is of much value in meeting the present and future traffic needs of urban communities.

Present Financial Influences.—The influence of the war on the financial situation is a feature of much importance as regards the present and immediate future of road-building on this continent. On the declaration of war by European powers in August last, while much uncertainty was felt, there was remarkable freedom from panic in the money markets of the world. Since the commencement of hostilities there has been a decided improvement. Crops, on the whole, in the United States and Canada have been good, and farmers are receiving good prices for their produce. While the flotation of municipal bonds is difficult, and capital is showing a natural timidity, there is a growing tone of optimism which promises much.

While municipalities and state governments of the United States are feeling the effect of war conditions, Canada is more directly influenced, and is, at the same time, meeting a heavy war expenditure.

The borrowing opportunities for Canadian governments are restricted, and while loans for large undertakings are seriously handicapped, means are being developed through local capital to meet necessary and desirable outlay.

The construction of roads for war relief has been largely accepted as a logical measure, and while rural municipalities, with a continuance of good crops and prices, will be in an excellent position to carry on the work, the ability of provincial governments to aid large undertakings may not be correspondingly favorable. Here private capital has, in at least one marked instance, stepped into the breach, and the construction of a concrete highway from Toronto to Hamilton (about forty miles) has been organized and commenced since September 1st. A proposal to construct a main road from Montreal to Windsor, across the Province of Ontario (over 500 miles in length), as a great memorial to the Canadian expeditionary forces, has been received with much public favor, and it is not improbable that construction may be commenced as a war relief measure.

The final effect on road construction must largely depend on the duration of the war. Should the struggle, with its tremendous waste, be prolonged for three years, as is predicted by an eminent authority, the ultimate influence on financial conditions is impossible to estimate. Should it be concluded in a year, as many hope, the present feeling of optimism will assuredly not be without substantial foundation.

RAILWAY CONSTRUCTION AT SALISBURY, ENGLAND.

Large numbers of the Canadian troops at Salisbury have recently been engaged in the construction of a light railway to serve their various camps. The roads, which were of a temporary nature, had given way under the strain of heavy tractor and motor truck traffic, engaged in the haulage of supplies. A contract was awarded to Sir John Jackson & Co. for the construction of this service railway, and Canadian engineers, many of them graduates of the universities of this country, Toronto, McGill and Queen's, are engaged in its construction.

In addition, the Canadian engineers have charge of the construction of a water supply system at Bulford and Larkhill.

THE EFFECT OF FROST UPON CONCRETE.*

By John Hammersley-Heenan, Assoc.M.Inst.C.E.

THE engineer who is called upon to carry out work in Canada during the winter finds that the methods of construction which were satisfactory in the summer will need considerable modification to suit winter conditions.

Concrete work, especially the lighter forms of reinforced concrete, used in building construction needs greater care and supervision. As a result of considerable experience gained during the last few years, it can be said that the freezing of concrete will not damage it if it has first had a chance to set under favorable conditions for about two days. The effect of the freezing is simply to delay the process of hardening, which will again proceed under suitable conditions, and will eventually attain its full strength. If concrete is frozen before it has commenced to set, it will not be injured if precautions are taken to prevent it from freezing again after it thaws until it is sufficiently hardened to withstand the effects of subsequent freezings. It is alternate freezing and thawing during the process of setting that causes the damage.

To meet the foregoing conditions, when carrying out concrete work in winter, it is necessary to devise means of mixing the concrete with materials freed of frost, placing it in the forms before it has commenced to freeze, and then protecting it and keeping it warm for about two days. After that it may be allowed to freeze without fear of its being damaged.

In the case of concrete in mass, of large bulk, it is unnecessary to apply external heat, as the large body of concrete will generate sufficient heat during the process of hardening to enable the mass to set; all that will be necessary is to protect the outside of the concrete so as to keep the heat in. This can best be done by covering the concrete with clean straw.

For light sections of concrete, such as in reinforced concrete, poured at a temperature not below 22 deg Fahr., some engineers allow salt to be used in a proportion not exceeding 10 per cent. There are many arguments for and against its use. The author prefers not to use it, except in marine works when the concrete is mixed with sea-water and the salt is admitted in that form. He has found that, instead of using salt, good results will be obtained for temperatures that do not fall below 22 deg. Fahr. by heating the water with a steam-hose taken from the mixer-boiler, and when necessary placing a few coke or wood fires on the heaps of sand and crushed stone, the usual precautions being taken to protect the concrete when in the forms, as described later.

For lower temperatures than those referred to above greater precautions must be taken to heat the ingredients by means of steam coils or radiators.

The concrete having been mixed, and the portion of the work to be carried out decided upon, the floor immediately below it should be partitioned off with tarpaulins, and coke stoves arranged under the floor slab, allowing about one stove to every 800 sq. ft. of floor space. All loose dirt and snow must be removed from the forms with brooms, and a steam hose should be applied to remove all ice and frost, the steam playing continuously over the forms in advance of the concrete, thus

^{*}From a paper read at a meeting of the Institution of Civil Engineers (Great Britain) December 2, 1914.