

The methods of mining at this mine are therefore somewhat special and varied. The cause of this variation is due to the fact that the ore body changes from place to place in hardness, width, and accessibility. In some parts of the mine it is hard to introduce the filling, while in others it is a cheap and efficient adjunct in extracting the ore. Wherever used it forms a compact and satisfactory substitute for timber, which, to perform the same duty, would be quite expensive.

SOFT ORE HEMATITE MINE, ISHPERING, MICH.

Here we have a mine which was formerly covered by Lake Angeline, a body of water of about 100 acres in extent, and 50' deep in the deepest part. The water was pumped out by means of powerful pumps, and the lake bed became comparatively dry. On the margin of the old lake, shafts were sunk, and the mining of the large deposits of soft ore began. The ore, being a soft red hematite, was very easy to break down, but it was impossible to have large chambers excavated, because of its heavy settling nature. As the soft ore caved so readily, a caving system of mining was soon inaugurated.

Haulage ways were, as far as possible, made in solid rock. Then raises were driven to the top of the ore deposit, at intervals of from 60 to 100 feet, and cribbed with two compartments. One for a ladder road and the other for ore. Sub-levels were also made to facilitate operations. The ore was loaded into cars holding about $2\frac{1}{2}$ tons, which were attached to a "bull-dog", and taken to the shaft in trains of six or seven. The bull-dog was operated by a cable, each end of which passed around a drum run by compressed air. One engine was located at the shaft and the other at the end of the haulage way. At the shaft the cars dumped directly into the skip, and were moved up to, and away from, the shaft by hand. The idea of the bull-dog is to facilitate coupling, the cars being connected to the bull-dog instead of directly to the cable.

When the chutes were completed a "top-slicing" scheme was begun. A drift 8' x 8' was driven parallel with the deposit, and timbered with square setts. These setts consisted of legs and caps as shown in Fig. 20, and placed 4' apart. At the raise it was important to have rather stout timber, because here the timber was expected to stand the longest, and was therefore subjected to most pressure. Farther from the raise or chute the timber was much smaller, 6 to 12 inches, and the caps were covered with light lagging. The caps, as a rule, were a few inches larger in diameter than the legs.