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GOLD.

GOLD.

THE ROPES GOLD MINE.

A great deal has been said from time to time and innumerable conjectures made respecting the existence of gold among the mineral deposits of the Lake Superior region. The discovery of veins of quartz fabulously rich in this precious metal has been so often reported, investigated and disproved that something more than the mere claims of interested parties are now necessary to establish public confidence or even to awaken any general interest in the reported "finds" of rich deposits of gold. And yet the faith that gold really does exist in our rocks in paying quantity, and the expectation that rich deposits of it would ultimately be found, has never ceased to prevail. Gold bearing quartz veins are of not infrequent occurrence. Specimens of quartz have been occasionally shown in which the native gold was plainly discernable to the naked eye. The early geologists are said to have made favorable verbal reports respecting their belief in the existence of gold, and the companies that were first formed to operate in this country were organized to explore and to mine for gold and silver. At later periods similar corporations have been formed and some exploring work done in different localities, but nothing was accomplished that proved of any permanent value except what has been learned in the matter of experience.

The first and only Michigan gold mining company to engage in systematic mining work and to actually produce gold bullion is the Ropes. It is a legitimate pioneer enterprise, undertaken by men of limited means who have faith in the enterprise, and believe they could carry it to a successful conclusion. The mine is in the S. ½ of the N. W. ¼ of S. 29, T. 48, R. 27, being about six miles northwest from the city of Ishpeming. The proprietor, Mr. Julius Ropes, had examined the property considerably during several years preceding his discovery of gold, and had collected and polished many beautiful specimens of serpentine and marble from the massive outcrop of these minerals which prevail in this locality. Great ridges of serpentine and marble may be traced for miles, and these minerals, as they are found here, it would seem are possessed of excellent quality in a sufficient degree to render this formation of economic value.

The whole formation has nearly an east and west trend, and is made up of bare, sharp ridges of serpentine, marble, magnesian schists, greenstones and quartzite, all correlated under the general term, serpentine formation.

The discovery of gold was made in 1881, at a point near the east line, 500 feet south from the northeast corner. To the west is the greenstone, and south of it the massive serpentine, followed by magnesian schists, in which

latter are found various quartz veins, including the one in which the discovery of gold was made, and in which it is supposed the mine is opened. The mine itself is 600 feet west from the point where the original exploring was done, across a valley in the high ground opposite.

The bluff in which the mine is situated slopes to the north and east to a narrow valley of low, wet land, in which the ledge is deeply covered with drift, and so wet that exploring work would be difficult to pursue; so that whether the mine is in the same vein that was first explored is only a matter of conjecture.

Regular mining was begun in October, 1882, and during the winter following a shaft was sunk 80 feet. In the succeeding summer a "five-stamp" mill was erected, Fraser's concentrator, which was run about two months on rock taken mainly from the shaft and east and west in the first level. About 200 tons were stamped, which afforded a yield, including concentrates, of $10 per ton—an encouraging outlook. Work was resumed in the following April, a new arrangement having been made whereby stock was sold to the amount of $40,000. With this money machinery was purchased from Fraser & Chalmers, Chicago, and the work has been continuously prosecuted since. A 25-stamp mill was completed and put in operation in November, 1884.

The mine has two shafts—one to first level, 100 feet deep, which is not now used. The other is the main working shaft, the Curry, which is now 260 feet deep—to below the fifth level. The hoisting is with bucket, worked from the engine house. The first level is only 30 feet below surface, and affords some of the best rock that has been found in the mine; much of the ground is standing. The mill is not capable of working up all the rock that could be mined. The vein is split in two parts in the upper levels which have the appearance of coming together further down. At 120 ft. east of the shaft the vein is cut off, but a small drift in south seems to strike it again, but not enough has been done to determine the matter.

It is possible that the regular vein lies northeast from the shaft, possibly a diamond drill would be the thing to use here east of the shaft. In the first and in the third level, 75 feet west of the shaft, the best rock was found, though now they are obtaining some equally good from the bottom level just opened. The dip of the vein is 80° south to the fourth level, when it changes and the dip is north, the foot becoming the hanging wall thence down to the fifth level. There seems to be some uncertainty regarding whether the levels are in the same vein. It is doubtful if the first level and the third west are in the same vein. On the fourth level they are in 60 feet east, and have carried the drift five to six feet in width, the vein being three feet to twelve feet wide; 80 or 90% of the rock broken goes to the mill, first through the Blake crusher, thence under the stamps, and finally to the concentrators and retorts, mercury being put in constantly to amalgamate the gold. From two-thirds to three-fourths of the gold and silver is held in the amalgam and is freed from the mercury by subsequent retorting. The concentrates are sent to Aurora, Ill., and thence to the U. S. mint. The bullion holds 39% gold, the remainder is silver.

The work has been largely experimental, mistakes have been made, due to the inexperience or incompetency of those in charge, which has run up the cost to a larger figure than was estimated. They have also had much trouble with the machinery, frequent breakages have occurred, requiring stoppage for repairs, resulting always in an increase of cost, since the stopping of the mill means also idleness to the mine. Recent alterations and repairs have put the mine in good shape now, capable of working off eighteen tons of rock per day, but greatly increased stamping facilities are required if the company is to make any money.

In July last a rich pocket was found in the first level west; 17 pounds of this rock gave $103 of gold. There were about 100 pounds of rock in the pocket that showed free gold. The October work was considered favorable. The mine yielded $2,500 in gold and silver; $2,300 of this sum was gold; 475 tons of rock were treated. In July, 1884, 60 tons of rock were stamped, etc., which brought $15 per ton. This was the last run of the old mill. The results show that there are rich pockets in the lode. Possibly, as Mr. Ropes thinks, if the mine were largely opened up there would be a sufficiently frequent occurrence of those rich pockets or shoots of mineral bearing quartz to pay. It is true of the copper mines that the ground is not uniformly rich. The copper is in "shoots," as they are termed, separated frequently by long stretches of barren ground, and I think the same is true of mineral bearing quartz veins. The rich mineral will not be found generally disseminated, but in limited portions of the vein. At the Ropes they have found small, isolated portions of the vein that would pay handsomely if they were large enough. As, for instance, the work of last month, when $2,500 were produced, and the total expenses are given as being $1,600; $3.37 per ton for expenses, against a yield of upwards of $5.26 per ton of rock stamped.

The company employs about 35 men. There are on the location 8 or 10 houses.

The following statement is furnished to me by the President as a general statement, taken from the company's books, of the year's work to Dec. 31, 1885:

No. of tons of rock treated	5,413
Total expenditures	$62,122 54
Total gold obtained	23,552 21
Total silver obtained	2,878 55
Total cost of machinery	15,507 71
Total construction cost	6,460 66
Total mining cost	40,154 17

The President states that they are doing better now than the average of the above figures indicates. During the first six months of the year want of a knowledge of the ground caused considerable unnecessary dead work in drifting and cross-cutting, and also a good deal of rock was run through the mill than later and larger experience would cause them to reject.

They understand the situation of the vein now better than heretofore and also have acquired skill in operating the mill, so that they feel confident of better results in future. The fifth level, Mr. Ropes states, is opening better than any ground they have had since having had the rich pocket in the first level. He states that an assay just made by himself, of rock from the fifth level, gave in gold $360 per ton; in silver, $14 per ton.

Of course this was a selected specimen, but it illustrates the fact that such do exist.

With the fifth level opened up, they estimate the stoping ground will suffice for 9 to 12 months, assuming that the fifth gives the same length as the others.

The management state that the mine is now paying expenses and something more, and they are hopeful of better results the coming year.

The capital stock of the company is divided into 80,000 shares at $25 per share; assessments made, 69 cents per share.

Julius Ropes, President; E. B. Howard, Treasurer; S. S. Curry, Superintendent, Ishpeming, Mich.

THE LAKE SUPERIOR GOLD

"find" created considerable excitement last summer through the rich specimens that were shown and the assays of the rock that were made, it being reported that the rock yielded $1,000 per ton. The location is three miles west from the Ropes, in the N. W. ¼, S. 35, T. 48, R. 28; the land belongs to the L. S. I. Mining Co., and some parties have an option for it. The rock is a light colored quartz, and while some rich specimens were found, an assay made of an average of the vein did not bear up the boom. A few assays of average specimens took the wind out of the sails and the excitement subsided.

THE PHILLIPS GOLD MINE

is just west of the Ropes over the line. At the time I visited it they were drifting from the bottom of a shaft 60 feet deep, in black serpentine. No quartz vein was found, and the work was subsequently abandoned.

There are many so-called gold mines, but usually there has been very little work done, the parties having merely made some tests of a quartz vein.

One of these in the N. E. ¼, S. 36, T. 48, R. 27, owned by the Canal Co., some exploration was done and excellent results at first obtained, but they did not continue.

Also in Sec. 18—48—27, Mr. A. B. Miner obtained some good specimens, and, apparently, a well defined vein, but it has not been tested much.

On Sec. 35, N. E. ¼ of the N. W. ¼, T. 49—26, is

THE COON MINE,

where some gold has been obtained, in pyrites, etc. They have sunk 35 feet in the ledge, and cross-cutted. Copper ore is found; zinc blende and galena also. It is a vein 5 or 6 feet wide and carries good copper ore.

The Coon is a corporation organized under the general mining laws of the State, with the title of the COON GOLD MINING CO., 80,000 shares, $25 each.

At 15 feet below the surface a rich streak was encountered which assayed $27 to the ton of rock. They claim a vein 12 feet wide, and give as a reason for not working that there is too much water to operate without machinery.

In the north part of the city of Marquette, in grading a street, a large quartz vein was encountered, many specimens of which were assayed and yielded gold.

At other points in the vicinity of the city gold bearing quartz veins have been found, talked about and slightly tested.

Tradition seems to locate the Eldorado of the peninsula in the Huron Mountains. It is in this region that those mysterious "finds," so rich and promising, of the early days, are said to have been made. There may be untold riches, veins fabulously rich in gold and silver, within the limits of this wild and secluded portion of nature's domain; but if so the genii that guard them seem possessed with the power to veil them effectually from the eyes of the eager searcher.

SLATE.

SLATE.

The slate formation of Baraga county comprises a wide belt, and extends from the Huron mountains west for many miles through Baraga county. At Huron Bay, and in the vicinity of L'Anse, where the deposits of this mineral have been more especially investigated, an excellent quality of merchantable slate is found in abundance, which has been examined and tested by experienced slate men, quarry men, architects and builders, etc., who universally pronounce it to be fully equal to any slate produced for nearly all purposes for which this rock is used.

Companies organized to manufacture roofing slate, etc., were formed as early as 1872, and work was begun at Huron Bay and continued for a year or two on a scale of some magnitude, but the company met with financial disaster, and the business, which was at a stand still, was again revived and work resumed at the former location under the auspices of a new company. But there is not, and never has been, enough done to sustain or to build up a prosperous business. I have examined all the places where work has been done, and there is not the least manner of doubt in my mind but that slate suitable for commercial purposes exists in practically unexhaustible quantities in the vicinity of L'Anse. Either way, east and west, for many miles, quarries could be opened and worked. Certainly Baraga county has in its slate deposits the basis of a great industry. There is no question regarding the quality of the material; the slate is generally of a jet black color, or a very dark blue black, but there are also lighter shades. It is fine grained, with smooth surface, free from pyrites or other deleterious minerals, and has the most perfect cleavage. The quarries would be within a short distance of Lake Superior, thus giving cheap transportation to the markets east or west; a large number of skilled laborers would find permanent employment, and the pleasant village of L'Anse would grow to be a large and prosperous town.

The manufacture of roofing slate is an industry that cannot well be carried on on a small scale, or perhaps it were better to say that it is an industry that can be more advantageously conducted by a number of companies all manufacturing and acting in concert. There are various reasons for this, but the most important one is that the slate is necessarily made of several sizes. The workman shapes the fragment to such size as it will make to the best advantage; and so a company will have ranked up in its yard slates of different sizes, running like window panes—6″x8″, 8″x10″ and so on. It cannot well do otherwise without great waste of material. It would be practically impossible to make any one size exclusively. They can simply manufacture right along, working up the material into such sizes as it will make to advantage, and so in time accumulate a quantity of each.

If it is required to fill an order, it is usually for some particular size of slate, it may be for a size that the company does not have, and one which it cannot in the course of its working manufacture, to the required amount, for a long time to come. Under such circumstances the order could not probably be filled, unless there were several companies who were working with an understanding in such contingences; that is they can, in a measure, pool their orders or sales. What one company does not have another may, and by drawing from one another in this way, they may be able to accommodate all customers. Also the making of slate is a handicraft by itself; the laborers must be trained to the business. Like weavers at the loom, the maker must know how to do it. Thus it is important to have plenty of skilled laborers on the ground to be got when required. If the business was extensively carried on at L'Anse, this class of workmen would congregate there; they would be on the ground, or be available when wanted, and the business could be pushed at any time if desired. Also the slate would be in the market; it could have a reputation that all would know and recognize. It would be known by builders and architects everywhere that the slate could be got of the quality, size and form desired, so that there would be no hesitation in using it in their bills of specifications, etc.

Of course the slate is not limited to roofing purposes alone. There are many other uses to which it can be applied, and to which it is admirably adapted, such as billiard and other tables, sideboard and bureau tops, mantels, window stools and lintels, etc. The material can be gotten out in blocks and slabs of almost any dimensions; it is hard and firm and like iron when struck with the hammer. When exposed to the action of the elements it weathers without serious disintegration. It takes a fine polish, is very tough and elastic; thin plates of it will resist breaking with remarkable force.

Pilasters, mouldings, tracery, images, monuments, etc., have been carved from some of the softer varieties to illustrate the adaptability of the rock for these uses, and the result is such as to leave no question of its practical utility for all such purposes.

The slate formation is made up of beds of slate rock, which at some points are found to be beds of workable slate. The planes of stratification and the cleavage planes are usually at opposite angles, but sometimes they are in the same direction and may even very nearly conform.

The corporation now holding the quarries at Huron Bay is known as

THE MICHIGAN SLATE COMPANY.

The lands of this company comprise those formerly owned by the Huron Bay and by the Clinton Slate and Iron Companies. The quarries are at Arvon, about twelve miles from L'Anse and five miles from Huron Bay, at an elevation above the lake of 500 feet. The company owns and operates a narrow gauge railroad between the mines and the bay, where it has also a dock for shipping, etc.

The quarry has now been working for four years, and during 1885 has made, of all sizes, 5,000 squares of slate, which is estimated as being the 1–100 of the total product of all the quarries in the United States. Prices have been low, but the company has been able to sell its product at a

margin, so the superintendent states. They hope for better prices in the future.

The number of splitters and dressers employed is	10
The number of quarrymen and other laborers	33
Diamond drill men	2
Total force	45

Capt. Hooper considers the company's facilities for handling the rock as excellent. The rock is loosened by powder blasts placed in what are called the "ribbons" in the formation and then is separated and worked out in huge blocks with wedges and picks, when it slides down into the bottom of the pit, from where it is elevated to the platform above and run to the dressing house or to the dump pile, according as it is slate or waste rock. There seems to be a great deal of waste, and immense heaps of waste rock have accumulated, derived mainly from the beds that it is found necessary to remove in order to quarry in those which are suitable for slate.

There are two trimmers, the men who finally trim the edges of the sheets and shape the slates; each trimmer requires two splitters—the men who split the blocks into sheets ready for the trimmer—and each splitter requires one dresser. The latter split the blocks across the joints into suitable size and shape to be rendered into sheets. The trimmers receive $2.25 per day. One trimmer will make 10 squares per day and clean up his own refuse.

The machinery comprises engine, which operates four drums for hoisting, etc. Some of the buildings are very good. The miners' boarding house is the best of the kind to be found anywhere in the mining region.

The officers are James M. Turner, President and Treasurer, Lansing; Thomas Hooper, Superintendent, L'Anse, Mich.

THE SILVER RIVER SLATE

is the name given to the property and explorations of Hon. A. C. Davis and others, on the Silver River, four or five miles east from L'Anse. These gentlemen hold a continuous strip of land through the middle of Sections 6 and 7, T. 50, R. 32, being two miles in length and a half mile in width. The river cuts through the formation in a succession of rapids, cascades and narrow gorges, affording a fine opportunity for studying the rock formation along its channel.

Mr. Daivs made some explorations at two points, three-fourths of a mile apart, one in each section, and near the river on the west bank. Both are opened in beds of veritable slate, though, probably, the strata are not the same, as the material differs very much in color and in texture. The upper pit is in a bed of hard black slate, which will split into sheets of great size and of almost any degree of thinness, perfectly uniform in surface, texture and color. The sheets have a clear, metallic ring when struck with the hammer, together with great toughness and elasticity.

The lower pit is in softer, blue-black slate, differing from that in the upper opening mainly in the degree of hardness. Some of this slate has been carved into various forms to show that it may be used for such purposes. The bedding planes dip at an angle of about 40° to the north, while the cleavage is south at about the same angle.

There has been just enough work done to demonstrate the excellence of the slate, and Mr. Davis is desirous of enlisting capital in the enterprise to carry on the business of slate making.

The river affords ample water-power that can be readily and cheaply directed to turning all the machinery that would ever be required for a large business, and the grade to L'Anse for a railroad, etc., is easy and inexpensive.

THE ST. PAUL SLATE CO.

has explored on Section 15, T. 50, R. 33, near L'Anse, on the line of the railroad and on the bank of Fall River, which empties into the extreme end of Keewenaw Bay.

This property has been thoroughly explored by Mr. R. R. Williams, an experienced and practical slate maker. The river runs through the section and the outcrop of the slate is found along its bottom and margins the entire distance. The banks of the river are generally low and the land is level, but near the north line of the company's property, near the northwest corner of the section there is an abrupt fall in the river of 50 ft., affording every facility for using it as water power. Below the falls the river runs in a deep gorge between its high, rocky wooded banks, making a wild, romantic scene of much interest and beauty.

One of Mr. Williams's best openings is just west of the M. H., & O. R. R. on the east and west quarter line of the section, half way between the center of the section and the east side. Thence west to the river, 80 rods, is a series of test pits, or openings, from which the slate rock has been quarried out in sufficient amount to show its quality, etc.

The trend of the formation is slightly northwest and southeast, and the dip, at the opening near the railroad, is slightly to the south, while the cleavage is also to the south at an angle of 45°.

The surface of the ledge, where uncovered, has been worn smooth by the ice and shows the scratches and grooves of the glacial action very clearly. The line of the marks is at right angles to the trend of the formation. There are also to be seen in the bedding planes and planes of stratification, lime spots, spread out thin, in appearance like insect fossil remains. They are shapeless, nearly like the hardened residue of a soft body, between smooth planes, subjected to great pressure.

No slate could be better than is here found, and I can readily agree with Mr. Williams, who has worked in the quarries in Wales and Vermont, when he declares it to be the best in the world.

It is the same blue black, beautiful color that much of the slate possesses that is found in this country. The surface is smooth, with just enough of plumbago in its composition to give it a pleasant and a beautiful appearance, especially when wet. The plumbago, contained, has a further advantage of rendering the slate more durable by resisting the absorption of moisture and thus escaping much of the destructive action of frost.

The pits to the west from the railroad are in wettish land; the slate, when exposed, shows the same glacial action previously mentioned and the slate in trenches and pits is of equally good quality.

Near the river a trench has been made exposing 70 feet across the formation. To illustrate its quality, blocks were taken out and split into sheets,

showing perfect cleavage—beautiful black slate. At one point a trench, 40 feet long, was on a beautiful green slate, precisely similar to the black except in color. It splits into thin sheets of fine green slate.

The land is level. The slate has a very slight dip. The falls at the river afford a fine water-power for working the machinery. The main line of the railroad crosses the property; it is but a short distance to the harbor at L'Anse. The slate is of the best, has been thoroughly explored and shown to exist in inexhaustible quantity. There is nothing wanting but capital to make of this location a successful enterprise.

There are other points in the Upper Peninsula where slate is found, but none that I have seen is at all comparable in excellence to that of Baraga county; these certainly are of superior value, and the best grades are probably not excelled in quality by any, native or imported. Slate making in the region about L'Anse ought to become, as it doubtless must, a great and prosperous industry.

COAL.

COAL MINES.

The coal mining business in Michigan does not make much of a showing. Some of the larger producing mines at Jackson have been worked out and abandoned within the last two years and there has been but little inducement to push the matter of opening new mines. The price of coal has been too low of late.

It is impossible for the Michigan coal mines, working a thin seam of coal, 2 feet to 3½ feet thick, and contending against a great influx of water, to compete with the Ohio coal mines, which are worked in veins that are 6 to 8 feet thick, and are also comparatively dry.

The Ohio coal is sold in Detroit at $1.80 per ton, a price which it is difficult for a Michigan mine to meet successfully.

The Michigan coal deposits seem to lie in shallow basins, sometimes so near the surface as to be directly beneath the drift, and thus to be so situated as to preclude the possibility of working, from the fact that there is no roof, no overlying rock, sufficient to support the soil, etc., above. Veins of coal situated in this manner have been opened in several places, and have been abandoned for this reason.

The most important of the coal mines at Jackson, the Slope mine, Eureka mine, and the Michigan mine, which I have previously described in the Commissioner's report for the year 1881, have been wholly idle during the past two years; it is supposed that the coal has all been taken out, especially is this the case at the Slope.

The Eureka was very wet and the company experienced much difficulty in working the mine. It is probable that the trouble with the water had much to do with the abandonment of the work.

The Michigan mine will be worked again when the company thinks it will pay.

There are now four companies engaged in coal mining at Jackson.

R. H. Emerson & Co.,—Jackson Coal Co.,—are the largest producers. The company is working a new shaft, near the city limits, that was opened three years ago and has been operated since the abandonment of the Slope mine. The company is working but a small force, having only mined in the past year 15,553 gross tons, enough to supply the limited demand which it has been enabled to create.

The chief trouble in working the Jackson mines arises from the water. If it could be drained to the shaft there would be no trouble in getting rid of it. If the shaft were in the lowest place this of course could be done, but it seldom or never so happens. The shaft is just as likely to be sunk in a high part of the coal vein as in a low one. The coal deposit

lies in long waves, the inclinations are not abrupt but are sufficient to disturb the flow of the water. Besides this there are frequent faults, usually slight, but it may prevent the drainage in the direction of the shaft. If the water could be run into a swump near the shaft and there elevated with a plunger, the problem of drainage of the mines would be a simple one. As it is the water has to be carried forward towards the shaft by a succession of steam pumps.

The mines are so near the surface,—40 feet to 80 feet below,—that they catch all the surface drainage and are soon flooded if any accident happens to the pumps.

Each mine has one hoisting shaft and further ventilation is secured by air shafts. They are sometimes troubled with a lack of ventilation, and an accumulation of "black damp." No explosive gases arise.

THE PORTER COAL COMPANY

now operates the old Woodville mine, one of the oldest and one of the largest coal mines that has ever been opened in the vicinity of Jackson. It is situated four miles west of the city and was first worked in 1837, but for eight years immediately prior to 1882 the mine had been closed down.

The mine is described, as are all the other coal mines in the vicinity of Jackson and elsewhere in the State, in the Commissioner's report for 1881; at that time, and in the following year I went through all the mines and made a complete examination of each.

The mine is in good shape now. The workings extend about 40 rods each way from the shaft and the coal seam averages about three feet thick. Mr. Jesse Hurd, the manager, states that the mine could produce as much coal as ever it did if the product could be sold at a fair price.

The Jackson companies pay 20 cents per car for mining the coal and reckon three cars to the ton, making the mining cost 60 cents per ton. The cars are hauled to the shaft by mules. These are used in all the mines.

Product of the Porter Coal Company's mine at Woodville:

Year.	Tons.	Year.	Tons.
1882	6,138	1884	15,000
1883	4,000	1885	13,000
Total tons			48,158

THE STAR COAL COMPANY

is a new organization working a shaft near the Jackson city line. The officers are, Ed. Elliott, President; N. Woodworth, Vice President; W. R. Kline, Secretary; John Cary, Treasurer.

The Company mined 5,125 tons in 1885.

THE STANDARD COAL MINE

at Jackson is a new undertaking that has not yet been fully equipped. It is on the line of the M. C. R. R., east of the city, and they are now laying a side track to the shaft. The shaft is 40 feet deep and the coal some 3 feet thick. Overlying the coal is a bed of indurated clay of a blue, slaty color, but not laminated or otherwise resembling slate. The bed is 8 feet thick. The material seems to be wholly free of grit.

As well as I could judge, without analysis or other practical test, it is a good article of fire-clay.

They are working 15 or 20 men at the mine and have mined 1,500 tons in the last year—1885.

The Superintendent is Robert Gage.

THE WILLIAMSTON MINE,

formerly operated by the Jackson Coal Co., has been abandoned. The last mining done was in 1883, during which year 883 tons were mined.

THE CORUNNA COAL CO.

continues to work its mine at Corunna, Shiawassee county, but complains very much of the condition of the business. It seems to cost the Corunna Co. more to mine its coal than it does at Jackson. The coal is harder and cannot be worked out with pick until it is blasted. The company has much difficulty in selling its coal. It supplies the freight engines on the Detroit & Milwaukee R. R., and there is a small local consumption. The mining is regulated according to the demand, that is, the company mines what it can sell and no more. Probably 150 tons per day could be taken from the shaft if there were sale for so much.

For a time previous to September, 1884, they supplied the coal for all the locomotives on the west division of the railroad, but they were underbid by Ohio coal men and lost the trade. Since then they have been gradually working up a small business with the railroad company (Detroit & Milwaukee), which is limited to supplying the freight engines.

The present bank was opened in 1882 and has been worked since. It lies west of the old mine and, it is claimed, has not proved as good. The coal seam runs from 2½ to 3½ feet in thickness. They have not worked much west of the shaft but mainly east, also north and south. Four mules are used in the mine for hauling the cars to the shaft. They do not work continuously, but off and on as they can sell the coal. The shaft is 67 feet deep and the workings extend about 40 rods east from the shaft and to a somewhat less distance to the north and south. They pay the miners 90 cents per ton for breaking the coal; the company trams it to the shaft; the men pay for their own supplies. The company has to make all its openings. The men get 90 cents per ton for breaking the ore after everything is in readiness for them.

About 8,000 tons were mined the past year. The mine has been more fully described in previous reports.

The coal burns rapidly, makes a quick heat, and thus, while it is not so

lasting, it possesses advantages in the way of getting up steam that commends it to this use.

The only additional fact of any importance beyond what has been previously reported in the Corunna coal district, is a diamond drill boring that was made north of the mine just one year ago. This boring was begun Nov. 28, and completed January 1, 1885, and extended vertically down 907 feet. It is the only instance of a diamond drill boring in the lower peninsula that has come to my knowledge. I have seen the core and find it to be argillaceous and arenaceous rock, mostly a very fine grained sand rock of a bluish grey color and rather soft. Very little of it possesses any appreciable amount of grit. It is all fine grained sand rock and slate. The drill for the work was obtained from Lake Superior, and the man who operated it was one experienced in such work. The core was preserved and Mr. Kincaid was very careful to preserve an accurate account of the boring. The following is the record which I copied from the books of the company at the office:

Soil, sand, gravel, etc.	26.0
Quicksand	1.6
Light slate	2.0
Dark slate	3.0
Fine dry slate	7.0
Sand rock	8.0
Black slate	7.0
Sand rock	8.0
Black slate	8.0
Blue slate	1.00
Sand rock	3.6
Blue slate	4.6
Sand rock	9.0
Blue slate	19.0
Fine grey slate	20.0
Blue slate	31.0
Sand rock	7.0
Blue sand rock	17.0
White sand rock	5.0
Yellow sand rock	6.0
Blue sand rock	2.0
White sand rock	69.0
Varied sand rock	7.0
Sand rock	13.0
Black grey sand rock	34.0
White sand rock	34.0
Dark sand rock	1.0
White sand rock	8.0
Blue sand rock	51.0
Common sand rock	20.0
Blue sand rock, uniform in color and texture	80.0
Blue—very hard—sand rock	12.0
Common sand rock	6.0
Alternate layers of blue slate and sand rock	39.0
Slate and sand rock	18.0

Blue slate	32.0
Sandstone—coarse grained sand rock	5.6
Black slate	0.6
Slate	1.0
Sand rock	9.0
Slate	10.0
Sand rock and blue slate	8.0
Clear slate	27.0
Dark sand rock	91.0
Sand rock	43.0
Black slate	12.0
Slate	14.0
Grey slate	5.0
Slate and sand rock	20.0
Sand rock	4.0
Total	907 ft.

The boring was discontinued at the above named depth, as the drill had already penetrated farther than it was intended to go when the work was undertaken.

There is a theory that has long been held at Corunna that at a depth of several hundred feet below the surface there exists a 6-feet vein of coal. It is claimed that a boring made years ago discovered this fact, and it was to test the truth of the matter that this late boring was made.

It is a valuable exploration, and has probably upset the deep vein theory. The parties who furnish the capital for operating the Corunna coal mine are residents of Youngstown, Ohio.

Tod Kincaid, general manager.

A shaft for mining coal has been sunk at Sterling in Arenac county. A good vein of coal, it was claimed, had been found. I have made diligent inquiry with a view of ascertaining if anything of sufficient value had been found to make it worth my while to visit the locality. I am informed by a gentleman long engaged in coal mining that he sunk a good many holes in the vicinity of Sterling, but found the coal vein too thin to work. I have not examined the "find" personally, but from information derived from parties resident at Sterling and vicinity, I learn that the coal vein is from 20 inches to 40 inches in thickness, at a depth below the surface of about 50 feet.

The overlying formation is slate and indurated clay. They designate the variety as cannel coal, but of how good quality I am not able to state.

A small force is employed in opening drifts from the shaft, and in this work have mined about 200 tons of coal. On the whole, it is stated to me, the indications are not very favorable.

The following table shows the product of the Michigan coal mines for the years indicated:

	Years previous to 1877.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Williamston mine							10,454	884		
Jackson mine		67,697	61,785	65,000						
Corunna Coal Co.			22,537	16,215	12,252	7,000	8,624	9,000	8,000	10,000
Other mines		1,500	1,000	800						
Jackson Coal Co.					66,780	61,666	60,103	40,412	13,712	15,553
Eureka Coal Co.					30,000	37,477	25,000			
Michigan Coal Co.					20,021	23,987	25,000			
Porter Coal Co.							6,158	21,000	15,000	13,000
Star Coal Co.										5,125
Standard Coal Co.										1,500
	350,000									

CLAY, STONE, SOILS, ETC.

CLAY, STONE, SOILS, ETC.

CLAY.

The clay that is found in Jackson county is likely to be of greater value than the coal. It already forms the basis of large manufacturing enterprises, and as the supply of clay, suitable for nearly all purposes, is practically inexhaustible, the manufacture of brick, pipe, tile, artificial stone, etc., etc., is soon to greatly increase at Jackson. The Jackson Fire Clay Co. does an immense business in the making of fire brick, common brick, drain tile, sewer pipe, etc., etc. The clay is brought from Spring Arbor, and from a point north of the city a few miles.

Another company engaged in this work is the

BENNETT SEWER PIPE CO.,

of Jackson, Mich. The clay proves very suitable for the purposes of pipe manufacture.

In all parts of the State abundance of clay occurs suitable for the manufacture of common brick, and is everywhere used for that purpose. In every neighborhood where the demand exists a brick kiln is found.

LIMESTONE.

Limestone which is suitable for burning and for mortar is not so frequently found in the lower peninsula as are outcrops of sandstone, and the lime made from it when it does occur is scarcely equal to Ohio lime. The latter is generally preferred for building purposes.

An abundance of limestone, both common and magnesian, exists in the upper peninsula, of every variety and texture, of the granular and crystalline forms.

Some of the deposits which are favorably situated for transportation may in time be utilized in manufacturing caustic and hydraulic limes for shipment into lower Michigan and elsewhere. The manufacture of lime and cement may become one of the industries of northern Michigan—certainly the stone suitable for these purposes is one of its resources.

BUILDING STONE.

Building stone is abundant in Michigan. Numerous quarries of sandstone

are found in Jackson county, some of which have been extensively worked for many years and afford a fine quality of building stone. Outcrops of sandstone or of limestone suitable for building purposes occur in many other counties, notably Shiawassee, Iosco, Kent, Eaton, Hillsdale, Barry, Saginaw, etc. The rocks of the Lower Peninsula are limestone, gypsum, sand-rock and slates, all of sedimentary origin and horizontally bedded.

The only disturbance to which they seem to have been subjected since the time at which they were laid down, was the denuding action of the drift period. To these eroding forces must be attributed the destruction of the coal deposits which primarily existed in far greater magnitude than are now found. The Lower Peninsula of Michigan is a drift-covered region, and the underlying sedimentary rocks not unfrequently outcrop in the central and more elevated portions of the State; these outcrops furnish the quarries from which building stone, etc., are obtained. This formation is the youngest of the Michigan series, and is that to which also the coal belongs, and that it suffered immense destruction during the glacial period is apparent from many facts. Sufficient evidence, however, is obtained from the drift itself, from the debris of the great moving ice masses beneath which the soft, yielding rocks of this formation were ground. In this drift all over the peninsula, mingled with the debris of the rocks of the far north, are found the particles, fragments and fossils of the rocks of the coal formation of the Lower Peninsula. It being the youngest and uppermost of the group and thus unprotected by later depositions, it bore the brunt of the erosive action of the great ice period. and in the drift material beneath which the scarfed and eroded surface is hidden from view, is abundantly contained the evidences of the action of this great denuding agency—a force which from the soft and yielding nature of the rock it was little able to withstand.

In the rocks of the Lower Peninsula are found all the elements requisite for building materials—stone, lime and sand. When the rocks are too deeply buried beneath the underlying drift to be available, the drift itself furnishes fragments and boulders in sufficient abundance to afford all the necessary material for foundations of buildings. Few structures in Michigan are without stone foundations from want of suitable material, close at hand, to furnish them.

In the Upper Peninsula building stone exists in endless quantity, varied and accessible and of surpassing excellence. The brownstone of Marquette and elsewhere in the peninsula may challenge comparison with any in the world for beauty, durability and general excellence.

The quarry at Marquette is continuously worked on a moderate scale and the stone finds great favor with the architects of Chicago, Detroit and Cleveland etc.

These brownstone deposits, of which there is but a limited area at Marquette, are placed in the potsdam period and are horizontally bedded, are very homogeneous and free from seams, which when present, tend greatly to diminish its value for the stone-cutter's use.

When first quarried the stone works freely but becomes harder on long exposure; it weathers well, not seeming to be injuriously affected by the action of the elements.

QUARTZ

appears annually among the shipments from the Marquette region; it is employed in lining the bessemer steel converters and for other like purposes. The shipments of this article first began from Lake Superior in about 1872, and the out-put has yearly increased since. It is said to answer the purpose for which it is used admirably.

The parties mining and shipping it are the Iron Cliff Co., the Deer Lake Iron Co., Hiram Burt and the Williams quarries near Marquette.

The products for the year 1885 were as follows:

	Tons.
Iron Cliff Co	4,316
Williams Quarry, Geo. P. Cummings	861
Deer Lake Iron Co	3,873
Total	9,050

SOILS.

Michigan has a great variety of soil; sand and clay, timber soil and prairie, pine land and swamp are found everywhere, intermingled in all counties in the State. In general it is of disintegrated and decomposed rock, with a variable portion of organic matter, derived from decayed and animal substance.

The chief constituent is silica, as a large portion of our soil is sandy, or approximately so. No doubt silica comprises 75% to 90% of the pine and oak opening soils. In addition are contained the silicates of alumina, iron, lime, magnesia, potash, and other substances in lesser degree.

The rocks which underlie the superstructure of the Lower Peninsula are deeply covered with the alluvial and drift, largely derived by decomposition and disintegration, from the rocks which out-crop so extensively in the Northern Peninsula.

The materials which make up our soil, the sand, the gravel, the mud and dust, the pebbles and great boulders, are mainly the fragments which once built up the rocky hills in our northern borders that for ages were subjected to the ever active and irresistible forces of nature that slowly diminished their volume and dissemminated the detatched particles and masses, which, borne forward by the rivers and winds, the waves, and the ice, have finally built up the rich and varied region which we possess.

Every particle of earth once constituted a portion, however small, of a preëxisting rock, perchance many times removed and re-formed in past time and destined, it may be, to enter again into rock masses in some future period.

The largest rocks ultimately lose their coherence under the action of natural agencies,—the mechanical and chemical forces of nature. In the mountainous districts the rocks are crumbled by the snows and frosts, to be crushed into smaller fragments and rounded or ground into dust by the forces of the moving ice, and thence borne forward by the torrents and mountain streams, the rivers, the waves and the winds to be spread over the valleys and plains, and thus to become soil that is to be further modified and enriched, as time progresses, by the growth and decay of animal and vegetable life.

But these mechanical forces are not the only disintegrating influences to which the rock masses are subject and to which we are indebted for the com-

position of our soil. The chemical forces of nature, though less apparent to the ordinary sense, are none the less productive of important results. Carbonic acid and oxygen, though invisible, are insidious and never ceasing in their action. The oxygen combines with the protoxide of iron that is found in our soil, changing it into per oxyde, a material much more conducive to the support of plant life. This protoxide exists frequently in the soil of swamps or the subsoil of lands, and is recognized by the brownish color which it gives to such soil. When, through the action of oxygen, it is changed into per oxyde, it gives a reddish hue to the soil. We readily see how quickly iron and many other metals oxydize and disintegrate on exposure to the atmosphere, and it is but natural to infer that the rocks and other substances must succumb to the like influence.

All rocks are composed of one or more of certain minerals, such as quartz, mica, feldspar, hornblende, calcite, etc. These minerals are variously composed of silica, lime, alumina, potash, soda, iron, magnesia, etc., and by the chemical decomposition of these minerals the valuable constituents which compose them are supplied to the soil in form available for plant food. Silica is a feeble acid that often holds in its uncertain grasp important alkalies to form silicates, as the silicates of potash, soda, magnesia, etc., which under favorable chemical conditions, that will occur in the laboratory of nature, are disintegrated and given to the support of vegetable life.

All the silicates which are soluble are decomposed by acids, and, indeed, the moisture which may hold a small percentage of carbonic acid or nitric acid slowly acts to decompose many of the silicates and give the alkali to the soil. This decomposition of a silicate by water and acids proceeds with rapidity proportioned to the quantity of acids which it contains. Carbonic acid and water are important agents in the decomposion of rocks. Especially is this true of the feldspathic rocks, those which are composed largely of the feldspar minerals—minerals which are compounds of silica, alumina, lime and soda.

Dr. Kedzie, of the Agricultural College, has accomplished a very important task in analyzing soils obtained from various parts of the State. He has taken soils brought from thirty-one different localities and subjected them to a complete and exhaustive analysis.

In connection with the simple analysis its popular characteristics are given, the kinds of timber which grow upon it, and the amount of cultivation to which it has been subjected, and the kind of crops which it has produced. Almost every variety of soil which the State affords is here dissected and the results brought together for comparison. To make these analyses was a work of great labor, which no one but a person actuated with zeal for the public good, that Dr. Kedzie always manifests, would have carried out. The results are highly interesting, and when properly interpreted, in the light of experience, are of much practical value.

Dr. Kedzie explains that the "chemical analysis of the soil is of value in determining whether a soil is capable of fertility." There are certain ash elements which are indispensable to plant growth, in the absence of which growth is impossible. If the supply in a soil is moderate the growth of vegetation will be correspondingly meagre. If, on the contrary, these "ash elements" are fully represented in available form, such a soil will be fertile. Here a chemical analysis of a soil is of value in determining the fertility of which it is capable, and of what elements it may be lacking to render it so.

Some of these analyses are of soils from the best portions, agriculturally, of southern Michigan, on which maximum crops have been raised for years; others are from the new counties in the north; but with few exceptions all alike show the soils to possess an excess of essential elements requisite for the production of any of our crops. Even the poorest are moderately rich in essential chemical elements.

Another important matter which Dr. Kedzie very intelligently discusses in connection with the fertility of soil is its capacity for the retention of moisture; and the result of his investigations, which are very thorough and complete, indicate that the soils in the newer counties in the north possess as great a capacity for the absorption and retention of moisture as those in the southern counties, whose fertility and excellence has been proved through years of prosperous cultivation.

The wells which have been dug, the borings which have been made, the many inland lakes, clear and sparkling, which exist, the great forests of hardwood timber which cover the surface, demonstrate that the water in the soil is sufficiently near and in sufficient quantity for the wants of vegetation.

The analyses of soils made by Dr. Kedzie verify what all the other facts also indicate, that the soil of the whole State is of the same origin, it contains, from wherever obtained, the same ingredients, differing in the proportions only for every variety. The analysis does not seem to indicate, any more than other facts would, whether the soil was taken from the southern counties or from the northern. All the facts go to show that there are equally good soils in all parts of the State, as there are also equally poor. The light sands to be found in places in the north are duplicated in the older counties. And the rich clay loams which have proved to be so productive in the southern counties are alike found in the north, with every indication of possessing an equal fertility. No better soil need be sought for than exists, in abundance, in the Upper Peninsula,—strong, rich loams, such as make the farmer's heart rejoice with gladness and fill his barns with increase and plenty.

Michigan has a great diversity of soil, and for the latitude, an agreeable climate. It is adapted to the production of a great variety of crops. No State possesses greater diversity in either of these particulars, the changes in soil are not confined to particular localities. Clay soils of all degrees of tenacity, timber soils of all kinds, light soils that are poor, sands with good sub-soil, or that have been mechanically triturated to a great degree of fineness, so that they are of the best; rich bottom lands, or swamp lands, etc., are found in all parts of the State alike, in every county, township, and in nearly every section. Almost every farmer has a great diversity of soil on his farm, adapted to a variety of crops; he has exactly the conditions for pursuing the best kind of farming,—a mixed husbandry.

Every part of the State—every variety of soil produces the best of wheat and all other farm crops. The Michigan prairies, unlike those of Illinois, yield their annual crops of wheat now as regularly and continuously as they did when the virgin sod was turned; but the rich, heavy loams of the middle and northern counties are proving to be the ones best adapted to this cereal. The desires of all for any kind of soil can be satisfied in any part of the State—from the quick, warm soil to the heavy loam.

The entire State, from the waters of Lake Huron to those of Michigan; from the once disputed border on the south to the Straits of Mackinac; from these charming waters to the borders of the great lake, is a region for

successful agriculture, where all the products most esteemed in the markets of the world may be raised in abundance. All the State is now accessible, since railroads traverse both peninsulas in all directions. One may seek a home in the southern counties, where is every convenience of the most advanced civilization, or in the northern borders, where is equally good soil, cheap lands, abundance of timber and a rapidly developing region.

The Upper Peninsula may almost be designated as the parent of the lower, for it is of the debris of the rocks of that northern region that its soil is largely composed. Everywhere through the drift of the Lower Peninsula, in the soil and over the surface, are found the fragments from the ledges and rocky hills of the north—pebbles, boulders, and masses of granite, sandstone, schist, diorite, jasper, trap, conglomerate, etc. etc., every variety and kind which abound in the far north, has its innumerable representatives in the drift of lower Michigan. And the comminuted and disintegrated particles of these primitive rocks, together with the ruins of the later rocks of lower Michigan, form the basis of that soil which makes such varied and ample return for all the labor of the husbandmen.

MARL.

In every part of the State, in many swamps are found beds of marl underlying the muck. These are of so common occurrence that deposits of marl are accessible in almost every neighborhood, and in an early day, in the older counties, the material was burned in kilns for the manufacture of "quick lime," and sometimes a very good article of lime was thus afforded. I have also known it used as a fertilizer, to be drawn out in the winter and mixed with the muck and spread upon the land, with excellent effect to succeeding crops. This marl is well known to farmers and ditch diggers; it is easily distinguished by its yellowish white color, and also it commonly contains many minute shells.

Dr. R. C. Kedzie of the Agricultural College has recently published a paper on this material, making many practically useful suggestions respecting its use, and also giving analyses of four samples obtained from different counties in the State. These analyses I regard of so much value that I here insert them:

	1.	2.	3.	4.
Carbonate of lime	79.60	56.16	90.00	80.00
Carbonate of magnesia	4.54	6.00	2.00	2.50
Oxide of iron	1.43	1.05	.....	.....
Clay and sand (insoluble in acids)	13.00	36.79	5.50	16.00
Organic matter and loss	1.43	.....	2.50	.....
Phosphate of lime	.....	.....	.....	1.50
Total	100	100	100	100

No. 1 sample was from Berrien county, 2 from St. Joseph, 3 from Lenawee, and 4 from Otsego.

As Dr. Kedzie observes, the value of marl depends upon the amount of lime and magnesia which it contains, and which occur mainly in the form of carbonates, a material that is easily tested by the application of a little acid, causing it, if present, to foam or effervesce in a greater or less degree, according to the amount contained.

Marl is valuable as a fertilizer; the important place which lime holds in a productive soil is well known. It holds a two-fold position; it is essential in the growth of the plant itself, and also greatly aids in the preparation of the humus contained in soil for plant food.

Dr. Kedzie, who is good authority in agricultural chemistry, states that when mixed with the soil, marl decomposes the sulphate of iron which may be present, and affords the alkaline condition essential to the nitrification and preparation of plant food.

I have seen it applied with good results to sandy lands and on low "sour" meadow lands.

Dr. Kedzie recommends 30 to 100 bushels to the acre to be spread on the surface; a good time is in the winter, when the frost may act upon it and aid in pulverizing it. He esteems the marl as preferable to burnt limestone, as it acts more slowly and with equal certainty.

To quote Dr. Kedzie's words: "For arable soils and light lands 30 bushels will do. On lands having a large excess of vegetable matter, such as muck beds, 100 bushels are desirable. There is little danger of injuring the soil by a heavy dose of marl, whereas an extensive dose of caustic lime may produce lasting injury. The marl is 'mild' and entirely wanting in the burning qualities of caustic lime."

GYPSUM.

GYPSUM.

I have visited the plaster quarries and mills at Grand Rapids since the close of the year, but I find nothing new to record in the manner of working, etc. I have described the quarries, all the details of the mining and manufacture, etc., in previous reports, and I discover nothing of especial interest to add beyond the bare statistics of production.

It will be observed that the production of land plaster has fallen off slightly in the past two years, due to competition in Iowa.

The Michigan plaster trade is now all done through an agency at Grand Rapids. The products are all pooled and each company is allowed an alloted share of the annual trade, both of land plaster and of stucco. The present prices are for land plaster, $2.50 per ton; for stucco, $2.40 per bbl. of 300 lbs.

TABLE Showing the Amount of Land Plaster and of Calcined Plaster, produced in Michigan, for each year since 1866, and previous years.

Years.	Land Plaster, Tons.	Stucco—Barrels, 300 lbs. each.
For years previous to 1866	*100,000	80,000
1866	14,604	.....
1867	17,439	.....
1868	28,837	34,996
1869	29,996	41,187
1870	31,437	46,179
1871	41,126	48,685
1872	43,536	59,767
1873	44,972	82,453
1874	39,126	82,449
1875	27,019	61,120
1876	39,131	64,386
1877	*40,000	*55,000
1878	*40,000	48,346
1879	43,658	50,800
1880	49,570	106,004
1881	33,178	112,813
1882	37,821	135,655
1883	33,225	201,133
1884	27,888	156,677
1885	28,181	141,575
Totals	790,744	1,533,195

*Partly estimated.

TABLE Showing the product of Land Plaster and Stucco produced by the different Companies in Michigan, in the Years indicated.

Name of Company.	Number of Tons of Land Plaster produced by Michigan Companies.							Number Barrels Stucco produced by Michigan Companies for Years given.						
	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Godfrey & Bro.	9,117	9,000	6,422	6,080	5,682	4,593	4,467	.....	23,000	27,500	30,274	37,000	30,433	30,942
Grand Rapids Plaster Co.	8,970	12,000	6,375	7,512	5,013	3,044	4,143	.....	23,500	20,400	32,854	40,000	24,390	26,498
Wyoming Mills Co.	7,000	10,000	6,093	6,801	4,400	3,052	4,059	.....	.....	.....	.....	12,000	13,108	11,193
Union Mills Co.	4,500	7,500	6,716	8,298	5,500	3,185	3,663	.....	35,000	34,913	23,074	30,000	23,176	15,654
D. Noble & Co.	10,585	9,570	6,572	6,037	4,000	3,202	3,900	.....	24,504	30,000	27,893	38,000	30,288	26,344
Smith, Bullard & Co.	1,586	1,500	1,000	2,993	4,600	4,122	4,346	.....	.....	.....	11,817	30,961	23,961	20,797
Alabastine Co.	.....	.....	.....	.....	4,032	6,690	3,606	.....	.....	.....	.....	13,172	11,321	10,147
Geo. H. White & Co.	1,900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	43,658	49,570	33,178	37,821	33,225	27,888	28,181	.....	106,004	112,813	135,655	201,133	156,677	141,575

SALT.

SALT.

In 1885 Michigan produced more than one-third of all the salt consumed in the United States, and within a fraction of one-half of all the salt that was made in the same territory.

The advantages which the manufacturers of salt in this State possess are due not solely to the plentitude and richness of the brine, but to the fact that the brine is procured in the vicinity of the great lumber mills in the Saginaw Valley, and at the lumber producing centers in the west margin of the State, thus securing cheap fuel—the slabs, pine saw-dust and waste steam. The same parties who own the mills own also the salt wells and carry on the manufacture of lumber and of salt simultaneously. The fuel costs them nothing; it would be otherwise, were it not put to this use, absolute waste. It is for this reason that salt in Michigan is made so cheaply and the producers are able to successfully meet foreign competition.

Heretofore it has been assumed that the salt basin was practically limited to the Saginaw region, but borings made on the west side of the State in the vicinity of Muskegon, Ludington, Manistee, etc., show that the salt basin, instead of being confined to the eastern part of the State, is equally productive on the west side of the State. There are six new steam salt blocks at Manistee, three at Ludington, one at Algonac, one at Frankfort, four at Marine City, etc., to go into operation the coming season. The estimated capacity of these new blocks is 700,000 barrels.

The total amount of salt consumed in the United States in 1885 was 9,850,000 bbls., derived as follows—to wit.:

	Barrels.
Imported from foreign countries	3,100,000
Manufactured in Michigan	3,300,000
New York	1,749,000
West Virginia	200,000
Ohio	530,000
California	176,000
Pennsylvania	170,000
Utah	96,000
Virginia	85,000
Louisiana	330,000
Kentucky	16,000
Illinois	50,000
Massachusetts	1,900
Total barrels	9,850,000

The total receipts from sales of salt in 1885 were $3,001,721.81.

The manufacture of this commodity began in Michigan in 1860. In 1869 the present law requiring all salt to be inspected went into effect. The following table shows the salt produced each year:

Years.	Barrels.	Fine, Barrels.	Packers, Barrels.	Solar, Barrels.	Second Quality.	Total, Barrels.	Average Price.
1860	4,000						
1861	125,000						
1862	243,000						
1863	466,356						
1864	529,073						
1865	477,200						
1866	407,077						
1867	474,721						
1868	555,690						
1869		513,989	12,918	15,264	19,117	561,288	$1 58
1870		568,326	17,869	15,507	19,650	621,352	1 32
1871		655,923	14,677	37,645	19,930	728,175	1 46
1872		672,034	11,110	21,461	19,876	724,481	1 46
1873		746,702	23,671	32,267	20,706	823,346	1 37
1874		960,757	20,090	29,391	16,741	1,028,979	1 19
1875		1,027,886	10,233	24,336	19,410	1,081,865	1 10
1876		1,402,410	14,233	24,418	21,668	1,462,729	1 05
1877		1,590,841	20,389	22,949	26,818	1,660,997	85
1878		1,770,361	19,367	33,541	32,615	1,855,884	85
1879		1,997,350	15,641	18,020	27,029	2,058,040	1 02
1880		2,589,037	16,691	22,237	48,623	2,676,588	75
1881		2,673,910	13,885	9,683	52,821	2,750,244	85
1882		2,928,552	17,208	31,335	60,222	3,037,317	75
1883		2,828,987	15,424	16,735	33,526	2,894,672	81
1884		3,087,033	19,388	16,957	38,428	3,161,806	73
1885						3,300,000	90
Totals		26,014,098	262,794	371,746	477,180	30,425,818	

The average depth of the salt wells is about 880 feet and the average strength of the brine is 91¼ degrees, while the Onondaga brine is given as 69½ degrees.

COPPER MINES.