

COST OF DREDGING WITH DIFFERENT CLASSES OF PLANT.

(Concluded).

The excavation made by the dipper dredgers and delivered into scows at side of dredgers amounts to 525,306 cubic yards. One of these dredgers has a dipper with a capacity of $2\frac{1}{2}$ cubic yards. The dipper has three steel teeth, about 6x5 inches. The hull is 85 feet long, 28 feet wide and 10 feet deep. There are three anchoring and supporting spuds, each 20 inches square. The dipper arm is 28 feet long, of wood sheathed with steel. The material was delivered into scows, each having a dropping pocket with a capacity of 140 cubic yards. A tugboat took these scows in turn into the St. Lawrence river, dropping the excavated material in a bay near the mouth of the canal. The distance to which the scows were towed averaged about 5,500 feet.

The dipper dredger worked ten hours per day. The tug and scows could not be operated at night. This dredger excavated to a depth of 20 feet below water surface.

The cost of operating this dredger, including the crew of dredger, tug and scows, coal, supplies, etc., was for each day of ten hours \$30.56.

The cost of dredger, tug, and two scows is \$43,000. Interest at 4 per cent. is \$1,720 per annum. One tenth cost for repairs and renewals is \$4,300 per annum. These distributed over actual working days would be \$28.80 per working day. Care during winter months, distributed over working days, \$1.00 per day. The total cost per actual working day of ten hours is thus:

Labor, supervision, coal and supplies.....	\$30.56
Interest, repairs and renewals.....	28.80
Care during winter.....	1.00
Total.....	\$60.36

This dredger excavated, delivered into scows, and deposited in the river 138,001 cubic yards in 183 days of 10 hours, thus giving an average of 754.1 cubic yards per day of 10 hours. The average cost was thus, with allowance for repairs, renewals, care in winter, coal, supplies,

and labor, both for dredger, scows, and towing tugs, 8.004 cents per cubic yard.

This excavation was in indurated material, as described above. Neither the centrifugal pump dredgers nor the orange peel bucket dredgers referred to below could excavate this material.

The attempt to use vacuum orange-peel dredgers for this excavation was abandoned, and one of them was rebuilt as the centrifugal pump dredger with 18-inch discharge pipe, described above. The other vacuum dredger was sent to the vicinity of New York, and is working in material quite different from any encountered in the canal.

The following summary of the results of the work has been made:

The total amount excavated by dredgers in this canal was 1,436,000 cubic yards. There were in addition excavated by other means 4,433,000 cubic yards.

The vacuum pump dredgers with orange peel buckets and pipe transmission lines were not serviceable in excavating and transmitting either the indurated or the softer material.

The centrifugal pump dredger excavating by revolving cutter to depths under water not exceeding 22 feet, lifting the material to a height of 30 feet above water and depositing it through a pipe of 12 inches diameter, 1,200 feet distant from the canal, could not excavate the indurated material but worked with success in the softer material. It excavated and deposited in three seasons 459,800 cubic yards of this material at an average cost of 8.507 cents per cubic yard, this cost including labor, supplies, coal, repairs, re-

newals and care during the winter seasons.

The centrifugal pump dredger, generally similar to the one last mentioned but with a discharge pipe 18 inches in diameter, working in the softer material, excavated and deposited in two seasons 290,780 cubic yards at an average cost of 9.399 cents per cubic yard. The centrifugal pump dredgers worked 22 hours of each 24 hours.

The dipper dredgers excavated during three seasons 525,306 cubic yards. This was indurated material. It was deposited in scows and towed by tugs and deposited in water about 5,500 feet from the dredgers. One of these dredgers with a dipper of $2\frac{1}{2}$ yards capacity, working 10 hours each day and excavating to a depth of 20 feet below the water surface, lifted and delivered 1,800 cubic yards in 183 working days of 10 hours, at an average cost of 8.004 cents per cubic yard, this cost including labor, supplies, coal, repairs, renewals and care in winter, for the dredger, scows and tug for towing.

Coal is included in these statements at a cost of \$3.00 per ton; the modification for a different price of coal can be readily found.

In latitudes where dredging can be done during all seasons of the year the modification required can be easily made from the data above given; the cost per unit will be reduced provided also there is continuous work for the dredger throughout the year.

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