

Road Metal.*

By HERBERT J. BOWMAN, C. E., BERLIN, ONT.

The term "Road Metal" is used to designate the material forming the impervious covering of roads and may be composed of broken stone, blast furnace slag, gravel or even burnt clay.

GRAVEL.—This is the most common material used in making the country roads of Ontario, and where good pit gravel can be obtained close at hand, it is without doubt the most economic road metal. There is considerable difference in the quality of gravel, that found in the eastern part of the province making a harder wearing surface, as it is composed of fragments of much harder rocks than those found in Western Ontario. This, no doubt, partly accounts for the excellence of the gravel roads of the County of Hastings. In the western part of the province where gravel is found at all, it is chiefly composed of pebbles of soft limestone, which quickly grind to powder under heavy traffic, and in some districts no gravel is to be found within a reasonable distance. For these districts burnt clay may be found to be the most economic material for the road covering, but so far, its use seems to be confined to the Western States. For ordinary country roads, unscreened gravel of a depth of ten inches may be used with the larger stones broken by hand and a road covering formed good enough for all practical purposes, but for leading roads a better road may be formed by screening the gravel, although there is some difference of opinion as to the number and size of screens to be used. The following quotation from a treatise on "The Science of Road Making," by Clemens Herschel, M. Am. Soc. C. E., is worthy of note.

"In gravelly soil all the materials that are needed for a good road are frequently on the spot; they only need sorting out and relaying. For this reason a common gravel sieve often constitutes the principal instrument, the judicious use of which will make a good road out of a miserable string of ruts and cobby elevations. It would only be necessary to sift out and separate the soil under the road to a sufficient depth, into cobbles, coarse gravel, fine gravel and sand; then replace them in order named and with the proper thickness of layers of each; wet down and roll, and the result would be a good road."

Where gravel is scarce or has to be hauled a long distance, an excellent road may be built having a Telford foundation of field stone, on top of which screened gravel is placed in two layers, each to be thoroughly rolled. In this method six inches in depth of gravel is quite sufficient. Roads of this nature are the favorite ones in Central Park, New York, where Rhoads Hook gravel is used, and "it being more than ordinarily clean and hard, bears an

intermixture or adulteration of twenty to twenty-five per cent. of inferior material to perfect its binding properties."

BROKEN STONE.—For leading country roads and town and city streets a better road metal is required than the gravel found in most parts of Ontario, and broken stone will best meet this requirement. Blast furnace slag is also an excellent road metal and is being largely used in the construction of the Rochester, N. Y., boulevards, but the supply of slag in this province is limited to the product of the new smelting works at Hamilton. Rocks suitable for breaking up into road metal should be hard and tough and proof against the action of the weather, qualities not always found together.

A rough classification of rocks in the order of their value for road metal is as follows: (1) Basalt or Trap, (2) Gneiss, (3) Granite, (4) Limestone, (5) Sandstone; and it will be interesting to investigate where these may be found in Ontario.

The first three rocks are found in unlimited quantities at most points north of a line drawn from Gananoque to the mouth of the Severn river. Upon reference to a geological map, the best one being that attached to the report of the royal commission on the mineral resources of Ontario, issued in 1890, it will be seen that this line represents the southern edge of the Laurentian area in Ontario. Trap rock, which is no doubt the best for road metal, is said to be found in dykes from a foot or two to forty or fifty feet wide in the gneiss near Gananoque, and could, no doubt, be found at many points in the Laurentian of northern Ontario, but is most common in the Huronian. In this latter formation near Bruce Mines an excellent trap (quartz diabase) is found and is shipped to cities in the United States to be broken up into road metal. It was used last summer in the construction of the Telford roads constructed in Cleveland, Ohio, for the board of park commissioners of that city.

South of the Laurentian area trap, gneiss and granite are found only in the shape of boulders brought down during the ice age and dropped as moraines. Thus along the band of moraines, or rough stony hills, stretching from Trenton to the lower end of the Georgian bay, plenty of material for road metal may be obtained good enough for ordinary purposes. Scattered over a large part of the western peninsula of Ontario, large boulders may also be found, and if care is taken to exclude the soft limestone and disintegrated granite and gneiss, a fair road metal may be made, often the only kind that can be obtained at a reasonable cost. Plenty of limestones, often hard and fairly durable as road metal, may be found among the Trenton limestones stretching from Kingston to about Bowmanville, and across to the Georgian bay. Some good material may be also obtained from the Niagara limestones along the "mountain" or escarpment between Niagara Falls,

Hamilton, and a point near Collingwood, also from the Guelph limestones between Niagara Falls and Southampton. In many of the limestones in this part of Ontario there are cherty bands which would produce excellent material for road metal, and in many of the more rapid rivers considerable accumulations of hard cherty boulders are found.

Although small cobble stones are not desirable for broken stone on account of the smooth water-worn surfaces of the greater part of the product, this objection only holds good to a limited extent when large boulders, often several hundred pounds in weight, are used.

CONCLUSION.—As the best obtainable material for road metal is often the cheapest in the end, further information is required as to where the best rocks are found. No complete geological survey of Ontario has ever been made, and the only information as to the older part of the province that can be obtained is from Sir William Logan's "Geology of Canada" (1863), and this publication of the geological survey is quite out of print and is found only in a few libraries.

The thanks of the writer are due for much valuable information to Dr. George M. Dawson, Director of the Geological Survey of Canada, to Professor A. P. Coleman, of the School of Practical Science, and to A. Blue, Esq., Director of the Ontario Bureau of Mines, and it is hoped that the members of the Association of Ontario Land Surveyors will, in the discussion, give much additional information as to the qualities of road metal in actual use throughout the province.

Against Dust-Polluted Food.

In a circular issued by the State Board of Health of Indiana, the instruction is given to the public that:

"The dust that floats in the air contains a great deal of filth. It carries pulverized manure, dried catarrhal and consumptive sputum, and much other offensive matter, besides micro-organisms of all kinds. All this we must endure, to the evident disadvantage of our health, when we walk abroad in cities where dust is not kept down. It is not well, however, that we should eat dried manure and dried spittle on our meat and groceries, even if cooked."

Health officers are directed to order butchers, grocers, and others not to expose meats, dressed poultry, dried fruits and other foods so that they may become polluted by the dust from the air in the ways described. In that State, health officers have ample authority in this matter.

A Good Thing.

Every good road is a monument to itself. Every bad road is its own destroyer. People who know a good thing when they see it like pleasant, serviceable roads.—*Exchange.*

*Extract from paper read at the annual convention of the Association of Ontario Land Surveyors, Toronto, Feb. 23th, 1895.