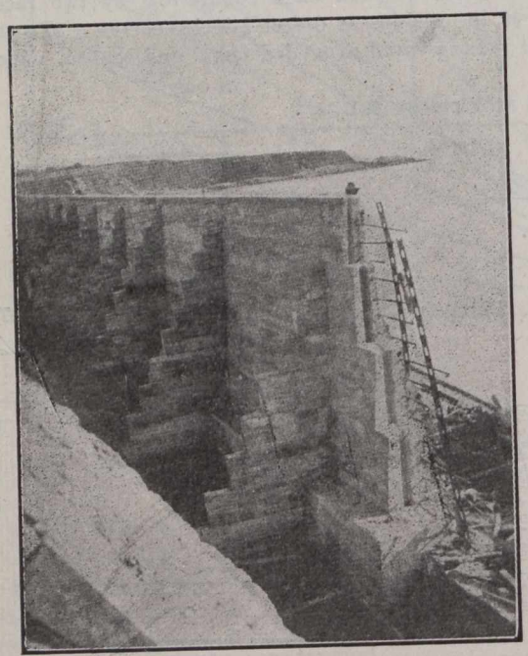
the counterforts the face and back plates are held together by ⅝-inch bolts. The footings of the counterforts are reinforced with ¾-inch diameter rods at 4½-inch centres which are carried about 2 feet into wall and rods of same diameter at 7-inch centres and 7 feet long are placed between the bottom tie rods so as to thoroughly anchor the counterfort to footing.

To protect the wall from the wash of the sea and battering by drift logs, a belt of granite has been placed in the face of the wall as shown. Holes were drilled through the granite and ¾-inch diameter rods placed therein set with neat cement, thereby double clamping each stone. In the event of the cement mortar between the courses showing signs of disintegration the joints are to be raked out and caulked with lead wool. The lower part of the wall up to the shoulder, excluding the granite, is in the proportion of 1:3:6 concrete and all other concrete is in the proportion of 1:2:4. All concrete was of a "wet" mixture and the cement used was Portland. The exposed face of the concrete is of cement mortar in the proportion of 1 part Portland cement to 3 parts sand deposited at the same time as the concrete, and lifting plates were at first used to ensure the bond, but



View of Wall.

spading was afterwards adopted as being found more satisfactory.

At the back of the wall a layer about 1 foot thick of broken rock is placed for facilitating drainage and a weeping drain of 3-inch drain tile placed in wall between each counterfort. The length of the wall is 1,680 feet, the greater part of which has an average height of 30 feet. It is finished on top with an iron pipe railing supported by reinforced concrete posts at 10 feet centres.

The work was done by contract and the total cost amounted to $119,020, divided up as follows: Wall, $112,130; convenience and steps to beach, $3,810; railing, $3,080.,

Work was commenced in January, 1911, and completed in February, 1912, but a great deal of delay occurred and time was wasted through disputes.

The plans were prepared in the Public Works Department by the author, acting under the instructions of Mr. Edward Mohun, M. Can. Soc. C.E., etc., who designed the work. Mr. A. E. Foreman, A. M. Can. Soc. C.E., was supervising engineer, and the contractor was the Pacific Coast Construction Company, Limited, Victoria.

PETROLEUM RESOURCES OF CANADA.

While the actual petroleum resources of Canada are comparatively small, nevertheless the potential resources are considerable.

In New Brunswick and Nova Scotia there are enormous deposits of oil shales which are valuable as a source of oil. On an average these shales will give a higher yield of crude oil than the oil shales worked so extensively in Scotland.

In the vicinity of Fort McMurray and Fort McKay on the Athabaska River, Alberta, there are enormous deposits of tar sands. The bitumen in the tar sand is the residue from evaporated petroleum and it has been estimated that there is 6½ cubic miles of solid bitumen in the tar sands exposed on this river.

Although enormous quantities of oil have evaporated from this district, nevertheless it is probable that accumulations of petroleum exist where the geological structure was such as to prevent its escape. This is also substantiated by the fact that natural gas occurs in quantity in districts where the tar sands are capped by overlying measures.

If large quantities of petroleum were discovered in Alberta, it would be a factor of great importance to the railway interests which operate in the Rocky Mountains and Jasper Parks and in forest areas in British Columbia and Alberta.

The Canadian Pacific Railway is now using oil-burning engines on its main line between Kamloops and Field in British Columbia. The Grand Trunk Pacific and some of the Canadian Pacific coast steamers also burn oil, and other boats are being changed from coal-burners to oil-burners. The oil is obtained from the California oil-fields. If supplies can be obtained at the prices now prevailing, its use will be very largely extended. Its cleanliness, the greatly decreased smoke, the decrease in the number of firemen required, the economy particularly in intermittent service, the increased efficiency—two boilers with oil, in steamship service, giving same steam as three with coal—and other considerations make it an almost ideal fuel.

WESTERN WATER POWERS.

The Prairie Provinces' water powers upon which fairly definite information is available are mostly all confined to the southern portion of the provinces. This is a rather unfortunate coincidence and is likely to mislead the uninitiated regarding the total potentialities of these provinces, as the larger water-powers are situated in the north, on the Athabaska, Peace, Slave, Churchill, Nelson and other rivers. As even a preliminary survey of these rivers will be of great value, the Commission of Conservation has undertaken this work. During the last two summers, its Hydro-Electric Engineer, Mr. L. G. Denis, has been in the field making measurements of flow, height of falls, etc. Last year, the many rapids of the Athabaska River were investigated and the flow of the Peace and other rivers was measured. This year, the work included many long miles of travel, mostly by canoe, the western limit of the trip being the Peace River canyon in the north-eastern portion of British Columbia, while the northern limit was Fort Smith, on the Slave River. On the return trip the several rapids and falls in the Clearwater River and the upper waters of the Churchill were investigated. The general impression created by these large northern water-powers is that they will undoubtedly become of great value in connection with the wood-pulp industry. The raw material is close at hand, the only retarding factor, at present, being the lack of means of transportation and access. The details obtained by these investigations will be included in the Commission's forthcoming report on the "Water Powers of Western Canada."