mately 10 feet above the ground and the streets depressed from 8 to 10 feet, or a sufficient amount so that the excavation from the streets will make up the embankment for the railway between the streets.

This adjustment of grade line is an economic one from the standpoint of cost, and if the grade of ramps does not exceed 3 or 4 per cent. in 100, one can have a clear view under the railway bridge if driving a team or automobile.

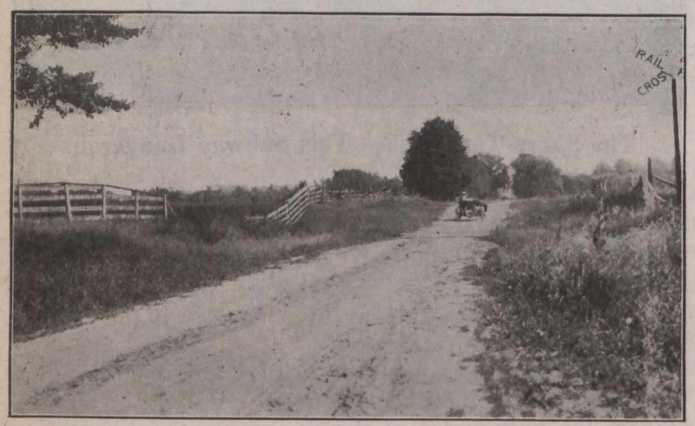
This was the method adopted in the case of the subway built on road No. 49 of the county system of Leeds and Grenville, in the township of Edwardsburg. The railway embankment was raised some nine feet, enabling the roadway to pass under with little or no depression. This method was also adopted by the Grand Trunk Railway in the city of Detroit where grade separation has been going on for the last 15 years.

The Grand Trunk Railway, in making studies for grade separation in the city of Detroit, was able to prove that, if the railway were carried on embankment from Brush Street Station to the top of the bench north of Gratiot Avenue, it would be much cheaper than the plan suggested by the city for depressing the railway tracks and carrying the streets over the tracks.

It has generally been found in considering the question of grade separation that, as a rule, the economic proposition is to place the grade line of the railway on embankment, although, as I have said before, the topographical features will rule.

As regards the minimum clearance of bridges over streets and highways in grade separation in the United States and Canada, the individual States vary in their requirements. For instance, in Buffalo the minimum clearance is 13 feet and on street car lines, 14 feet; in Chicago, 12 feet, and 13.5 feet on car lines; Detroit, 13 feet, and 14 feet on car lines; New York, 14 feet; Philadelphia, 14 feet; Vermont, 13 feet; and Canada, 14 feet.

The maximum grade laid for street ramps in the United States, varies in the different States and cities from 3 to 5 per cent., but there have been exceptions to this in special

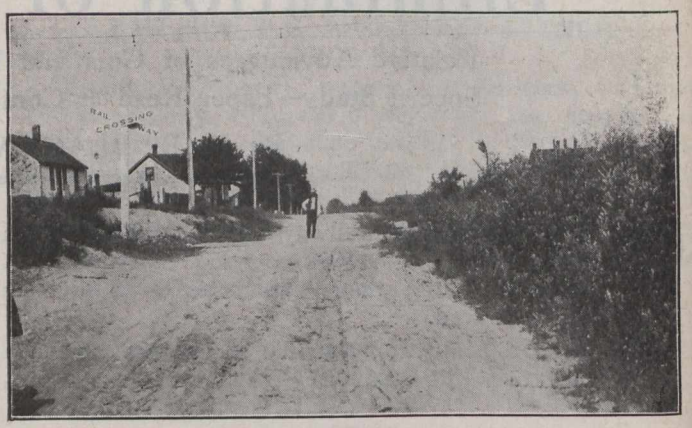


Typical Level Crossing

cases, on account of location, where the grade has been 9 and even 10 per cent. In Canada, the Board of Railway Commissioners have control of grades and location.

In the province of Ontario, where the highway passes over a railway by a bridge, the clear distance between the top of rail and the lowest member of the bridge is specified in chapter 185, section 116, clause 1 of the Revised Statutes of Ontario, which reads: "Every bridge, tunnel or other erection or structure, over, through or under which any railway passes, shall be so constructed and maintained as to afford at all times an open and clear headway of at least seven feet between the top of the highest freight car used on the railway and the lowest beam, member, or portion of that part of such bridge, tunnel, erection or structure, which is directly over the space liable to be traversed by such car in passing thereunder."

Approaches to subways should be laid out so as to get as clear a view as possible and in no case should this be



Unusual Growth on Right of Roadway Makes This Crossing More Dangerous

less than 100 feet, and if the topographical features are such that this cannot be had, then a "slow order by-law" should be passed, and large signs, readily seen, placed on the road.

The drainage of subways is a very important matter and when the roadway is depressed to any extent, may be very difficult and expensive, and in certain cases impossible.

When drainage cannot be had, pumping has to be resorted to, in which case a well is constructed and a pumping system installed.

As an instance of expensive drainage, I might mention the Thompson Road subway at Fort Erie yard, Bridgeburg. This subway is under 15 tracks and cost approximately $90,000. A deep drain had to be excavated to the nearest creek, a distance of about one-quarter of a mile, and rock was encountered which cost about $5 per yard to remove.

WATERPROOFING FOR CONCRETE BOAT

The entire hull of the concrete boat built last fall at Montreal was coated with Toch Bros.' "Liquid Konkerit" waterproof cement coating. All of the hull below the water line was given a second coat, using Toch Bros.' R.I.W. 112, which is especially made for coating hulls of ships below water lines.

BRITISH COLUMBIA ENGINEERS

The Kootenay branch of the Engineering and Technical Institute of British Columbia was formed at a recent meeting in Nelson, B.C., the headquarters of the branch.

The institute, which is applying to the legislature at the forthcoming session for a charter, will be an organization composed of civil and mining engineers, architects and members of allied professions.

The following provisional officers were appointed: Wm. Cunliffe, chairman; A. E. Pickford, secretary-treasurer, and A. E. Thompson, assistant secretary-treasurer.