if the soffit board shrinks in width no unsightly gap appears along its length between it and the wall. The fascia projects above the backs of the spars as shown in order to tilt the bottom course of slates. Another example of this type is shown at D, Fig. 69. As a fillet is used to tilt the slates, the depth of the fascia is reduced to 4-in. The projecting feet of the spars are covered with 6-in. by $\frac{3}{4}$-in. soffit boarding which is nailed to 2-in. by $1\frac{1}{4}$-in. soffit bearers secured to the ends of the spars. The small quadrant mould covers any gap which may be caused if the boarding shrinks.

A sprocketed eaves may be formed by (*a*) fixing the sprockets on the backs of the spars or (*b*) nailing them to the sides of the rafters.

An example of the former is shown in Fig. 38. The construction is made clear in the enlarged detail at D and the isometric drawing A, the latter showing one end of a spar cut, the next spar is shown with the sprocket fixed, and the next with the sprocket and bearer fixed. The soffit boards are *tongued, grooved and V-jointed*, and at hipped ends, etc., the ends of the boards should be carefully mitred (see S, Fig. 37). The bedmould should be *scribed* to the wall (" scribe " means to mark for accurate fitting, and in this case scribing is necessary to ensure that the back of the mould shall fit the more or less irregular surface of the brickwork). A brick-on-end course, projecting $\frac{3}{4}$-in. as shown, provides a simple and effective finish and also forms a flat arch for the window.

The sprockets shown at K and L, Fig. 37 give a graceful sweep to the lower portion of the roof. Here they are fixed to the sides of the spars and the wall plate. They are inclined at an angle which equals the difference between a right angle and the pitch of the roof (*e.g.*), $90° - 55° = 35°$). Sprockets should not be given an inadequate slope such as is shown at M, for, besides detracting from the appearance, it makes it difficult for the slater or tiler to negotiate the angle at the intersection between the sprockets and spars unless a triangular fillet (shown by broken lines) is fixed. A roof with a flat slope is also difficult to make watertight at the eaves. The construction of the eaves is similar to that already described, but attention is drawn to the alternative methods of supporting the soffit bearers. That at K shows one end of each bearer nailed to a fillet which is plugged to the wall, the other end being nailed to the side of the spar. The bearers at L are let into the wall at one end (*pockets* or holes being left by the bricklayer for this purpose) and these ends are tightly wedged. The sprockets are shown in the plan F. Those nailed at each side of the hip rafters are necessary to provide a means of fixing the upper ends of the two short sprockets at each corner and the bearers to which the fascia (mitred at the angle) and the mitred ends of the soffit boards are nailed. One of these bearers is shown at T but has been omitted at S in order to show the mitre between the soffit boards.

A detail of a similar eaves is shown at H, Fig. 69.

Beamfilling or Windfilling.—This is the brickwork which is continued up between and to the back of the spars after the latter have been fixed. This is shown in all of the eaves details (sometimes by broken lines), and, for obvious reasons, it is especially necessary when the roofs have open eaves.

It is not necessary to take the brickwork up above the top of the wall plates, and the practice which is sometimes carried out of beamfilling on top of the wall plates cannot be too strongly condemned. Cases of dry rot in roofs have been attributed to beamfilling which has been continued for the full thickness of the walls to the backs of the spars and sprockets. Any defective slates or other roof covering at this point allow water to enter, and owing to the wood members being confined by brickwork (or masonry) they become saturated and remain so, resulting in defective timber. Adequate ventilation is just as essential for roof timbers as it is for floor members (see p. 61) if dry rot is to be prevented.

(*c*) TRIPLE OR FRAMED ROOFS.—The unsupported length of purlins should not exceed 16-ft. (see p. 73) if extravagant sizes are to be avoided, and if there are no cross division walls available to provide supports which would limit the purlins to this span then roof trusses (sometimes called *principals*) are necessary. Hence a framed roof consists of three sets of members, *i.e.*, spars which distribute the weight of the roof covering, snow, and wind pressure to the purlins which transmit this load to the trusses, and these in turn transfer the weight to the walls. The outline of the truss must conform to the shape of the roof, which in the case of the king post roof truss is a triangle. A triangle is the strongest form of framed structure for it cannot be deformed if its members are sufficiently strong and properly connected together.

King Post Roof Truss.—An outline elevation of a king post roof truss, which is one of the simplest forms of trusses, is shown at C, Fig. 39. The two longer inclined members are called *principal rafters* (as distinct from common rafters or spars), the horizontal member is the *tie beam*, the vertical member is the *king post*, and the two shorter inclined members are *struts*.

The student in the class in Building Science will have probably carried out the following simple experiment in connection with the solution of framed structures when loaded: A vertical load is applied at the apex of two inclined members which are hinged at the top (representing a couple of spars). They will at once spread if the feet are not restrained and the unsatisfactory couple roof (see E, Fig. 36) would act in this manner if the walls were not sufficiently strong. A horizontal member is now connected to the feet to produce a structure resembling a close couple roof (see L, Fig. 36). Whilst this prevents the spreading of the inclined members, it is apparent that the tie is pulling on the two lower joints and each of the sloping members is pushing on the joint at the apex and that at the foot. If these results are applied to the king post roof truss it follows that the tie beam is in tension (indicated by the arrows on the line representing this beam at C, Fig. 39, and which point away from the joints) and each of the principal rafters is in compression (as shown by the arrows pointing in the direction of the thrust towards the joints). The tie beam has a tendency to bend downwards (sag) on account of its own weight (an 11-in. by 4-in. by 22-ft. long redwood tie beam weighs approximately $2\frac{1}{4}$-cwt.) and this in turn tends to pull the feet of the rafters inwards and cause the apex to rise. This is prevented by the king post, which is connected at its upper end to the head of the principal rafters and at its foot to the tie beam. The king post is therefore in tension and arrows are accordingly shown on the line representing this post at C pointing in the direction of the pull and away from the joints. Each purlin is supported by the principal rafter at mid-span, and if the joints are secure these rafters would tend to sag under these concentrated loads but are prevented from doing so by the provision of the short inclined struts. The struts, being in compression, are shown with the arrows pointing towards the joints. Their lower ends must not abut on the tie beam otherwise the latter would tend to be forced away from the king post and they are therefore connected to the lower end of the king post.