to contend in the construction and maintenance of earth roads, water on the surface causing clay or loam roads, even under light traffic, to work up into an impassable condition, and, during long continued wet weather or under heavy traffic, such roads will always be bad, though their unsatisfactory condition may be minimized greatly by first building them up to a rounding surface with grader, then maintaining their surface by frequently dragging to fill ruts, caused by wheel traffic, so the water will run off instead of lodging in them and soaking into the road, causing the mudholes so often encountered on earth roads. The split log drag, or several types of similar implements working on the same principle, have been found very effective and economical in maintaining such roads, costing about one-third as much as a blade grader to trim up rutted roads, and, in many cases, doing quite as efficient work. In many parts of the Province the heavy clay loam, so desirable for agricultural purposes, is a most unsatisfactory road material, will not carry heavy traffic when dry, and absorbs water freely in wet weather, with the result that such roads go to pieces. In some parts of the Province gravel is available for top dressing, and, when within a reasonable distance, makes a great improvement for a time, but soon works down into the clay, when the process must be repeated. A top dressing of sand has been experimented with on heavy clay roads and found to give very satisfactory results, but this, like the gravel, soon becomes mixed with the clay, when another coat of the same material is required. Frequently neither gravel or sand are obtainable within a reasonable distance, and are sandy or gritty subsoil, frequently found and exposed by the ditches along roads, generally upon hills or slight elevations, provides a top dressing far superior to the natural clay loam, some of it packing and binding very satisfactorily under wheel traffic, and forming a roadbed quite impervious to water, and since macadam and the many types of asphalt are probably, owing to their cost at the present time, out of our reach, a great improvement might be made on country roads by making the best use of material available.

Draining to Prevent Seepage of Water from Side Ditches Into the Roads .- This, in many places, is of more importance than raising the road by grading, and frequently costs less. It will be noticed, where pools of water are allowed to lie in the ditch alongside of roads, that the road frequently breaks down into impassable mud holes. This is caused by the seepage of water into or through the road bed. In many cases such water can easily be drained along the side of road, or away from it, at a less cost than fixing the mud holes by raising the road after the water has caused the damage. Grading the bottoms of ditches, so water will drain off, is quite as important as grading the surface of road, but, considering that it is a common practice all over the Province to pasture cattle on the road allowance, where the ground is soft and ditches necessary, they are soon tramped in, damming up water and undoing the work that has cost large sums of money. If the owners of cattle, grazing on the roads, were compelled to repair the damage done by them, in wet country where drainage is necessary, the revenue for road improvements might be considerably increased. Considerable damage is also done tramping down the approaches to bridges and culverts, and I never knew of it occurring to the owner of a large or small herd of cattle, that anyone but the public should contribute to the improvements made necessary by his grazing them on the roads. Of course, in certain parts of the country, where there is vacant or unfenced land, it is difficult or impossible to prevent such damage, though in other parts, where well fenced, the highway is considered a convenient public pasture. Proper ditching, on hills or hillsides to carry off the water and prevent it running down the wheel tracks and destroying the road in many parts of the country, receives

but scant attention. I have observed many hills, where a road had been well constructed and properly ditched, where immense damage had been done by water running down upon it, when a few dollars spent keeping the drains open would have avoided considerable loss and inconvenience caused by an impassable road, and in this respect I would ask for the hearty cooperation of the Local Improvement District to keep such ditches open. Before closing my remarks on primitive earth roads, I would like to say a few words with reference to the use of brush, where such is available, for a corduroy or bottom on wet or springy ground. It frequently happened, where such is required, that nature has provided brush in the immediate locality, the very nature of the soil causing a growth of willow, and, where such exists, and frequently has to be cleared from the road, it is a good practice to use it for a brush mat in wet places, covering this again with the best material available, when a foundation will be provided for a road that should be passable even in bad weather, while, without brush or corduroy, raising a grade with the material available frequently results in simply adding to the depth of mud to be travelled through. In certain parts of the Province, where the country is wet and drainage not feasible, too much attention cannot be attached to this precaution. Another practice sometimes followed is to grade roads through low wet ground, sloughs and potholes, during dry weather, without much provision to drain the water off, when it turns wet, or, at least, to control it so it will not rise over the road. Large amounts of money have been spent grading such roads in this Province, that were lost when the weather turned wet and the sloughs and potholes filled up with water. When it is not feasible to put in drainage, to at least control the raise of water, and the high water mark is in evidence, and money is not available to raise the grade above such high water mark, then the obstruction should be gone around, otherwise the money put into it is pretty certain, sooner or later, to be lost. There is a very general impression, in the minds of the public, that statutory road allowances, as laid out under our system of sub-division, should be followed regardless of physical difficulties, which is entirely erroneous, and results in an attempt being made to grade down impassable hills, and to grade roads over ground quite unsuitable for road purposes, that might and should be gone around. In the older Provinces the system of survey differed from ours, and the Crown reserved a certain percentage from all lands for such purposes. Our old trails, in many localities, illustrate what we might have had, in the way of roads, where the contour of the country is more generally followed. While on level prairie it is generally quite feasible to follow road allowances, the same system is quite unsatisfactory in rough or broken country, and a very sincere effort should be made to overcome the objections of the owners of lands, where such diversions are necessary so a permanent and safe road may be established.

## QUEBEC STREAMS COMMISSION.

The Honorable S. N. Parent, chairman of the Quebec Water Works Commission, which has recently had its name changed to the Quebec Streams Commission and has been invested with the powers of a corporation in order to carry out its scheme of constructing a large storage reservoir on the upper St. Maurice, for the purpose of regulating the flow of that river for generating electricity, is in Quebec in connection with this work. The area of the proposed reservoir will be more than 300 square miles and the amount of water to be stored will be about 160 billion cubic feet. It will drain a basin of more than sixteen thousand square miles in area, and give a regular flow of 18,000 cubic feet per second in Shawinigan and other places.