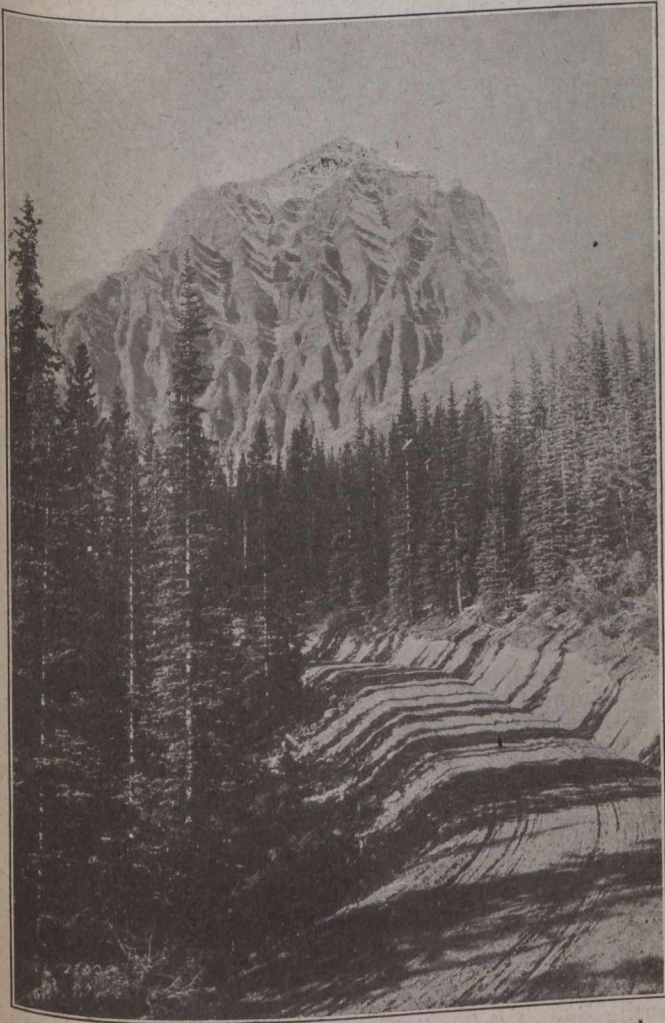


May 24, 1917.

and gravel roads, and the constant annual increase in motor traffic will make it increasingly difficult to maintain good road surfaces. It was early realized by the Parks Branch that surfacing of a more or less permanent nature would eventually be required, and a satisfactory material has been provided for by the reservation of tar-sand areas on the Athabasca and Christina Rivers in the vicinity of Fort McMurray.

The areas reserved by the Parks Branch for this purpose consist of two claims of one square mile each,—both claims being located with the view of not only including first-class material, but of affording easy mining and good transportation facilities. A projected line of the Alberta and Great Waterways Railway passes within two



Motor Road near Lake Louise, Alta. In background, Mount Temple, 11,626 ft.

or three miles of the reservations, and it is expected that the line will be constructed early enough for transportation requirements. The claims were located for the Parks Branch by an expert of the Department of Mines in 1914.

Analysis of the bituminous deposit shows the percentage of bitumen in the aggregate to be ample for road purposes, and extracted bitumen also compares favorably in tests with standard asphalts. A sample section of bituminous sand paving was laid in Edmonton, Alberta, and showed no effects of wear after a year's use.

From the data so far obtained it is estimated that there are 3,500,000 tons of high-grade material available in the two claims, or a sufficient quantity to construct

3,800 miles of sand-bituminous paving 2 inches thick and 15 feet wide.

Conclusion.—Highway work in the National Parks has not yet reached an advanced stage, and the great part of its development still lies in the future. In addition to the roads already constructed or projected; there are hundreds of miles of future highways whose routes at present are merely marked by the rough tote road or the blazed trail.

The construction of these highways will in due course be accomplished, and the best part of the National Park areas made reasonably accessible by a network of mountain highways.

The general outline of the present roadwork in the National Parks here given, indicates the steps being taken towards this ultimate aim of park highway development, and also illustrates the part taken by a branch of the Federal Government in the "good roads movement" of Canada.

WINNIPEG SUB-SURFACE FORMATION AND SUITABLE HEAVY FOUNDATION TYPES.

By J. Q. Rankin, C.E.

IN a consideration of the type of foundations suitable for heavy buildings and structures, it is necessary that there should be some knowledge of the character of the ground over which the structure is to be placed. This knowledge can only be had authoritatively from a study of the geological history and characteristics of the district in which the proposed building or structure is to be situated.

The purpose of this paper is, however, not to deal in detail with the geology of the Winnipeg District, but I believe that a generalized summary of the nature of the rock and overlying stratifications will doubtless make clearer the points which we wish to consider in connection with the types of foundations suitable for sustaining heavy buildings and structures.

Geological Formation.—The greater part of Manitoba overlies a part of an immense area of granite and associated rocks formed in pre-Cambrian time. After a period of erosion these limestones and associated rocks, such as the basal sandstones, were laid down during the Cambrian and Ordovician periods.

The present surface of the igneous granite lies at a depth of some 600 feet below the city of Winnipeg, but outcrops east of Winnipeg near the White Mouth River. The limestones were deposited in comparatively thin layers, from a few inches up to a number of feet in thickness, and are separated from each other by bedding planes (thin layers or films of clay). They are comparatively level, having an inclination of about 3 feet in a mile toward the west. They outcrop on the present surface about 20 odd miles east of Winnipeg and also about 12 miles west of the city. Directly under Winnipeg, however, the top layer of these limestones vary from 50 to 65 feet below the surface. They are largely of fossil origin. They are also water-bearing and the present artesian water supply of this district is drawn from them. Occasional breaks are encountered in the upper layers of this rock. They have the appearance of small gullies or ravines, as though having been formed by stream action, and are filled with a very fine white sand deposit.

After these limestone stratifications had been deposited there occurred a period of comparative rest—a lost interval—and no deposits of consequence occurred