

In respect to inspection of bridge work, Mr. A. W. Campbell hit the nail on the head, in an address delivered by him a short time ago and reported in part as follows:—"Mr. A. W. Campbell emphasized the fact that there is a great need in Canada to-day for skilled inspectors who will act as the connecting link between the designing engineer and the contractor who undertakes the construction of public works. Deploable waste and extravagance was the result of municipalities engaging laymen, who were careless and pliable in the hands of a contractor. To the layman, the architect or engineer was apt to be a man of fanciful ideas, who could write long specifications and draw more or less intricate pictures. . . . As a public official charged with the handling of public funds, he had reached these conclusions from years of experience, and deemed it but right that he should give the public the benefit of his experience, and warn them in the interests of good workmanship and economy. Contractors, however honest, were chiefly concerned in the profits accruing, not the perfection and durability of the work, and it might be accepted as an axiom that the quality of the work could not be left wholly to the contractor."

The cost of cement-concrete bridge work varies in proportion to the cost of the material for construction delivered at the work. For example, take two arches of similar design built in the County of Peel last year. In one case the crushed stone, sand and gravel cost \$2 per cubic yard delivered at the work, the cement was teamed about 10 miles, and the price paid for the concrete was \$7.15 per cubic yard. In the other case, the crushed stone cost \$1.50 per cubic yard, the sand and gravel 40 cents per cubic yard, the cement was teamed  $\frac{1}{2}$  mile and the price paid for the concrete was \$5.75 per cubic yard. The minimum price paid for concrete in arch bridges was \$5, and the maximum \$8 per cubic yard. The minimum paid for concrete in abutments was \$5, and the maximum \$5.75 per cubic yard. The price paid for concrete covered excavating and refilling. The price paid for reinforced concrete bridge floors was from 20 cents to 25 cents per square foot. The steel for reinforcing in arches and flat top concrete bridges cost about  $2\frac{1}{2}$  cents per pound. The railing used on most of our concrete structures last year was two lines of 2-in. gas pipe with globe fittings, which makes a strong railing with a good substantial appearance at a reasonable cost. The cost of the railing painted and complete was 64 cents per foot.

The wages paid on the work were as follows:—

Ordinary labourers, \$1.50 to \$1.75 per day; road foremen, \$2 to \$2.50 per day; machinery engineers, \$2.50 per day; teams, \$3.50 to \$4 per day.

The cost of operating road machines was from \$13.50 to \$14.50 per day. In some cases traction engines were used on these machines instead of horses with good results. The cost if operating was less, and it is estimated that on a clay road and in hot, dry weather, nearly twice as much work can be done.

The cost of operating steam rollers was from \$3.90 to \$4.50 per day, to this may be added the cost of sprinkling \$4 per day, making the total for rolling and sprinkling about \$8 per day.

For the roads in the south part of the county crushed stone was brought in by rail, as satisfactory local material was not available. This added very much to the cost of these roads. In some cases the freight was double the price of the stone, f.o.b., at the quarry.

The following data gives in tabulated form the details relating to the dimensions, cost, etc., of several roads built on the County of Peel Road System in 1908 and 1909:—

Road No. 1.—Well graded, knolls cut down and hollows raised. Metal consolidated with a steam roller. As no local material was available, crushed stone was brought in by rail. The freight on about one-half the stone was 65 cents per ton, and on the remainder, which was delivered at another station, \$1 per ton. The price of the crushed stone f.o.b., at the quarry was 50 cents per ton.

Road No. 2.—Well graded. The gravel was evenly spread on the road early in the summer, without being rolled, and in the fall when the gravel was partly consolidated by the travel over it, it was gone over a second time, the ruts filled and the road recrowned.

Road No. 3.—Similar to No. 1, with the exception that the stone was all shipped to the same station, the freight being 65 cents per ton.

Road No. 4.—This was an old stone road, wide and flat on top, the grading consisted mainly of cutting off the shoulders, although in some places it had to be regraded and ditched. Crushed stone was placed in the centre of the road 9 feet wide, and along each side of this a strip of gravel about 3 feet in width, forming a boxing for the stone and making

Grading.					Road Metal.					
No.	Location.	Width of grade.	Cost per mile.	Class of metal.	Width of metal.	Depth of metal.	Freight on metal.	Length of haul for teams.	Cost per mile.	Total cost per mile.
					(Consolidated).					
					Feet.	Inches.	Miles.			
1.	Ching'sy	28'	\$126	Crushed stone.	9	7	\$1,034	1 $\frac{3}{4}$	\$3,145	\$3,271.00
2.	Caledon	24"	195	Pit gravel.	7	9	Local	1	685	880.00
3.	Toronto Tp.	24"	175	Crushed stone	9	8	1,005	3 $\frac{1}{2}$	3,557	3,730.00
4.	Toronto Tp.	27"	145	Crushed stone & pit gravel.	15	4	857	Stone $\frac{1}{2}$	2,170	2,315.00
						6		gravel $\frac{1}{2}$		
5.	Ching'sy	27"	200	Crushed stone	8	6	876	1 $\frac{3}{4}$	2,808	3,008.00
6.	Caledon	24"	272	Pit gravel.	7	8	Local	1	528	800.00
7.	Toronto Tp.	22"	190	Crushed stone.	9	8	940	2 $\frac{1}{4}$	3,214	3,404.00
8.	Ching'sy	24"	200	Crushed stone & screened gravel.	8	6	Local	2 $\frac{1}{2}$	1,750	1,950.00
9.	Toronto Tp.	26"	85	Gravel.	8	9	Local	...	650	1,115.00
					9	5	.....	...	480	