

RECLAIMING CALUMET AND HECLA TAILINGS WITH A HYDRAULIC DREDGE

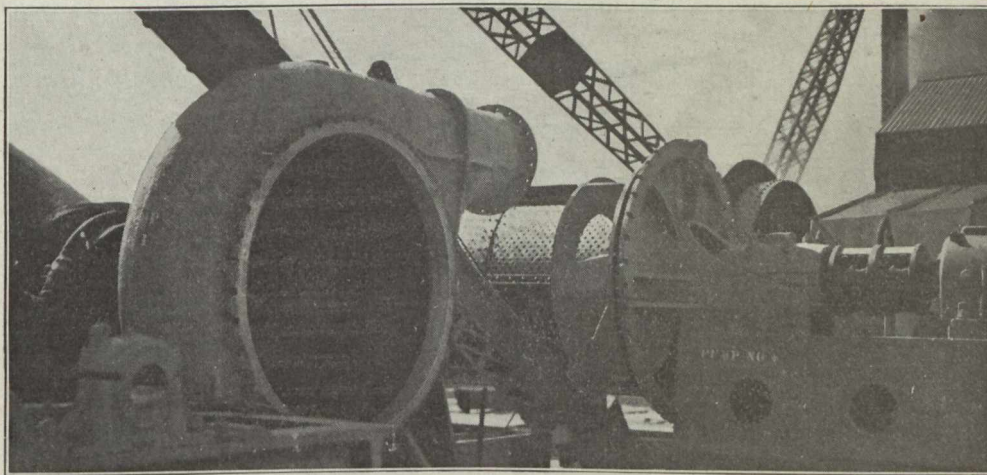
For nearly forty years, the Calumet and Hecla Copper Mining Company has deposited in Torch Lake at Lake Linden, Houghton County, Michigan, an immense amount of sand, the residue from the rock crushed in the stamp mills. In the early days sand containing fully one per cent. copper was thus disposed of. During the past few years the loss in tailings has been much reduced, but only recently has a process been perfected whereby the tailings now in the lake can be reworked and the copper recovered. It is estimated that the amount to be recovered on the shores and in the lake aggregates 40,000,000 tons.

In order to accomplish this, the Calumet & Hecla Company have under construction a hydraulic dredge

problem mentioned before. No. 1 pump is driven by a 750 h.p. motor, and No. 2 by one of 1,250 h.p.

Pump No. 1 delivers the material directly from the lake to the screen on the dredge. When this screen is disconnected, by changing the pipe connections, it pumps ashore through a pipe line up to 800 ft. in length, with a maximum elevation of about 30 ft.

Pump No. 2 pumps ashore from the sump under the screen through a pipe 2,500 to 3,000 ft. in length, with a maximum elevation of about 10 ft. This pump is so designed that it may be connected to the suction pipe and thus take the material directly from the bottom of the lake to shore, in place of No. 1. Either pump may be used independently when the screen is not in



Centrifugal Pump, Dredge No. 1. Calumet and Hecla Mining Co.

which is designed to dig to a depth of 100 feet below the surface of the lake, a greater depth than has ever been attempted by a hydraulic dredge before. In fact, the maximum depth dredged in this manner at the present time is attained by the sand suckers in Long Island Sound, a depth of 70 ft. The dredge was designed and built by the Bucyrus Co.

The problem encountered as far as it affects the dredge design is somewhat complex. Certain portions of the tailings piles have in the past been used as a public dump, consequently, a certain percentage of foreign matter is contained therein. It becomes necessary, therefore, to screen the material thoroughly before delivery. As, however, only a portion of it requires screening, the design of the dredge must be such that the screen may be cut out when not required. This has led to the necessity of two pumps, and a complicated control.

The dredge has a steel hull, 110 ft. long, 56 ft. wide and 9 ft. deep. The deck, however, has an 8-ft. overhang, which makes the extreme width of the hull 72 ft. The digging ladder is 136 ft. in length, requiring a ladder well 70 ft. long by 10 ft. wide. This extreme length of well has necessitated an exceedingly heavy overhead truss.

There are two centrifugal dredging pumps, each of 20 in. diameter, which for convenience will hereafter be referred to as No. 1 and No. 2. Two pumps instead of the usual one are made necessary by the screening

use. The decision as to which pump should be used depends upon the length of the pipe line at the time. It is impossible of course to make one pump suffice, as the screen when in use breaks the flow.

The screen is 7 ft. in diameter and about 45 ft. long. It is made of manganese plates with perforations one inch in diameter. It delivers the refuse to a scow alongside.

No cutterhead is required because of the loose character of the material, which has no binder. Hydraulic jets are provided, however, with which to break up the material if necessary. These jets are operated by an 8-in., two-stage horizontal double suction turbine pump, driven by an independent motor.

On account of the great depth of the lake and the soft nature of the material, the dredge works on head and side lines instead of spuds.

Instead of one winch, as is the custom of dredges of this type, the length of the ladder well makes it necessary to have two. Each has four drums, for the ladder hoist, two bow swing lines, two ladder swing lines, two stern swing lines, and a tail line. Each winch is driven by an independent 50 h.p. motor.

An air compressor is provided for operating the air cylinders which control the friction clutches. A 6-in. service pump of the same type as the jet pump is supplied for sealing the swivel joints in the suction pipe in order to prevent air leaks. There is also an overhead crane for serving the machinery.