MUNICIPAL DEPARTMENT

HARDWOOD PAVEMENTS.

Mr R. W Richards, City Surveyor of Sydney, New South Wales, who has had an active connection with the well-known hardwood pavements in Sydney since their inception in 1880, contributed a valuable paper on their construction and management to the English Association of Municipal and County Engineers.

The wood pavements in Sydney now cover nearly 387,000 square yards of surface, extending over 20 miles of streets. The first pavement was laid with various kinds of timber with the blocks cut in sizes 3 × 6 × 9 inches of well seasoned hardwood. The foundation was of 6 to 1 concrete laid to a thickness of 6 inches, floated with cement mortar. Upon this the blocks were laid 1 inch apart, the joints being filled in with bluestone screenings and tar, when thoroughly grouted, flush with surface, a top dressing of clean, coarse sand and tar was spread to a thickness of ¾ inch over the entire surface; then the roadway was thrown open for traffic. Each kind of wood was separated, and included classes known as red gum, black butt, ash, box, Baltic, blue gum, brown pine and cedar. In less than five years about one-sixth of the ash timbers were removed, and renewed with spotted gum and black butt; about one-tenth of the box, one-half of the Baltic, one-fourth of the brown pine, and all the cedar blocks were removed, and blocks of blue gum laid; and by 1893 the whole of the original blocks had been removed and the pavement relaid with black butt and tallow wood. These pavements cost about $6.50 per square yard, the filling between the blocks accounting for much of this expense.

In 1887 the width of the joint was reduced to from ¾ to ⅜ inch, and in 1888 the width of the joint was reduced to ¼ inch when grouted and thoroughly rammed, complaints having been made of the noisiness and slipperiness of the wider joint. The blocks are laid with a butt joint, the blocks being dipped in tar, hammered up at every twelfth row, and afterward flushed with boiling tar and river sand. It is found that the expansion of the narrow jointed pavement is less than in the wide jointed ones. To allow for any possible expansion, however, a 2 inch seam of sand or clay is laid parallel with and close to the curbing. Outside this layer hardwood planks 3 inches thick, 6 inches deep and 12 feet long, are fixed so as to break joints with each other on each side of the street. No trouble from expansion has been had with this arrangement. The cost of these pavements now is about $3.80 per square yard, wages being $1 50 per day instead of $2.00 as in 1885. To prevent slippe iness, the pavements are sanded when occasion demands nearly $6,000 a year being expended in this way.

As the result of 17 years' experience, Mr. Richards has come to the conclusion that a carriageway pavement laid upon a good foundation of concrete with New South Wales hardwoods, with slape or butt joints, with convexity of 1 in 60 or 1 in 80, as the longitudinal gradient may suggest, properly cleansed and maintained, is the best and most suitable form of pave*ment for heavy and continual traffic; and* that the best timbers for such work are tallow wood, black butt, blue gum, red gum and mahogany. These timbers, after having been so laid in Sydney streets, have, upon examination, shown wear at the rate of from $\frac{1}{16}$ inch to $\frac{3}{16}$ inch per annum, and have not required repairs of any kind, although the traffic on one 36-foot street in Sydney has been found by count to amount to 330 vehicles per hour, averaging one ton in weight, and on another street as many as 500 vehicles an hour have been observed. Mr. Richards considers the jarrah and karri woods of Western Australia very good paving material, but not comparable with the tallow wood and black butt of New South Wales.

ROAD-MAKING MACHINERY.

A few days ago a trial was made in Springfield-road, Chelmsford, of one of the new scarifying machines recently purchased by the Essex County Council, acting under the advice of the chief surveyor. A section of roadway was selected for the trial in front of the Chelmsford Prison, and the scarifier, which was attached to and formed part of one of Messrs. Aveling and Porter's ten-ton steam-rollers, was set in motion. The roadway, which is of hard granite, readily yielded to the tearing up progress of the scarifier, which consists mainly of a row of high-tempered steel teeth, set to whatever depth of breaking up is required, and easily regulated and adjusted by the driver in charge of the roller. In a few minutes a large area of roadway was thoroughly torn up and made ready to receive fresh metal, and within three hours of the work being commenced, the road was re-coated with granite and steam-rolled, an operation which under the old system of hand labor would have entaild several days' work. Entire satisfaction was expressed by the experts present.

USEFULNESS OF VARIOUS KINDS OF STONE FOR HIGHWAYS.

A most important matter to consider in the choice of stone for road metals, in highway work, is its resistance to weather and friction. The amount of traffic, the value of the material considered simply as material, independent of price, and the price itself, are the three elements to be carefully determined and weighed with and against each other. German statistics are not wanting to show the comparative resistance of various road materials to wear caused by similar conditions.

Taking as a standard 1 cubic meter = 1.3 cubic yards of basalt, with a crushing strength of 1,500 kilograms per square centimeter (21,335 pounds per square inch), the equivalent necessary quantities of other stones are as follows:

Crushing Strength.		Material.	Proportionate quan. required (cu. in. or cu. yds.
Kg. per sq. cm.	Lbs. per sq. in.		
1,500	21,335	Basalt.	1.
1,400	19,912	Basalt.	1.08
1,300	18,490	Diorite; aphanitic greenstone, melaphyr or angite porphyry, gabbro.	1.20
1,200	17,068	Granite, syenite, compact quartz porphyry.	1.32
1,100	15,645	Porphyry of the granite group.	1.59
1,000	14,223	Quartzy graywack millstone grit	1.84
900	12,801	Graywack.	2.15
800	11,378	Quartzy limestone, compact new red sandstone	2.57
600	8,534	Jura limestone.	4.00
500	7,112	Jura sandstone.	7.00
400	5,689	Chalky limestone	12.00

The extraordinary decrease in durability compared with crushing strength shows the necessity of great care in testing and choosing stone for road-metaling purposes.

In the table, average values are given; and the conditions of climate, traffic, etc. are the same in all cases. Under different other conditions it may be said that the differences in durability are less, the less the traffic and the more favorable the weather and the position of the road.

With good weather conditions, favorable position as regards dampness, and light traffic, more attention should be paid to cost than when contrary conditions prevail.—Robert Grimshaw, C.E., in Municipal Engineering.

In France, where a national system of highways is maintained at the expense of the general government, stringent and compulsory regulations for the width of tires are enforced; from three to ten inches is the rule, depending on the weight of the load. These regulations are rigidly and impartially enforced.