stair.

5. The maximum number of steps in a flight is preferably twelve; this is especially desirable for stairs used by invalids and the aged; stairs in public buildings should conform to this. Such limitation requires the provision of landings, but when space is restricted these cannot be provided and hence the number of steps often exceeds the desired maximum, as seen in Fig. 30.

What would otherwise be a half-space landing should not be divided into two quarter-space landings by a single riser; such an arrangement has been a frequent cause of accidents, especially to unaccustomed users.

6. It must be of adequate width. A satisfactory width for the average-sized house is 3-ft. from wall to wall, or wall to centre of outer string. A narrower stair has a mean appearance and the conveyance of large pieces of furniture, luggage, etc. is likely to damage its balustrade and walls. The width of landings should be at least equal to that of the steps; an increased width is preferable, as the appearance is thereby enhanced and the removal of large objects expedited with less likelihood of damage to the structure.

7. Adequate headroom must be provided. As already mentioned, the minimum headroom, measured vertically from the outer lower edge of an apron to the line of nosings, should be 6-ft. 6-in.; an alternative measurement is 6-ft. at right angles from the line of nosings to this edge of the apron.

This minimum height cannot always be obtained, and as a result large furniture can only be negotiated with difficulty; when this height is unduly restricted, injury may be caused to tall persons, especially when descending the stairs.

<sup>1</sup> This rule is sometimes departed from and the bottom three or four steps are made slightly wider than the rest, the increase being gradual with a maximum width at the first tread.