

the horizontal damp proof course in the wall, sloped back and covered with 6-in. of site concrete as shown at H.

**DAMP PROOFING.**—The horizontal damp proof courses are stepped as shown, care being taken that none come within 6-in. of the ground; the vertical joints should be as short as possible in order not to weaken the walls, otherwise the steps should be as shown at G where asphalt mastic is applied and the adjacent walling toothed. A vertical damp proof course, indicated by a thick line, would be required on the back face of the garage division wall unless the earth is removed and the site concrete sloped as explained above. The vertical damp proof course is required to be continued round the side walls of the garage as the floor is below the ground level; this may be applied to the internal faces, as shown by the shaded area, but if this is objected to on the score of appearance, it may be formed within the thickness of the wall in the usual manner.

### CONCRETE FLOOR CONSTRUCTION

A concrete floor may consist of a single layer, known as *one-course work*, or two layers called *two-course work*. The former is commonly adopted for floors of garages, cellars, coal houses, etc., and those which are to be covered with other materials such as boarding and asphalt; site concrete is in one layer only. Two-course work is generally employed in good practice, and consists of a base layer covered by a finishing surface or wearing coat which should not be less than  $\frac{3}{4}$ -in. thick. A common mix for the base is 1-cwt. Portland cement,  $2\frac{1}{2}$ -cub. ft. of clean coarse sand and 5-cub. ft. of coarse aggregate graded 1-in. down to  $\frac{1}{8}$ -in. (producing a 1 : 2 : 4 mix, see p. 30); just sufficient water should be used to give a 2-in. slump. A hard wearing surface, known as a *granolithic* finish, is obtained from a mixture of 1 part cement, 1 part sand and 2 to 3 parts clean granite or whinstone chippings (crushed granite) capable of passing through a  $\frac{1}{4}$ -in. square mesh sieve and excluding dust; approximately 60 per cent. of the chippings should be retained on a  $\frac{1}{8}$ -in. mesh sieve; the surface concrete should give a 1-in. slump (see p. 31). The concrete is either machine or hand mixed, as described on p. 34. An excess of water, cement and trowelling (see below) should be avoided, as this brings the cement to the surface and produces what is known as a dusty floor. The surface should be applied to the base before the latter has hardened. The ground should be firm, any soft patches being replaced with concrete or hard stone. Sometimes a 6 to 12-in. layer of broken bricks or stone is first laid to receive the base layer; this sub-base is called *hard core* or *penning* (see Fig. 21).

**Methods of forming a Concrete Floor.**—Large floors are formed in a series of bays or sections, a convenient size being 10-ft. square, concreted alternately. One of several methods of forming a two-coursed floor is as follows: As shown at A, Fig. 23,  $1\frac{1}{2}$ -in. thick *edge-boards* or battens are nailed to wood stakes (or secured by staples to  $\frac{3}{4}$ -in. diameter metal rods) driven in along the boundaries of the bays at about 4-ft. centres, the top edges of the battens being brought to the

required floor level by the use of a long straight edge and spirit level. The base concrete is deposited in a bay, spread, and shovelled up to a height slightly more than the finished level. A wood *strike-board*, *tamper*, or *striking-off board* is then used to consolidate and bring the concrete to a uniformly level surface; as shown at B, this strike-board is notched at each end, the depth of the notch being equal to the thickness of the surface coat of the floor. It is manipulated by a man at each end who, working together, tamp down the concrete by lifting and releasing it as they proceed slowly backwards and forwards, any excess concrete being struck off as the tamper is brought forward when traversing the battens, and any low patches being filled in before the surface is given a final light tamping.

The wearing coat should be laid within an hour of mixing the base concrete. The ends of the strike-board used for forming the finishing coat are not notched (see C). The granolithic mixture (see preceding column) is deposited and then levelled as the strike-board is caused to traverse the edge-boards with a to-and-fro and zigzag motion. When sufficiently hard, the surface is tamped and floated with the wood *float* D, any irregularities being made good. The surface is finally trowelled smooth by means of the *steel trowel* E, which is worked in a circular motion. Excessive trowelling brings to the surface a liquid scum, called *laitance*. Such should be avoided, as this destroys the initial set and produces a friable, non-wearing surface having a glossy finish which has a tendency to dust and craze.

Not all surfaces are finished in this manner. Thus, for common work, the concrete is often *spade-finished*, i.e., the surface is beaten down and smoothed over with the back of the spade. Another finish, often adopted for paths and roads, is produced by jumping the strike-board up and down as it traverses the edge-boards, to form a series of small corrugations. A hard-wearing surface of attractive appearance may be produced by mechanically operated grinding discs which are applied to the floor after it has become sufficiently hard. This exposes and polishes the coarse aggregate.

*Terrazzo* is another finish used in first-class work. One method is to cover the concrete base with a 1-in. thick wearing coat composed of 1 part cement and 2 parts sand; crushed marble of  $\frac{1}{4}$ -in. gauge (free from dust) is sprinkled and rolled into this coat whilst it is still soft; when sufficiently hard (three or four days after laying) it is ground down to a smooth surface by stone discs mechanically operated. Another terrazzo finish consists of a 1-in. coat of 1 part cement and 2 $\frac{1}{2}$  parts crushed marble of  $\frac{1}{4}$ -in. gauge or less, which is machine ground after it has been allowed to partially harden.

An alternative method of forming a two-course floor is as follows: The floor is divided into bays, as above described, by temporarily bedding wood battens, called *screed rules*, on narrow strips of concrete; these are firmly tapped in position until their top edges are brought to the required level by means of a straight edge and spirit level; each alternate bay is dealt with in turn; the base concrete is deposited and levelled off to the top of the screeds by a straight edge which is drawn over them in a zigzag manner; the concrete is compacted or *punned* with a *wood rammer* (see F) or *iron rammer* or *punner* (see G); the top layer of concrete is then spread over the base, brought to a level surface flush with the screeds by means of the straight edge, floated (D) and trowelled (E) as already described; the screeds are removed, and the holes filled in with concrete and levelled off.

The floor should be covered with damp sacks or 2-in. thickness of sand, kept moist by occasionally spraying water on it from a hose to prevent the concrete from drying out too rapidly. It should be kept damp for at least ten days (see p. 35).