

MUNICIPAL DEPARTMENT

CAUSES OF DEFECTIVE SIDEWALKS.

By A. W. CAMPBELL, C. E.

In using gravel only, the difficulty arises from the fact that the cement, sand and stone are not and cannot be expected to be mixed uniformly in these proportions. Gravel usually contains sand, but not in uniform quantities nor in any definite proportions. Some pockets of so-called gravel will be almost completely sand, while adjoining it there is scarcely any sand, perhaps almost clean stone. To mix such material with cement to produce concrete, while in many cases it may be successful, is always hazardous. The only safe way, where gravel is the material to be used, is to separate by screening the sand and stone which compose the gravel, then to mix the sand and cement in proper proportions to form the mortar, to which is then added the stone, uniformly, and in its proper proportion.

A cause of an inferior sidewalk is that the materials composing it have been carelessly mixed. The cement and sand should be first mixed dry. This should be turned over and mixed with shovels not less than ten times before the water is added. Water is then added in just sufficient quantity to slightly dampen the mixture, and the paste should be again turned over and mixed not less than six times. If this work is properly done each grain will be surrounded by a sufficient coating of cement. This mortar having been spread out, the stone should be added and the whole turned over and mixed not less than ten times before being used, the last mixing ensuring that each stone is completely surrounded by a coating of mortar.

The use of too much water in mixing will produce, when set, a concrete of spongy texture. Concrete when ready to be put in the work should have the consistency of freshly dug loam, and should be rammed into place until moisture appears on the surface.

Neglect to keep a newly laid walk damp, and protected from the rays of sun, will permit the surface to set too rapidly. Minute, hair-like cracks will appear on the surface. These fill with water, which freezes in cold weather, and the expansion destroys the surface of the walk, causing a thin layer to shale off in patches. The same shaling will result from laying concrete in frosty weather; nor should it be mixed or laid in wet weather.

Another cause of the failure of sidewalks is that the concrete has not been properly

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and completely separated into flags to allow for expansion, with the result that in hot weather, when expansion takes place, the sidewalk is thrown up at points of least resistance. The expansion of concrete is about the same as that of steel, and no railway company would contemplate for an instant the laying of a continuous steel track in which there are not joints at proper intervals to allow for this expansion. This is true to the same extent with a concrete sidewalk, and every care must be taken to first cut through the foundation layer of concrete, then through the surface layer directly in line with the joint underneath. The entire joint should then be filled with sand to ensure complete separation.

The surface layer of the sidewalk must be laid upon the foundation layer while the latter layer is still damp and before it is set, otherwise there is not a proper union of the two and shaling will result.

The effect of frost on a wet sub-soil must also be guarded against by the use of under-drains, otherwise the upheaval of the ground, under the expanding influence of frost, is very apt to crack the walk. The separation of the sidewalk into flag divisions, however, is also of service in this respect by giving the separate divisions an opportunity to rise and subside

with the soil underneath. No dependence however, should be placed on this, as a saturated sub-soil will eventually cause a very uneven surface, since the separate flags when once upheaved seldom return exactly to their original position.

Walks are very commonly laid by contractors who furnish their own specifications and agreement. Where such is the case, the agreement should contain a clause specifying in the most stringent terms that the walk is to be kept in perfect condition, order and repair, so that at the end of the term of guarantee, usually five years, the walks shall have given satisfactory evidence of their proper construction and durability. The guarantee is generally so worded that it can be interpreted to mean that the contractor is simply to keep the walk in repair for five years, and entailing no responsibility upon the contractor even if the walk at the end of that period is ready to crumble to pieces, demanding almost immediate reconstruction. A town, however, should not depend upon the contractor's guarantee, but should employ an experienced and reliable inspector to see that the specifications are faithfully carried out.

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