

$\frac{1}{2}$  inch to 1 inch. Three-quarters of an inch is sufficient for most requirements. The base is laid in a similar manner to ordinary concrete, and the wearing surface is spread like a coat of plaster before the concrete of the base has had a chance to set, and is floated to a smooth surface. The processes are described at length below. The proportions of the concrete for the base are most customarily one part of cement to two of sand to five of small broken stone or gravel. In the wearing surface the most common proportions are one part of cement to one part of sand.

All cities require Portland cement for use in their walks. For a mill floor which is not to be affected by frost, natural cement might perhaps be used for the base, but the Portland cement costs nowadays in most localities so little more than natural cement that it pays to use it on account of its additional strength. There are a number of brands of American Portland cements which are just as good for this, as well as for other purposes, as are the foreign brands.

The sand for the base should fulfill the requirements for ordinary first-class concrete; that is, it should be fairly coarse and clean. The coarse stuff of the concrete base should be smaller in size than is used for concrete generally, on account of the thinness of the layer. Either clean gravel or broken stone may be used for it. In sidewalk work some cities require that the stone or gravel shall pass through a screen having a  $\frac{3}{4}$ -inch mesh, while others allow the sizes of the particles to run as high as  $1\frac{1}{2}$  inches. For a mill floor stones as large as the latter size

may be used, but a large part should be of smaller dimensions. The sand or the dust need not be screened out of this coarse material, except in gravels where the sand largely predominates over the stones.

For the wearing surface the same sand may be used as is employed in the concrete of the base, provided it is clean and sharp. If crushed stone is easier to obtain than sand of the proper quality, it may be used instead, after being screened through a screen having meshes of either  $\frac{1}{4}$ -inch or  $\frac{1}{2}$ -inch, the former being preferred. If crushed stone is used for this top surface it should be a good hard stone, such as trap or granite.

#### LAYING THE CONCRETE.

Having prepared the foundation and selected the material we come to the actual work of laying the concrete. The concrete is preferably divided into separate "stones," which are usually from 4 to 6 feet square, the size depending upon the general layout of the floor. The principal object in dividing the surface into squares in this way in sidewalk use is to prevent visible cracks. If expansion or contraction, due to the heat of the sun and to frosts, tends to produce cracks they will merely open or close the joints between the stones, so that the effect is not noticeable. In order to form these stones forms are laid, consisting of strips about two inches wide and as deep as the total thickness of the pavement; that is, for the thickness we have mentioned,  $3\frac{3}{4}$  inches or 4 inches deep. These strips are set on edge so as to form the boundaries of the blocks, and stakes of wood are driven into the ground behind them to hold them temporarily in place. The blocks are laid alternately, being allowed to set before the forms are removed and the intermediate blocks filled in.

The concrete for the base can be made by the same methods described in a previous article for ordinary concrete. The mixing should be very thorough. A good way is to thoroughly mix the sand and cement dry, shovel it on to the broken stone or gravel which has been spread in a layer, and mix the three materials so as to obtain a uniform color throughout. Some contractors employ two men with shovels to do this mixing, while a third rakes the pile with an iron rake. When thus thoroughly mixed water is poured on

to it, and it is again turned with shovels two or three times. If desired the sand and cement may be first wet up in a mortar before being mixed with the gravel or broken stone instead of mixing all of the materials together dry. In this case it should have at least two turnings after the mortar is placed with the coarse stuff. The concrete thus prepared is wheeled and spread between the forms. It is leveled and thoroughly rammed so that the surface is the proper distance below the top of the forms to insure the correct thickness of the top layer. In laying this concrete for the base care should be taken to see that it is neither too wet nor too dry. There should be sufficient water to show upon the surface when rammed, but the mass as left by the rammer should be solid and not too much like "pudding."

#### LAYING THE TOP SURFACE.

To insure a perfect floor the top or wearing surface must always be laid before the concrete base has had a chance to set. By this I mean that it must be laid immediately, within at the most, say, an hour or two. If the base is laid for an entire floor and then the mortar spread on in one batch a joint will be formed between the two layers and the upper surface will be liable to peel off. A perfect union between these two layers is an absolute essential for durability. The materials for the wearing surface may be mixed like ordinary mortar. But the mixing must be extremely thorough. The sand, or screened stone, should be mixed with the cement dry until the mass is of an absolutely uniform color throughout, and then it may be wet. A regular plasterer should be employed to attend to the laying of this surface. The mortar is spread upon the base already laid, and it is smoothed off by drawing a straight edge over the tops of the forms. As soon as it becomes sufficiently dry it is hand floated with a plasterer's trowel.

(To be continued.)

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