

central strut to each pair of boards (as shown at B) but occasionally it is advisable to use two struts (see C).

The struts are slightly longer than the horizontal distance between the boards and they are driven down until they are tight and more or less horizontal. The sides of the trench are given a slight batter from the top inwards to facilitate this operation and to reduce the tendency for the members to become loose as the earth shrinks, as it does on the removal of moisture. Care should be taken not to over drive the struts and disturb the earth behind the boards.

3. *Moderately Firm Ground.*—Where the soil is firm, except where it is inclined to be loose in patches, the timbering may consist of the simple arrangement shown at D—otherwise the trench may require a temporary support as illustrated at E.

The wide walings at D provide a continuous support, three struts being used per 14-ft. length of waling.

The arrangement at E shows poling boards held in position by walings which are strutted. The poling boards are placed at a distance apart varying with circumstances; in the figure they are shown at 18-in. centres, but this distance may be reduced to 1-ft. or increased to 3-ft. The timbering is done in easy stages for it is not advisable in this kind of soil to defer it until a length of trench is excavated equal to that of the walings, as a section of the unsupported excavation may collapse.

The following is the procedure adopted: A short length is excavated sufficient to enable the labourer to insert and temporarily strut a pair of poling boards (thus resembling A). This is repeated until sufficient poling boards have been placed which could be spanned by the walings. A stiff waling is then placed along each side and strutted against the boards as shown, after which the temporary struts can be removed. Temporary strutting is shown by broken lines at F.

It is often necessary to drive wedges down between the waling and boards which have become loose or have been strutted a greater distance apart than usual. An example of this is shown at E.

4. *Loose Earth.*—The arrangement of the timbers is similar to that shown at G (excepting that sometimes the sheets are placed about 1-in. apart) and is described below.

5. *Loose and Waterlogged Ground* (see G).—Horizontal sheeting is necessary, for unlike the soils referred to in the first three classes, it is not possible to excavate in loose soil for several feet in depth before resorting to timbering. The sides of the trenches dug in this soil begin to fall before 1-ft. depth has been reached, and hence the need for horizontal boards or sheets. The following is the sequence of operations: The excavation is made to a depth slightly in excess of the width of the sheeting to be used, when a board is placed against each side and two or more temporary struts are driven between. The excavation is continued for 9-in. depth or so and a second pair of boards is placed tight up against the bottom edge of the first set and strutted. The condition at the end of a section at this stage is shown at H. This operation is repeated until four sets of boards have been temporarily strutted or the required depth has been

reached, when poling boards are placed at a minimum distance apart of 6-ft. centres and strutted as shown at G, and the temporary struts removed.

When the foundations have been completed and the walls built to a height of two or three courses above the ground level, the timbering is removed and earth is returned on both sides of the wall and rammed solid.

The examples illustrated in Fig. 42 should only be taken as typical. The nature of the soil and the general conditions are so variable that the spacing and arrangement of the timbers can only be decided upon the site. Very often the general system of timbering on work in progress has to be departed from on account of the local variations in the character of the soil. It is perhaps unnecessary to add that many buildings are erected with foundations of such little depth that the shallow trenches formed to receive them do not require any timbering.

CENTERING

A *centre* is a wood member or frame which is used as a temporary support for an arch during its construction. The removal of this support, known as “*striking the centre*,” does not take place before the mortar between the voussoirs of the arch has set, and often it is left in position until the door or window frame is required to be fixed. A centre must of course be sufficiently rigid to support the weight of the brickwork or masonry to be constructed on it, and, in addition, provision must be made to permit of “*easing the centre*,” a term which is applied to the operation of *slightly* lowering the centre before the mortar has set. A centre is supported on vertical *posts* or *props*, and the introduction of folding wedges between the heads of the posts and the centre permits of its easement and also the adjustment of the centre to the required height to receive the arch. The term *centering* includes the centre, together with the wedges, props, etc., complete.

The shape and details of a centre are dependent upon the type, span and width of the arch to be supported. In practice any suitable timber which is readily available is converted to the required shape, and thus there is a big variation in the sizes and arrangement of the members. The following illustrated examples should therefore be considered as typical:—

Turning Pieces.—The simplest form of centre is that required for flat arches and those having a small rise and width. Such are called turning pieces, and, as shown at A, B and D, Fig. 43, they consist of solid pieces of timber each of which has its upper surface shaped to conform with the soffit of the arch to be supported. The flat arch at A is that shown at A, Fig. 15, which has a 4½-in. soffit and a ½-in. rise. It is advisable to set the turning piece slightly back from the front face of the wall in order that it will not interfere with the bricklayers' line and plumb-rule. The turning piece rests at each end upon a pair of folding wedges,¹ and these are supported by props which rest upon a *sleeper*

¹ Students often make the mistake in examinations of showing the wedges with their length parallel to the length of the turning piece. It is obvious that when in this position the wedges cannot be adjusted because of the brick jambs.