satisfactory service under pre-war loading, but under the much heavier loading of the post-war period many of these roads are cracking and potholing and even failing completely.

The lighter wheel loads of ten years ago caused little deflection or deformation of the road surface, but the greatly increased numbers of trucks and buses with far heavier wheel loads which obtain at the present time cause much greater road deflections, particularly if the road structure is strained beyond its elastic limit. This means that, whereas the lighter loads caused little stretching of the road surface, the heavier loads deform and stretch the road crust to a much greater extent. Indeed, as the heavy wheel loads pass along the road a slight groove or rut temporarily forms under the wheel. This deformation causes slight cracks to open in the road surface.

A sound road will regain its original shape and the cracks may close up again on the passing of the wheel load. However, particularly in the winter months when road surfaces often remain wet and slushy, the pressure exerted by the tires forces small amounts of moisture through the temporary surface cracks. This moisture does not readily escape and over the winter months there is a gradual build-up of water in the clay-bound metal or gravel course. If the clay binder is rather too plastic, instead of serving the purpose of cementing the gravel together, as the moisture increases the clay becomes a lubricant between the stone fragments so that movement and rocking of the gravel occurs. This quickly leads to potholing and perhaps complete break-up of the surface.

To avoid such conditions and to retain a desirable surface under the more frequent and heavier truck loading it is imperative that for the future more attention must be paid to the selection of a suitable mineral binder fraction. Experience has shown that neither existing binders in pit gravels nor any added binder should have a plastic index exceeding 5. In the past, materials with plastic indices of 6 to 10 or higher have often been used. The binder should possess at least a few pounds tension and should have some plasticity, but with the plastic index lying between 0 and 5.

It may be possible in the laboratory to mix a highly plastic clay with a metal course aggregate so that the total resulting binder fraction passing the fifty-mesh sieve has a low plastic index. Field mixing, however, will not achieve this. Unbroken and unmixed lumps of clay will remain in the road-mixed metal course. These clay lumps, no matter how small, will almost invariably eventually lead to surface failures.

If loadings on the highways continue to increase, it will almost certainly be necessary to abandon the cheaper clay-bound water-worn gravel courses in favour of crushed rock, which, through its interlocking properties, has high stability when the voids are filled with non-plastic crusher dust. This latter type of water-bound roller-compacted macadam will not deteriorate due to the entrance of small quantities of moisture. However, if care is taken in the selection and mixing of sand-clay binders, gravel courses should give satisfactory service under a good seal coat for any reasonable highway loading, and in the meantime at least, until sufficient crushing plants can be obtained to produce the necessary crushed stone for the higher class of macadam, gravel-course construction will have to be accepted.

VISITS OF INSPECTION TO THE NORTHERN PORTIONS OF THE NORTH AND SOUTH ISLANDS, AND CONTACT WITH LOCAL BODIES AND AUTOMOBILE ASSOCIATIONS

As mentioned in last year's report, the Board paid a visit to North Auckland, Auckland, Coromandel, and Waikato areas in April, 1948. In November, 1948, the Board visited Nelson, West Coast, and Canterbury areas.