

may be desirable for the sake of affording better foothold for animals, some openness at the top of the joint is desirable, and the bituminous joint fillers may be preferred. With bituminous joint fillers, care must be taken to select materials which will not be too brittle in cold weather and so chip out from joints under traffic, and which will not be so soft in hot weather as to flow out of the joints between the blocks. It is believed, although not yet generally admitted as having been actually proven by experience, that the use of a bituminous mastic for joint filling would be an improvement over the customary practice of using bituminous material alone for this purpose. Great care should be taken with bituminous fillers of any kind to insure the actual filling of the joints between the blocks, and great care must be taken to insure this result.

Shoulders and Gutters.—Where rigid or fairly rigid pavements are laid, their edges should be protected and the sudden transition from such a pavement to any softer shoulder material avoided by means of edges or such reinforcement of the shoulder material as may be necessary. The line or strip of contact between a cement-concrete roadway and the flanking material of the shoulders being the zone of weakness under traffic, it is important to accommodate the traffic and to protect the roadway as well as the shoulders from the formation of ruts along this line. This is especially true when the roadway is so narrow as to result in the frequent passage of vehicles from the pavement to the shoulders.

Such material for and construction of the shoulders should be had as will result in their being capable of efficient and economical maintenance under the local conditions existing or likely to prevail.

The shoulders may be reinforced with paving, concrete, macadam, gravel, or similar surfacings; or they may be of the natural local material available, due consideration being given to the advisability of tapering down from a relatively high rigidity of the roadway itself to any soft natural material at the outside edges of the road.

Finishing of Surface.—An objectionable slipperiness of many pavements may be decreased or prevented by proper precautions during construction or by proper treatment thereafter. The length of time that a finished pavement should be closed to traffic in order to season properly before use varies from a few hours to several days, dependent on the character of the material and methods used and on climatic and other local conditions. Pavements in which Portland cement is used for filling the joints or in the mass of the surfacing itself should seldom, if ever, be closed for less than two weeks after completion.

The committee consists of W. W. Crosby, chairman; H. K. Bishop, A. H. Blanchard, secretary; A. W. Dean, N. P. Lewis, C. J. Tilden and G. W. Tillson.

RAILROAD EARNINGS.

The following are the weekly earnings of Canada's trans-continental lines during March:—

Canadian Pacific Railway.			
	1917.	1916.	Inc. or dec.
March 7	\$2,442,000	\$2,198,000	+ \$244,000
Grand Trunk Railway.			
March 7	\$1,063,190	\$ 992,026	+ \$ 71,164
Canadian Northern Railway.			
March 7	\$ 669,100	\$ 540,200	+ \$128,900

PROPOSED EXTENSION OF WATERWORKS AND SEWERAGE SYSTEMS AT TRAIL, B.C.

HEREWITH is presented a summary of reports submitted to the corporation of the city of Trail, B.C., by A. L. McCulloch, consulting engineer, Nelson, B.C., for the proposed extension to the waterworks and for the proposed sewerage system.

Waterworks.—The present system was constructed by a private company in the early days of the city's growth. It was bought by the municipality in 1910, the supply being by gravity from a small mountain stream, supplemented by an additional supply through a 4-inch pipe from the smelter water supply, the latter being, however, only intended as an emergency supply.

On account, however, of the rapid growth of the city in the last two or three years, the present supply is not satisfactory, even for domestic supply, and is totally inadequate for efficient fire protection.

The present population of the city is estimated at 4,000. There has been an increase of 40 per cent. in the school population of the city during the last 12 months, and in all probability there will be a large increase in population during the next 12 months.

It is therefore essential that something should be done at once to secure an adequate water supply and to build larger mains for adequate fire protection.

Available Supplies.—To get the amount of water required with an assurance of a reasonable supply for the future growth of the city the following sources could be utilized:—

- (1) By gravity from Cambridge Creek, supplemented by the storage and use of water from Violin Lake.
- (2) By pumping water from the Columbia River.
- (3) By a gravity supply from Blueberry Creek, distant 17 miles from the city. This supply, on account of the cost, could only be developed in conjunction with the Consolidated Mining and Smelting Co., who also need to supplement their present gravity supply.

All the other streams in the neighborhood of the city, including Rock, Stoney, Murphy and Trail Creeks, are utilized as a water supply to the smelter.

Of the three available supplies, that from Cambridge Creek is easily the best and cheapest to develop.

In December there was a flow in Cambridge Creek of 630,000 gallons per day, while the flow from Violin Lake was 260,000 gallons per day, a total of 890,000 gallons per day, with an estimated extreme low-water flow of 600,000 gallons.

By utilizing the storage possibilities of Violin Lake this available daily supply can be increased to over 1,500,000 gallons per day.

Violin Lake is at an elevation of 1,850 feet above the business portion of the city. It is a long, narrow lake, being about one mile long, and has a surface area of 50 acres; it has a depth of 60 feet, the depth at 25 feet out from the proposed point of diversion being 9 feet.

Between Violin Lake and Cambridge Creek there is a ridge or divide 23 feet above the level of the water in the lake, the distance being 2,650 feet to get to a point on Cambridge Creek at the level of the lake.

This divide presents obstacles to utilizing Violin Lake to supplement the flow from Cambridge Creek.

It is feasible to conduct the water over this ridge by a syphon, which, however, may require almost daily attention, and on account of the remoteness from the city (about 7 miles) should only be resorted to if a gravity flow conduit is impracticable, which it is not.