

**SASHES.**—It will be seen on reference to Figs. 60 and 61 that the upper sash slides in the recess formed in the frame by the pulley stile, outer lining and parting bead, and that the lower sash is accommodated in the recess formed by the pulley stile, inner bead and parting bead. Each sash consists of two stiles, a top rail and a bottom rail, but as the bottom rail of the upper sash meets the top rail of the lower sash when the window is closed, these two members are called *meeting rails*. A minimum clearance of  $\frac{1}{32}$ -in. should be allowed all round the sashes to permit of easy movement, and this is often increased to  $\frac{1}{16}$ -in. when the window is to be painted.

*Joint between Stile and Top Rail of Upper Sash* (see H, Fig. 58, and R, Fig. 61).—The detail at H is usually adopted. The alternative detail at R shows the top rail haunched tenoned (like a door) at each end and each stile suitably morticed to receive the tenon and wedges. Glued wedges (waterproof glue being used) and a hardwood pin or dowel complete the joint. The methods of securing the sash cord are described on p. 119.

*Joint between Stile and Meeting Rail of Upper Sash* (see T, Fig. 61).—The bottom of the meeting rail of the top sash and the top of the meeting rail of the bottom sash are at least  $\frac{3}{8}$ -in. wider (assuming that the parting bead is  $\frac{3}{8}$ -in. thick) than the thickness of the stiles, otherwise a gap equal to the thickness of the parting bead would be left (see L and P, Fig. 60). The joint between the meeting rails are either just bevelled, or, as shown, they are *bevel rebated*; the latter joint is preferred, for it assists in preventing the sashes from rattling, effectively increases the difficulty of gaining access to the sash fastener (see O, Fig. 61) from the outside, and enables the rails to separate easily when the sashes are opened.

The stiles of the sashes may extend from  $1\frac{1}{2}$  to 3-in. beyond the meeting rails and these projections are shaped as required to form *horns* (or *brackets* or *joggles*), but they are often omitted as they are considered to detract from the appearance. The details at T and U show both types. The horned form at T shows a mortice and tenon joint (called a *fork tenon*) with the bevelled portion passing over the inner face of the stile, which latter is dovetailed to receive it (see section and the isometric sketch); the central tongue is wedged; it is usual to leave the upper edge of the bevelled portion projecting slightly beyond the face of the stile, and this may be afterwards dressed down to the stile when the meeting rails are fitted together. In the second or hornless type at U a dovetailed joint must be adopted, otherwise the joint would readily become loosened when the sash handles (see P, Fig. 61) are pulled downwards whilst the sash is being opened. Note the shaped end in the isometric sketch and the broken lines in the alternative section which indicate the dovetailed tongue and bevelled portion. The joint is either screwed or doweled as shown at T.

*Joint between Stile and Meeting Rail of Lower Sash* (see V, Fig. 61).—Like the top sash, the stiles of the bottom sash may be provided with horns, but in first class work these are omitted and a dovetailed joint between the meeting rail and each stile is adopted as shown at V, which indicates the upper end of

the stile shaped to receive the dovetailed tenon and bevelled portion of the meeting rail; the latter portion passes over the outer face of the stile, and its lower edge is usually left slightly projecting beyond this face until both meeting rails are finally fitted together.<sup>1</sup> This joint is also pinned or screwed. A groove is formed down the edge of each stile to accommodate the sash cord; this is similar to that shown at R and S and is indicated by broken lines at V. Note the provision made on this meeting rail to receive the glass; as both meeting rails are of the same depth, it is not possible to form the usual rebate on the lower sash meeting rail and in lieu of it a groove is formed along the underside of the rail.

The ends of the bevelled portions of the meeting rails must be cut away for clearance round the projecting parting beads. The small piece so removed from the bottom sash meeting rail is indicated by broken lines at V. The groove for the cord, the clearance for the parting bead, and the dowel holes have been omitted in the sketches so as to render the details less confusing.

*Joint between Stile and Bottom Rail of Lower Sash* (see W, Fig. 61).—This is an ordinary pinned haunched tenoned joint. The bottom of the rail and the end of each stile are shaped as required (examples at M and Q, Fig. 60). The joint shown at J, Fig. 58 is very often adopted.

*Joint between Glazing Bars.*—The scribed and franked joints between sash bars are described on p. 108 and the halved joint is shown at M, Fig. 61. Glue is applied to the joints before assembling and cramping each sash.

*Scantlings of Sashes.*—The usual nominal thickness of a sash of average size is  $1\frac{3}{4}$ -in., but the thickness may be increased to 2 or  $2\frac{1}{4}$ -in. for larger sashes, whilst small sashes may only be  $1\frac{1}{2}$ -in. thick. The common scantlings are: stiles and top rail, 2-in. by  $1\frac{3}{4}$ -in. thick; meeting rails, 2-in. wide by  $1\frac{1}{2}$ -in.; bottom rail, 3 to 4-in. by  $1\frac{3}{4}$ -in. thick. Glazing bars may be out of  $1\frac{3}{4}$ -in. by 1-in. stuff but a thickness of  $1\frac{1}{4}$ -in. reduced to 1-in. gives the better appearance.

**TIMBER.**—The timber employed in the construction of windows of this type are redwood, pitch pine, teak and oak. The former is most used, although a more durable wood such as oak, teak or pitch pine is specified for the sill. Oak or teak are used throughout for first class work.

**HARDWARE.**—Although there are many patent devices on the market for use on windows of this description, the following simple fittings have been proved to be quite effective for their purpose. They include sash fasteners, sash lifts, sash handles and pulleys, together with the weights and sash cords or chains.

*Sash Fastener* (see O, Fig. 61).—This affords an effective security, provided it is of best quality. The fitting is of brass or bronze and comprises two castings, one being screwed to the centre of the meeting rail of the top sash, and the second (or *lug*) being screwed to the top of the meeting rail of the bottom sash; on

<sup>1</sup> Students should be careful to show the joint between the meeting rails correctly. Examination scripts and homework sheets frequently show details which indicate the bevel running downwards from the inside to the outside. Movement of the sashes would not, of course, be possible if the meeting rails were constructed to such details.