

guaranteed. It was pointed out that the men engaged at home on the output of war munitions had as responsible and important duties to perform as had their brothers in the trenches, and it was only by their unselfish co-operation that the soldiers could be kept well supplied with ammunition so urgently necessary to bring the unfortunate war to a speedy and satisfactory end.

In the course of a week over 95% of the recruitable employees (between the years 18 and 38) applied for war badges and signed a guarantee in the matter of regular and diligent adherence to duties.

SOME ROAD MAINTENANCE COSTS.

THE work of the New York State Commission of Highways is carried out under nine divisions with a division engineer at the head of each. Under him are two departments, *i.e.*, construction and maintenance, in charge of the resident engineer and superintendent of maintenance respectively. In each county, or part of it, in case the mileage of improved roads is very large, the maintenance work is supervised by an engineer who reports to the superintendent. Monroe County with its 220.19 miles of completed state and county highways in 1914 was divided into two sections, east and west of the Genesee River. An article appearing in the Cornell Civil Engineer for May, and written by Paul Macy, C.E., of the maintenance department, has to do with the costs of a portion of the maintenance work done during 1914 in eastern Monroe County. In this territory in 1914 there were 99.303 miles of completed road of the following types of construction: Waterbound macadam, 14.594 miles; oiled waterbound macadam, 41.380 miles; bituminous macadam, 27.149 miles; amiesite pavement, 1.000 mile; asphaltic concrete, 9.940 miles; concrete-bituminous top, 4.250 miles; rock asphalt, 0.990 mile. Total, 99.303 miles.

The maintenance work in the field is done both by contract and by pay-roll system directly by the department. The latter includes minor repairs by the patrolmen and more extensive repairs by organized gangs. Each patrolman supplies himself with a horse and cart and necessary small tools and is provided with bituminous material and stone. His duties comprise the making of small patch repairs to the pavement; the cleaning of ditches and culverts; the mowing of weeds and grass along the highways and around the guard rail and culverts; and the general inspection of his beat. The average cost of the salaries of such men was \$67 per mile in 1914.

The total amount of money spent in 1914 up to December 1st was \$68,705.83, divided as follows:

		Average per mile.
Patrol	\$ 6,589.00	\$ 67.00
Repairing, painting and building guard rail	2,550.48	26.00
Maintenance material, stone and oil	6,013.49	61.00
Ordinary repairs	5,963.16	60.00
Oiling 40.669 miles	19,870.75	488.00
Resurfacing 1.45 miles bit. mac. mixing method type 2	23,007.77	15,867.00
Engineering and expenses	4,711.18	47.00
Engineering and inspection, 4.94%		

Of the oiling work done during the year 32.244 miles were done by contract and 8.425 miles by the department directly. The cost of this class of work is itemized under Tables I. and II. respectively.

In the work shown in Table I. both the cover and bituminous material were applied by contract. The cost of cover as shown in this table is excessive, due to the fact that the cost as given covers all material bought and delivered upon the shoulders of the road. In the case of each of these contracts approximately 100 tons of cover per mile were applied.

In Table II. the bituminous material was applied by contract, cover being furnished and applied by the department. The amount of cover used was approximately 50 tons to the mile.

Table III. shows the cost of oiling work done entirely by the forces of the department.

During the season, particularly in the late fall, the shoulders on 22.075 miles of road were scraped and shaped up, an ordinary two-team road scraper being employed. The cost of this work is shown in Table IV. It is difficult to state an average cost upon this class of work, owing to the great variation in conditions. Where it is necessary to pick up and haul away the surplus material the cost becomes large, as shown on roads Nos. 16 and 19. However, where average conditions prevail and all the material may be used to widen out the shoulders a fair average cost of \$25 per mile may be assumed.

In the early part of the summer all the wooden guard rail was repainted one coat. Ready mixed paint was used, costing \$1.50 per gallon f.o.b. points near Rochester, and was applied by the department's own forces. In most cases a gang of three or four men, including the foreman, was employed. These gangs were transported from road to road in a box wagon which was also used to carry paint, brushes, oils, material and tools for making small repairs, etc. The cost of this labor was as follows, the driver of the wagon being used as a painter:

Foreman	\$.50	per hour
Labor25	" "
Horse and wagon, including driver37½	" "

Each man painted approximately 300 linear feet of rail per day on the average and used 0.6 gallons per 100 linear feet. The itemized cost of this work was as follows:

Cost of Painting Wooden Guard Rail One Coat.—

Total number of linear feet, 49,998; cost of labor, \$478.50; cost of material, \$475.77; total cost, \$954.27. The average cost per foot was: Labor, .0096; material, .0094; total, .019.

Cost of paint used	\$450.00
Cost of oil and turpentine	18.79
Cost of brushes	6.98
Cost of labor	478.50

Total cost \$954.27

Below is shown the cost of erecting new concrete guard rail. The cost of hauling 2¼ miles is included in the labor.

Cost of Concrete Guard in Place.

No. of linear feet	1,440
Total cost of labor	\$ 237.00
Cost of rail and freight	1,053.76

Total \$1,290.76

Average cost of labor per foot	\$0.164
Average cost of rail per foot732

Total \$0.896