

fleet is 220 during the warm weather, but a slight increase in the force takes place in the late autumn owing to the extra labour necessary when lines are frozen and decks coated with ice. In another portion of this paper, mention is made as to the number of hands required to work each vessel and also the duties assigned to individuals.

The dredges are all of the dipper or spoon type, their principal dimensions being as follows: Length of hull 90 ft., width of hull 36 ft., maximum depth of hold from 9' 6" to 10' 9" according to dredge; size of main engine 16" x 18" double cylinder.

Each dredge has three spuds, two at the bow and one at the stern. The bow spuds are each operated by two wire ropes, one for lifting and one for pinning up, the former passing around a sheave located in the spud near its lower end and the latter over a similar sheave held in a casting at the upper end. The lifting and pinning up wires lead to the same drum, one coming in while the other comes off. The forward spud drums are operated by the main engine, clutches and brakes being provided for throwing in and out of gear or holding the drums stationary. The stern spud is raised by a wire rope attached near the lower end, no spud sheaves or pinning up arrangement being used. The wire passes to a drum driven by an engine which also actuates the deck capstans. Thus spud passes through an aperture in the stern deck and is held in position by rollers carried in yokes, one at the deck line and the other at the top of the spud slides. The upper yoke is directly secured to the piston rod of a long stroke steam cylinder, thereby affording means of moving ahead when the bow spuds are lifted.

The dipper is lifted by means of a single wire rope passing to a spirally grooved drum. The diameter of the drum varies in such a manner that the wire comes in slowly while the bucket is in the cut with an increase of speed when the dipper is clear of the material being dredged. The drum is driven by two cast steel spur gears which engage or disengage with the drum by means of a pair of belt frictions operated by a toggle joint mechanism and a steam thrust cylinder.

The dipper handles used are of the split type and are built of Douglas fir encased on all sides by steel plates, the plating being secured by Lowmoor iron rivets which pass through the wood from plate to plate. A heavy steel casting with lugs to receive the bucket connections, is bolted to each side of the handle at its lower end.

The handle is gripped or allowed to slide, as the case may be by means of a steam piston and a combination of fibre-covered plates which bear upon the sides of the handles as well as upon four long plates secured to the inner surfaces of the split portion of the arm.