Dredging on the St. Lawrence.

Out of the 220 miles of the ship channel of the St. Lawrence River which lie between Montreal at its head and the Traverse near the mouth, there are about 70 miles which were originally in need of improvement in order to give a minimum depth of 30 feet and a width of 450 feet on tangents and from 500 to 750 feet on curves. Of these 70 miles, 56 miles have already been dredged in that portion where the tide is not available, so that with the help of the tide for a short distance a 30 foot depth is now obtained all the way from Montreal to Quebec.

From now on the work will be concentrated toward obtaining a greater width in Lake St. Peter, and the tidal parts of the river, as well as the full depth of 30 feet at low tide. About an equal amount of work is yet to be done above and below Quebec. Up to this date 48,037,670 cubic yards of material has been dredged, and it is estimated that 17,385,000 cubic yds. are yet to be dredged, which will give a total of 65,522,670 cubic yards, a very formidable quantity of material.

The St. Lawrence is different from most rivers in its bank and bottom conformation. Usually a river has at its source steep slopes which tend to erode the banks and to transport coarse and heavy material. As the slope becomes more gradual, this erosion decreases until at the mouth of the river the water carries in suspension a fine sediment which deposits, to the great detriment of navigation. In the St. Lawrence the material from most of the sources of supply is all deposited in the settling basins. From the lakes to the ocean the bottom of the river is usually hard, so that there is not only clear water, but a permanent river bed.

The nature of the material composing the bottom of the river, though in many places very difficult of dredge, is for the same reason of such a character that a dredged cut once made is substantially permanent.

In the ship channel the material to be excavated varies from soft blue clay into which a pole may be planted some 6 to 7 feet by hand, to stiff clay, to hard pan as hard as a macadamized road, to shale rock and large boulders. In one or two localities coarse sand is found, at which points dredging has to some extent to be repeated. Below Quebec, at the localities where the fresh and salt waters meet, there are the usual sand bars, but these do not seem to be increasing. The movable nature of the material, added to more instability in the shoals below the lack of uniformity of the tides, currents and salt water, results in Quebec. It is therefore expected that the maintenance of the excavated channels there will require some annual re-dredging. The currents of the St. Lawrence are, for a river of such size, not only reasonable and regular, but altogether free from the usual dangers to navigation resulting from freshets. Except for floods during the ice accumulations, the fluctuations in level are gradual and not excessive. The winter season, with its ice and snow, is the one great drawback to the St. Lawrence.

The improvement of the St. Lawrence is one of the great works of the world. It was begun in 1844, the first dredge in 1846 excavated in Lake St. Peter, in one day 1,200 cubic yards. By wonderful improvements in plant in 1888 a dredge would excavate 7,200 cubic yards without trouble, and in 1906, working day and night, 20,000 cubic yards was a frequent day's work.

The following statement gives the dredging plant now owned and operated by the Department of Marine and Fisheries, Canada, in connection with the River St. Lawrence Ship Channel: 6 elevator dredges; 1 hydraulic dredge, with 23 pairs of pontoons for floating pipes and 2 winch scows; 1 suction hopper dredge; 1 ice breaking and sweeping tug; 12 towing tugs; 4 coal barges; 2 stone lifters; 1 sounding scow; 1 coal scow; 6 house boats, and 14 hopper scows. Of the elevator dredges four have hulls of wood, the other two have steel hulls. The buckets are generally cast steel, especially designed for working in rock or other hard material. On the division between Batiscan and Quebec, most of the excavation is in solid shale rock. In consideration of the fairly soft character of the shale rock, the elevator dredge is by far the most economical and efficient machine known to dredge it. The one hydraulic dredge in use is the well-known "J. Israel Tarte." The St. Lawrence at Lake St. Peter widens out into a shallow water lake, about 9 miles wide and 22 miles long. The material is almost all soft blue clay of the consistency of ordinary table butter. A bank made almost vertical will remain for years. There is practically no filling in, but the wash of the propellers deepens the centre of the channel slightly, and deposits it near the south bank. It was in this material that the dredge "J. Israel Tarte" excavated 1,984,510 cubic yards during the fiscal year ended June 30, 1906, at a cost of $117,668.03, or an average of 5.92 cents per cubic yard. The average hourly rate of dredging was 1,000 cubic yards.

The dredges are operated 132 hours per week, or steadily from midnight on Sunday until noon on Saturday. Stops are only made for repairs, for shifting from one place to another, bad weather, or to give room for passing vessels. Coal is supplied by barges without stopping the work.

The constant steady work in exceedingly hard material at a depth of from 32 to 42 feet is very hard on machinery. Only the very best designed and well constructed plant can stand it. Traffic must not be interrupted and the work must always be carried on in the more or less swift current. The material is increasing in hardness from year to year, as the work nears Quebec. All the soft material except the remainder of the work in Lake St. Peter, is now completed. A dredge that can remove 6,000 cubic yards per day in soft material, without trouble, is more fatigued by dredging 1,000 cubic yards of hard pan, in which boulders are imbedded.

About 400 men are employed in connection with the dredging operations. These men, all sailors, were born and brought up at Sorel or at some of the parishes bordering on the River St. Lawrence. Most of them have been trained to the service from boyhood. A captain and an engineer are in general charge respectively of the vessel and machinery. The re-