

yet been found in this country that possess the superior qualities of the specular ores of Lake Superior, and for this purpose these ores must always be held in high esteem. Much thought has been given recently by the iron and steel manufacturers to a new steel made by a manufacturing company of Chicago; several cold chisels for use in the mines, after trial, have been found to give better satisfaction than the tools made by the celebrated manufacturers in Pittsburg. The new steel is harder and finer in texture, and will wear better than any previously in use. It is of great value in cutting up the hard Jasper-quartz and flint rocks that are met with in working the veins of ore in the mines.

We expected to see openings and galleries at the mines at Marquette similar to those in Pennsylvania, and were much surprised to find that the ore lay in such huge veins and outcroppings that it could be taken out as quarrymen take out sandstone or slate from the quarries in the East. The mines present the appearance of a large pit of 100 to 200 feet in depth, and of a circumference nearly equal to that of half an acre. At different points the veins are worked at an angle of 45 degrees from the bottom level, and the vein thoroughly explored from the surface of the pit to the bottom. The veins vary in size from three feet in width to 100 feet or more. At the Republic Mine we saw the miners working at the side of a hill that seemed to contain nothing but solid, pure ore, and the ore was taken out as fast as the picks could bring it to the ground. Three men's work at this mine represented for one day 20 tons of ore, dug, broken, and carted away to the stock-piles near the railroad track. The Republic Mine was opened last October, and has already produced 30,000 tons of ore. The unmined ore is believed to amount to millions of tons. The owners were offered for the property, before a pick was used in exploring it, 2,000,000 dols. by some iron manufacturers of Cleveland and Pittsburg. In the richness of the veins, their extent, and the ease with which the ore is taken from the hills, the Republic Mine is a sight worth seeing. John Stewart, Moses Taylor, and other New York capitalists are largely interested in the iron property of this district.

The mines are surface mines generally, and are worked from the surface; but one or two mines are underground mines, of which the Champion is the best example. Here they take out the ore in drifts and breasts on different levels, leaving from 20 to 30 feet of substance between the levels. The ore is raised in ships through the shafts, the hoisting-cab'e for all of which is driven by the same engine. This mine is worked upon the same principle as that commonly followed in the coal mines of Pennsylvania.

The veins of ore run usually from east to west, and the mines are situated from five miles to sixty miles back from the town. The ore is brought to the docks on the railroad track in cars especially adapted for the purpose, that run out on a wooden tramway 50 feet above water-mark, when the ore is dumped into wooden pockets made expressly for loading the vessels and for storing in readiness for ships' delivery. One wooden pocket holds about 60 tons of ore; the Cleveland Iron Company's docks, this year, with their improvements, will hold full 5,000 tons of ore in pocket at once, and will allow six vessels to load at the same time. The railroad company also own docks of almost equal capacity, the cost of which was some 400,000 dols. The railroad is making large returns of earnings from tariff on transportation of the ore; and from time to time it builds, at its own expence, side-tracks ten miles in length to the new mines, for farther development and speedy delivery.

The iron ore of Lake Superior costs about six dols a ton to mine and deliver at the lake ports; it is sold at 12 dols. to 12½ dols. per ton delivered at the ports; the profit is, therefore, equal to six dols. per ton net. This business pays better than gold or silver mining, and is adding millions to the already great wealth of some of the residents of Marquette.

It is impossible, of course, to predict the prosperity of Marquette ten years hence, or of the magnitude of this iron mining that is even now in its infancy. One railway now serves for communication between Chicago and this place. Still two additional roads are in process of construction from Detroit to Mackinaw, and hence to Marquette; the State has appropriated lands, and the telegraph poles are already in position for the distance of 50 miles. Marquette seems to have a great future near at hand. The following shows the production of ore of some of the largest mines during the year 1872:—Lake Superior, 185,070 tons; Cleveland, 152,607 tons; Jackson,

118,842 tons; New York, 68,950 tons; Champion 68,405 tons; Washington, 38,841 tons; Barnum, 38,381 tons; Cascade, 35,069 tons; Lake Angeline, 35,221 tons.

#### AMERICAN LIGHTHOUSES.

A short time since (*vide* page 203 of our last number), we illustrated two types of recent American lighthouses, and we now give on pages 230 and 231 views of two others, both connected with the lighting of the great lakes. The first of these, namely, that erected on the shores of Lake Erie at Cleveland, Ohio, requires no special description; but we illustrate it merely on account of its architectural features. The other lighthouse, namely, that at Spectacle Reef, Lake Huron, is of special interest on account of the mode adopted in establishing the foundations. We are indebted to the last received report of the Lighthouse Board of the United States for the following interesting account of the operations:

At the date of the last annual report (July 1, 1871), the crib 92 ft. square, with a central opening of 48 ft. square to receive the cofferdam which was to form the pier of protection, as well as a landing place for materials during the building of the lighthouse, was in course of construction at Scammon's Harbour. The original intention was to put the crib in position in four sections, but upon further consideration it was decided to attempt placing it as a whole upon the reef, which was successfully accomplished, as is detailed hereafter.

In order to get accurate soundings to guide in shaping the bottom of the crib, and to fix with a degree of certainty the position of these soundings and that to be occupied by the crib, the following method was pursued: Four temporary cribs, each 15 ft. by 25 ft., of round timber, were placed in from 8 ft. to 10 ft. of water, in a line corresponding with the proposed eastern face of the pier of protection, and filled to the level of the water with ballast stone. These four cribs were then decked over and connected together. Upon the pier thus formed about seventy cords of ballast stone were placed ready at the proper time to be thrown into the crib forming the pier of protection. The lower two complete courses of the pier of protection, having been fastened together by screw bolts, forming a raft, constituting a ground plan of the pier of protection, were then towed from the harbour where they were framed to the reef, and moored directly over the position to be occupied by the finished pier. Its position was marked upon the temporary pier referred to above, and soundings taken at intervals of 2 ft. along each timber in the raft, thus obtaining accurate contours of the surface of the reef within the limits of these timbers. The raft was then towed back to the harbour, hauled out upon ways, and by means of wedges of timber the bottom was made to conform to the surface of the reef. The raft, now become the bottom of the pier of protection, was then launched, and additional courses of timber built upon it, until its draught of water was just sufficient to permit its being floated into position on the reef, at which time it was estimated that the top of the pier would be 1 ft. out of water.

The depth of water on the reef at the points to be occupied by the four corners of the pier of protection was found to be as follows: At north-east corner, 10 ft. 6 in.; at north-west corner, 13 ft.; at south-west corner, 14 ft. 6 in.; and at south-east corner, 9 ft. 6 in.; the position to be occupied by the pier of protection having been so chosen that the sides would correspond to the cardinal points of the compass. Mean while five barges at the harbour had been loaded with ballast stone, making together with those on the temporary pier at the reef, 290 cords (about 1800 tons) at command, with which to load the pier of protection and secure it to the reef as soon as it should be placed in position.

On the evening of the 18th of July, 1871, everything being in readiness, and the wind, which had been blowing freshly from the north west for three days previously, having somewhat moderated, at 8 p.m. the tugs (Champion (screw propeller) and Magnet (side wheel) took hold of the nameless crib and started to tow it to the reef, 15 miles distant, followed by the Warrington (screw propeller), having in tow the schooner Belle (the two having on board a working force of 140 men), the tug Stranger (screw propeller) with barges Ritchie and Emerald, and the tug Hand with two scows of the Lighthouse Establishment. The barge Table Rock, with fifty cords of stone on board, was left in reserve at the harbour. The con-