MUNICIPAL DEPARTMENT

ROAD CONSTRUCTION.

Mr. A. W. Campbell, Provincial Instructor in Road-Making, has issued Bulletin No. 2, containing much valuable information on the methods of constructing public highways, from which we take the following :

ROAD DRAINAGE.

The most frequent cause of bad roads in Ontario is lack of drainage. When a road is good during the summer months but scarcely passable in spring and fall, the plain inference is that, if it could be kept dry it would be good the whole of the year. In a couple of months of spring and fall, roads, otherwise good roads, because of insufficient drainage, are destroyed more than in all of the remaining ten months of the year. Because of neglect in the simple matter, road labor and expenditure is very largely wasted. No farmer or business man can conduct his personal affairs in such a manner without failure.

Excavations called "drains" are, it is true, made at the side of the road, but frequently are not provided with outlets, or the outlets are allowed to speedily fill up. From these receptacles, water soaks in and softens the foundation of the road. Loose dirt from this "drain" is piled in the centre of the road. This is soon roughened and tracked so as to hold water on the surface until it penetrates into the roadbed, producing pitch-holes —and actions against the municipality for damages. Under-drainage is seldom thought of to carry the water away from the foundation. The object of our road-makers appears to be to cover the water with gravel or crushed stone, a tedious and costly process. A road must have a firm foundation obtained by drainage, since it is the natural soil which must support not merely the road metal but the traffic also. Strength in a roadbed must be had not so much in the road covering as in the natural soil beneath it.

Under-drainage is as necessary as surface drainage. A dry foundation is more necessary than a dry surface. Under-drains are needed not as much to carry away the water which falls on the surface of the road as to interrupt the water rising in the saturated earth from the impenetrable stratas beneath, "to lower the water line." Common field tile should be used three or four inches in diameter, hard, well-burned, and unwarped, every care being taken to lay it in the trench with a constant fall to a free outlet. Usually it is best to lay two tile drains, one on each side of the road, about two and a half or three feet below the bottom of the open drains. Thus placed, they may be used as outlets for the surface drains if better cannot be obtained, proper catch-basins being provided. Lay the tile to an even and uniform grade and make the joints close. It is a good practice to cover the joint with sod, grass side down. A coating of straw is good in quick or running sand, but it is much better to completely surround the tile with sawdust.

A perfect system of drainage is obtained by surface and tile drainage. The surface of the road must be sufficiently rounded or crowned in the centre to shed the water readily to the side ditches or gutters. The water in its course to the gutters must not be impeded or held by hollows tracks or ruts in the roadway. The gutters must be carried to a free outlet as often as possible having a good fall.

It is bad practice to carry water long distances and pour it over hills by the road side. Deep and dangerous gulches are thus created. This water before reaching the hill should, if possible, be carried through adjoining property to an outlet. Roads along sidehills should have a tile drain and an open gutter along the inner side of the roadway, and the trench containing the tile should be filled with gravel, broken stone, or other porous material to intercept the soakage water from the uplying land. On hills the course of the water may be arrested in the open drains at short intervals and *caused to enter the tile through catch-*basins, thus over-covering the wash of excessive and rapid flows of surface water. The traffic of winter often forms a channel for the water in the centre of the road, and in the spring before frost leaves the surface of the road the pathmaster should examine every hill and see that the gutters are free from obstruction of snow and ice. If this is neglected, constant and expensive repairs will be necessary.

Water in "springy" places on a roadbed should be conducted by drains from the centre of the road diagonally to the side under-drains. Springy places on a hillside embankment should also be tapped by a blind drain, and the water led quickly to the tile drains.

Take the water out and keep the water out.

CULVERTS.

Small culverts should be made of vitrified or concrete tile, or iron pipe. Stone masonry is the best material for larger culverts. There is a tendency in some municipalities to narrow waterways across road allowances by the use of embankments. This practice, while formerly adapted to the conditions of the climate in Ontario, has become very objectionable since the land has become cleared of its timber, and extensive drainage works have been constructed. Subjected as we are to severe floods and freshets unrestrained by timbered land and augmented by large drains, every facility should be offered to the flow of water. Large expenditures have been created by washouts caused by contracted waterways under bridges and culverts, an extravagant method of lessening the original cost.

BRIDGES.

Iron and steel are rapidly increasing in favor as bridge materials, replacing wood to a very great extent. The former are *constantly decreasing in cost while the* value of wood is increasing. There are, however, sections of the province where wood is still plentiful and where, notwithstanding the greater durability of steel, economy dictates its use. The selection of any particular form of bridge must be controlled by the adaptability to location and economy, since no one of the well-recognized types of bridges, whether beam-truss, suspension-truss, or arch-truss is better than another. Any bridge designed on correct principles is good.

ROAD MACHINERY.

In every branch of manufacture, industry and construction, the need of proper machinery is felt, and wherever it is used the economy is recognized. Labor saving machinery as such at one time received very much opposition, but to-day all invention and improvement in this regard is received eagerly.

The most important varieties of road machinery are rollers, graders, and stone-crushers. The last mentioned of these, the stone-crushers, are almost indispensible in localities where gravel is not obtainable, and where field stone or bed rock are to be had. They are also valuable in localities where the gravel is coarse or where, while gravel is obtainable, macadam roads are needed and may be constructed from stone in the immediate vicinity. A screen attachment is very useful in coursing the metal, and, in gravel, in removing sand and earthy matter.

Graders are needed in every township and have about the same relation to roadwork that the self-binder has to the harvest field. Work can be done by them much better and more economically than by hand labor. A great portion of the successful use of a grader depends on the operator. He should be instructed in its proper management, should be capable of handling it in a workmanlike manner, and of following any instructions given him, and his services should always be employed when the machine is used. He should know also the proper way of shaping a roadbed, since the machine of itself has no knowledge of roadmaking, and unless the operator has, satisfactory results can hardly be expected.

Henry R. Lordly, C. E., consulting hydraulic engineer, is engaged preparing plans for a novel system of raising water to the reservoir at Yarmouth, N. S. The Rife hydraulic rams or engines are to be used, which engines are worked by the power of the water obtained from the mains. The same amount of water will be used over again to work three engines and nearly a million gallons per day will be raised. The whole plant will cost less than half of steam driven engines, and the cost of running is trifling. Yarmouth will have the most economic pumping system in the country. Mr. Lordly is acting for the Caledonion Iron Co., Montreal, the makers of these hydraulic engines for Canada.