

The estimates of production on these two properties, however, falls short of the estimates made on the original E. & A's. On the Gardner there is almost no opportunity of increasing the estimate. The Mackinaw has opportunities for a large increase if the ore body is found to continue down on its dip, provided the Sulphur content does not increase to such an extent with depth as to render it inadvisable to continue mining operations. Although these two properties are operated as one mine, owing to the fact that they represent separate leases, each mine will be reported separately.

MACKINAW MINE.

The product for 1919 was as follows:

Mackinaw Low Sulphur,	28,560 tons	
" High "	21,608 "	
TOTAL ORE,		50,168 tons
Rock,		12,693 "
TOTAL ORE AND ROCK,		62,861 "

The ore shipped during 1919 and balance of ore in stock are as follows:

	<u>SHIPMENTS:</u>	<u>BALANCE OF ORE IN STOCK:</u>
Mackinaw Low Sulphur,	28,634 tons	2,289 tons
" High "	3,598 "	17,910 "
TOTAL,	32,232 "	20,199 "

The following is an estimate of the ore above 4th level, as well as prospective ore below the 4th:

	<u>MACKINAW LOW SUL.</u>	<u>MACKINAW HIGH SUL.</u>	<u>TOTAL</u>
Ore, 4th to 3rd levels,	14,776	29,554	44,330
" 3rd to 2nd "	6,641	13,282	19,923
TOTAL DEVELOPED,	21,417	42,836	64,253
Prospective Ore below 4th level,	98,822	197,644	296,466
" " above 2nd "	7,973	15,947	23,920
GRAND TOTAL,	128,212	256,427	384,639

The work in detail for the year was as follows:

SECOND LEVEL.

Work was started on this level in February 1919. The plat was first
GARDNER MACKINAW MINES.

cut, ground excavated for loading pocket at the shaft and pocket installed, after which drifting was started towards the ore body. The ore was reached in August, the total length of the rock drift from shaft to the ore body on this level being 440 feet. The drift has been extended along the foot, following the ore, until in December when the full breast of rock was struck. The drift was then driven a short distance to the South in to the hanging, after which it was decided to postpone further work at this point and to widen the drift in ore in preparation for opening shrinkage stopes. The total length of the ore body developed on the Mackinaw property on this level is 130 feet. By the end of the year the drift had been widened out and timber was being installed in preparation for starting stopes.

A careful examination made of the rock at the point where the ore was cut off indicates that the ore was cut off here on account of a fold in the foot. It is probable that by drifting ahead along the general strike of the formation ore will again be encountered beyond this sharp fold. As soon as stoping is under way on this level, drifting will be resumed here.

THIRD LEVEL.

The work of opening the 3rd level from the shaft was started in 1918 in which year the plat was cut, pocket installed and a drift started towards the ore body. Drifting was continued in 1919 and the ore reached early in June. In the meantime the 3rd level had been opened in the ore from raises put up from the 4th level, so that when the drift from the shaft reached the ore body it holed in to an ore drift along the footwall, which had already been driven. The work of preparing for opening stopes was pushed as rapidly as possible; it was necessary to complete this work and install timber for the chutes before it was possible to put motor haulage into operation. This work was completed and electric haulage was started in Sept. Stopes were opened as rapidly as possible and by the end of the year there were four contracts working in stopes above the 3rd level on the Mackinaw property.

The main haulage drift had not reached the limit of the ore body, and after stopes were opened to a point near the breast, drifting was re-

sumed and additional stopes will be opened as the drift advances. From the development work on the 4th level during the last month it was probable that the 3rd level drift can be extended about 100 feet, which will permit of opening two additional stopes.

FOURTH LEVEL

The 4th level was opened in 1918 to the ore body, and a drift driven along the footwall in ore for a distance of 260 feet. Drifting in ore was continued in 1919 until in May, when it was decided to temporarily stop further drifting. For some distance the drift along the foot had been in lean ore running from 1% to 2% in Sulphur. As the footwall drift advanced some shrinkage stopes had been opened. In order to prove out this system of mining one stope was put through from the 4th to the 3rd level. It happened that this stope was opened at a point where the ore had the least thickness between the foot and hanging. The ore at this point also happened to run quite low in Sulphur. This method of mining seemed well adapted to this ore body, and it was decided to follow this system at both the Gardner and Mackinaw Mines. Preparations were made for opening additional stopes as rapidly as possible, and more miners were taken on as soon as places could be provided. During the year there has been thirteen stopes started on the 4th level, Mackinaw, of which number five have been completed. Work is still underway in eight stopes. All of the first stopes opened happened to be located in the thinnest part of the ore body, i.e., where it had the least thickness between the foot and hanging. The stopes opened later in the year above the 4th level showed a remarkable gain in thickness between the foot and hanging; so that while the first stopes opened were completed in practically two months, some of the later stopes opened will require from six to nine months to complete.

For a considerable time after opening the footwall drift in lean High Sulphur Ore, it was not considered likely that any ore in this part of the mine would be of a grade that could be mined. Later in the year a crosscut was driven from this footwall drift over to the hanging, which showed the ore to be 35 feet in width and at this particular point the average under .5 in Sulphur. A remarkable change was noticed in the physical structure of

the ore body. All the ore which had been developed up to this time was a hard hematite ore, ranging from steel ore down to an ordinary hard red hematite. The ore in the crosscut above referred to seemed to be made up of alternate bands of limonite and hematite. It is considerably softer than any other ore previously developed, so that it is as yet impossible to state just what system of mining will be adopted, if the conditions disclosed by this crosscut are found to continue for any length along the strike of the ore body.

The outline of the past years work on the Mackinaw property, given in preceding paragraphs, shows that the ore body has been opened on the 2nd, 3rd and 4th levels. Stoping is under way between the 4th and 3rd and between the 3rd and 2nd levels; preparations for opening stopes above the 2nd is also under way. Under present existing plans, no connection will be made to the Mackinaw shaft on the 1st level. Connection will be made with the drift to the Gardner shaft on the 1st level, which will provide ventilation. It is planned to transfer the dirt coming from the 1st level Mackinaw through raises down to the 2nd level. The greater part of the ore body at the elevation of the 1st level is on the Gardner property, and only a small tonnage will be found on the 1st level, Mackinaw.

If sales are made of the ore, and it is decided to continue to operate these properties, it is very desirable that diamond drilling be done on the 4th level, Mackinaw, to determine the Sulphur content and general physical structure of the ore at depth. A drift should be driven in the hanging on 4th level a distance of 300 to 400 feet and a number of holes drilled from the end of this drift. It is recommended that this work be authorized and done during 1920 in order to permit of planning future operations on the Mackinaw property.