greater), and when the wall exceeds 9-in. in thickness an *additional* footing course must be provided at the bottom as shown ; the *offsets* or *set-backs* (or steps) must be regular (2¼-in.) or the footings may be of uniform thickness throughout (*i.e.*, one offset only) ; the footings must be in cement mortar and not lime mortar. This type of foundation was generally employed before cement concrete had reached its present high standard of efficiency ; as the concrete foundation shown at A is more economical than B it is not anticipated that the latter will be often adopted unless for some special reason such as the availability of sound second-hand bricks (those from a demolished building which have been cleaned, *i.e.*, the mortar has been removed).

(c) *Concrete and Footings* (see C, Fig. 10). The width of the concrete bed and the composition of the concrete are as described for (*a*) ; the thickness of the concrete must not be less than one and one-third the projection of the concrete from the footings ; this results in the combined thickness of the concrete and footings being equal to that of the concrete bed at A. As a working space of 6-in. between the bottom course of footings and the edge of the concrete is usually preferred, a more practical section is that shown by broken lines at C which results in a slight increase in the minimum requirements in width and thickness of the concrete.

The section at D shows a form of construction which is permitted by many local authorities for walls which support light loads and do not exceed 20-ft. in height. The width of the trench must be sufficient to give a clear working space of 6-in. between the sides of the trench and each face of the wall.

Sections E, F and G, Fig. 10, show the construction which conforms to the bye-laws of some local authorities. Whilst it is still adopted for first class work, it may be expected that it will be replaced by the lighter (and therefore cheaper) construction shown at A, B or C as local authorities amend their bye-laws in accordance with the Model Bye-laws (1937), and especially for general work where the minimum requirements are sufficient for the purpose. Fig. 9 shows a sketch of the foundation shown at E, Fig. 10.

The method of obtaining the depth of the concrete beds shown at E, F and G should be noted in addition to notes 1, 2, 3 and 4 which are stated on the drawing. Rule 4 is important, as, in addition to being more effectively tied into the wall, headers are less liable than stretchers to accidental displacement before the mortar has set ; whilst stretchers in the top footing course at F are unavoidable, these should not be laid continuously along one side but should be staggered, *i.e.*, should alternate with two headers.

The depth of the foundations varies with the character of the subsoil and the relative importance of the work. Clay soils are liable to expand and contract, and such movement may cause damage to the foundations unless they are placed at a sufficient depth ; if such sites are waterlogged it may be desirable to adopt 4-ft. deep foundations. It is not necessary to exceed 3-ft. depth for dry soils such as gravel. All brickwork below the ground level should be built in cement mortar in order to increase its stability.

The construction of the floors shown by broken lines at E and G is explained on pp. 59-65.

Pier Foundations.—An example of a foundation suitable for a detached pier (as illustrated in Fig. 7) is shown at H, J, K, L and M, Fig. 10. Whilst footings may be dispensed with and the foundation designed in accordance with A, it should be noted that brick footings serve a useful purpose in gradually transmitting the concentrated load from the pier to the concrete.

DAMP PROOF COURSES

One of the chief essentials in building is that the structure shall be dry. A damp building is unhealthy to those who occupy it, it causes damage to the contents of the building, and it gradually impairs the parts of the structure affected. There are various causes of dampness in walls, the chief of which are : (1) moisture rising up the walls from the adjacent ground, (2) rain passing down from the tops of walls, (3) rain beating against the walls which may absorb the water to such an extent as to show dampness on the internal faces and (4) the absorption of water from defective rain-water pipes.

With reference to the first cause, the student of Building Science (a subject which normally forms part of a grouped course in Building) will have probably studied the structure of a porous material such as a brick ; he may have carried out tests to determine its *porosity* (the percentage of its pore space), relative *permeability* (its capacity to permit the passage of water through it), and the amount of water that it will absorb. He will appreciate that brickwork below the ground level will draw the moisture from the ground and may impart it from one course to another for a considerable height. The amount of moisture absorbed depends upon the water content of the soil and the quality of the bricks, mortar and workmanship.

To prevent water absorbed from the soil rising and causing dampness in the wall and any adjacent woodwork and plaster, a continuous layer of an impervious material is provided. Such a material is known as a horizontal damp proof course. The position of such a course varies from 6 to 12-in. above the ground level (see sections in Fig. 10). The level should not be less than 6-in. otherwise soil (forming flower beds and the like) may be deposited against the external face of a wall at a greater height than the impervious layer and thus water may be transmitted from it to the wall above the damp proof course.

The following are some of the materials used to form horizontal damp proof courses :—

Asphalt.—The raw material is a chocolate-coloured limestone which is impregnated with bitumen or natural pitch. It is quarried and imported from the British West Indies (Lake Trinidad), France (Seyssel), Switzerland (Val de Travers) and Germany. Fine grit in varying proportions is added and completely incorporated with the asphalt at a very high temperature, after which it is cast into blocks (weighing about ½-cwt. each). These are received on the site, when they are re-heated and applied in the following manner : Wood