

## STONE AS ROAD MATERIAL.

By James S. Wilson,

of The Sirdar Granite Co., Calgary, Alta.

THE construction of a system of highways, with connecting service roads, is a matter of the utmost importance to Canada. If she intends to avail herself of the opportunities presented in the commercial disorganization of Europe in consequence of the war, immediate steps must be taken to commence the task of creating the arterial system of roads that this vast Dominion requires.

Roads connecting the various provinces must be constructed, with the necessary service roads or feeders, allowing easier access from centre to centre and to railway points. This huge task of constructing an arterial system of roadways is one that requires to be handled boldly by men of wide experience, involving, as it does, enormous expense and engineering difficulties of no mean order.

Hitherto, the methods generally pursued in road construction have been of the most makeshift description, building more with the view temporarily to serve but a small area rather than on a permanent basis to a predetermined plan, which would form a standardized unit that would connect district to district, and ultimately become part of a great Dominion system of highways.

While, no doubt, these temporary roads act in some fashion as a means of transportation, their period of usefulness soon expires and the work practically has to be performed all over again. The grading and draining, of course, once done, is good for all time, so long as it has been executed to plan, but the system of gravelling is no doubt a poor outlay for the money expended and can only be considered as a temporary expedient.

Instead of undertaking the surfacing part, the laying of a road foundation should be the first consideration—a foundation that will be permanent and ever remain an asset, no matter what class of finishing will be required. In almost every part of the provinces stone in limestone, sandstone, schist, granite, boulders, etc., is available, and can generally be procured within reasonable distance of place where required. These stones, laid to a uniform level with proper contour and bound with material which generally can also be procured near the site of the work, would more serviceably perform the work of the temporary gravel roads and be a permanent part of a first-class highway, the surfacing of which would be executed at a later and more opportune time.

Of the above material, sandstone is the most suitable stone for bottoming. Experience has taught the European surveyor and road-maker that this stone has more give to it than the harder stone and does not require so much material to maintain the surface in good condition. In constructing first-class bottoming or foundation, after the grading and draining, which is necessary in any case, has been executed, care should be taken to see that the subgrade conforms to the required contour, due allowance being made for consolidation of rolling. Stakes should be driven in at sides, quarters and centre to the proposed finished level of road surface; lines should be carried from stake to stake at the height to which the bottoming is to be laid.

The stone for this foundation or bottoming should consist of pieces of any of the previous named material in sizes up to 15 in. in length and 9 to 10 in. deep by

10 to 12 in. broad, should be laid by hand, in courses having their longer axes at right angles to the side of the road, with their broadest side down, the irregular tops knapped off and the interstices filled in with broken material, the whole well knit, bound with ashes or some gritty material, and, where possible, rolled with a heavy roller.

The cost of this part of a first-class road would, of course, be in excess of the present type of road, the excess practically amounting to the cost of hauling and laying the bottoming, an inconsiderate amount in view of the permanence of the structure and its service qualities. To meet this extra cost a levy or overtax should be imposed upon the taxpayers of the district through which the proposed road is to pass—no great hardship when it is considered that the overtax levied will be distributed in their district, the hauling of material and cost of labor being executed locally, offsetting the extra imposition.

To keep these roads in condition a certain amount of maintenance would be necessary, but where this is done on a thoroughly organized basis the cost per mile is very small. The system adopted by the French and other governments, and the county councils of England, Scotland and Ireland, is to divide the roads into sections, each of which is in the care of a patrolman, who performs necessary repairs, material being deposited at convenient places alongside of the roadway for this purpose, so that he can even up any discrepancies of road surfaces. Over a certain number of patrolmen is a supervisor, who sees that the patrolmen are provided with material to fulfil any repairs required, etc.

In the case of the bottomed road, one patrolman would be able to attend to a large area, and, as the material for repairs does not cost much, the expense of this item would scarcely be felt. Roadways require continuous repair. Experience has shown that it is the holes that make the holes, and only by prompt attention to the minor inequalities can extensive repairs be avoided.

To effectively carry out this scheme of road construction it would be necessary to appoint a board of control, similar to that appointed by the British government some years ago. The functions of this Board are to receive applications from districts desirous of constructing roads, advising them as to the most suitable road to be adopted, and, where the district making the application is unable financially to undertake the work, make a grant to assist them in the carrying out of the most suitable and modern structure that can be procured. By this means a system of standardized roads would be built and the best value received. While Government aid is not likely to be afforded for some time here, there is no reason why this should be a barrier to the appointment of such a board in Canada, whose duties of determining the need for road construction in any given district and the standardizing of the work would greatly tend to lessen the cost of same and prevent an excessive taxation for this purpose.

A great deal of the stone used for road bottoming would be supplied by farmers, who, instead of picking them off their land and depositing in some corner, would haul to an arranged place by the site of the proposed work, receiving payment when the material was used.

In many cases this would be most helpful to the farmer breaking new land and act as an incentive to the better preparation of the soil; also promote interest in the question of good roads that would not otherwise be aroused.