

hence the appointment of the present body. The commission will report upon the probable effect on Montreal harbor of the various improvements suggested for the St. Lawrence. It will go more into detail in connection with the actual lowering of harbor levels which has taken place at many points. It will examine carefully into the effect of the diversion of water by the Chicago drainage canal and the effect of storing water in the Ottawa Valley. The improvement of ice conditions in the harbor and the construction of the proposed bridge connecting the north and south shores of the harbor will also be looked into.

The commission will take about two years to complete its work.

CONCRETE IN DRY DOCK CONSTRUCTION.

PRIOR to the construction of the Pearl Harbor dry dock, a series of experiments were performed to determine the mixture that would produce the most dense and plastic concrete. These tests are outlined in a paper by Mr. H. S. Stanford, appearing in the Proceedings for May of the American Society of Civil Engineers. The paper describes in detail the construction of the docks, but only his discussion of the tests on concrete and his conclusions regarding the use of tremies will be referred to here.

In connection with the experiments the ingredients in each mixing were carefully weighed, then mixed with shovels and placed in an 8-in. pipe closed at one end, to determine the volume of the mixture. The degree of density was obtained by comparing the volume with the weight. The plasticity was determined by observing the action of the concrete when handled with shovels and by the settlement into the mass of two wooden rods having sectional areas of 1 and 2½ sq. in. respectively, under the weight of a man.

It was found that, other conditions being the same, the concrete made with the 1-in. stone was more dense and plastic than that obtained with the larger stone. Graded stone, containing such percentages of each size that when plotted it gave a straight line, produced con-

Results of Crushing Tests.

Class.	Sand.	Age.	Crushing strength in pounds per square inch.	
			In salt water.	In fresh water.
I. Three parts screenings passing ⅛-in. mesh with dust retained on 30-mesh, with 1 part Puget Sound sand		3 days	685	620
		28 days	1,435	1,320
		2½ mos.	1,860	2,285
II. Screenings passing 3/16-in. mesh with dust retained on 30-mesh		3 days	590	470
		28 days	1,280	1,230
		3 mos.	1,985	1,985
III. Screenings passing 3/16-in. mesh containing all the dust of fracture		3 days	630	565
		28 days	1,505	1,390
		3 mos.	2,655	2,370
IV. Sand from Puget Sound		3 days	905	845
		28 days	1,745	1,780
		2½ mos.	2,450	2,360

crete which was at the same time most dense and plastic. An excess in the percentage of small pieces increased the plasticity but decreased the density, whereas a deficiency in the smaller sizes had little effect on the density but reduced the plasticity. Mixtures in proportion of 1:2.5:4

were more plastic than 1:2:4 but not as dense; 1:2:4 mixtures were more dense than those of 1:2:3.5 but not as plastic.

A series of 132 laboratory crushing tests were made on 6-in. tubes. Nine sets of 12 blocks were made of concrete mixed in proportions of 1:2:3.5, using for each test uniformly graded stones not larger than 1 in. but with differently mixed or prepared sands for the different tests. The results are given in the accompanying table.

In addition to that, fifteen large-sized test blocks were made under conditions which resembled those actually existing when placing under-water concrete for the bottom of the dock. The concrete for these tests was deposited with tremies in water about 52 ft. deep, the end of the tremie being held near one corner of the form, so that the concrete had to flow an extreme distance of about 6 ft. after leaving the tremie.

A great deal of interesting experience in the use of tremies has been acquired in handling a product at first practically worthless, and then gradually improved until it finally attained a high degree of excellence. Tremies 12 in., 15 in. and 18 in. in diameter were used in these experiments (approximately 14,840 cu. yd. of concrete were deposited through tremies), and the author arrived at the following conclusions:—

The results obtained from a tremie depend to a great extent on the proportions, character of materials and plasticity of the concrete which is being used; the excessive frictional resistance to the movement of concrete in a 12-in. pipe causes frequent clogging in the pipe and gradually increases the pressure at the exit, making it impracticable to hold the end of the tremie embedded in the deposited concrete; the frictional resistance to the movement of concrete in an 18-in. pipe is not sufficient to prevent the occasional loss of a charge in the tremie, thereby interrupting the filling of the form, with added uncertainty as to the quality of the product; the frictional resistance in a 15-in. tremie is apparently just about right to obtain the proper discharge pressure necessary for efficiently regulating the flow of concrete by raising and lowering the tremie with the end maintained within the deposited mass. The concrete flows freely to distant parts of the form without causing disturbance in the mass. The tremie 15 in. in diameter is best suited for the work, and in the Pearl Harbor dry dock construction the size was adopted and actually used for placing the greater part of the tremie concrete.

Approved designs, however, eliminated practically all tremie-placed concrete, without involving endangering conditions. This fact is considered a most valuable feature of the plan of construction, inasmuch as there can be no absolute certainty that concrete deposited under water will possess the uniform degree of perfection essential to dock construction.

RUSSIAN RAILWAY EXTENSION.

The administration of railways in Russia has made the following appropriations in the estimate of expenses for 1915: The sum of \$13,056,589 has been appropriated for the purchase of 90 passenger engines and 390 freight engines, with equipment. The amount of \$6,366,237 is assigned for the purchase of 8,350 freight cars, and \$2,994,308 has been appropriated for the purchase of 505 passenger cars. In connection with the proposed direct international railway communication, the Russian tariff committee proposes to construct direct lines connecting Archangel with Vologda, Petrograd, Moscow, Kief, Warsaw, Saratof, Kharkof, Odessa, Ekaterinoslav, Omsk, Riga and Reval, and through Archangel connecting with the ports of New York, Halifax, Liverpool and Glasgow.