

Second. As to buckling. This has been a most awfully over-ridden hobby-horse. There is nothing that can happen to any kind of pavement so inexpensive and so easy to repair.

Either lay the blocks with tight joints, both longitudinal and transverse, as has been the practice in New York, with ample longitudinal expansion joint at the curbs, filled with a bituminous filler so compounded as not to melt below 175 degrees Fahr. or become brittle above 15 degrees Fahr.

This method will prevent bleeding, buckling and slipperiness and will make waterproof the pavement.

Third. As to slipperiness. Creosoted yellow pine block pavement is, as are all other smooth pavements, slippery under certain climatic conditions. If the pavement is not clean (covered with a film of dust or soot), and the morning is mucky, heavy fog or heavy dew, or very light sprinkle of rain, or light frost or snow, the pavement will be, for two or three hours, slippery. This condition will probably exist for two or three hours one day in every week the year through, and not more than that in any section of the United States. All of which can be overcome by an occasional whipping of coarse sand on the surface.

If the engineer will make the crown of his wood block pavement as light as the grade of the street will admit, and if above  $4\frac{1}{2}$  per cent. grade, will separate the blocks transversely with a creosoted strip  $\frac{3}{8} \times 1$  inch and fill the joint above the strip (the strip to be set up on the concrete base), with the bituminous filler, already described, and pebbles, there will be very little, if any, slipperiness, not any more than on asphalt, bitulithic, concrete or brick with cement grout filler under the same conditions.

Fourth. All creosote plants buy their oil in large quantities, and as fully 90 per cent. of the treating of timber and paving blocks is done under expert supervision, selected by those who pay for the work, the danger of imposition is reduced to the minimum.

As to the quality of the wood, any novice can tell whether it conforms to the engineer's specifications.

As to the construction work of the pavement, it is practically the same as that of several other pavements—so, where can the deception be practiced?

Fifth. As to the sanitation of the pavement, proof sufficient has already been given.

Sixth. As to the extent of repairs, we have shown that no expensive plant or gang of trained laborers are necessary to be maintained for said purpose, but the only thing needed is a laborer, a hatchet and a few new blocks.

**What Improvements Can We Suggest?**—I think we are on the "right line,"—will only mention a few points which, after long experience, much study and many critical inspections, have impressed me as essentials.

First. Be careful in making the Portland cement base. Have the ingredients carefully selected and well mixed; proportion depth to traffic, and always finish the concrete base with a template and straight-edge, exactly parallel to the contour and grade of the finished pavement.

As to cushion for the blocks, I prefer the mortar bed—of one part cement and three parts screened sand, mixed dry, struck off with a template and dampened with a hand-sprinkler just in advance of the paver.

Lay the blocks close-jointed sidewise and with one-eighth inch joint between ends of the blocks, carefully spaced.

At the curbs provide an inch expansion joint for a thirty-foot street, between curbs, and  $1\frac{1}{2}$  inches for a 50-foot street.

Have no transverse expansion joints on the pavements.

Trim the blocks to fit neatly around manholes, catch-basins and all permanent fixtures; provide necessary expansion joints around same.

Let the blocks be brought to a firm bearing by means of a hand-rammer in the hands of an active, careful laborer, or quickly rolled with a light tandem roller, from three to five tons.

After the blocks have been spaced, inspected and low blocks brought up to grade, the surface should be swept broom clean and a bituminous filler, so compound as not to melt below 175 degrees Fahr. or become brittle above 15 degrees Fahr., heated until as thin as water, should be poured on the surface and worked back and forth with a squeegee until all cracks, interstices and expansion joints are three-quarters full, using sufficient force on the squeegee to leave only a thin coating on the surface of the blocks, into which, while hot, sprinkle a layer of pebbly sand.

Traffic should be excluded for at least four days, and longer if necessary, for the mortar bed to properly harden.

If a sand cushion is used, let it be only one-half inch in depth, made of screened sand not too fine.

This plan should be used universally on bridge floors.

**What Should Not Be Done.**—Blocks should not be loosely laid on a sand cushion, varying from  $\frac{1}{2}$  inch to 2 inches in depth and a sand filler used—remember, wet sand is as unyielding as granite. You could with equal propriety each day drive steel wedges between the blocks. As the blocks shrink the sand trickles down to fill the space made and keeps the blocks hugged in this narrowest limit. When the blocks are wet so also is the sand, and when the blocks want to expand to their natural sizes, the wet sand will not yield and a buckle of the block occurs.

If sand is to be used as a filler, lay the blocks close-jointed both longitudinally and transversely, and place a half-inch layer of coarse, pebbly sand on the surface.

Neither should a paving pitch filler be used unless specially made for the purpose, guaranteed not to melt below 175 degrees Fahr. or become brittle above 15 degrees Fahr.

Ordinarily paving pitch on a wood block pavement is a nuisance in hot weather, and below 50 degrees Fahr. it is absolutely unyielding. Wood blocks will want room for expansion below 30 degrees Fahr.

**As to Treatment.**—The period should not be too short—making haste is dangerous; gradual heat, not at any time to exceed 240 degrees Fahr., rapid vacuum up to 22 to 26 inches of mercury—slowly increasing pressure not to exceed 200 pounds.

Better retain 150 pounds pressure longer than hasten the work by applying 250 pounds pressure for a shorter time.

**As to Timber.**—Like the specific gravity of the oil, too much of a bugaboo is made of the amount of heart lumber to require. We have diligently searched for evidence to prove that sap in creosoted wood blocks wear more rapidly than heart, and not in one instance have we found such evidence.

The blocks, if laid level on a concrete foundation with close joints, the compression or wear has been perfectly regular, as much on the heart side as on the sap side.

The treatment seems to toughen the timber, making the heart and the sap of equal wearing surface in paving.

Therefore, we say there is no good accomplished in calling for 66 per cent. or 95 per cent. of heart. Such requirement adds considerably to the cost of the timber. Our mill men are anxious to sell heart lumber, but they greatly increase the price charged therefor.

Square-edged and sound Virginia southern yellow pine, free from all defects which would injuriously affect the timber for the uses intended, are all that is needed in an up-to-date, first-class timber specification for paving blocks.

With these precautionary suggestions as to timber classifications, treatment and construction observed, we will have in the creosoted yellow pine block pavement the ideal pavement.