

Engineering Department

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Good Roads.

The vitality of business is circulation, a steady uninterrupted flow of money and marketable commodities. Business is very sensitively organized and disturbing elements arising in its path, act and react throughout the entire community.

In a country whose business is so dependent upon agriculture as is Ontario, and with agriculture so dependent upon the condition of the country roads, it becomes evident that the transportation system upon which, in canals and railways, we have lavished so large an expenditure, is far from complete as long as the first link, the country road, is weak and incomplete. An index to the value of good roads at all seasons is found in the condition which prevails when good sleighing comes after a period of impassible mud in the fall. Good roads would not, it is true, entirely take the place of sleighing, but they would largely prevent the references to bad roads which so often occur in weekly trade reports.

Not only do we need better roads to meet present requirements. It has become a truism that "facilities create traffic," and there is not the slightest reason for doubting that good roads are the one thing needed for fostering the "undeveloped resources" which exist in the country around us, which we need not go to New Ontario to discover.

The importance of good roads is not, as a rule, sufficiently realized as a factor in transportation. Reference has been made in a number of newspapers recently to the freight wagon service which has been inaugurated by some of the Toronto and Hamilton manufacturers, and running between these two cities. It is estimated that the saving in freight amounts to seven or eight cents per hundred, on the goods carried. It is instanced largely in condemnation of freight rates, and yet when we consider that in European countries, France, Belgium, Germany, England, where good roads exist, exactly the same thing is done, and teamsters successfully compete with railways in carrying freight as much as three hundred miles, it is not so much an evidence that a freight wagon service is a retrograde step, that we are going back to the ways of our grandfathers; but it means rather that we are progressing, that we are beginning to gain the modern idea of the value of roads. Horse power may be looked upon as very inadequate for this class of work, but where roads are perfectly made, steam power, in the shape of traction engines, is being used for hauling wagons equipped with wide tires, capable of bearing five and six tons; with, if necessary, several of these wagons in a train. Such engines are now, in

some cases, being fitted with electrical dynamos.

The total production of Ontario farms has a value annually, it is estimated, of \$200,000,000. All this must first pass over the common highways before reaching the markets. It is the basis of Ontario's wealth.

The amount is far in excess of that needed for home consumption, and the only resource is to obtain a market in foreign countries. This market is available only so far as we can sell more cheaply and produce a better quality than other competing countries.

It is not the effect of present conditions which constitutes the evil of bad roads; but it is in the conditions which they prevent that the loss lies.

It is on the principle that with every means provided for easy, quick and good transportation, a market would be created for two loads, where we now sell but one. Many links in the system of transportation are being perfected, but the chain will not be complete without cheap transportation over the first part of the journey, the common highways.

The dullness and isolation of farm life will be overcome by good roads, and they will thereby tend to elevate and bring about a better citizenship. The school, the church, the public meeting, the neighbor's house, will be more easily reached. The effect of all this, the increased land value, the greater profits and pleasures of the farm, is to render the country attractive rather than repellant. The effect is to draw the people of the city to the country rather than drive the people of the country to the city. "How can we relieve the congested condition of our cities?" By making the farm profitable, by giving to energy and ambition sufficient business opportunities on the farm, this problem will be solved, and one of the most important factors in the solution is "Good Roads."

Cement Concrete Culverts.

A great number of townships throughout the province have largely discarded timber as a material for small culverts and sluiceways. Cedar where obtainable has been most commonly used, but all varieties of suitable lumber are becoming scarce, the price is constantly increasing and the quality now available is far from being equal to that of former years.

Those municipalities which have experimented with sewer and concrete tile, have, with very few exceptions, been favorably impressed with the new materials, failures and some dissatisfaction are occasionally reported, but this in every case can be traced to causes not in any sense condemnatory of the new materials.

Where any kind of tile is used there are certain requirements which must be observed. In the first instance the tile must be of a good quality. With vitrified sewer tile there appears a tendency on the part of dealers to supply pipes which have been rejected in sewer construction. It is just as necessary to use good tile in culverts as in sewers; and where "culled" tile are used, failure is, almost of a necessity, the result. These tile must be perfectly sound and straight, not warped or misshaped in any way, otherwise good joints cannot be made and water will lay in the hollow places; the culverts will wash out, and if water rests in the pipe frost will destroy them.

If cement concrete pipe are employed, they too must be of first class quality. They must be well shaped, as with sewer pipe, and all the rules for making a good concrete must be observed—that is, the material composing the concrete (cement, sand and stone) must be of good quality, and properly mixed. The making of good concrete is not a difficult matter, but it seems as though it were an impossibility to find men who will follow directions. Dirty sand or gravel; too much water, careless and insufficient mixing; neglect to see that the materials are used in the right proportions, are the defects most commonly found. Concrete cannot be mixed like common mortar, and an attempt to do so is far too often made. It is affirmed by cement manufacturers that masons are the greatest offenders in this respect; that it is almost impossible to get them to follow any other system than that to which they have been accustomed in the use of common lime; and that therefore an entirely inexperienced but practical man, who will follow directions, will often make the best concrete.

To meet with success in the use of tile culverts they must be put in place properly. They should be laid with a good fall on a regular grade to a free outlet, in such a way that water will not stand in them. If water stands in the pipe, the action of ice will crack and burst them.

The tile should be laid with the spigot end down grade, and the joints made tight with cement mortar. If the joints are open water will work its way along the outside of the culvert, and finally make a considerable channel which will allow the culvert to get out of line and finally result in a "cave-in." To prevent the water finding its way along the outside of the pipe, too, it is advisable to protect the ends with concrete, stone, or brick head walls.

Care should be taken to excavate a concave bed for the pipe, with depressions for the bell of the pipe to rest in, thus securing an even bearing, without which a heavy load passing over before the culvert has properly settled into place, may burst the tile. Tile cannot be used in very shallow culverts, but must have a sufficient depth of earth over them, to