

hardpan, and crib it up with two-foot tile. Three such wells in a mile and a quarter of bad road in his county had sufficiently drained it. A boggy road had been remedied by a V-shaped trench filled with stones. He pleaded for a fair treatment of superintendents by County Councils.

To Improve Old Gravel Roads.

"The reconstruction of old gravel roads" was dealt with by Mr. J. M. Young, of Harriston, Superintendent of Wellington County. He reduced the width to 24 feet, except near towns, where it was made 30 feet. The grass sides were cut away, and the roadbed uniformly drained, springs being remedied by tile draining. The old roadbed was ploughed up as far out as the gravel had spread, generally fifteen feet, then the girder was put on, surplus earth being levelled off towards the fences. The chief difficulty was in getting experienced girder operators.

To Maintain Earth Roads.

Speaking of earth roads, and how most economically to maintain them in ideal condition, Mr. W. B. Rittenhouse, of Beamsville, gave it as his experience that tile or underground drainage was better than surface drainage in nearly all cases, in providing a good bottom. He cautioned against undertaking many macadam roads except for main highways. After cutting up and grading the road, the speaker said they got the traffic directed along the centre of the road by driving a wide-tired wagon carefully along the centre of it, and all others will follow that track; when ruts form, the road is dragged and levelled again. It costs less when a good road was once made, to keep it good by constant care. Most road work should be done early in the season when the earth is soft and miry; it could be done then more easily and better.

Don't Build Roads Too Wide.

Mr. H. R. Jupp, of Orillia, County Road Superintendent of Simcoe County, said he would never build a road wider than 24 feet; that was sufficient for all kinds of traffic, and a wider road, while looking well, cost too much to build and maintain.

"Steel Highway Bridges" was the subject of a paper by Mr. A. W. Connor, C.E., Toronto. The most important means to the preservation of steel bridges, he said, was keeping them well painted. The surface should be clean and dry before painting, as rust would spread under paint.

Financial Condition Good.

The auditor's report, which was adopted, showed a balance on hand of \$272.84, there being \$233 left over from last year, the county grants amounting to \$120, and Government grant to \$200. The expenses totalled about \$280.

Officers Elected.

The following officers were elected for the ensuing year: President, W. H. Pugsley, Richmond Hill; Vice-President, Thos. L. Kennedy, Cooksville; Secretary-Treasurer, Col. J. E. Farewell, Whitby; Assistant Secretary, W. A. McLean, Toronto; Executive Committee, R. H. Jupp, Orillia; Warden Hall, Prescott; K. W. McKay, County Clerk of Elgin, and L. A. Hamilton, Lorne Park.

PREPARATION AND USE OF ROAD METAL.*

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The preparation and use of road metal covers a very large field, but this paper is intended to cover a few of the essential points and bring about a healthy discussion on the subject and an exchange of ideas.

We will not deal with the cost of the material on the road as it depends so much on the size of the plant, class of stone, and the length of haul, and for this reason it is not fair to compare the cost of road construction in one section with that of another section even in the same township. The cost of laying the metal on the road should be reduced to a minimum, which can only be done when all the teams are working to full capacity with the least handling of material that is possible.

The preparation of the material may be divided under two heads. The preparation of the material to be placed on the road and the preparation of the road to receive the material.

Whether the source of the metal be a quarry or field stone sufficient coarse material should be piled convenient to site for crusher, and arrangements made for keeping a surplus of coarse material on hand as well as supplying the crusher, and a bin of sufficient capacity to provide against a temporary shut down to the crusher for minor repairs or adjustment. The time and labor saved in loading from a bin against loading from a pile will far more than pay for the sinking fund and interest on the cost of the bin.

The metal should be screened on coming from the crusher, first separating out the dust and chips up to ½-inch, then sorting out the 1-inch and 2½-inch and tailings. Where new construction work is being done, the proportion of tailings and 2½ should be much greater than where repair or reconstruction work is being done; also very hard or tough metal will stand to be more finely broken than the softer metals.

In preparing the road surface to receive the metal, the surplus dust or fine material on the surface, as well as the false berm at the edge of the ditch, which has been formed by the growth of grass and collection of dust, should be removed as it holds the water and softens the roadway. To do this the use of a scarifier is used to advantage to loosen up the material so that the grader can do with one cut what it would take three or four cuts to accomplish with unloosened material.

It is not advisable to place the metal on a smooth hard surface of a macadam roadway as it takes more material than is necessary to form a good wearing surface, as a thin layer of metal will not bond on the smooth surface. The old surface should be roughened to give a bond between the old and new metal. To accomplish this the scarifier drawn by a traction engine is the most economical method.

The traction engine should also be used for hauling the grader.

After the material has been loosened it should be trimmed with the grader and the broken stone spread and levelled and rolled with the steam roller.

By the use of the steam roller a thinner coat of metal can be put on and bound into the loosened macadam below and a good road formed at once instead of allowing the traffic to kick the loose stone about and take a long time to make a possible road.

It is not only the automobiles that are damaging our macadam roads, but the narrow tires on the vehicles and also the hind wheels running in the same track as the front wheels.

If the Legislature could be prevailed upon to pass an act compelling all vehicles to have the hind axle longer than the front axle by twice the width of the tire, then our macadam roads would not rut so soon and would cost much less for repairs as the rutting causes the water to lie on the road and soften the binding and metal and increase the wear.

*Read at the Ontario Good Roads Association.