The upper 7-in. by 1½-in. poling boards, placed at 1-ft. 6-in. centres (see C) are held in position by a single waling along the centre, and they are accordingly known as *middling boards*. Struts are placed between the walings at a minimum distance of 6-ft. so as not to unduly impede the digging operations.

The lower set also consists of middling boards. These are wider than those in the upper "setting," although the narrow boards may also be employed, provided the distance between them is that considered to be necessary, *i.e.*, 6-in.

A pair of walings, together with their struts, is known as a *frame*, and it is advisable to support these by vertical props or *puncheons*, wedged between the walings at or near the ends of the struts. Puncheons are necessary, especially in deep excavations where the ground is uncertain, to prevent the walings from dropping. They are often dispensed with when the ground is reasonably firm and the trench is to be left open for only a short while. In this example, each puncheon is placed between the walings and continued with a short piece supported on a *sole plate*, partially embedded in the ground, to distribute the weight. As shown more clearly at D, a pair of *driving* wedges (or a pair of folding wedges as used for centering, see Fig. 20) are used to tighten the lower puncheon, and the upper puncheon is brought tightly up to the top waling by driving wedges between its foot and the lower waling (see A).

A *platform* or *staging*, necessary to receive the soil as the excavation proceeds, is shown at B, C (by broken lines) and a portion at A. This necessary provision is referred to in the next column.

The following is the usual procedure adopted in fixing this type of timbering: The ground is excavated to a sufficient depth to allow the top setting to be fixed. A waling is placed along each side in the correct relative position and supported by temporary puncheons. A pair of middling boards is placed between the walings and the sides of the excavation at approximately 6-ft. centres. Small wood packing pieces are placed between the boards and the walings, and these pieces are afterwards replaced by small wedges called *pages*. A strut is fitted between the walings opposite each pair of boards and tightened by driving in wedges at *one side only*. The rest of the polings are now placed in position between the walings and soil and forced tightly against the sides of the excavation by driving down pages between the boards and walings. The excavation is continued to the required depth and timbered as described above. If the tops of the middling boards of the lower setting are level with the feet of those above, all of the former can be placed in position by forcing their lower ends into the ground and nailing them at the top to the boards above. The walings and struts of the bottom setting are then placed and wedged, and the puncheons are finally fitted and wedged.

The struts should be tightly wedged, although care should be taken not to disturb the sides of the excavation by overdriving the wedges.

The timbering should be occasionally examined and any slack wedges and pages, due to the shrinkage of the soil, etc., tightened. If the struts show signs of bending, due to the extra pressure caused by the expansion of the soil during very wet weather, the wedges should be eased as required.

The sketch at A shows more clearly the timber details. It also illustrates a portion of the drain, embedded upon concrete, which is laid to the required fall in a narrow and shallow trench excavated at the bottom of the main trench (see p. 75 and Fig. 29, Vol. II).

Middling boards are only suitable for trenches dug in comparatively good ground.

TRENCHES IN DOUBTFUL GROUND (see F, G and H).—These illustrate the use of poling boards, called *tucking boards*, which are used for excavations in loose soil, such as made-up ground (soil, etc. which has been tipped into hollows in the ground and levelled over) and soft clay. The section shows a relatively wide trench required for a sewer, and three settings of boards are employed. The boards in each setting are secured at both ends between walings. Each of the middle and lower walings has a continuous wood fillet nailed to it level with its upper edge (see V); this is called a *liner*, and its thickness equals that of the boards. The upper boards are "toed" into the soil behind the liners of the middle walings until their feet are approximately level with the underside of the walings. Pages are driven down at the top between the boards and walings and, as required, at the bottom between the liners and boards (see H and V). The boards forming the second setting are "tucked" into position (hence their name) by placing them diagonally and fitting their heads between the waling and the feet of the upper boards, and forcing their bottom ends into the soil behind the liner nailed to the lower waling until they assume a vertical position. Pages are inserted to fasten any loose boards. The boards in the bottom setting are placed and held in a similar manner. The walings are supported by puncheons and the struts are tightened by wedges, as described in the preceding column.

To facilitate the handling and fixing of heavy struts, it is customary to nail short strips of boards at their ends (see E, G and H). These are called *lips* or *lipping blocks*. The struts are placed in position with their lips supported on the walings, and wedges are then driven in horizontally between one end of each strut and the waling. Temporary props may be used in lieu of lips.

Two platforms are shown in the section at G. There is a limit to which men can conveniently throw the excavated soil. This limit is considered to be 5-ft. Hence platforms or stages to receive the soil must be provided at approximately 5-ft. vertical intervals, and the top stage should preferably be not more than 4-ft. below the surface in order that the earth deposited on it may be thrown well away from the sides of the trench. Platforms consist of stout planks placed upon struts which are either cleated (see L) or propped. An edging to a platform, as shown, assists in retaining the heap of deposited material, but this is often omitted. They are usually arranged on alternate sides (see G and L) and staggered, as shown by broken lines at F and M. The soil excavated from the lower level of a deep trench is therefore shovelled from one platform to another until finally