

the traffic does not absolutely warrant the extra width, a 16-foot roadway is much more satisfactory as it is more liable to be kept in good condition.

Although the grade line of a road is very important, and a grade should not exceed 7% or where at all possible to obtain it, an easier grade should be found, still the grade line of the side ditches is much more important. How often have you noticed, especially where the country is slightly rolling and the work is done with a road grader, that great care is taken to carry the ditch through with a uniform depth. The bottom of the ditch is therefore the same distance below the surface of the ground, across the slight depression, as across the adjoining higher ground. The result is self evident, and after every fall of rain the side ditch instead of being a benefit to the road is a detriment. It would have been better not to have a ditch at all, for without the ditch the water would likely have run off, but the ditch prevents this and holds the water until it soaks into the road and forms a mud hole. Therefore, in my opinion, the grade line of the side ditches is by far the most important feature in earth road construction.

The next point that should be taken into serious consideration is the construction of offtake ditches. There cannot be too many of these. It is a poor policy to put in offtake ditches at long intervals and carry the water through the side ditches along the road. The quicker it is taken away from the road the less chance of injury to the road bed.

The same may be said about culverts. Where the road runs across the general slope of the country frequent culverts are necessary, it being a detriment to carry the water any distance along the ditch on the upper side of the road, for if this is done a large percentage of the water never reaches the culverts but filters under the roadbed and the consequences are soon apparent. Again in the case where the road follows with the general slope of the country, if the slope is too great the flow of water cuts away the roadbed and very often the ditches become so deep and the road so narrow that it is dangerous for traffic and, if the slope is not sufficient to carry the water away freely, it seeps under the roadbed, which is ruinous. In the first instance offtake ditches are required to reduce the volume of water that passes through the side ditches, and in the second instance they are required to remove the water more quickly from them.

Surface drainage is very often greatly interfered with by driveways leading into private grounds, or what we might call farm crossings, and especially if they are put in during a dry season of the year. They very often consist of a few poles thrown in the side ditch and covered with earth or possibly a load of manure or straw, in either case forming a dam. Of course, no doubt there are a great many who construct suitable crossings and it is to be hoped that the wisdom shown by them will lead others to follow their example.

There is one other point I would like to draw your attention to and that is the size of culverts used. The general tendency is to put in culverts which are too small to carry the water away freely, and in many places I have noticed the water level with the roadbed on the upper side of the road and the culverts running full. Too great care cannot be taken in putting in culverts of a proper size.

When it is desired to top dress an earth road with new material, care should be taken to secure it from the best available supply. River washed gravel is of very little use, as the pebbles are worn smooth and all the fine binding material has been removed by the action of the water. Even if clay or loam were mixed with river

gravel, owing to the smoothness of the pebbles, it would not be nearly as satisfactory as material obtained from a gravel pit. Pit gravel frequently contains too much clay or earthy matter. Also very often the pebbles are of a uniform size, which is not suitable. The best pit gravel for road purposes should be composed of pebbles varying in size up to about $2\frac{1}{2}$ inches in diameter and enough clay for a binding, so that the material may bond readily and if two layers are used the coarse material should form the bottom layer, then if there is sufficient binding in the material the finer particles will be washed down, filling the voids and good results will be obtained.

Top dressing 12 feet wide, averaging $4\frac{1}{2}$ inches, would run about 880 cubic yards per mile and with a haul of one mile would cost \$575 per mile in place with a three-mile haul would cost \$1,000 per mile, with a six-mile haul would cost in place \$1,750 per mile. This does not allow any charge for gravel, which might run as high as 25c. per cubic yard if obtained from a gravel pit of commercial value, nor does it allow any charges if shipped by rail, either for the extra handling or freight. In this connection I might state that no attempt should be made at top dressing a road until it is first properly crowned and ditched.

In conclusion, I wish to draw attention to the problem of maintenance. It is quite usual when a road is constructed to immediately forget about it, imagine it will last forever and look after new work. No matter how perfect is the construction of an earth road, whether top dressed with gravel or not, it requires constant care. The maintenance of earth roads is best accomplished by use of a split log drag or other implements of a similar device and if the drag is used with good judgment the cost is very little in comparison with the cost of repairing or reconstructing the road if allowed to go to pieces. Earth road repairs or reconstruction become unnecessary in proportion to the increased care in maintenance.

WATER POWER POSSIBILITIES IN ALASKA.

W. P. Lass, in an address on March 16, in New York City, before the American Electrochemical Society, declared that a proper development of the water power in south-eastern Alaska would be more valuable than either the gold mines or fisheries. He contended that the greater part of south-eastern Alaska, although undeveloped, unsurveyed and unprotected has been held in national forest reserves and little attention has been paid by anyone to its development and utilization. The present generation should use efficiently the great water supply of Alaska for power. It is an ever-flowing source of power that lost to-day can never be regained.

INTERNATIONAL CONFERENCE ON CITY PLANNING.

On May 25-27, there will be held in Toronto the International Conference on City Planning. Models, maps, plans and diagrams will be exhibited, illustrating the latest practice in Europe and America. Canadian cities and towns, and Canadian architects and engineers are cordially invited to send exhibits. All communications should be addressed to W. S. Lecky, Commission of Conservation, Ottawa, Ont. The exhibits may be classified under the following heads: Planning of Streets; Water Supply and Sanitation; Parks and Playgrounds; Waterways, Docks and Bridges; Railroads and Transit; Helping Industrial Prosperity; Garden Cities and Suburbs; Housing the People; Civic Centres and Public Buildings; Comprehensive Plans. Canadian social reformers will derive much benefit by attending this conference, listening to the addresses, taking part in the discussions, and by an inspection of the instructive exhibits that will be there shown.