The water has been running through this main for 18 months successfully, with the exception of one small leak which has been repaired by a diver. A pressure gauge is kept on the bridge and inspected twice daily. The emergency main was left on the bridge and can be operated at any time should any accident happen to the submerged main. The relaying of the submerged main was carried out under the direct supervision of the writer.

Expenditure and Revenue.—To arrive at the total amount of interest and sinking fund chargeable to the ratepayers of New Westminster, $125,000 must be deducted since the municipality of Richmond has paid that sum to the corporation in cash, and the Vancouver Power Company has paid the cost of the water tower and tunnel approach amounting to $927,905.

Looking at the financial or business side of the undertaking it is interesting to review a few facts that are of

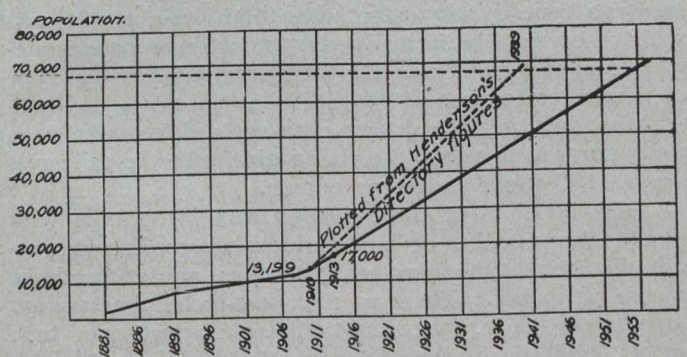

Fig. 17.—Population Curve, City of New Westminster.

vital interest to see whether it is going to be a profitable undertaking.

The corporation has to find annually the sum of $35,263 for sinking fund and interest on works already constructed.

The new works add $15,774 to the annual liability for the next 50 years.

The annual cost of operating the waterworks department is about $16,500.

The returns from the treasurer's office show the annual revenue to be $85,000 to $100,000, which includes rates received from the ratepayers and for water sold outside the city limits to other municipalities. As the city and the surrounding neighborhood grow, the sales will increase and show a good profit.

The writer has drawn a population curve (see Fig. 17) which may prove interesting, although it is very uncertain. Western Canadian cities must grow and grow rapidly, and are building for a golden future. He cannot close this article without acknowledging the valuable assistance rendered by his resident engineer, Mr. A. R. Lewis, A.M.Inst.C.E.

APPENDIX I.

Cost of Work.

Manufacture of 25-in. pipe	$204,686.76
Purchase of 12-in. and 13-in. pipe	20,113.36
Purchase of 13-in. flexible pipe	7,501.20
Sluice valves and air valves	3,168.51
Cast iron specials, etc.	3,024.31
Cast steel specials	762.15
Bolts, anchorage, etc.	181.36
Wood pipe for blow-offs	92.48
Venturi meters	2,389.70
Stacking pipe at Westminster Junction	485.22
Testing steel	617.50
Contract price for digging trenches and laying 25-in. main, etc.	101,444.65
Contract price for digging trenches, 12-in. and 13-in. main	10,916.48
Floating arm and fittings at reservoir	386.37
Laying submerged main	1,012.56
Repairs to submerged main	1,472.73
Extra work authorized	500.00
Engineering expenses, including inspection	14,806.97
Legal expenses, advertising	4,437.69
	$378,000.00
Cost of water tower and approach	191,307.00
Cost of tunnel to tower pipe and shafts	87,308.00
Cost of clearing banks of lake, to be submerged by raising lake level	649,289.00
Total cost of works	$1,305,904.00

SPECIFICATIONS FOR CONCRETE.*

By Cloyd M. Chapman.

TO be generally acceptable, specifications for concrete should fulfil two requirements, namely: (1) they should insure the production of suitable concrete if the aggregates are properly used, and (2) they should permit the use of materials found in the vicinity of the work, if such materials are capable of producing concrete of the required quality.

The present method of specifying may insure the quality of the material, but it does not permit the use of a wide choice of aggregates from which first-class concrete may be made.

Concrete is a cheap building material because it is composed largely of inexpensive aggregates, and for economic reasons these aggregates should be secured from deposits in the vicinity of the point of use. Whatever materials are locally valuable for aggregates must be used in the great majority of cases, for aggregates which must be transported long distances are no longer inexpensive. The material at hand capable of making concrete of fair quality will generally be used in preference to a better material which must be brought from a distance at considerable cost for transportation.

It is generally true that even a very poor sand, that is, one which compares very unfavorably with standard sand when tested in 1:3 mixtures with cement, will give a suitable compressive strength if sufficient cement is used. Where most excellent materials are available, the present style of specification does not permit a variation of the proportions however good the materials may be. For instance, some well-graded sands give strengths 40 per cent. higher than that obtained with standard sand in the proportion of 1:3. Yet such sands receive no credit for quality under the present form of specification.

Specifications serve their purpose when they secure the products described, but they serve the industry best when broad enough to cover all the materials capable of furnishing a product of the desired quality.

In order to cover and include all materials which are capable of producing concrete of the quality required for the particular service it is to perform it is only necessary to specify the result required instead of specifying the materials used. In this way it would be possible not only properly to safeguard the product but to permit the use of such materials as are available in each locality.

*From a paper read to the American Society for Testing Materials.