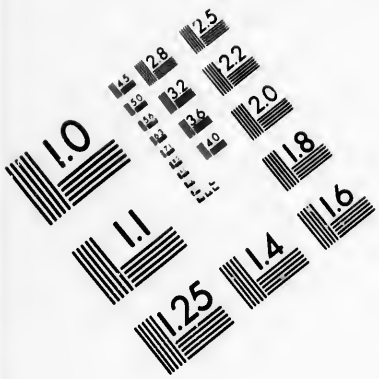

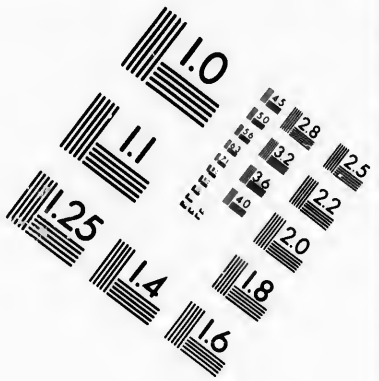

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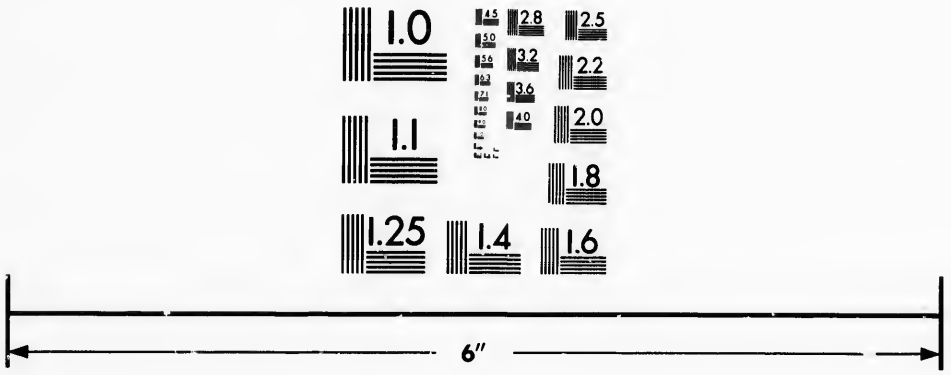

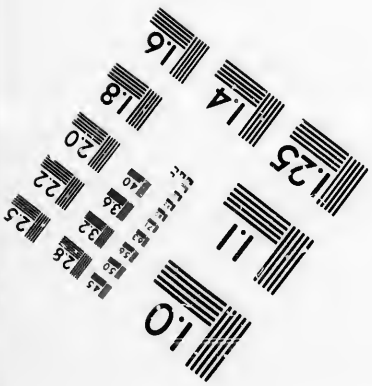

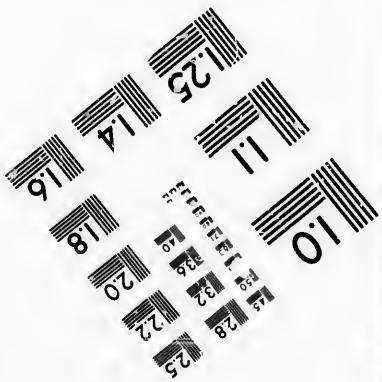

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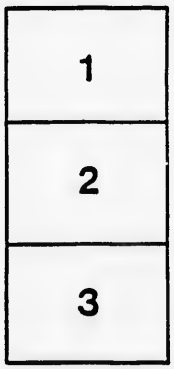

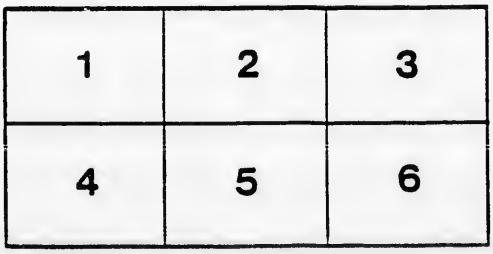

THE

MINERAL REGION OF LAKE SUPERIOR:

COMPRISING

ITS EARLY HISTORY,

Those parts of Dr. Douglass Houghton's Reports of 1841 and '42 relating to the Mineralogy of the District;

THE

REPORTS OF THE LINEAR AND GEOLOGICAL SURVEYS OF 1845; A NOTICE OF MINING COMPANIES—THEIR OFFICERS AND LOCATIONS; WITH AN ACCURATE LIST OF LOCATIONS AND LEASES UP TO

JULY 17, 1846;

AND

A VARIETY OF STATISTICAL INFORMATION, INTERESTING AND USEFUL TO THOSE VISITING THE MINERAL DISTRICT;

ACCOMPANIED BY THE

CORRECTED MAP OF THE MINERAL AGENCY OFFICE,

AND A

CHART OF LAKE SUPERIOR.

BY JACOB HOUGHTON, JR.

BUFFALO:
OLIVER G. STEELE.

1846.

PREFACE.

This volume is presented to the public, as the second edition of a work published by the author, early in the spring of the present year, in connection with Mr. T. W. Bristol. It comprizes, in addition to the same matter—which has received many important corrections, a brief sketch of the early history of the Mineral Region, notices of nearly fifty additional mining companies, lists of locations and leases with explanatory references, and much other valuable information. The favorable reception of the first edition has been the encouragement to a re-publication of the work, and it is hoped that the public will continue their kind patronage, for which, it need hardly be said, many thanks are due.

In speaking of the tracts on Isle Royale, it is mentioned that leases of them have been granted. When the article was written, it was confidently so reported, but the contrary is now known. Parties are, however, going on and establishing themselves on the tracts which they claim.

Buffalo, July 31, 1846.

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EARLY HISTORY

OF THE

Mineral Region of Lake Superior.

Long prior to the visit of the first white man to the north-west portion of the United States, the existence of mineral of some kind was known to the wandering tribes of Indians, who ranged over the country. When the first Jesuit Missionary penetrated the wilderness, he heard a wild tradition, related by the simple savage of the forest, that there was a large island in the great sea before them, where the Great Spirit resided. That the island was full of a bright metal, supposed to be gold. No one ever approached it and returned, for it was guarded by fire, and often times the deep roar of the Spirit in anger made the earth tremble as with fear. That sometimes the sun was darkened, and the whole earth covered as with a cloud by the smoke which ascended from the distant mountains. The natural reverence of the untutored savage was strongly excited by such awful exhibitions of the power of the Great Spirit they worshiped. When the sky was clear, they said the island, the seat of his power, was distinctly visible; but woe unto the man who dared approach it. Once

and once only, did the tradition tell of a brave and resolute Chief who reached this island, and loaded his canoe with the golden sand—but he had scarcely taken his leave, before the lightnings gleamed from the mountains, the earth tossed to and fro, and the sea, lashed into foam by the unseen spirit, fast following his frail canoe—destroys him. Such is the outline of the first information respecting mineral wealth on the shores or islands of Lake Superior. It was treated like the fabulous accounts of the fountain of Youth or the isle of Atlantis. But it would now seem that the tradition had more foundation than was supposed. It evidently refers in point of time, to the period when the volcanoes in that region were in active operation. We find now the unerring indications of volcanic action, and the time was when those dwelling on the shores of that inland sea, must have heard and witnessed the awful explosions and eruptions of a volcano, and seen the earth roll to and fro, and the sea lashed into foam by the convulsions of earthquakes. This tradition is alluded to by all the early explorers of that region, and particularly by Carver, Henry and McKenzie.

Passing from fable and tradition, of which there is ample to satisfy the most craving appetite, we find the first mention of the actual existence of copper, in the journal of Father Claude Allouez,* a Jesuit Missionary, who at that time established a mission at La Pointe. This worthy minister left Montreal in August, 1665,

*Rene Mesnard was the first white man who explored the Lake Superior country. He was there in 1660, and while at the Keewenan Portage, his voyagers were "making the portage," he wandered into the woods and never after was seen or heard of.

and took the usual route up the Ottowa river, through Lake Nipissing, down what is now known as French river to Lake Huron, and from thence to Lake Superior. This route, so little known to the citizens of the United States, even at the present time, is the one through which the immense trade of the Hudson's Bay and the North West Fur Companies is carried on with that region. It is more than four hundred miles less by this route from Lake Superior to Quebec, than by Lakes Huron, St. Clair, Erie and Ontario. On the 2nd of September of that year, Claude Allouez reached Lake Superior, which he says the Indians reverence as a divinity. He pursued his tedious and solitary way along the shores of the lake, noticing every prominent point or remarkable object. He informs us the Indians told him that there was a very large mass of entire copper near the shore of the lake, but that he searched for it in vain. That his information was correct has since been demonstrated; for the large mass of copper now in the Navy Yard at Washington, weighing nearly two tons, was found on the Ontonagon river, about sixteen miles from the shore of the lake, and in the immediate vicinity of his examination; for he states that after his search he proceeded and reached a large Chippewa village, called Che-gov-me.gon, about eighty miles west of the Ontonagon river, on the 1st day of October, 1665. Many other allusions are found in the journals of the early Jesuit Missionaries, of the existence of an abundance of copper throughout this region. We are struck, now, with the accuracy of their accounts, as in the instance of the existence of the large piece of copper mentioned by Father Allouez, as well as in the general description of the scenery on the coast.

In 1689, Baron La Hontan gave to the world a book of travels in Canada. He followed in the footsteps of Allouez, and describes many of the same objects. After describing Lake Superior, or as it was called more frequently, *Lac Tracey*, and the country about it he closes by saying "that upon it we also find *copper mines*, the metal of which is so firm and plentiful that there is not a seventh part base from the ore."

The tradition referred to, and the mention of the existence of *copper* and *copper mines* in the narratives of Allouez and La Hontan, are all I have been able to find on this interesting and exciting subject, prior to the commencement of the year 1700.

Prior to the commencement of the eighteenth century, the humble but sincere Missionary, influenced by no selfish motive, but kindling with a heroism that defied all danger, that could endure without complaint all toil, and anxious only to spread the light of the gospel throughout the habitable world, had planted the cross at numerous points from the Atlantic to Lake Superior. The records of the Missionary establishments must contain much information, of a highly interesting character. But we have had no access to them, and cannot pretend to draw from their rich stores of knowledge.

In 1721, P. De Charlevoix, following in the footsteps of Allouez and La Hontan, passed up the St- Lawrence, through the then usual route, visited Lake Superior, and finally crossed from the lakes to the Mississippi, and explored that river to the Gulf of Mexico. His published account is much more minute than those who preceeded him, entering more into detail as to the resources of the country he passed through. Speaking

of Lake Superior, he says, "Large pieces of *copper* are found in some places on its banks, and around some of the islands, which are still the objects of a superstitious worship among the Indians. They look upon them with veneration, as if they were the presents of those gods who dwell under the waters: they collect the smallest fragments which they carefully preserve, without, however, making any use of them. They say that formerly a large rock of this metal was to be seen elevated a considerable height above the surface of the water, and as it has now disappeared, they pretend the gods have carried it elsewhere; but there is great reason to believe that in process of time the waves of the lake have covered it entirely with sand and slime; and it is certain that in several places, pretty large quantities of this metal have been discovered without being obliged to dig very deep. During the course of my first voyage to this country, I was acquainted with one of *our* order, [the Jesuits,] who had been formerly a goldsmith, and who, while he was at the mission of the *Sault de Ste Marie*, used to search for this metal, and made candlesticks, crosses, and censors of it; for this copper is often to be met with almost entirely pure."

In June, 1765, Capt. Jonathan Carver left Boston to visit the country bordering upon the lakes. His route was through Albany to Niagara. Whether he passed through Lake Erie, or took the route through Lake Simcoe to Lake Huron is somewhat doubtful. The starting point of his travels, he says was Michillimacinac. From thence he coasted to Green Bay in company with several of the fur traders of the North West. He ascended the Fox river, through Lake Winnebago,

crossed to the Wisconsin river, and descended the latter to the Mississippi. He mentions particularly the lead mines in the vicinity of the Wisconsin. He ascended the Mississippi to the Falls of St. Anthony during the year 1766, and returned to St. Peter's river and remained with the Indian tribes in that vicinity until the spring of 1767. He then retraced his steps to the mouth of Chippewa river and up that river to an Indian town of that name. He crossed over to a head branch of the St. Croix river, "and descended this branch to a fork, and then ascended another to its source. *On both these rivers I discovered several mines of virgin copper, which was as fine as that found in any other country.*" This is the first mention of copper mines by Carver. His route from the head waters of the St. Croix, was to the sources of a river which he named Goddard's river, but which is probably the Bois Brule, and which he descended to Lake Superior. He says that the Ontonagon river is "remarkable for the abundance of virgin copper that is found on and near its banks, a metal which is met with also in several other places on this coast." "I observed," says he "that many of the small islands, particularly those on the eastern shores, were covered with copper ore." His book has often been called but a second edition of Gulliver's travels, and his account of the country supposed by many to be wholly the work of an active imagination. I think that full reliance cannot be placed upon his statements, although I have sought in vain to find any record or evidence of his having obtained a *permit*, or made a *location*, or organized *a company*, for the purpose of selling the stock; no imputation of this kind can be successfully brought

against him. That he visited the places, or most of them, he describes, there is now no good reason to doubt, though his statements generally are to be received with many grains of allowence. The publication of his travels produced such a sensation in England, that a Copper Company was forthwith organized for the purpose of working the mines. Several of the nobility engaged in this enterprize, and among others, the Duke of Gloucester, and Sir William Johnson. This was in 1771. This company engaged in their arduous undertaking with great spirit. They obtained a considerable quantity of pure copper, by digging in the alluvial banks of the Ontonagon river, and it is stated in the published account that "a Mr. Norberg, a Russian gentleman, "acquainted with minerals," found on or near *Point aux Iroquois*, a lump of *silver*, which, upon analysis, was found to contain *sixty per cent* of pure silver. It was taken to England and deposited in the British Museum, where it undoubtedly may be found at the present time.

A query has been raised whether this was not a mass of cloride of silver, and we hope that some one having access to the British Museum may examine it, and give the result of such examination to the public.

Mr. Alexander Henry, the historian of this English company, gives a minute account of their operations. He says, after having examined the Canadian shore, "they returned and then coasted westward, but found nothing until we reached the Ontonagon; where, besides the detached masses of copper formerly mentioned, we saw much of the same metal *imbedded in stone*.

Proposing to ourselves to make a trial on the hill, till we were better able to go to work upon the solid rock,

we built a house and sent to *Sault de Ste Marie* for provisions. At the spot pitched upon for the commencement of our operation, a green colored water which tinges iron of a copper color issued from the hill, and this the miners called a *leader.*"

In diggi' g they found frequent masses of copper. some of which were of three pounds weight. Having arranged every thing for the accommodation of the miners during the winter, we returned to the *Sault.* "Early in the spring of 1772, we sent a boat load of provisions, but it came back on the 20th of June, bringing wi.h it, to our surprise, the whole establishment of miners. They reported that in the course of the winter, they had penetrated *forty feet* into the face of the hill, but on the arrival of the thaw, the clay on which, on account of its stiffness, they had relied, and neglected to secure by proper supporters, had fallen in; that from the detached masses of metal, which to the last had daily presented themselves, they supposed there might be ultimately reached, a body of the same: but could form no conjecture of its distance, except that it was probably so far off, as not to be pursued without sinking an air shaft; and lastly, that the work would require the hands of more men than could be fed, in the actual state of the country.

Here our operations ended. The metal was probably within our reach, but if we had found it, the expense of carrying it to Montral, must have exceeded its marketable value. It was never for the exportation of copper, our company was formed, but always with a view to the *silver*, which it was hoped the ores, whether of *copper or lead*, might in sufficient quantity contain."

The operations of the English mining company, show the necessity of acting under the advice of those who are thoroughly versed in the science of mineralogy and geology. Had this company been guided by scientific men, the result would have doubtless been very different, for the digging for ore at the places mentioned are well termed by Dr. Houghton in his report, "as Quixotic attempts, and resulting, as might have been anticipated, in a failure, to find the object sought." Although more than seventy years have elapsed since that company abandoned their works, still the place on Miner's river, as well as on the Ontonagon, where they commenced their excavations, are distinctly visible. The names of several of the men employed, were cut in the rock at the mouth of Miner's river, where they are still to be seen.

The next accounts we have of these mines are from the pen of Alexander McKenzie, who embarked on a voyage in the North-west, in the year 1789. His object seemed to be more for the purpose of discovering new regions, than to lay open the resources of those already known; and he pushed on through the lake, and far into the country, whose waters flow into the Northern Ocean. For his daring spirit of adventure, he was knighted. He says, in speaking of Lake Superior, that "on the same side, (the south,) at the 'Tonogon, is found a quantity of *Virgin Copper*. The Americans, soon after they got possession of that country, sent an agent thither, and I should not be surprised to hear of their employing people to work the mines. Indeed, it might be well worthy the attention of the British subjects to work the mines on the North coast, though they are

not supposed to be so rich as those on the South."

I have sought in vain for the evidence of an appointment of an agent by our government, as mentioned by McKenzie, in the extract I have given from his travels. The first trace of any action of the United States Government about the mines on Lake Superior, was during the administration of President John Adams. On the 16th of April, 1800, Congress passed a resolution, which may be found on page 403 of the third volume of the Laws of the United States, "*respecting the Copper mines on the South side of Lake Superior.*" This resolution provides "that the President of the United States be authorized to employ an agent, who shall be instructed to collect all material information relative to the Copper mines on the South side of Lake Superior, and to ascertain whether the Indian title to such lands as might be required for the use of the United States, in case they should deem it expedient to work the said mines, be yet subsisting, and if so the terms on which the same can be extinguished: and that the said agent be instructed to make report to the President in such time that the information he may collect, may be laid before Congress at their next session." This action of Congress was taken at a time when a large increase of our navy, the right arm of our defence as a nation, was contemplated, and copper was in much demand for the use of our ships of war. Whether an agent was ever appointed, or if appointed, whether he ever visited the country is not known to us. It seems, however, probable from all we do know, that the jealousy of the Northwestern Indians, excited to acts of hostility by the English government, prevented the examination as contemplated by the resolution of Congress.

The only further action of our government in relation to the mines at this period, which we have been able to ascertain, was to test the quality of the copper, which might be produced. Mr. Custis, the Minister Plenipotentiary from the United States forwarded to the mint of Utretcht, in the Netherlands, specimens of the native copper found on Lake Superior, with a request that the same should be analyzed. The inspectors of the mint in communicating the result of the analysis, speak of the properties of the copper, as well as the manner of its production in the form in which it is found. "From every appearance," he says, "the piece of copper seems to have been taken from a mass that has undergone fusion. The *melting was, however, not an operation of art, but a natural effect caused by a volcanic eruption.* The stream of lava probably carried in its course the aforesaid body of copper that had formed into one collection, as fast as it was heated enough to run from all parts of the mine. The united mass was probably borne in this manner to the place where it now rests in the soil. The crystalized form observable every where on the original surface of the metal, that has been left untouched or undisturbed, leads me to presume that the fusion it has sustained was by a process of nature; since this crystalized surface can only be supposed to have been produced by a slow and gradual cooling, whereby the copper assumed regular figures as its heat passed into other substances, and the metal itself lay exposed to the air."

"As to the properties of the copper itself, it may be observed that its color is a clear red; that it is peculiarly qualified for rolling and forging; and that its excellence

is indicated by its resemblance to the copper usually employed by the English in plating. The dealers in copper call this sort *Peruvian copper*, to distinguish it from that of *Sweden*, which is much less malleable. The specimen under consideration is incomparably better than *Swedish* copper, as well on account of its brilliant color, as for the fineness of its pores, and its extreme ductility. * * * The examination of the North American copper, in the sample received from his Excellency, the Minister, by the operation of the cupel, and test by fire, has proved that it does not contain the smallest particle of silver, gold, or any other metal."

In 1819 our government had its attention again called to the region, and an expedition was fitted out under the command of General Cass, then Governor of the Territory of Michigan. The main object sought to be attained, was the settlement of the difficulties existing among the various Indian tribes, living on the borders of the lake and extending beyond the Mississippi. But while this was the object, the resolution of Congress of 1800 was not lost sight of, and instructions were given to collect such facts in relation to the country, as was contemplated by Congress in the passage of the resolution referred to. Hon. Henry R. Schoolcarft, had charge of this subject, and by his industry and knowledge of the country, collected a valuable mass of historical facts, all tending to show the existence of copper at many points, both on main land and the islands. His examinations were, however, of a cursory and superficial character, and not caiculated to determine accurately the location of the mines, if any existed.

His general conclusions are, that, though many large masses of copper have been found, yet, "no body of it which is sufficiently extensive, to become the object of profitable mining operations, is now known to exist in any particular place;" but that a mineralogical survey of the country would doubtless bring to light the particular locations of the mines, which he thought must exist in the country. We have been essentially aided in our examination, by the clear and able articles he wrote on this subject, though there is nothing in his report or description of the country, which would enable a geologist or mineralogist to form any accurate opinion or judgement respecting even the probability of the existence of mines.

In 1831, a second expedition was sent out by the United States government, for the purpose of ascertaining the sources of the Mississippi. It was under the command of Mr. Schoolcraft. The object sought for was successfully accomplished. Attached to this party was Dr. Douglass Houghton, whose name has since become so thoroughly identified with that region. The general character of the country, and its geological features were carefully observed, but further than this, little was added to the stock of knowledge already obtained, respecting the mineral resources of the country.

In 1836, Michigan as a sovereign and independent State, came into the Union, and within little more than a year, had organized a State Geological Department, for the purpose of more speedily developing the hidden resources of the State. Dr. Houghton was placed at the head of this department, and C. C. Douglass and Bela Hubbard was his assistants in mineralogy and geology.

The annual reports from this department made known the practical results of this enterprize, as well as the zeal with which it was prosecuted. In the course of these explorations, in 1840, the Geological corps carried their researches into the wild, but interesting region of Lake Superior. And the fourth annual report exhibits the progress of the work in that rich field of scientific observation.

As our knowledge of that region had hitherto been confined to the exceedingly imperfect and unlimited observations of voyaging travellers, mingled with much that was conjectural, or merely fanciful, the lucid statements of fact, and the extended and accurate information there brought to view, gave a peculiar value to this report. All that portion of the report devoted to "Mines and Minerals," will be found in the following pages.

We commend this report to the careful perusal of all those who are desirous of obtaining any knowledge of the subject. The Geological survey of Michigan was prosecuted with vigor until the State was paralyzed by the financial crisis which extended over our whole country. In 1844, Dr. Houghton devised the plan of connecting the linear surveys of the public lands of the United States, with a geological and mineralogical survey of the country, This plan was fully set forth in a paper prepared and read by him before the association of Geologists at Washington, in that year. The immense advantages likely to result from such a survey, if successfully carried into execution, was at once comprehended. The Commissioner of the General Land Office having obtained a promise from Dr. H. that he would undertake the work, recommended to Congress

an appropriation for that purpose. This was made and the survey commenced by Dr. Houghton. It was while engaged in this work, that Dr. H. lost his life, being wrecked in a storm on Lake Superior, on the 13th of October, 1845.

According to the plan of this work, a full and minute report was to have been prepared and returned by Dr. H. to the office of the Surveyor General. In lieu thereof, the administrators of his estate caused the reports of Messrs. Burt and Hubbard, which follow, to be prepared, and returned with the field notes and maps of the survey. These reports give a concise and comprehensive description of the country over which the surveys have been extended, and embrace the very latest reliable information.

Annexed hereto is a list of the Mining companies. This list cannot be expected to be complete, for new companies are springing up daily in every part of the United States, which fact renders it impossible to make out an entire list, and I have met with great difficulty in furnishing this imperfect one.

Under the administration of John Tyler, a treaty with the Chippewa Indians was made by Robert Stewart, in the summer of 1842. The treaty was ratified by the Senate of the United States, in February, 1843.

By this treaty, all of the country east of Fond du Lac, including the islands in Lake Superior, not previously acquired, was ceded to the United States. Immediately after the ratification of the treaty, applications were made for permits to explore and dig for copper ore on the south shore of Lake Superior. The Secretary of War considered these applications, and in the spring of

1843, issued three permits to Ansley, to Wilson and Carson, and to Turner and Snyder. These were the first permits that were granted.

Sometime in may, a party of explorers landed at Copper Harbor, consisting of Col. White, Capt. Sage and Mr. Havens of Dubuque. They went as the agents of Turner and Snyder. They, however, were unable to secure a location.

In the spring of 1843, Walter Cunningham was appointed Special Agent for the mines on Lake Superior, and on the 18th of June, in company with some twenty persons, he landed at Copper Harbor, where he established his agency. This agency remained at Copper Harbor until the spring of 1846, when it was removed by Gen. John Stockton, the present agent, to Sault de Ste Marie, with assistants stationed at Copper Harbor, at the mouth of Ontonagon river, and La Pointe. On the 18th of June, leases 1 and 4 were made; 4 for Ansley & Co., and 1 for Wilson & Co. Leases 2 and 5 on Eagle river, were taken by the same parties about ten days after.

About that time Col. Charles H. Gratiot, with a company of miners from Gratiot's Grove, arrived at Copper Harbor, and also a company consisting of Thomas Carrol and others, from Vinegar Hill, Wisconsin. This last company immediately preceeded up the lake as far as Ontonagon river. They here found James Paul and Nick D. Miniclier, who had reached there some time in the month of March, having crossed the country by land from Plattville. Paul and Miniclier were the *first* miners who came into the country, for the purpose of mining, after those under Henry, in

1771. They had come to take, and were in possession of the copper rock.

In the lead region of Wisconsin, Illinois and Iowa, in prospecting for that ore, which is there found in the metalliferous limerock, the miners sink their shafts in the "*sways*" or swales, and they not unfrequently sink to a depth of from 60 to 100 feet without meeting with a "lode," if not altogether unsuccessful. In imitation of this style of prospecting, Carroll and his men sunk several shafts in the clay banks of Ontonagon river, at what points I have been unable to ascertain. Like Henry, who had followed the same course before them, they met with quite a number of boulders of native copper, like him they were unsuccessful in striking a lode, and like him they returned without being able to accomplish anything.

On the 23d of July, Joab Bernard made lease No. 7. Gratiot, Bernard and Mandlebaum then coasted from Eagle river to La Pointe, and examined particularly the Porcupine mountains. From La Pointe they proceeded to Isle Royal, and thence home via. Sault de Ste Marie. On this trip Gratiot and Bernard concocted the plan of forming the Lake Superior Company, and they may truly be said to have been the founders of this company. They persevered through all difficulties, and though at times disheartened, they would return to their work with increased diligence, and urge on their co-partners.

In the summer, 1844, C. C. Douglass, formerly Assistant State Geologist of Michigan, was employed by the Lake Superior Company to explore their locations already made, and also to explore for the purpose of making further locations. During these explorations,

Mr. Douglass discovered quite a number of veins, several of which have since been proved to be among the richest in the country. Mr. Douglass had the management of most of the field work for that Company.

Sometime in July, the same Company employed Dr. Charles T. Jackson, of Boston, to examine the veins upon their locations, and to make out a report of the result of his examinations, and also to give his opinions as to the practicability of working the veins that *had been*, and might be discovered. He immediately left Boston, and visited several of the Company's locations, but was mostly confined to Lease No. 2, to which his report entirely relates. On account of the slight examinations which he was enabled to make, the situation of the country being unfavorable at that time, he could not make out as decisive a report as the Company had desired, and it was looked upon as rather unfavorable to the working of the mines.

During the winter of 1844 and 1845, Col. Charles H. Gratiot remained upon No. 2, with a company of miners, in order more fully to test the vein upon which they were at work. In the spring of 1845, the Company sent on a large number of miners and laborers, and also castings for mills. The forest soon echoed to the sound of busy life, and the haunts of beasts became the habitations of men. During the course of the summer, a saw mill, and also a stamping and crushing mill were erected, and improvements in every part of the country rapidly progressed.

Several Companies grew up, as it were, with the Lake Superior Company, and may be numbered as the first companies. These are The Pittsburgh and Boston

Copper Harbor Company, The Boston Company, The Copper Falls Company, The Bohemian Company, The New York and Lake Superior Company, The Isle Royal Company, and the Superior Company.

The best history of the companies for 1845 and up to this time, is furnished by the annexed list of mining companies, for it is impossible to collect reliable details. Thousands visited the country, and companies were daily organized, and the results of the "grand rush" are yet to be realized. It is hoped that they may all ultimately be successful, but it feared that the *visionary* hopes of some will meet with a gloomy disappointment.

The map of the Mineral Region, which accompanies, is the most correct, and the fullest that has yet been published, giving the locations made up to July 17, 1846. The locations are laid down according to the corrected Agency map, and can be relied on. As far as it relates to the township and section lines, the topography and geology, it is projected from the field notes of the latest United States surveys, and is correct.

Since the first issue of leases of tracts in this district, leases of all the tracts applied for on Isle Royal were refused. This was occasioned by a doubt as to the *right* of granting them, the permits being considered to limit the explorations for mining purposes, to the "south shore of Lake Superior." And, by the way, in the report of the committee on Public Lands, May 4, 1846, I find the following:

"The committee have diligently examined for the authority given by acts of Congress, for the expenditures of such large sums of money paid to agents, and for the power to grant leases on the copper lands, and

have been unsuccessful in their search, unless it may be derived from the act of 1807, entitled 'An act to prevent settlements being made on lands ceded to the United States, until authorized by law;' which provides, 'that in all cases where the tract of land applied for includes either a *lead mine* or *salt spring*, no permission to work the same shall be granted without the approbation of the President of the United States, who is hereby authorized to cause such mines or springs to be leased for a term not exceeding three years, and on such conditions as he shall think proper.'

It will be remarked, that this act extends only to '*lead mines and salt springs*,' and by it no express authority is given to lease the copper or other mineral lands, nor is there any authority found by the committee for the appointment or salaries of the numerous train of agents, surveyors, &c., which have been employed since 1843 in that service. Perhaps it was thought inferable, as in the permits for those explorations, and in the leases granted, it is expressed '*for lead or other ores*;' and as the President was authorized to lease the *lead lands and salt springs*, the authority to appoint agents to carry out the object was also inferred. The committee felt themselves constrained to object to this proceeding, as one dangerous and unprecedented, by which numerous offices have been created, and large sums of money drawn from the treasury, without any authority of law, as they believe." Also,

"The committee from respect to the action of one of the departments of government, will not venture to recommend an annulment of the leases which have been granted, although they believe them to have been made

without any authority of law. They yet feel it their duty to provide for the security of the government in the recovery of its rents, to require a renewal of the leases heretofore executed, to the extent of the period for which they were originally granted, and no longer; and to further provide, that such leases as shall not be renewed within a reasonable time, shall be declared void, and the President required to cause defaulting lessees to be removed, for which there is ample provision in the act of 1807."

It is also stated in this report that the amount, to that date, drawn from the treasury to be applied in defraying the expenses of this Mineral District, was $32,805,91; while the receipts for rents were $192,22. A bill for the sale of these lands, granting also the pre-emption right, is now before Congress, and it is hoped by all who feel an interest in the welfare of the Mineral Region, or the progress of the settlements and development of the resources of our country, that it will be passed and become a law.

But to return to Isle Royale. The leases of the tracts applied for, which cover the entire island, have lately been granted, and several companies have proceeded there with a view of commencing immediate operations. Isle Royale is well situated both for mining and commercial purposes, having some of the finest natural harbors in the world, within a very few miles of some one of which, the mines will be situated.

It is a favorite theory of some, that the mineral range of Lake Superior is a continuation of the mineral range of Mexico, and that, as it approaches Lake Superior, it separates into two branches, the one being the Keewe-

naw Point range, and that the other, to which Isle Royale is referred, passes along the south-west coast conforming nearly to its course. By some, however, Isle Royale is referred to the Porcupine mountain range. Explorers of the north and east shores report a trap range in the vicinity of Mamainse, which would correspond with the direction of the Keewenaw Point range, and also in the vicinity of Isle St. Ignace, which would correspond to the supposed direction of the other range. These explorers report flattering discoveries on the Canadian shore.

The Provincial Government, which has wrung from the Home Government the concession of managing the colonial lands, it must be allowed has conducted much more prudently and judiciously in regrad to their mineral lands, than our own government. Twenty seven permits only have been granted, and no more are to be, until returns are made and leases issued upon these. The permittees are authorized to locate a tract two miles at right angles with, by five miles following the course of the vein, not being confined to the north and south and east and west boundary lines. To secure a lease, he is obliged to survey his tract, and return a copy of the field notes of the survey, together with a report, describing the vein or veins he may have discovered, to the Secretary of the Province. By these regulations, together with the importance given to priority of discovery, the actual explorer is protected in his rights, and there are none or few of those conflicting claims which hase been a source of so great annoyance to our own citizens. It has been stated that in our own mineral district, leases have been issued on tracts of land upon

which a white man never trod. The period for which the leases will be granted, or the per-centum on the metals produced, which will be demanded by the Canadian Government, I have not yet learned.

Several Mining Companies have been organized, and have sent out exploring parties, the results of whose labors are yet to be made public. The Provincial Geologist, Mr. Logan, by order of government, is now on Lake Superior, where he is prosecuting surveys and explorations.

The chart of Lake Superior which accompanies, is reduced from the one executed by Lieut. Henry W. Bayfield, who was engaged under the British government in the years 1824 and 1825, in making a survey of this lake, and the most implicit confidence can be placed in its accuracy. For the rapidity with which this survey was carried on, and for its minute accuracy, it is unequalled. It has resulted incalculably to the benefit of the marine on this lake, as he meandered and carefully triangulated the entire coast, and took all of the necessary soundings.

Between the years 1800 and 1810, large schooners were on Lake Superior, engaged in the service of the Hudson's Bay and American Fur companies. A schooner called the *Recovery*, belonging to the British North Western company, was one those so employed. On the breaking out of the war, great fears were entertained for the safety and preservation of this vessel, and it is said this was accomplished by stratigem. In one of the deep, narrow bays on the north-east end of Isle Royale, which was then within the jurisdiction of the British, this vessel was secreted, after having her spars

taken out. Here, entirely covered over with boughs of trees and brush wood, she is reported to have lain until the termination of hostilities between the two nations, and was then brought out from her hiding place and again put in commission. Subsequently she was run down the Ste Marie rapids, and placed in the lumber trade on Lake Erie, under the command of Capt. Fellows. Her owner, I believe, was Mr. Merwin, of Cleveland. The fragments of the Recovery were for a long time visible near Fort Erie, opposite Buffalo.

Another schooner named the *Mink*, was also one of those on Lake Superior previous to the war. This craft was also brought down over the rapids, and was employed in the general trade of Lake Erie for several years, under the command of Tom Hammond, an officer who served in Perry's fleet. This vessel after being used here sometime, was finally sunk in Riviere Rouge, which empties into Detroit river, a few miles below Detroit, where her fragments remain. A third vessel, which had been in the same service with the Recovery and Mink, also undertook to pass down the rapids, but in so doing struck a rock and went to pieces. Her name is not given. From that time until 1822, Lake Superior was navigated only by a solitary sail, a small craft which also passed down the rapids, and soon became extinct among the young fleet then springing into existence on the lower lakes. In 1834, the fur business revived, and orders were issued by the American Fur Company, for the commission of a large vessel for Lake Superior. To Messrs. Ramsay Crooks and O. Newberry, of Detroit, were given the management of the matter, and the command, when ready for service, en-

trusted to Capt. Charles C. Stanard. The Astor was the first American vessel that was launched upon Lake Superior.

The *Astor* was a schooner of 112 tons, and was built by the American Fur Company, in the summer of 1835. Her builder's name was G. W. Jones. Her frame timbers and planks were got out at Charleston, Ohio, in the fall of 1834, and were shipped on board the schooner *Bridget* from that place, in April, 1835. and arrived at Sault de Ste Marie on the 1st of May. The timbers were then carried to the head of the rapids, where the Astor was built. Her keel was laid on the 17th May, and the vessel was ready to launch about the 1st August, and she sailed on her first voyage on the 15th August, on her upward bound trip to La Pointe. On the 26th August, Capt. Stanard discovered the celebrated rock, which has since excited so much curiosity, and has been so great a source of annoyance to the navigators of Lake Superior. This rock is minutely described in another place. Capt. S. did not go to it at that time, as it was near night, and the weather thick and the lake rough. But in the fall of that season he went on it. When first discovered it appeared to be a batteau capsized, and the sea breaking over it, with a rough lake and the weather so thick he was unable to make out what it was until within half a mile.

Capt. Chas. C. Stanard sailed the Astor until the close of the season of 1842; after which time, his brother, Capt. Benj. A. Stanard sailed her until she went ashore and was wrecked, at Copper Harbor, on the 21st September, 1844. No lives were lost; cargo mostly saved.

At the time of the gale, the Astor lay at anchor in

Copper Harbor. When it came on to blow very hard, her cable broke and she went ashore. Her hull is still to be seen on a low conglomerate cliff in Copper Harbor, immediately south of the entrance.

The American Fur Company had two small vessels built, of about 20 tons each, in the year 1837; one of which was so poorly constructed that it was never launched. The other, named the *Madaline*, was sailed by Capt. Angus, and was employed principally in the fishing trade—built by a Frenchman. In 1838, the same company built the schooner Wm. Brewster, of 73 tons. She was launched sometime in August, and sailed in September, Capt. John Wood, master. In September, 1342, the American Fur Company, supposing that she would rot before she could pay for hsrself on Lake Superior, the Brewster was run down the rapids, and subsequently put in service on Lake Erie. The timbers of the Brewster were got out at Euclid, Ohio, and carried up above the Sault, where the vessel was built. Her builder's name was Mason. The fleet now on Lake Superior, is composed of the following,—Steamboat Julia Palmer, 280 tons; Propeller Independence, 280 tons; Schooners Napoleon, 180 tons; Algonquin, Swallow and Merchant, about 70 tons each; Uncle Tom, Chippewa, Fur Trader, Siskawit, 40 tons; and White Fish, 50 tons.

Section illustrative of the order of super-position of the Rocks of the Upper Peninsula.

9.	Tertiary Clays and Sands.	Thickness in feet.
8.	Upper Limerock Group, (embracing as members, the Drummond Island and Mackinaw Limestones.)	
7.	Lower Limerock and Shales.	
6.	Sandy or Intermediate Limestone.	
5.	Upper Grey Sandstone.	mean 700 ft.
4.	Lower or Red Sandrock and Shales.	extreme 6,500.
3.	Mixed Conglomerate and Sandrock.	extreme 4,200.
2.	Conglomerate rock.	extreme 5,260.
1.	Metamorphic, Trap and Primary rocks.	

MINERALS AND MINERAL VEINS.

[*From Dr. Houghton's Report of* 1841.]

In considering this portion of the subject, I propose to treat the minerals of the different formations separately, so far as the same can be done, and although this method will necessarily cause some repetition, it will enable me to show, more perfectly than could otherwise be done, the connection between those minerals that may be regarded as of practical value, and the rocks to which they belong.

As a whole, the rocks on the upper peninsula are deficient in *number* of minerals, though some few individual *species* occur abundantly.

MINERALS OF THE PRIMARY ROCKS.

The following list can by no means be regarded as perfect, but it will serve, at least, to convey an idea of the small number of minerals which are found in connection with the rocks of this group.

Schorl,
Tourmaline,
Hornblende,
Actynolite,
Mica,
Feldspar,
" red,
Quartz.

MINERALS OF THE METAMORPHIC GROUP OF ROCKS.

Quartz, common,
" milky,
" greasy,
" tabular,
Serpentine, common,
Iron, scaly red oxid of,
" hæmatite,
" pyritous,
Steatite,
Novaculite.

Of the minerals enumerated as occurring in the metamorphic rocks, the milky variety of quartz is abundant, sometimes composing almost entire ranges of hills. The novaculite is also abundant, but of a coarse variety.

This last is associated with the talcose slates. The remaining minerals appear either disseminated, or forming druses in the quartz rock, though sometimes they occur in thin beds or veins, in the talcose slate, which beds conform to the line or cleavage of that rock. Although the hæmatite is abundantly disseminated through all the rocks of the metamorphic group, it does not appear in sufficient quantity, at any one point that has been examined, to be of practical importance.

MINERALS OF THE TRAP ROCKS.

Quartz, common,
" smoky,
" milky,
" greasy,
" radiated,
" mamillary,
" drusy,
" amethystine,
Chalcedony,
Cornelian,
Jasper,
Agate, common,
" fortification,
Augite,
Actynolite
Serpentine,
" pseudomorphous,
Chlorite, common,,
" earthy,
Analcime,
Harmotome,
Heulandite,
Steatite, common,
Asbestus,
Amianthus,
Calcareous spar,
Copper, native,
" pyritous,
" black,
" red oxid of,
" azure carbonate of,
" green carbonate of,
" " " ferruginous,
Lead, sulphuret of,
" carbonate of,
Iron, pyritous,
" red oxid of,
" hydrate of,
" silicate of,
Manganese, ferruginous oxid of,
Silver, native, (very rare,)
Stilbite,
Laumonite,
Prehnite.

Since a consideration of the minerals contained in the trap, will also involve a portion of those embraced in the conglomerate, the mixed rock, and red sandrock and shales, I will, before referring minutely to those of the trap rocks, lay before you a list of those which occur most frequently in the sedimentary rocks last mentioned. The fact that veins of mineral matter, traversing the trap, are frequently continued across the several sedimentary rocks, and that dykes are of frequent occurrence in these latter rocks, would lead to the inference that there would be a considerable degree of resemblance in the character of the minerals embraced in these dykes and veins, in both the trap and sedimentary rocks, and to a certain extent, this inference would be true; but it should be borne in mind, as has already been stated, that the veins, in traversing the several upper rocks, undergo very great changes in mineral character.

MINERALS OF THE CONGLOMERATE, MIXED ROCK AND RED SANDROCK.

Calcareous spar
Quartz, common,
" milky,
" drusy,
Chalcedony,*
Cornelian,*
Jasper;*
Agate,*

Copper, native,†
" pyritous,†
" blue carb. of,†
" green carb. of,†
" earthy green carb. of,†
" black,†
Zinc, siliceous oxid of,
" carbonate of,

*Occasionally occurring among the pebbles constituting the mass of the conglomerate.

†Chiefly in those portions of the veins traversing the conglomerate.

Iron, pyritous,
" black oxid of, (cemented iron sand,)
" red oxid of,
" hydrate of,
" silicate of,

MINERAL VEINS OF THE TRAP, CONGLOMERATE, &C.

In order to render the subject of the mineral veins traversing the above rock, so far intelligible as may be in my power, I have already been particular to define, as far as could be done without maps and sections, the relation which the trap rocks, together with the superincumbent conglomerate, mixed sand and conglomerate and red sandrock bear to each other, and it will be necessary, in considering the mineral contents of these rocks and the veins traversing them, to keep this relation constantly and clearly in view.

It will be recollected, that the northwesterly range of hills, commencing at the extremity of Keewenaw Point, and stretching from thence in a southwesterly direction into the interior, were referred to as being more clearly of trappose origin than either of the other ranges, and that the rock of the southerly portion of this range is either compact greenstone or altered syenite, while that of the northerly flank is almost invariably either an amygdaloid or a rock approaching to toadstone.

The several ranges of hills to the south of that last alluded to, are either well formed, compact greenstones, altered syenite, or (as we approach the primary range,) imperfectly formed granites. So far as the several ranges of hills, lying south from the northerly range, are concerned, they would appear to be, as a whole, deficient

in minerals, and the rocks are not apparently traversed by veins or dykes of any more recent date than that of the uplift of the northerly trap hills.

Veins clearly of a date posterior to the uplift of that portion of the trap rock last mentioned, are of frequent occurrence, and these veins not only traverse a portion of the trap range, but also pass into the conglomerate, and sometimes completely across the three sedimentary rocks, immediately above the trap, thus having an unbroken length of several miles. The class of veins to which I now allude, where they occur in a connected or continuous portion of the range, rarely vary more than 12° to 15° form a right angle to the line of bearing of the sedimentary rocks, and in pursuing this course, they necessarily cut across the dykes of trap before alluded to, as so frequently appearing between the strata, and conforming to the dip of the lower sedimentary rocks.

That the veins under consideration belong to a single epoch, is inferred from the fact, that none have been noticed with other veins crossing them, as also for the reason that none have ever been noticed with dislocations, heaves or disturbance of any kind, save what may be referred to causes connected with their immediate origin.

That these veins must be regarded in the strictest sense as true veins, cannot be doubted, and that their origin or source, over the extended district alluded to, has been the same, is inferred from the perfect identity of their mineral contents; for a description of one of these true veins may be said to be essentially a description of the whole, Thus, while the mineral contents of the different portions of the same vein change

as the rock traversed changes, the corresponding portions of different veins almost invariably bear a striking and close resemblance to each other.

These veins, as has already been stated, where they traverse connected ranges of the trap, are regular in course and direction, but when they are connected with a single uplifted knob of that rock, they are irregular and can scarcely be defined, appearing, in the latter instance, rather as matter injected into the fissures of a shattered mass of rock, than as connected veins.

The importance of carefully studying the relation which these veins bear to the rocks which they traverse, as also the relation which they bear to the numerous trap dykes, together with the few cotemporaneous veins noticed in the trap, is very much increased by the circumstance, that these veins are more or less connected with, or rather contain, metallic materials, which, it may be fairly inferred will hereafter become of very considerable practical importance. In fact, so far as we may be enabled to judge from the examinations already made in this district of country, it is confidently believed that most, if not all the metalliferous veins of the upper peninsula belong to veins of the epoch of those under consideration. It is true that native metals, more particularly copper, are sometime found, in place, occupying the joints or natural septæ of greenstone, but in these instances, the amount of metal is always comparatively small, and, with one or two exceptions, I have invariably been able to establish some connection between the native metal occupying these joints and the termination of some metalliferous vein that traverses other portions of the rock not far distant, and it is believed that the

metal filling these joints has invariably resulted from the action of causes precisely analogous to those which have placed similar metals in the veins to which I have alluded.

The earliest as well as all travellers, who have visited the district of country under consideration, have not failed to make frequent allusion to the loose masses of native copper that have been occasionally found scattered over it, nor has any one failed to allude to the large bowlder or loose mass of that metal upon the Ontonagon river. Almost invariably, the opinion has been expressed, from the frequent occurrence of these masses, that the metal must be abundant in the country. But, after all, the true sources from which these masses had their origin, or the relation which they hold to the rocks of the district, would appear never to have been understood; and all, or nearly all, that was known of their true relations, was left to conjecture. The result of this has been, that while some have excessively magnified every thing connected with a subject of which, in truth, nothing was known, another class, equally far from what is really true, have regarded these masses of native copper as bowlders transported from high northern latitudes.*

As far back as 1831 and 1832, I had occasion to pass,

*The vast area of country over which the bowlders of native copper, from the district under consideration, (together with its westerly prolongation,) have been transported, is worthy of remark. They are not of unfrequent occurrence in the sand and gravel of the southern peninsula of Michigan, and since the commencement of the geological survey, many of these masses have been met, some of which weigh from seven to eight pounds. In the vicinity of Green Bay, a mass was discovered, some ten years ago, which weighed 140 pounds, if my memory serves me correctly. Loose masses, of a similar character, have been met with in various other portions of Wisconsin, as also at various points in Illinois, Indiana, and Ohio. In these cases, the occurrence of these masses of native copper are no more indications of the existence of veins of the metal in the immediate vicinity, than are the immense numbers of primary bowlders scattered over the southern peninsula of Michigan, indications of the existence of primary rock in place, in the district where they are found.

no less than three times, along the south coast of Lake Superior, as also to ascend several of the important tributaries of that lake, and during these years, I passed by three different routes, widely separated from each other, completely across to the Mississippi river. It is true that these journeys, made through a complete wilderness, uninhabited except by savages, were necessarily made under circumstances that admitted of only very general observations; but the result of these previous examinations have proved of immense service to me, in aiding the labors of the past season. I allude to these journeys and examinations at this time, in order to show you the difficulties by which a full understanding of the subject under consideration is surrounded, for I became satisfied at that time, not only that the subject was not understood by the mass of those who had traversed the country, but that even the natives of the country had no knowledge of the true sources from which the transported masses of copper had their origin.

During the time of the examinations alluded to, a bare glimmer of light was thrown upon the subject by an examination of some small masses of copper, found occupying the joints of the greenstone; as also by the examination of a single vein in the conglomerate, containing the ores of copper, which has since been found to be the termination of a vein that is somewhat obscurely continued from the trap region. While these examinations were sufficient to enable me to draw the inference that the masses of native copper came chiefly, if not wholly, from the trap, and more rarely from those sedimentary rocks resting immediately upon it, it was supposed that this occurrence would follow the general law, and that

it, together with the other ores of the metal, would occur in greatest abundance near the line of junction of this rock, with the overlaying sedimentary rocks. Nothing, or at least very little, was known of the true extent or range of the trap rocks, and the very great inaccuracies in the published maps of the country, rendered it almost impossible to apply even the data on hand to such purpose as to relieve the embarrassment.

With a full knowledge of these difficulties, I determined, during the past season, to endeavor to surmount them by so far adding to our geographical knowledge of the coast of the lake and its immediate vicinity, as to enable me to place whatever geological observations of importance might be made, in such condition that the relations of the several parts might be understood. Having sufficiently accomplished this, I proceeded to a very minute examination of the several rocks overlaying or resting against the trap, together with a determination of the thickness of the several members, and their rate of decrease or wedging to the east. With these data, I was enabled, by noting the dip of the rock upon the coast, to determine, with sufficient accurary for the purposes to which the rule was to be applied, the line of junction between the trap and conglomerate rocks. This rule, when put in practice, enabled me to decide, with a very considerable degree of certainty, this line of junction, when the rocks were covered with a very considerable thickness of detrital matter; and when so covered, I was enabled, by traversing the country, on the line of bearing of the upper rocks, the more readily to gain access to such points as would admit of examination.

These observations soon showed me that this line of

junction between the trap rock and the south edge of the conglomerate, instead of pursuing a course parallel to the coast, only continued its parallelism for a few miles westerly from the extremity of Keewenaw Point, after which, for a long distance, it recedes from the coast rapidly. These facts served to explain in part, why the subject of the origin of the masses of copper had remained a mystery, for the country through which this line passes, is hardly ever passed over, even by the Indians, and probably large portions of it have never been passed over by the whites; but in addition to this, the obscure character of the metalliferous veins is such, that they would scarcely attract the observation of the traveller whose attention was not called especially to the subject; for many of the richest ores are so far from having the appearance of the pure metal, that they would be the last suspected to contain it in any form.

That the connection of these ores with the containing rocks was not understood by the English mining company, whose attention was turned to this subject at an early day, is to be inferred from the fact, that they commenced their operations at Miners' river, where the rock is the upper or grey sandstone, which has never been observed to contain mineral veins; and, also, on Ontonagon river, near the mass of native copper, at which point a shaft was commenced and carried about forty feet through a reddish clay, at which point the red sandrock was reached. Now, although the metalliferous veins sometimes pass from the trap across the red sandstone, these veins in the red sandrock have never been noticed to contain any other ores than those of zinc and iron, unless it be at the immediate point where the vein crossing comes in

contact with a dyke of trap, which condition does not exist at the point alluded to, on Ontonagon river. What indications could have induced these Quixotic trials at the points where they were commenced, is more than I have been able to divine, and as might have been anticipated, the attempts resulted in a failure to find the object sought.

Having thus, in a general manner, set forth the obscurity by which the subject of the true source of the transported masses of native copper has been surrounded, together with some of the reasons which have served to prevent its being fairly understood, I will now proceed to a general sketch of the metalliferous veins of the district, so far as the same have been examined; premising, that our knowledge of them is still deficient in very many important particulars, which can only be supplied by a careful and continued examination of the subject, which, in fact, can only be said to be but just commenced.

I have had occasion to refer to the outer or northerly range of hills, or those from which the metalliferous veins may be said to spring, as being composed of trap rock, and lest what has been said may not be fairly understood, I will repeat, that the more southerly part of the range is uniformly composed of compact greenstone, under which head I not only include true greenstone, but also those forms of altered granular gneiss and gneissoid granite, which sometimes are associated with it, while the outer or northerly portion of the same range is usually composed of an amygdaloidal form of trap. The cells of the amygdaloid are usually filled with the different varieties of quartz, cornelian, chalcedony and

agate, and sometimes, though more rarely, with native copper, or with calcareous spar, though they are sometimes entirely empty, constituting a perfect toadstone.

The metalliferous veins cross this range of trap, usually very nearly at right angles to the prolongation of the hills, and are frequently continued in the same course, across the upper or sedimentary rocks, thus crossing the latter at an angle varying but little from their line of bearing. While the continuity, of course, of the vein, may remain perfect in its complete passage from the greenstone across the several members of the conglomerate, mixed and red sandstone rocks, the character and mineral contents of the vein undergoes essential change, and not only does the vein appear to be influenced in its mineral contents, but also in its width, for, as a general rule, the width of the vein increases as we proceed northerly, or from the greenstone. Thus, a vein which may appear of only a few inches in width, or as a bare line in the southerly or greenstone portion of the range, increases in width rapidly as it approaches and passes across the amygdaloid, and at or near the line of junction between the amygdaloid and the sedimentary rocks, it will frequently be found to have attained a thickness of several feet, while in its passage across the sedimentary rocks it is usually either still further increased in width, or becomes so blended with the rock itself, as to render it difficult to define its boundaries.

These metalliferous veins, like those which occur under similar circumstances in other portions of the globe, do not continue uninterruptedly of any given width, for great distances, nor is their width increased regularly, for they frequently ramify or branch off in strings, that

pursue a course generally somewhat parallel to the general direction of the main vein, and which eventually again unite with it. Sometimes these ramifications or branches destroy, as it were, for a considerable distance, the whole vein; but they at length unite again, and the main vein is, after their junction, as perfectly developed as before.

While traversing the most compact, southerly portion of the greenstone, the veins are most frequently made up of a very compact and finely granuloted greenstone, sometimes associated with steatitic minerals and silicate of iron, under which circumstances they usually are destitute of any other metallic mineral, but occasionally, instead of the materials above mentioned, their place is supplied by native copper, without greenstone or matrix, and usually free from nearly all earthy impurities, but almost invariably incrusted with oxid, or carbonate of the metal. Those portions of the vein traversing the greenstone, in which native copper occurs, under the circumstances above mentioned are invariably thin, rarely exceeding three or four inches in thickness, and usually considerably less, and they are liable to very considerable variation in width, from the divergence caused by the vein traversing the joints of the rock, where these joints produce the same character of change as is produced by the ordinary ramification of a vein.

As these metalliferous veins traverse the northerly portion of the range, or approach the sedimentary rocks, they undergo a gradual change in width as well as in mineral character, and it has been noticed that where the amygdaloid is most largely developed, the vein, as a general rule, has not only a greater width, but also

has its mineral contents more perfectly developed; a circumstance which might fairly have been inferred from the fact that those points, where the amygdaloid occurs most largely, may be regarded to have been so many centres of intensity of action, at the time of the original uplift of the range, from which circumstance they would remain in a softened state, or in such condition as to admit of the more perfect formation of these cross veins for a longer space of time after that condition had been passed at other points.

In the outer or amygdaloid portion of the rock, the vein is almost invariably accompanied by a veinstone of quartz, involving all the varieties before mentioned, as associated with the trap rocks, which quartz, though occasionally it occurs massive, of several feet in width, usually appears in the shape of a series of irregular ramifying and branching minor veins, that may be said to constitute the main vein. These subordinate veins of quartz, which may be stated as the true veinstone, vary from a mere line to several inches in thickness, and in the aggregate they may be said to constitute from one-third to one-half the total thickness of the vein. In their branches and ramifications, they sometimes include portions of the rock which they traverse, at other times they embrace imperfectly formed steatite, with silicate, carbonate and red oxid of iron,* and occasionally, though more rarely, it is associated with carbonate of lime, usually assuming the form of an opaque rhombic spar.

As the main vein traverses the conglomerate and overlaying rocks to, and including the red sandstone. these veins, as a general rule, undergo still farther

* The latter closely resembling the Gossan, of the Cornish miners.

changes, for very soon after entering the conglomerate, the veinstone changes from its quartzose character, and is made up, either wholly, of calcareous matter, mostly rhomb spar, or of this mineral, with occasional ramifications of quartz. The whole usually including, and sometimes investing fragments of the conglomerate or the pebbles of that rock, separated.

As the vein is continued still farther in the direction of and into the red sandstone, these changes are still noticed, and eventually the vein is found to be composed either entirely or mostly of calcareous spar, and eventually so completely is its metalliferous character lost, that it would not, if examined singly, be suspected to be any portion of a metalliferous vein.

The metalliferous character of these veins is most largely developed almost directly at or near the line of junction of the trap and sedimentary rocks, and they rarely continue, without considerable change, for a greater distance than one-fourth to one-third of a mile, on either side of the line, though a few veins were noticed in which, in the southerly or trap extension, the character of the vein continued for a distance of over a mile, nearly unchanged, while in its passage through the conglomerate, for half that distance, its character was also perfectly preserved.

The mineral character of the veins is somewhat varied in those having different degrees of thickness, though it is difficult, if not impossible, to lay down any rule which would characterize this change. The different veins vary very greatly in width, ranging from a mere line to 14 or 15 feet, the greatest observed width of any single vein.

In the descriptions of the veins given above, I only intend to include those which are most perfectly developed; for, in addition to these, there also many which are imperfectly formed and short, and in which many of the above characters are in part or entirely wanting. These latter are usually of little practical importance, and thus far have been comparatively little examined.

Of the metallic minerals occurring in those portions of the *true* veins which traverse the trap rocks, together with that portion of the conglomerate immediately resting upon or against the trap, by far the most important consists of the several ores of copper, with which iron occurs disseminated in the forms before described, and occasionally, though more rarely, native silver has been detected, associated in the same vein. After as minute an examination of the subject, as the circumstances will permit, I am led to the conclusion, that the only ores of the metallic minerals, occurring in those portions of the veins, which traverse the rocks last alluded to, which can reasonably be hoped to be turned to practical account, are those of copper.

In these portions of the veins, the metal referred to, occurs very frequently in the form of native copper, with which are associated the red oxid, azure carbonate, green carbonate, and more rarely what may be denominated copper black, and still more rarely, pyritous copper. *None* of these have been noticed in a crystaline form.

It must not be imagined that these several minerals make up the whole or even any very considerable portion of the entire length and breadth of the veins, in which they occur, for they are distributed in bunches, strings, and comparatively narrow sub-veins, in a manner

precisely analogous to that in which these ores are usually distributed, in similar rocks, in other portions of the globe. The quartz veinstone, before described, has always so much of the green tinge communicated by the carbonate of copper, that it cannot fail to be detected; but the presence of disseminated native copper in this veinstone, would, at first, hardly be suspected, and it is not until a fresh fracture has been made, and the mineral closely examined, that the numerous dark points and minute threads are discovered to be copper in a native state. Large portions of this quartz veinstone, (when the included metal can scarcely be detected by the naked eye,) when examined with a glass, are found to contain very delicate threads of native copper, that traverse the quartz in every possible direction, and so completely is this latter mineral bound together, that it is fractured with difficulty, and its toughness is very greatly increased.

The specific gravity of this veinstone is very considerably above that of ordinary quartz, and usually, the difference is so considerable, even in those masses where the copper can scarcely be detected by the naked eye, as to be apparent to even the most careless observer. But in addition to this finely disseminated condition of the native copper in the veinstone, it is also disseminated in a similar manner through the rocky matter embraced by the veinstone and in the amygdaloid and conglomerate portions of the rocks, it sometimes extends, for a distance of from two to three feet into the rocky matter on either side of the veins, sometimes completely, or in part, filling the cells of the amygdaloid rock.

The conditions above described refer to the main portions of the veins only, while there are other portions

in which the copper appears to be concentrated in larger masses, constituting bunches and strings, and in which places the sides or walls of the veins are sometimes wholly made up of thin plates of native copper. In these portions of the metalliferous veins where the metal appears, as it were, to be concentrated, it also occurs, much in the form before decribed, except that the masses of metal vary from the merest speck to that of several pounds weight. In opening one of these veins, at a concentrated point, the observer, unless he had previously examined other portions of the vein, would be led to erroneous conclusions as to its richness, a source of error which cannot be too strongly guarded against; for while the vein, for a short distance, may be found to be exceedingly rich in mineral, the mineral in another portion of the vein may either wholly or in part disappear, a condition which is similar to that observed in those veins of copper that have been extensively worked and found to be the most productive, on the continent of Europe and the island of Great Britain.

The excess of native copper, (compared with the other ores,) which occurs, *in these portions* of the veins, is a peculiar feature, for it may be said, in truth, that other ores are of rare occurrence. In those portions of the veins traversing the trap, and where other ores do occur, it is usually under such circumstances as to favor the presumption that their origin is chiefly from that which was previously in the native form; for the carbonate and oxids, almost invariably appear either investing the native copper, or intimately associated with it, though they sometimes appear in distinct sub-veins. Pyritous copper is so rare, in connection with the trappean portions of the veins, as scarcely to deserve notice.

I have already stated that native silver, occasionally, though very aarely, occurs in the trappean portions of these veins, intimately associated with the copper, but it is in so minute quantities as to render it probable that it will not prove of any practical importance. Other mixed compounds of this metal occur so rarely as scarcely to deserve notice.

Leaving the trap rock, the character of these veins, as they traverse the conglomerate, undergoes important changes; for not only does the veinstone become gradually changed, from quartz to calcareous spar, but the amount of native copper diminishes, and its place is either supplied wholly or in part by ores of zinc and calcareous spar, or wholly by this latter mineral. There are, however, occasional exceptions to this *general* rule, for occasionally the place of the native copper in the veins, in their passage through the conglomerate, is supplied by a variety of complex compounds of the same metal, which compounds are of exceeding interest; but this change would appear always to be intimately connected with, or to bear some relation to, the dykes of trap which traverse the conglomerate rock. Several instances of this kind were noticed upon the northerly side of Keewenaw Point, either directly upon or near to the coast, as also at several other places in the interior, westerly from Keewenaw Point. A vein, which may without doubt be referred to as one of this character, (though in consequence of intervening bays and lakes between it and the ranges to the south, its connection with the main range has not been seen,) will serve to illustrate the character referred to.

This vein, which reaches the immediate coast of the

lake, upon the easterly cape of the bay known to the voyagers as the Grande Marrais of Keewenaw Point,* terminates, so far as examinations can be made, in the coarse conglomerate rock. The coast of the lake, for many miles on either side, is made up of abrupt cliffs of a similar rock, as usual, being made up of coarse rolled pebbles of trap, chiefly cemented with calcareous matter, which is usually associated, more or less, with the red oxyd of iron. Immediately south of the coast, a heavy dyke of trap traverses the conglomerate, which dyke corresponds in position with the line of bearing and dip of the conglomerate rock.

The vein, which, at its termination upon the immediate coast of the lake, has an extreme width of about 10 feet, may be traced, in the bed of the lake, in a direction north 5° east, for a distance of several rods, after which, in consequence of the depth of water, it is completely lost. This vein, at the point where it appears upon the coast, may be said to be in a concentrated state, or in a condition analogous to that before described, where the native copper occurs in the condition of bunches and strings, though the condition in which the metallic minerals occur is essentially different from that in the trap; for, instead of native copper, we have several mixed forms of the green and blue carbonates of copper and copper black, more or less intimately associated with calcareous spar, and in the adjoining rock, and in small ramifying veins, occasional small specks and masses of native copper, weighing from 1 to three ounces, occur, but those are by no means abundant. No quartz occurs

* Copper Harbor.

as a veinstone, and none of the ores have been noticed in a crystaline form.

It has already been stated, that these true veins, in traversing the conglomerate, frequently almost lose their character, and it becomes difficult to define their absolute width, or in other words, it would appear as if, at the time of the formation of the veins, the conglomerate had not been perfectly cemented, the result of which would be, that the mineral matter, which, under other circumstances, would constitute a perfect vein, would frequently appear in only an imperfect one, or the mineral which would under other circumstances, make up the vein itself, may have been injected laterally through the interstices of the rolled masses constituting the conglomerate, in which case the mineral would, in fact, take the place of the ordinary cement, thus simply investing the pebbles of the conglomerate. Now, although at the point under consideration, a wide and remarkable distinct vein is developed, the rock, for many feet on either side, has the interstices between the pebbles filled wholly, or in part, with various mixed and irregular forms of the ores, accompanied by calcareous matter, as before stated, and with occasional specks and small masses of native copper.

Those veins traversing the conglomerate take on a similar character, to a greater or less extent, rather frequently, but the place of the copper is more usually supplied by the siliceous oxyd, and more rarely by the carbonate of zinc, which compounds, sometimes may be seen forming a perfect or partial cement to the rock, for considerable distances on either side of the vein. These ores of zinc, like those of copper, are uniformly

amorphous, and almost invariably more or less associated with some form of carbonate of lime, with which they may, under some circumstances, unless closely examined, be confounded.

Although these copper and zinc ores occasionally appear in considerable quantities, in those portions of the veins traversing the conglomerate, they usually embrace or simply incrust portions of the rocky matter; or rather the rocky matter and those ores appear to be coarsely and mechanically mixed. These veins furnish beautiful cabinet specimens of the blue and green carbonates of copper, and more rarely of pyritous copper, together with the other varieties mentioned.

Having already devoted a larger space to the consideration of these veins than had been intended, I will simply add, that in pursuing their course northerly, across the mixed rock and the red sandrock, their mineral character is nearly or quite lost, the veins as before stated, being made up either entirely of calcareous spar, or of that material containing very meagre ores of zinc.

The district of country to which these veins have been referred, thus far, only comprises the ranges of hills south of Lake Superior, but veins of a very similar character, and of similar contents, also occur upon Isle Royale. The order and changes in the character of the veins upon Isle Royale is necessarily reversed, or in other words, the southerly point of the vein corresponds to that of the north point in the district south of Lake Superior. The mineral veins of Isle Royale have not been examined with sufficient care to enable me to determine with much certainty, their average width or value. Those examined were mostly narrow, the widest

not exceeding eighteen inches; but in these the mineral contents are essentially the same as in those upon the south side of the lake.

Native copper, in very thin plates, was occasionally noticed, occupying irregularly the joints of the compact greenstone of Isle Royale, but invariably in comparatively small quantities. It should, however, be noticed of Isle Royale, that the veins, so far as examined, are less perfectly developed in their passage across the conglomerate, and that they very rarely contain any traces of zinc.

Upon the north shore of the lake, no attention was given to the subject of mineral veins, but, from the character of the geology of that district, it may be inferred, that they will also be found in portions of it, and that, where they do occur, they will be uniformly either directly upon or not far from the coast of the lake.

In addition to the *regular* veins already described, irregular veins frequently occur, traversing the whole, or portions of the outliers of trap, or those knobs which appear to have been elevated singly; and, although these veins may, without doubt, be referred to the same epoch as the regular veins before described, they nevertheless frequently differ considerably in mineral contents.

The limits of the present report will not permit a separate description of these several distinct trap knobs. I will, therefore, confine my remarks to that already refered to, as occurring upon the south coast of Lake Superior, immediately northwest from Riviere Du Mort, and which forms the promontory known as Presque Isle.

In nearly all those portions of this knob, where the trap, conglomerate and sandstone, are exposed in such

a manner as to permit examination, each of the rocks are seen to be traversed by innumerable irregular ramifying veins, which in the sandstones are made up of quartzose and calcareous matter; but many of which, near the junction of the igneous and sedimentary rocks, are metalliferous, and this metalliferous character is more fully developed as the veins are extended into the trap rocks.

The metalliferous portion of these veins, rarely exceed three to four inches in width, and they ramify in such a manner that the mineral uniformly occupies situations similar to bunches or strings, at the junction of the ramifications. The minerals contained in the metalliferous portions of the veins, are sulphuret and carbonate of lead, earthy green carbonate of copper, pyritous iron, and more rarely, pyritous copper. Occasionally there is a quartzose, or mixed quartzose and calcareous veinstone; but more usually the several metallic minerals are blended in a base of rocky matter. The sulphuret of lead is distributed either in the form of small cubic crystals, while the other metallic minerals are usually distributed either in irregular masses, or investing portions of the rocky matter. These associations are referred to, as showing the character which these irregular veins assume, rather than from any supposed value which they may possess for practical purposes.

In addition to the minerals referred to, the trap of Presque Isle occasionally contains asbestus, common serpentine and imperfect agates; the two former minerals usually occupying the narrow joints of the rock.

Before referring to the economical considerations connected with the veins which have been described, I

will briefly refer to another situation in which the ores of copper have been observed in intimate connection with the trap range of rocks.

The southerly side, or greenstone portion of the trap range, appears to have been elevated in such a manner as to have caused but little disturbance to the sandrock lying between that and the range of simply altered rocks lying still farther to the south; but near to the junction of the sandrock and greenstone, there is usually a red slate resting against the trap, and which may be said to fill up, in a measure, the irregularities in the ranges of hills. This slate, which is sometimes seen of 100 to 200 feet in thickness, though usually it appears as a mere band, is traversed by irregular and imperfect veins, of what may be denominated a ferruginous steatite, containing placentiform masses of greasy and milkish quartz, that sometimes contain more or less of the ores of copper. The earthy carbonates of copper are also sometimes so intimately connected with these veins of steatitic matter, as at first to be scarcely recognized. More rarely, distinct, very thin veins of green carbonate of copper occur, well characterized, in this red slate, though these veins are never of any great length. The red shale extends, more or less perfectly, along the whole length of the trap range, skirting that range of hills upon the south, but I have not yet been enabled to devote sufficient time to its examination to enable me to determine whether any portions of these veins can be regarded as of practical importance. The examinations which have been made, would lead me to look unfavorably upon these veins, and I regard them as having an origin completely distinct from that of the veins which traverse the northerly escarpment of the trap rock.

Having thus considered all the general circumstances under which the several ores of copper, zinc, lead, iron, manganese and silver have been noticed, in connection with the trap rock and the sedimentary rocks, immediately resting upon it, it becomes important to consider how far inferences may be drawn from these examinations, as to their occurrence in such quantities as to be of practical importance. I have already stated that so far as regards the ores of lead, iron, manganese and silver, I am lead to conclude that at none of the points examined do they occur in veins, or otherwise, sufficiently developed to warrant favorable conclusions as to their existence in sufficient quantities to be made available, and from all that is now known of the country, I am led to infer that neither of these, unless it be iron, will be so found.*

The examinations which have thus far been made of those portions of the veins containing ores of zinc, have not been extended sufficiently to enable me to determine with much satisfaction, their extent as a whole. At several points in the veins these ores are sufficiently abundant to admit of being profitably worked, but I would be unwilling, from an examination of a few points, to attempt to determine the character of the whole.

In considering the practical value of the copper ores of the upper peninsula of Michigan, where we are as yet compelled to judge from our examination, of what may be said to be the simply superficial portions of the veins, we can arrive at no safe conclusions, except by comparisons of the district with those districts similarly sit-

*These remarks are intended to apply directly to the trap region. Beds of bog iron ore occur, east from Chocolate river, which probably may at some future day be profitably worked.

uated, which have been extensively worked in other portions of the globe. Comparisons of this charcter, to be really useful, must necessarily be sufficiently minute to enable us to understand the relations which the ores in the districts compared, bear to each other, in all respects, which circumstances render it necessary that a degree of minute information should be at hand, that is not at all times to be obtained. As the information on hand, with respect to the copper and tin veins of Cornwall, England, is more minute than that of any mineral district known, I propose, in order to avoid confusion, to confine my comparison to this district, simply, premising that however closely the two districts may resemble each other in character, it does not follow, as an axiom, that because the district with which we compare our own has been largely and profitably productive, that of Michigan must necessarily be so too; for it will be seen, as the subject is pursued, that there are not only several points in which it is impossible with our present knowledge of that of Michigan, to institute comparisons, but there are also some points on which there is a considerable degree of discrepancy.

The comparison instituted, in the main, is intended to refer rather to the character and contents of the mineral veins of the two districts than to the geology, although some general reference becomes necessary to the geology of the districts, to render the comparison perfect. The topography of the Cornish district bears a close resemblance to that of Michigan, both districts being marked by their irregular and broken outline, and by the occurrence of more or less frequent, nearly insulated knobs, rising to a considerable height above the elevation of the general ranges.

Although the older rock of Cornwall, or that from which the metalliferous veins of the district may be said to have their origin, is more distinctly granitic than that of the metalliferous region upon Lake Superior, the elements of which the rocks are composed, may be regarded as essentially bearing a very close resemblance; a resemblance which it is conceived, would have been still more perfect had the granitic rocks of Cornwall been subjected to the action of secondary causes similar to those of the region under consideration. The rocks resting upon or against the granitic rocks of Cornwall, consist of clay slates, hornblende rocks, &c., which bear little real analogy to the rocks resting directly upon the trap of Lake Superior, but it is conceived that the composition of these upper rocks has little bearing upon the origin of the metalliferous veins, and may be regarded as in a measure unimportant; and however much these rocks may differ, they are traversed alike by the metalliferous veins of the lower rocks in such a manner, that the close resemblance cannot be mistaken.

It is a matter of history that the ores of tin have been more or less, extensively raised in the mineral district of Cornwall, from the earliest settlement of the island of Great Britian, but the working of the veins of copper at an early day, does not appear to have been carried on to any very considerable extent. The great importance to which the produce of copper from the Cornish veins, (in a district which, compared with the mineral district of our own state, is of very small dimensions,) has arisen, will be shown from the accompanying table, which I have reduced from the official returns, included in the several years, and which table, it will be seen,

shows for a series of years, the average annual amount of copper produced from the ore, the average amount of which it sold, together with the amount per cent of copper contained in the ore, and the average value of the copper, per pound, at the smelting house. This table, which has been drawn with great care, from data that can scarcely lead to incorrect results, will not only serve to show the large aggregate amount of metal produced, but it also shows, from the low average per cent of metal contained in the ores, (if we had no further knowledge upon the subject,) that much capital must be required for, and a large amount of labor applied to the raising and smelting of these ores; a circumstance which should be carefully borne in mind, in all that relates to the mineral district of Michigan.

Table showing the average annual produce of the Copper mines of the County of Cornwall, England, from 1771, *to* 1822.

Years.	Average No. of tons of ore per year.	Av. No. of tons copper produced per year.	Av. amount per year for which sold.	Av. per cent of copper produced from the ore.	Av. value of the copper per lb.
					c. m.
1771 to 1775—5 years.	28,749	3,149	$816,283	12	10 9
1776 to 1780—5 "	27,589	3,309	826,609	12	11 1
1781 to 1786 6 "	31,351	4,122	962,389	12	10 1
1796 to 1802 7 "	51,483	5,195	1,125,046	10	18 2
1803 to 1807 5 "	70,923	6,169	3,171,725	8	23
1808 to 1812 5 "	70,434	6,498	5,886,835	9	12 9
1813 to 1817 5 "	82,610	7,272	2,878,723	8 8	17 6
1818 to 1822 5 "	94,391	7,757	3,111,811	8 2	17 9

The general resemblance in the mineral contents of the copper veins of Cornwall and those of Michigan, is for the most part very great, though in some respects

there is a considerable discrepancy. It should, however, be remarked, that some difficulty exists in comparing the mineral veins of Cornwall, where several of them have been worked to the depths varying from 1,000 to 1,500 feet, with those of Michigan, where the examinations are nearly superficial.

In making these deep excavations, not only in the county of Cornwall, but also in the copper districts of Bohemia, Hungary, Silesia, Transylvania, Saxony, &c., (some of the veins in the latter districts having been explored to a depth very considerably greater than those of Cornwall,) an immense mass of facts has been accumulated, with respect to the general formation and mineral character of veins, or lodes of copper, which facts have led to the understanding of many of the contingencies connected with its associations, so universal, that, when applied to this mineral, they may be regarded as general laws, that may fairly be inferred to govern, with more or less certainty, all those lodes or veins which have similar geological relations. Though a general consideration of those relations of the veins of other countries, may, perhaps, be regarded as somewhat foreign to the present report, I deem it more advisable to refer to these general laws in such a manner as to leave the reader to judge, by comparison, the condition in which the ores of Michigan may be fairly inferred to occur, rather than to draw conclusions directly: and, in so doing, it will always become necessary to refer to some of the characters of mineral veins, or lodes, in general.

Veins are usually divided into two general orders, viz; "*cotemporaneous veins*, or those which were

formed at the same time as the containing rock, and *true veins*, whose formation is supposed to be subsequent to that of the rocks which are contiguous to them." A *true* vein may be defined to be "the mineral contents of a vertical or inclined fissure, nearly straight, and of indefinite length and depth."* The contents of a true vein, as a general rule, differ widely from the character of the rocks which it intersects, though this does not invariably hold good, and the vein also, as a general rule, has well defined walls.

The contents of cotemporaneous veins, bear a much closer resemblance to the rocks which embrace them, and as a general rule, they are shorter, more crooked, and less perfectly defined than true veins.

The metalliferous veins being contained under the head of true veins, it is to these that the whole of my remarks will be directed.

Metallic veins are the repositories of most of the metals excepting iron, manganese and chrome, which occur more frequently and abundantly in beds than in veins. The thickness of the metallic veins varies from a few inches to many feet, and the same vein also varies in thickness in different parts of its course, sometimes contracting to a narrow string of ore, and then expanding again to a width of many feet. The deposits of metal in the veins are as irregular as the widths of them, and so much so as to render the profits of mining proverbially uncertain. Ore is generally found to occupy certain portions of the veins only, differing constantly in extent, whether the length or the depth on the course of the vein be considered, or the portion of its width which

*Corne, on the mineral veins of Cornwall.

is filled up by it. No veins occur which are regularly impregnated with metal to any great extent, and when ore is found, it is in what the miners aptly term bunches or shoots, or in interspersed grains and strings, which are more or less connected with, or embraced in, veinstone, that, according to the rock which the veins intersect will be fluor spar, calcareous spar, quartz, &c. The unproductive parts of veins, even in the most profitable mines, generally far exceed in extent the productive parts, but that mine is considered to be rich which has either frequent or extensive shoots of ore, and the great art of the miner consists in tracing and working the valuable accumulations of the metals, with as little waste of labor and expense on the poorer portions of the veins as possible. "In the mines of Cornwall, the ores of copper and tin commonly occur in detached masses, which are called bunches of ore; and the other parts of the vein, being unproductive, are called *deads*."

The depth to which metallic veins descend is unknown, for we believe no instance has occured of a *considerable vein being worked out in depth*, though it may sink too deep to render the operation of the miner profitable, or it may branch off in a number of strings which are too much intermixed with the rock to be worked to advantage.* Some veins appear to grow wider, while others contract as they descend.

The superficial part of a vein generally contains the ore in a decomposing state, and it frequently happens that the ores in the upper and lower parts of the vein are different; thus, "in Cornwall, blende or sulphuret

*Koenig.

of zinc often occupies the *uppermost* part of the vein, to which succeeds tinstone, and at a greater depth, copper pyrites." When a metallic vein, in its descent, passes through different kinds of rock, it is frequently observed that the products of the vein vary in each bed, and when it passes through regularly stratified beds of the same rock, there are particular strata in which the vein is always found most productive- This change in the productiveness of mineral veins is more particularly noticed at or near the transition from unstratified to stratified rocks; thus, granite syenite and those rocks which have a graniti-form structure, are frequently noticed to contain metals at or near their junction with stratified formations. On the other hand, the veins which traverse stratified rocks are, as a general law, more metalliferous near such junctions, than in other portions.*

Where a rock is crossed and penetrated by a great number of small veins in every direction, the whole mass is sometimes worked as an ore, and is called by the Germans a "stockworke." Where the ore is disseminated in particles through the rock, such rocks are also worked for the ore, when it exists in sufficient quantity.

As a general rule, those metals which are oxidable at ordinary temperatures, or which readily combine with sulphur, *rarely occur in a metallic state*, but are usually found in combination either with sulphur, oxygen or acids. The chief ore of copper raised from the mines of Cornwall, is the yellow sulphuret, though the blue

*Lyell. Necker.

and green carbonates and arseniate are more or less distributed; native copper and the oxids are also, though more rarely found.

By a comparison of what has been said upon the character and mineral contents of metallic veins in general, I trust a just view of the real condition in which the ores of copper are invariably found, will have been conveyed, and that, by the aid of this, we will be enabled to examine, without undue expectations, those mineral veins which occur within the limits of our own state. In the main the resemblance between the character and contents of the copper veins of Cornwall and Michigan, so far as can be determined, is close; the veinstones, (with the exception of fluor, which I have never observed in the latter,) are essentially the same; but in instituting this comparison, it should be borne in mind that the metallic veins of Cornwall have been in progress of exploration for centuries, and that shafts and galleries have been carried to great depths, while those of Michigan, simply superficial examinations have as yet been made, and these in a wilderness country, under circumstances of the utmost embarrassment, and attended with the utmost excessive labor, privation and suffering.

In respect to the character of the ores which occur in the two districts, there are important differences, for while pyritous copper is the most important workable ore, not only in the Cornish mines, but also in those of other portions of our globe, it is comparitively of rare occurrence in the mineral district of Upper Michigan; for, as I have already mentioned, the mineral of the trappean portions of the veins in the latter district, is

essentially made up of strings, specks and bunches of native copper, with which more or less of the oxids and carbonates are associated; while those portions of the the veins traversing the conglomerate are characterized by the occurrence of the oxids and carbonates, with occasional metallic and pyritous copper, or the places of all these are supplied by ores of zinc, associated with more or less calcareous matter. In the thin mineral veins of Presque Isle, pyritous copper is more abundant, where it is associated with sulphuret of lead, as before mentioned.

The occurrence of this native copper in the veins, and the manner in which it is associated with the veinstones, in all respects corresponds with the ordinary association of the other forms of ores, in those veins that have been extensively worked in other portions of the globe; but I confess that the preponderance of native to the other forms of copper, was regarded as an unfavorable indication, at least until this had been found to be more or less universal with respect to all the veins. It should, however, be remarked, that in those portions of the veins where the quartz of the vein and the accompanying rock are very compact, the native form is much more common than in those portions where the veinstone and accompanying rock are more or less cellular and soft.

The worked copper veins of Cornwall, are stated by a Mr. Carne, to average from three to four feet in width, and to have a length as yet undetermined. But few have been traced for a greater distance than from one to one and a half miles, and but one has been traced for a distance of three miles.

The veins which I have examined in the mineral district of Michigan, exceed the average of those last mentioned, but the imperfect examinations which have been made, render it difficult to determine this with certainty. I have traced no one vein for a further distance than one mile; and usually for distances considerably less. It was not, however, supposed that these veins terminated at the points where they were left, but the further examinations were abandoned at these points, in consequence of physical difficulties connected with the present condition of the country.

The native copper is frequently free from all foreign matter, and is as completely malleable as the most perfect refined copper, but it more usually contains disseminated particles of earthy minerals, chiefly quartz. I have not been able to detect the alloy of any other metal, in a single instance.

The fatigues and exposures of the past season, have so far impaired my health, that, as yet, I have been unable to analyze as carefully, as could have been wished, the several ores furnished by the mineral veins of the upper peninsula, but sufficient has been done to show satisfactorily that the copper ores are not only of superior quality, but also their associations are such as to render them easily reduced. Of those which have been examined, embracing nearly the whole, (and not including the native copper,) the per cent of pure metal, ranges from 9.5 to 51. 72, and the average may be stated at 21 . 10 Associated with some of these ores, I have detected a metal, the character of which remains, as yet, undetermined.

Were the analysis of the several ores of copper

sufficiently perfected, I should deem it unnecessary to lay them before you at this time, for with what is now known of the district, it is conceived, the result would lead to erroneous rather than correct conclusions. The analysis of separate masses of ore, no matter how much care may be taken to select the poor as well as the richer ores, for the examinations, will be usually far from giving the average per cent of what would be the product when reduced to practice. I have, in order to arrive at safe conclusions, not only analyzed, but also assayed many of them, but when we come to consider what constitutes the true value of a vein of copper ore, we will perceive why it is unsafe to judge of the whole by the analysis of small portions.

By reference to the previous statistical table of the product of the copper mines, of Cornwall, it will be seen, that the average produce of the ores since 1871, has never exceeded 12 per cent of the metal, and that, from 1818 to 1822, it was only 8 . 2. This shows the aggregate, and it was well known that while many of the productive veins are considerably below this, the largest average per cent of any single vein, in that district, it is believed, has never been over 20 per cent, and it should be borne in mind that this average is taken after the ores have been carefully freed from all the rocky and other impurities, which can be separated by breaking and picking.

The value of a vein may be said to depend upon the abundance of the ore, and the ease with which it can be raised and smelted, rather than upon its purity or richness. Upon this point, with respect to our own mineral region, public opinion would perhaps be more in error

than upon any other, and most certainly we could hardly look for a mineral district where the character of the ores were more liable to disseminate and keep alive such errors. The occurrence of masses of native metal, either transported or in place, are liable to excite, with those who have not reflected upon the subject, expectations which can never be realized, for while, in truth, the former show nothing but their own bare existence, the latter may be, as is frequently the case, simply imbeded masses, perfectly separated from all other minerals, or they may be associated in a vein where every comparison would lead to unfavorable conclusions, as to the existence of copper, in any considerable quantities, I have frequently noticed very considerable masses of native copper, occupying the joints of compact greenstone, under such circumstances as I conceive, might readily excite in many minds, high expectations, but a little reflection would satisfy the most careless observer of the uselessness of exploring these joints, under the expectation or hope of finding them a valuable repository of the metal. Again, not only native, but also the other ores of copper occur in veins, either so narrow as to render it useless to pursue them, or so associated as to render it probable that exploration would not be attended with success.

While I am fully satisfied that the mineral district of our state will prove a source of eventual and steadily increasing wealth to our people, I cannot fail to have before me the fear that it may prove the ruin of hundreds of adventurers, who will visit it with expectations never to be realized. The true resources have as yet been but little examined or developed, and even under

the most favorable circumstances, we cannot expect to see this done but by the most judicious and economical expenditure of capital, at those points where the prospects of success are most favorable. It has been said of the Cornish district, in respect to the supposed large aggregate profits, that "a fair estimate of the expenditure and the return from all the mines that have been working for the last twenty or thirty years, if the necessary documents could be obtained from those who are interested in withholding them, would dispel the delusion which prevails on this subject, as well as check that ruinous spirit of gambling adventure which has been productive of so much misery."* And if these remarks will apply to a comparatively small district, which has been explored and extensively worked for centuries, with how much more force must they apply to the mineral district of our own state. I would by no means desire to throw obstacles in the way of those who might wish to engage in the business of mining this ore, at such time as our government may see fit to permit it, but I would simply caution those persons who would engage in this business in the hope of accumulating wealth suddenly and without patient industry and capital, to look closely before the step is taken, which will most certainly end in disappointment and ruin.

The extreme length of what I have denominated the mineral district, (within the limits of Michigan,) may be estimated at a fraction over 135 miles, and it has a width varying from one to six miles; but it must not be imagined that mineral veins occur equally through all

*Hawkins on the tin of Cornwall.

portions of it, for sometimes, for many miles together, none have been noticed, and the situation of the country is such as to render it probable they never will be. The range and course of the mineral district has been so far defined as to render it unnecessary to say more upon this subject to enable such persons as may wish to examine, to pass directly along its complete length.

I have thus far omitted to allude particularly to the large mass of native copper, which has been so long known to exist in the bed of Ontonagon river, lest, perhaps, this isolated mass might be confounded with the product of the veins of the mineral district. That this mass has once occupied a place in some of these veins is quite certain, but it is now perfectly separated from its original connection, and appears simply as a loose transported boulder.

The attention of the earliest travellers was called to this mass of metallic copper by the natives of the country, and it has been repeatedly described by those who have visited it. The mass now lays in the bed of the westerly fork of the Ontonagon river, at a distance which may be estimated at twenty-six miles, by the stream, from its mouth. The rugged character of the country is such, that it is but rarely visited; in proof of which I may state, that upon my visit to it, during the last year, I found broken chissels, where I had left them on a previous visit, nine years before, and even a mass of the copper, which at that time had been partially detached, but which, for the want of sufficient implements I was compelled to abandon, was found, after that interval, in precisely the same situation in which it had been left.

The copper in this boulder, is associated with rocky matter, which, in all respects, resembles that associated with that metal in some portions of the veins before described, the rocky matter being bound together by innumerable strings of metal; but a very considerable portion of the whole is copper, in a state of purity. The weight of copper is estimated at from three to four tons.*

While the mass of native copper upon Ontonagon river cannot fail to excite much interest, from its great size and purity, it must be borne in mind, that it is a perfectly isolated mass, having no connection whatever with any other, nor does the character of the country lead to the inference that veins of the metal occur in the immediate vicinity, though, as before stated, the mineral district crosses the country at a distance of but a few miles.

The occurrence of cornelian, chalcedony, agate and amethystine quartz, in the amygdaloidal portion of the trap, has already been noticed, and these minerals are considerably abundant. They frequently possess very great beauty and perfection, and when ground and polished, they may be used for all the purposes to which those minerals are usually applied.

By the act admitting Michigan as a state into the confederacy, and in which her boundaries are defined, it does not appear to have been the intention to include within her limits any portion of territory lying upon the north shore of Lake Superior, but in consequence of the

*This mass of copper was removed by Julius Eldred, and after considerable masses had been cut from it, was weighed in New York November 1843, and found to weigh 3708 pounds, net avoirdupois.

peculiar shape of the coast at that point where the *national* boundary line "last touches Lake Superior," at the mouth of Pigeon river, a direct line to the mouth of Montreal river, if followed literally, would throw within the state of Michigan, several small rocky islands, together with a few miles of the south cape of Pigeon bay, situate upon the north coast. This boundary leaves in Wisconsin the whole of the Apostles' group of islands, near to the south coast, while it includes within Michigan, Isle Royale, situate near to the north coast of the Lake.

Isle Royale is a little less than an Island of rock, rising abruptly from the lowest depth of the Lake, in irregular hills to a height varying from 100 to 450 feet above the level of the Lake. The island has the length of a fraction over 45 miles from northeast to southwest, and a breadth varying from 3½ to 8 miles,. The most northerly point of the island is very nearly in latitude 48° 12′ 30″ north, the parallel of longitude 89° west from Greenwich, crosses the island a little east from its centre. Its nearest approach to the main land is near its northwesterly end, where it is separated from a point of the north coast, a few miles east from Pigeon river, by a distance of a fraction less than 13 miles. Isle Royale is separated from Keewenaw point, of the south coast, by a distance of 44 miles, and the elevated hills of this point may be distinctly seen from Isle Royale, when the atmosphere is clear.

Nearly the whole of the northwesterly side of Isle Royale is a continuous, elevated, rocky cliff, which will scarcely admit of a landing; but the southeasterly side, together with the easterly and westerly ends, are deeply

indented with bays, which form secure harbors. The northeasterly end is made up of a series of elevated, rocky spits, with intervening bays. These spits of rock continue for a length varying from 10 to 12 miles, with a width scarcely exceeding half a mile, and altogether, they may not inaptly be compared to the hand with the fingers half spread. The bays have a sufficient depth of water to admit vessels of the largest class to enter nearly one-third the whole length of the island.

Much of Isle Royale is absolutely destitute of soil, and the island has a most desolate appearance, ; but notwithstanding this, it is of immense value for its fisheries, which are yet scarcely appreciated.

Though not within the limits of our state, I will briefly refer to the general character of a portion of the country west from Pigeon river, on the north coast. That district of country upon the immediate coast, extending from our national boundary, at Pigeon river. to Fond du Lac, is more decidedly and abruptly mountainous than any portion of the south coast of the lake. The hills rise in broad and somewhat knobby steppes or plateaus, to heights varying from 400 to 1,200 feet above the lake, and the summits of these hills are usually not farther inland than from ten to twenty miles. The rocks of the hills are very frequently bare over considerable areas, and the valleys containing arable soil, are few and very narrow.

The route of the fur trade to the northwest, *via* Rainy Lakes, Lake of the Woods, snd Lake Winnipee, was formerly wholly carried on by passing over these hills, from a point a few miles west from the mouth of Pigeon river. The trail or portage path passes over a low

portion of the range, and finally falls upon Pigeon river, which is ascended to its source, from which, by a series of portages, the sources of the streams flowing northwesterly are reached. The hilly portion of the country, though of exceeding interest in a geological point of view, is the most desolate that can be conceived.

EXTRACT FROM DR. HOUGHTON'S REPORT OF 1842.

During the current year, the geological and topographical surveys have progressed steadily toward completion, though in consequence of the reduction of the number engaged in the work, which became necessary in consequence of the comparatively small amount of funds applicable to that object, the amount of work accomplished has been somewhat less than that of the preceeding year. The labor so applied has been chiefly devoted to the westerly portion of the upper peninsular, including a part of that which may be designated as the mountainous district of our state, while a smaller proportion of the labor has been directed towards a closing up and completion of the surveys upon the lower, or southern peninsular.

In connection with the duties assigned me relative to the boundary line between our own State and Wisconsin, I have been enabled to complete a very perfect Geological section of nearly 180 miles in length, crossing from the mouth of Montreal river of Lake Superior to the mouth of the Menominee river of Green Bay, a district highly interesting both in its geological and topographical features. This section crosses the up-

per peninsular somewhat farther west than any of the sections I have heretofore made.

In addition to this a large amount of work has been performed in the mountainous region stretching from Montreal river to Ontonagon river, and extending southerly from Lake Superior, a distance of some 40 miles, including, what may be termed, the *westerly* portion of the copper district, within our State. This district has been but partially examined the preceeding year, the examination of that year having been more particularly directed to a district of country lying east from it.

Several geological sections have been completed across this intricate region, and notwithstanding the many obstacles imposed by the mountainous and wild character of the country, the surveys of this district have been completed with as much minuteness as an adherence to the original plan of the survey would permit. In addition to the several geological sections completed, all the rivers entering Lake Superior between and including the two streams mentioned, have been carefully examined to their very sources, and the Porcupine mountains have been traced out through almost their entire range.

These surveys of the westerly part of the upper peninsular have added much valuable information to that before collected, respecting the geology and topography of that interesting portion of our State, and have served to add confidence to our previously expressed opinion respecting its value for its minerals and for agricultural purposes. The *general* geological and mineralogical character of this country was so fully given in a previous report, that it is not conceived to be necessary, at this

time, to make further allusion to it, except to add that the copper ores associated with the altered, conglomerate, and sandstone rocks, in *this* portion of the range have been found to be more extensive than was originally supposed. In character, these ores closely resemble those heretofore described as existing in the Keewenaw Point range.

The *southerly* range of mountains traversing the upper peninsula, and which in a previous report has been referred to, as commencing at a point a little north-westerly from the mouth of Chocolate river of Lake Superior, has been found to be continued in a south-westerly direction, with a gradually diminished altitude across the Menominee river of Green Bay, into the territory of Wisconsin. This chain of mountains through a portion of its course has a direction nearly parallel to that of Green Bay, and frequently approaches to within 25 or 30 miles of the coast of that bay. It will be recollected that the northerly portion of this mountain range was described as being composed of sienitic and gneissoid granite, flanked on the south by mica, talcose and chloritic slates and quartz rock, the separate members of the group being frequently traversed by dykes of trap, and with occasional knobby hills of the latter rock. Presque Isle of Lake Superior, made up of trap and altered sandrock, in which rocks were found numerous small ramifying veins of the sulphurets of lead, copper and iron, was referred to as a portion of this mountain range.

This southerly chain of mountains, with its hills and dykes of trap, though the elevation, in a southwesterly direction is considerably lessened, preserves very nearly

similar geological characters to that portion before described, and the rocks, in the vicinity of the trap, were frequently found to contain similar minerals to those observed in the vicinity of Lake Superior. The direction of this range is such as to leave no doubt but the low knobs of syenitic granite in the vicinity of Puckaway Lake of Fox river, and the more elevated knobs of trap and altered rock lying a short distance to the north, in Wisconsin, belong to the same system of rocks, and since the hilly district of the Wisconsin river would fall within this range, it may be fairly inferred that the disturbance of the stratified sandstones and limestones of this region may have originated from the same causes which have produced the more elevated mountains on the south of Lake Superior.

This subject possesses a high degree of interest, from the fact that within the limits of this range would fall the lead district of Wisconsin and Iowa, and this inference is rendered the more probable from the remarkable similarity in the character of the contained minerals. Thus far I have been unable to trace any portion of the great limestone formation of the upper peninsula, to any near proximity to this range, where the same traverses that part of Michigan, and thus far in tracing the range westwardly no considerable deposits of lead have been found until the lower rocks are covered by heavy deposites of limestone ; which would lead to the inference that these upper deposites have performed an important part in *arresting* and *fixing* the minerals refered to, and which minerals may fairly be inferred to have had their origin from the lower rocks, to which reference has been made. If the position thus

assumed be tenable, we can scarcely look for heavy deposites of lead within that portion of the southerly range of mountains traversing the upper peninsula of Michigan, for the reason that the upper formations are wanting, at least they are so through all that portion of the district that has been minutely examined.

DETROIT, FEBRUARY 16, 1846.

SIR:

By contract with the Commissioner of the General Land Office, under date of June 25, 1841, the Late DR. DOUGLAS HOUGHTON was required to make both a linear and geological survey of a section of country bordering on the south shore of Lake Superior. He was engaged in this work, which was nearly completed, at the time of his lamented death. As administrators of his estate, we have caused the field notes and papers connected with the survey, as far as completed, to be carefully examined, and the accompanying reports of Mr. Wm. A. Burt, and Mr. B. Hubbard, to be prepared. Mr. Burt, who was the principal assistant of Dr. Houghton in the field, reports in full as to the geology and topography of that portion of the country surveyed by him; and Mr. Hubbard, Assistant State Geologist of this State, and whom we employed for that purpose, has prepared a like full report upon the remainder of the surveyed territory, from the field notes of the survey and the specimens collected. We herewith submit these reports to you, with the field notes and other papers, &c. The linear survey, as far as the work has progressed, is complete. It could not have been expected that the information, contained in the reports, in relation to the geology of the country, would be as complete and accurate in detail, as it would have been, could they have been prepared by Dr. Houghton himself, who had, for many years, been zealously engaged in the investigation and study of the peculiar formations of this region. Enough, however, will appear, to enable the Government to appreciate, both the advantages, and the perfect feasibility, of the plan of connecting geological with the linear surveys of the government lands, as originally proposed and zealously advocated by Dr. Houghton.

Respectfully, yours,

[SIGNED.] HENRY N. WALKER,
SAM'L. T. DOUGLASS.

To HON. LUCIUS LYON,
Surveyor General, &c.

TOPOGRAPHY AND GEOLOGY

OF THE

SURVEY

OF A

DISTRICT OF TOWNSHIP LINES,

SOUTH OF LAKE SUPERIOR,

1845.

This survey embraces Keewenaw Point, and a narrow tract of land bordering the south coast of Lake Superior, from the south boundary of township 48 north, ranges 25 and 26 west, near Chocolate river, to the mouth of Carp river on the northwest side of the Porcupine mountains in township 51 north, range 44 west. (See the accompanying map, to which reference will be frequently made, in the course of these remarks.) Upon this map are delineated the boundaries of the survey, together with the principal streams and small lakes. The straight lines are the boundaries of townships with their numbers and ranges, and the irregular and dotted lines represent the boundaries of the different rock formations, with their characteristic names, on the side which they occupy.

The topography of this district may be divided into two parts, the hilly or mountainous, and the undulating or roling lands.

Of the hilly or mountainous land, three tracts of considerable areas, are found widely separated by undulating or rolling land.

That part of the district between Huron Bay and the south boundary of township 48 north, ranges 25 and 26 west, and denominated primary range on the map, is made up principally of numerous rocky knobs and irregular hills, with intervening valleys of arable lands; most of these valleys have small streams meandering through them, with rapid or quick currents of pure water. Between some of these knobs and hills, however, cedar, tamarack, or spruce swamps are found, and less frequently small lakes.

The highest elevations on this range, probably attain an altitude of 800 or 900 feet above the water of Lake Superior, and present to the spectator a very rugged and broken appearance, and frequently along the southeasterly slope of these knobs and hills, which is generally the most precipitous, high cliffs or sloping ledges are seen; but along the south boundary of the survey, the hills are more regular in outline and have a westerly direction

The land upon this part of the district not occupied by the primary range, is undulating and rolling except where furrowed with deep ravines or interrupted by the valleys of streams. These lands lie between the primary range and the Lake coast, and are in many places considerably elevated, forming bluffs on the Lake coast, from 20 to 80 feet in height.

SOIL AND TIMBER.

The soil on this part of the survey is generally a sandy loam, but in some places it is decidedly a sandy

soil, and sustains a heavy growth of timber, of sugar maple, hemlock, birch, pine, cedar, fir, lynn elm, ash, spruce, tamarack &c.

STREAMS AND HARBORS.

The largest streams (rivers they are called here,) on this part of the district, are not above the size of ordinary mill streams, for which purpose they would answer well, having generally falls or rapids within one or two miles of the Lake coast. Some of these streams at their mouths form convenient harbors for small boats, and may be ascended with them to the first falls or rapids, for which purpose the Huron, Pine, Yellow Dog and Riviere Du Mort or Nekomenon river, are the best.

The only harbors for vessels are at Presque Isle, T. 48 N., R. 25 W., and to the south of a point of land on the east side of Huron Bay, T. 54 N., R. 31 W. (See map.)

TRAP RANGE OF KEEWENAW POINT &C.

This second hilly range commences at the northeast end of Keewenaw Point, and has a course a little to the south of west, for about eighteen miles, where it gradually bends to the southward until its general course is southwest, to the south boundary of the survey.

This range is from two to six or seven miles wide, and about eighty miles in length upon this district, and from the east end of Keewenaw Point, to a little west of the east boundary of range 29, these hills occupy nearly its entire breadth. Here the southeast side of this range recedes from the Lake coast, and stretching inland southwesterly, passes along the northwest side of a small lake in township 55 north, ranges 32 and 33 west.

from thence generally in a southwest direction, to the corner of sections 31 and 32, on south boundary of T. 51 N., R. 37 W.

The northwest boundary of this range leaves the Lake coast in township 58 north, range 32 west, and stretching a little inland, crosses Portage Lake, in township 55 north, range 34 west, thence generally in a southwest direction, to near the corner of sections 33 and 34, on the south boundary of township 51 north, range 38, west. The highest elevations upon this hilly range, are supposed to be, from five to eight hundred feet above Lake Superior, and, as in the hills of the primary range already described, their southeasterly sides are generally the most precipitous; and it should be farther remarked, that these hills are not destitute of interest in an agricultural point of view. Considerable tracts of tillable land are found upon them, with a good soil, and well timbered with sugar maple, birch, lynn, ironwood, red oak, &c., and, on Keewenaw Point, better adapted to cultivation than most of the land upon its coast. To the east of this hilly range, (south of Portage Lake,) to Huron Bay, and west of it to the Porcupine mountains, with the exception of a few moderately elevated hills, the country is undulating or rolling; there are, however, many deep ravines, and valleys of streams on this part, also tracts of level land. These lands are generally susceptible of cultivation, and, so far as they have been proved at the Missions near the head of Keewenaw Bay, and at the Ontonagon and Iron rivers, have been found to yield abundantly, in produce suitable for culture in this climate.

Over this entire tract, except where occupied by

swamps or in some places on the Lake coast west of Keewenaw Point, the soil is generally a sandy loam, and the most loamy parts are in the valleys of the Sturgeon and Ontonagon rivers.

These lands are extensive and generally support a heavy growth of timber of sugar maple, birch, hemlock, pine, fir, cedar, lynn, ash, elm, spruce, &c. And it may be worthy of remark, that scattering pines of an excellent quality, may be found southeast of the hilly range of Keewenaw Point, and northeast of Portage Lake to the south boundary of township 57 north, range 30 west.

LAKE COAST AND HARBORS.

The Lake coast is generally bold and rocky, and though very irregular in its course, has few indentations of a character to form good harbors for vessels. The best and most convenient, are Copper, Agate and Eagle Harbors, situated on the north side of Keewenaw Point. (See map.) Also, a lee can generally be made south of a point on the east side of Keewenaw Bay, T. 51 N., R. 32 W., and a vessel drawing 5½ feet of water may enter the Ontonagon river, T. 52 N., R. 40 W.

RIVERS.

Upon this part of the district, there are three rivers navigable for small crafts, for a considerable distance into the country; they are the Portage, Sturgeon and Ontonagon rivers.

Sturgeon river has its source to the south of the head of Keewenaw Bay, in the hilly country, and runs northerly, nearly parallel to the west coast of this bay, and enters Portage Lake on section 33, T. 54 N., R. 33 W.

and may be ascended with small boats into T. 52 N., R. 33 W. section 7; here its navigation is interrupted by drift wood which fills the channel for about 25 or 30 chains. This passed, which may be done by a good portage, the river may be ascended into T. 51 N., R. 34 W; but on account of a strong current in this part of the stream, setting poles or the best oarsmen are necessary, to effect an ascent to this point.

Portage river is about four miles in length, and the outlet of Portage Lake. It is a stream of considerable depth and breadth, and after passing the bar at its mouth, may be ascended with vessels drawing eight feet of water into Portage Lake, and thence to the head of this Lake near the south boundary of T. 56 N., R. 34 W. about 20 miles from the entrance at the mouth of Portage river. From the head of Portage Lake light boats ascend a small stream about one mile, and from thence by a portage of another mile over nearly level land enter Lake Superior.

Doubtless, at some future day, these two miles will be canalled, for the passage of larger crafts through this channel into Lake Superior.

The Ontonagon river is the largest stream on the south side of Lake Superior. This stream is navigable for batteaux in an ordinary stage of water, to the rapids near the south boundary of T. 51 N., R. 39 W.

Near the mouth of this river, on the right bank, is an eligible site for a town, and when this harbor is improved, as it deserves to be, will probably become a place of considerable importance. There are other small streams on this part of the survey, the most important of which are, Eagle, Elm, Misery, Sleeping,

Fire Steel and Iron rivers. These streams cannot be ascended far, even with canoes, on account of rapids or drift wood, but most of them form convenient harbors for small boats on the Lake coast.

PORCUPINE MOUNTAINS.

The third hilly range embraces the northerly portion of the Porcupine mountains, the easterly boundary of which commences on the coast of Lake Superior, three or four miles west of the mouth of Iron river, in T. 51 N., R. 42 W. thence runs nearly south to corner of sections 33 and 34, on south boundary of said township. Westward, these knobby mountains spread over the remaining part of the survey to the coast of Lake Superior, the highest elevations of which have an altitude probably of 950 feet, and the easterly hills have a more regular outline, than those of the westerly part, the latter in some places presenting cliffs and sloping ledges of great height.

These mountains, and the valleys between them, except near the Lake coast, or where occupied by rocks, have a good soil of sandy loam, which supports a heavy growth of timber of sugar maple, birch, lynn, hemlock fir, elm, &c.

The Lake coast bordering these mountains is generally rocky, and affords no good harbors for small boats, except at Carp river. This stream runs W. S. W. nearly parallel to the coast of the Lake, for about ten miles, and at the distance of about two miles from the coast, it then bends to the northwest, and after passing falls and rapids near its mouth, enters Lake Superior on section 33, township 51 north, range 44 west.

GEOLOGY.

Within the boundaries of this survey there are five principal groups of rocks, which occupy large areas.—They are, primary, trap, conglomerate, sandstone, and slates.

That group of rocks which may be denominated primary, and including the metamorphic rocks on the south, are found generally a little inland, (excepting in the vicinity of Presque Isle Harbor) from the coast of Lake Superior; and from the south boundary of township 48 north, ranges 25 and 26 west, into township 51 north, range 32 west, about three miles S. S. W. of the head of Huron Bay. (See map.)

These rocks make up a series of knobs and high conical hills, forming a broken range which has a course as near as could be determined W. S. W.

These elevations are of various heights, probably from 75 to 900 feet above Lake Superior, and, generally, the elevating force appears to have acted mostly upon their southeasterly sides, as this side generally presents cliffs and bold ledges, while their northwesterly sides slope away more gradually.

The metamorphic rocks alluded to, flank the primary rocks on the south, where the two becomes so much blended with each other as to make it difficult to define a line of junction between them. It may, however, be approximately drawn, commencing at the lower falls of Riviere Du Mort, or Nekomenon river, about one mile S. S. W. of Presque Isle Harbor, thence running W. N. W. to corner of sections 31 and 32, on south boundary of T. 49 N., R. 25 W. and curving a little westerly crosses the east boundary of T. 49 N., R. 27 W. near the corner of section 25 and 36.

The principal rocks which compose the metamorphic group are quartz, compact and granular, imperfect talcose slates, which are in some instances slightly argillaceous, and slaty hornblende. These rocks are more or less stratified and imperfectly jointed, and dip generally N. N. E.—In two instances however they were seen to dip S. S. W. A few veins of quartz were seen traversing these rocks, but no one was observed to be metalliferous. I have however seen specimens of specular iron ore said to have been obtained in township 48 north, range 26 west.

Within the boundaries of the metamorphic rocks upon the survey, several knobs of syenitic granite, and also dykes of greenstone were seen.

PRIMARY ROCKS.

That portion of this range which may be denominated primary rock, and lying to the north of the metamorphic rocks already described, is generally composed of granular quartz, feldspar, and hornblende, constituting a compact syenite. In some places slight traces of mica are observable, giving rise to a syenitic granite.

These minerals predominate in different proportion in different places, and not unfrequently in different parts of the same ledge or hill.

In some places it is mostly a hornblende rock and in others the leading minerals are feldspar and hornblende, giving rise to a syenitic greenstone, and less frequently a well formed granite is found. In several instances a compact greenstone was found, intruded among these rocks in various forms. And when in veins or dykes these do not appear to have any particular magnetic bearing.

One of these veins may be found of about one foot in thickness, traversing a ledge of syenite W. S. W., at 45 chains and 60 links in going west on south side of section 36, south boundary of T. 51 N., R. 28 W.

Throughout this entire group of rocks, quartz and feldspar veins are often found, and, in many instances, both are seen traversing the same rocks, and crossing each other at various angles. These veins are from a line to a foot or more in width, and were observed to be more frequent and of a larger size in townships 51 and 52 north, ranges 28 and 29 west, than in any other part of the primary range. Also a few veins containing calcareous spar were seen near the junction of the primary and sedimentary rocks.

In regard to the metalliferous character of any of the veins traversing the primary rocks, in this portion of the mineral region (so called) it may be sufficient to say that no vein indicating a workable quantity of metal of any kind was observed, but it should not be inferred from this that they do not exist here.

My observations were mostly confined to township lines, which do not *always* pass over the most favorable places for examination, and afforded no opportunity of tracing up veins, that have some metalliferous indications, until their characters were developed.

ARGILLACEOUS SLATES.

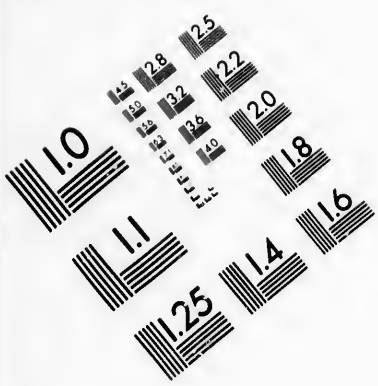
Flanking the primary rocks already described on the northwest, in T. 51 N., R. 30, 31 and 32, W. argillaceous slates were found. They seldom crop out, and, on account of their being generally covered with a considerable depth of earth, their precise limits could not

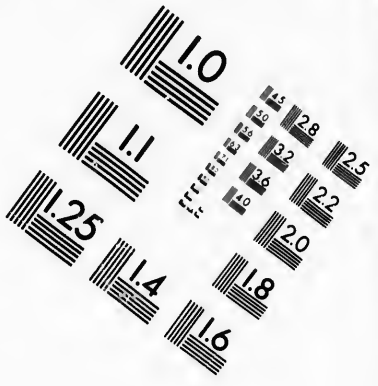
be defined. They are, however, supposed to occupy a space from one to two or more miles in breadth, before they are overlaid with the sandstone. These rocks have, generally, near their junction with the primary rock, a dip from 20 to 30 degrees to the N. or N. N. W. and their line of cleavage dips to the S. or S. E. making an angle with the line of deposition of about 65 degrees. These slates are generally of a dark brown color; but a curious variety was found in both branches of Huron river, on south boundary of T. 52 N., R. 30 W. section 36. Loose masses have been brought down these streams in abundance, some of which are varied with numerous stripes of red, light gray, light and dark brown &c.

RED AND VARIEGATED SANDSTONE.

Flanking the slates already described, and resting upon them, red and variegated sandstones were found.—These rocks extend north and west in nearly horizontal strata, passing Huron and Keewenaw Bays, and flank the base of the trap range of Keewenaw Point, on the southeast, throughout the survey. This sandstone also flanks the primary rock before described, on the north and northeast, to the coast of Lake Superior, except in the vicinity of Presque Isle. These rocks occupy a larger area on the survey than all the other rocks; they are generally laminated, and not unfrequently jointed, and vary considerably in the fineness of the materials of which they are composed, in different strata; and the whole are tolerably compact.

Though the strata of the sand rock may, in general, be considered horizontal, it has evidently been some-





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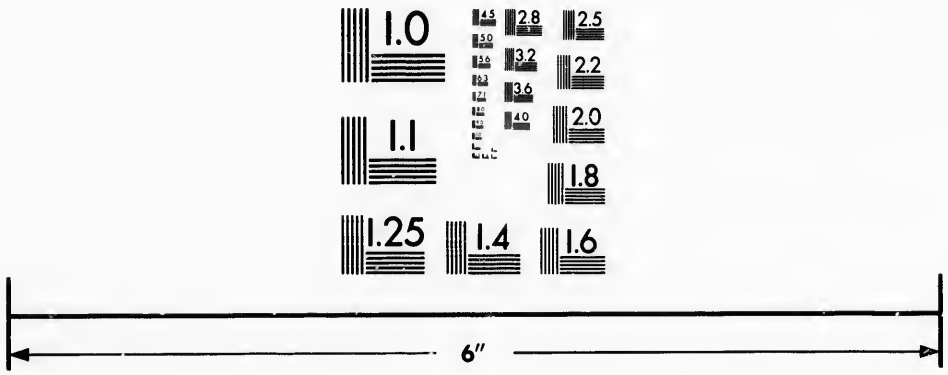

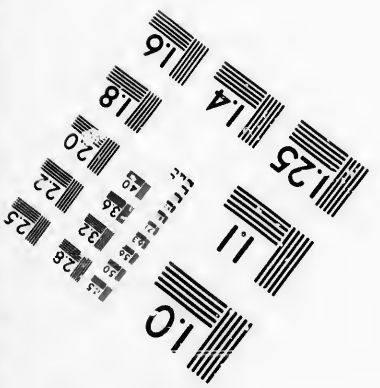

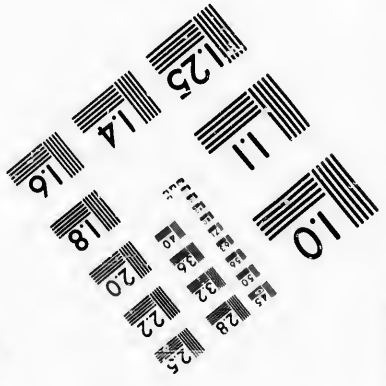

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what disturbed and contorted, and was observed in the vicinity of the northern slope of the primary and trap hills, to have a considerable dip from them.

This rock borders a large proportion of the Lake coast throughout this part of the survey, and may be seen, forming ledges from a few feet to 70 or 80 feet in height; and it should be mentioned, that novaculite, or at least a very fine grit for whetstones, may be found in a ledge on the east side of Keewenaw Bay, near its head, on section 35, T. 51 N. R. 33 W.

This ledge is laminated and jointed, and from it may be obtained whetstones of almost any degree of fineness, Also, to the S. S. W. of this ledge, on section 2, a good quality of reddish clay was seen, and at several other points on the bay coast, in this vicinity.

TRAP RANGE OF KEEWENAW POINT.

This range commences at the east end of Keewenaw Point, and has a course generally to the southwest, in a series of trap knobs and irregular hills, from three to seven or eight hundred feet in height above Lake Superior.

Their general topographical character and boundary have been already described. (See map.)

Generally, the middle and southeasterly side of this range is a compact greenstone, which gradually obtains an amygdaloidal structure, near the northwest slope; and along this slope, in many places, a decided amygdaloid is found, the cavities of which are frequently filled with quartz, calcareous matter and epidote.

These characters of the trap rock are well sustained throughout this range of the survey. It has also been

observed, that generally the slope of the trap rock has a much higher angle on the southeast, than on the northwest side of this range.

CONGLOMERATE ROCK.

This rock is of a great thickness, and flanks the trap range on the northwest side, from the east end of Keewenaw Point, westward, into township 57 north, range 33 west.

The conglomerate rock is made up of rounded pebbles and small boulders, principally derived from rocks of the trap family, and so firmly cemented together, that when broken, these rounded masses frequently divide through the middle. This rock does not appear to be very uniform in its dip; it may be estimated, however, to dip N. N. W., from 20 to 50 degrees.

Resting conformably upon the conglomerate rock, are a series of alternating strata of sandstone and conglomerate, embracing between their strata several trap dykes of considerable extent, which dip with these rocks to the N. N. W., at an angle of 30 to 40 degrees. The injection of these dykes has produced great changes in the rocks, by which they are embraced. The sandstone near the dyke is converted into an amygdaloid, and the character of the conglomerate much changed by igneous action. This is exemplified on the points of rocks, west of the entrance of Eagle Harbor, where they are severally seen.

These trap dykes may be seen at several other places, from Copper Harbor to a little west of the east boundary of T. 57 N., R. 33 west.

The conglomerate rocks above described, were not

seen flanking the northwest side of the trap range of Keewenaw Point, southwest of township 57 N., R. 33 W., or between this and the Lake coast, until they were found on the northwest side of the Porcupine mountains. They are supposed to be wanting between these points, or they have diverged from the trap range, and occupy the bed of Lake Superior, which latter condition is deemed the most probable, as this direction best conforms to the strike of these rocks at both places.

VEINS AND VEINSTONE.

Between the east end of Keewenaw Point, and Portage Lake, the trap and conglomerate rocks are traversed by many well defined veins, at nearly right angles with the general course of the trap range, and at the surface of the rocks, these veins are from a mere line, to several feet in width.

The veins above alluded to, are generally nearly vertical in the rocks they traverse, and in some instances, they appear to have been fissures in the rock, and subsequently filled with veinstones, differing much in their character in different rocks.

In the greenstone and amygdaloid, these veins are usually made up of trap, more or less associated with quartz, and on their sides firmly blended with the rock which they traverse; but, in the conglomerate rocks, the veins are almost uniformly of calcareous matter.

Besides the well defined veins, above alluded to, there are others imperfectly formed, having a more diffusive character; also, at several points on the Lake coast, along the line of conglomerate rocks, veins of calcareous matter were seen, apparently embraced between

their strata. These veins have a course nearly at right angles to the veins before alluded to, and are supposed to be of no very great extent.

Some of these veins at least are metalliferous through some portions of their course in the rocks which they traverse, and contain native copper and some of the ores of copper. Green and blue carbonate, and the black oxide, are thought to be the most abundant of the ores; and so far as I have been able to observe these veins, their metalliferous character is best developed along the line of junction of the the trap and sedimentary rocks on *both sides* of the trap range.

The metalliferous character of these veins above described, have been most explored on the northwest side of Keewenaw Point, where some of them are now being worked, and much interest is felt by the enterprising proprietors of these works.

Thus far, several of these veins offer increased inducements to prosecute the work, and a few years of labor will develope, in some *good* degree their true character.

That portion of the trap range of Keewenaw Point, extending southwest of Portage Lake, to the south boundary of the survey, has generally less width than that which has already been described, and the trap rocks do not so frequently crop out, consequently, its junction with the sedimentary rocks, could not often be seen. But the aberrations of the magnetic needle, (determined by the Solar Compass,) has always been found to be very great on or near the trap hills, by which means, it is believed, that its boundary on the township lines, where no out crop could be seen, has been very nearly

defined. (See map.) But few veins are seen traversing the rocks on this part of the trap range, and no one observed to be metalliferous. Creditable reports, however, say, that copper veins have been found near the head waters of Elm river.

ARGILLACEOUS SLATES.

Argillaceous slate of a dark brown color, and slaty sandstone, are developed on a large scale in the bed and banks of Iron river, through township 51 north, range 42 west three or four miles east of the Porcupine mountains. These slates are very variable in their direction and amount of their dip in different places. They vary from N. E. to S. E., and dip from 15 to 45 degrees in that direction.

These slates were also seen 50 or 60 chains east of Iron river, near corner of sections 25 and 36, and dipping E. N. E. about eleven degrees. From these facts it is reasonable to infer, that the slates dip under the sandstone, to the east of them, and that they extend west, to the base of the Porcupine mountains. But these slates, except in the streams before mentioned, are generally overlaid with a considerable depth of earth, and, therefore, their boundary could not be correctly defined.

Argillaceous slaty sandstone, somewhat similar to those already described, are found on the northwest side of the trap range of Keewenaw Point, on the east and south boundaries of township 53 north, range 36 west, (sections 25 and 33.) These slaty sandstone seldom crop out, consequently their limit was not ascertained. These rocks dip considerably to the northwest.

RED SANDSTONE.

Between the slates of Iron river and the trap range of Keewenaw Point, (except as above mentioned,) and south of the north half of T. 57 N., R. 33 W. and the Lake coast, to the south boundary of the survey, so far as known, the country is underlaid with red sandstone.

This rock frequently appears along the Lake coast, and in the beds and banks of streams and ravines.—The sandstone here is supposed to belong to the same formation of the red sandstone already described, east of the trap range of Keewenaw Point. Its general character is the same, except that in some places it contains more mica. This sandstone was observed to dip most near the trap range, in a N. N. W. direction, which dip diminishes to the coast of Lake Superior. A nicely stratified and jointed form of this rock, may be seen on the Lake coast at the south boundary of T. 55 N., R. 36 W.

TRAP AND CONGLOMERATE ROCKS OF THE PORCUPINE MOUNTAINS.

The remaining part of the survey embraces the northerly portion of the Porcupine Mountains, the boundaries of which have already been described. (See map.) These mountains are made up of a somewhat broken range of trap and conglomerate hills, having an estimated height from three to nine hundred and fifty feet above Lake Superior.

South of Carp river, (which runs nearly parallel to the Lake coast,) and the south boundary of the survey, also the west half of T. 51 N., R. 42 W., embraces

the trap rock within this part of the survey, which occupies an area of less than one township.

A large proportion of this trap is very compact, but in some places it is an amygdaloid, the cells of which are generally filled with calcareous matter or epidote. This trap, also, varies in color from a dark green or gray, to nearly a brick red.

To the northwest of the trap rock hills, and separated from them by the valley of Carp river, are two conglomerate hills, having a course nearly parallel to the Lake coast, from six to eight miles, the highest parts of which are estimated at 400 feet above Lake Superior.

These conglomerate rocks appear to belong to the same formation with the upper conglomerate of Keewenaw Point, having, like the latter, alternating strata of sandstone and conglomerate rocks, which dip to the N. N. W., at an angle from 25 to 45 degrees. A few veins of calcareous spar, were seen in these rocks at the Lake coast, on east boundary of T. 51 N., R. 43 W.; also, near the *lone* rock (so called,) in T. 51 N., R. 44 W., but no one observed to be metalliferous.

It is, however, creditably reported, that copper veins have been found on this part of the survey.

DRIFT.

Numerous erratic boulders and other finer materials, are found spread over this region of country, apparently derived from the rocks which abound here, and from the region north of Lake Superior. Therefore, it is not uncommon to find transported blocks along the Lake coast, or in valleys of streams which contain copper or other interesting minerals. The relative position of the

land and water of Lake Superior, at some remote period of time, appears to have been quite different from their present state, as is evidenced by the effect of the Lake on the rock, and the form of the Lake bluffs, in many places some two hundred feet above its present level.

Thus far, a brief view of the geological condition of the various rock formations has been taken, leaving to the reader the pleasure of drawing his own conclusions as to the causes which have produced these geological effects, and also as to what may be deemed to be more or less valuable or interesting in this region of country.

In executing this part of the work, I have been much assisted by valuable instructions from our late and respected State Geologist, Dr. Douglass Houghton, who had this survey in charge, and from whom a critical geological report was expected.

In conclusion, it may be proper to remark, that in consequence of township lines being confined to distances of six miles apart, and to north and south and east and west courses, they frequently pass, for a long distance, over ground not the most favorable for geological examinations; also, supplies have to be furnished with packmen, instead of pack horses, in this region of country, and each man of a party on township lines, is under the necessity of performing his duties with a pack upon his back. But, notwithstanding these difficulties, it is believed that when experience shall have perfected this system of linear and geological surveys, it will be found the cheapest and the best yet devised for the public interest.

WILLIAM A. BURT.
Deputy Surveyor.

GENERAL OBSERVATIONS.

UPON THE

GEOLOGY AND TOPOGRAPHY

OF THE DISTRICT

SOUTH OF LAKE SUPERIOR,

SUBDIVIDED IN 1845, UNDER THE DIRECTION OF

DOUGLASS HOUGHTON, DEPUTY SURVEYOR.

THE subdivisions embrace the following townships which are fully completed, and the notes and maps thereof, are herewith returned.

Town	46	North,	Ranges 24, 25 and 26	West.
"	47	"	" 24, 25 and 26	"
"	48	"	" 25 and 26	"
"	51	"	" 32 and 33	"
"	52	"	" 32	"
"	53	"	" 32 and 33	"
"	54	"	" 32 and 33	"
"	55	"	" 31, 32 33 and 34	"
"	56	"	" 30, 31, 32, 33 and 34	"
"	57	"	" 29, 30, 31, 32 and 33	"
"	58	"	" 26, 27, 28, 30 and 31	"
"	59	"	" 27, 28 and 30	"

The notes and maps of town 58 north, ranges 29 and 32 west, and town 59 north, range 29 west, were in possession of Dr. Houghton, and were lost with him.

For our present purpose, the above named towns may be arranged in two divisions, which, from their different geological features, will be separately considered.

In the first, will be included towns 46, 47 and 48 north, ranges 24, 25 and 26 west. In the second division, the towns upon the Keewenaw Peninsula. Towns 48, in ranges 25 and 26, and all those of our second division, are within the *town line survey* of the past season, and the general features of their topography and geology, are exhibited with great purspicuity and accuracy, in the report of Wm. A Burt, Esq. accompanying the returns of his surveys. I shall therefore, as far as possible, avoid repetition of facts which appear sufficiently detailed by him.

PRIMARY AND METAMORPHIC REGION.

Granite Rocks.

The portion of country included in our first division, which is occupiod by these rocks, embraces towns 46 north, ranges 24, 25 and 26 west, together with most of the lower tier of sections in the towns adjoining on the north.

Throughout this region, the granite rocks make their appearance in a succession of rounded knobs, elevated from 20 to 100 feet above the surrounding country, and from 300 to 800 feet above the level of Lake Superior, and having a general range a little south of west, and north of east.

These rocks vary much in character and composition, being sometimes hornblendic, and approaching a perfect syenite, but more commonly feldspathic, or

composed of quartz and feldspar, in which the latter mineral predominates. In the more southerly portion of the district, the feldspar is red, and gives a predominant color to the rock. Occasionally, the granite is traversed by quartz in irregular veins. Some portions are massively stratified, the masses dipping to the north, or being nearly vertical. The knobs are rounded in outline; and are sometimes bare rock; but, in general, they, in common with the surrounding country, are well timbered with spruce, hemlock, fir, birch, sugar maple, white pine and aspen. The soil is, in general, sandy, and second or third rate.

Plains of spruce pine occupy the more elevated portions of the district, embracing about one half or the central part of town 46, range 25, and, stretching northerly, include the southwesterly one fourth of town 47, range 25. This tract is destitute of streams, and the soil is very poor and sandy. The timber is chiefly an inferior spruce pine. These plains divide the waters flowing into Lake Superior on the N. and E., and Lake Michagan on the S.

This granite district is intercepted on the east by a belt of the red sandrock, hereafter alluded to, which occupies the tract between it and the Lake coast.

A little south of Presque Isle, granitic rocks make their appearance on the coast of the Lake, and westerly from Presque Isle, continue to occupy the projecting points for several miles, the red sandrock occupying the intervening bays. Knobs also of this rock, occupy the portion of town 48 north, range 25 west, lying north of Riviere du Mort.

The granite of this portion of the country is traversed

by large and irregular dykes of greenstone trap, and the granite itself puts on a trappose character, the two rocks being sometimes with difficulty distinguishable from each other. This is the commencement of an apparently very large extent of granite country, extending westerly into the region not yet surveyed by section lines.

These granites are important in an economical point of view, being so situated as to be easily quarried, and affording a great variety of very durable, as well as ornamental building stones. When we consider that the whole vast valley of the Mississippi to the south, is made up of secondary rocks, it seems probable that these granites will furnish a valuable article of commerce so soon as a more easy communication shall have been afforded between Lake Superior and the lower Lakes.

METAMORPHIC GROUP.

The rocks thus designated, occupy the country lying between the two granite regions above mentioned.—The several portions of this district vary so much in the character of the prevailing rocks, as to call for separate descriptions.

The more southerly, which I shall here denominate the *quartzite* portion, is composed of white and brown quartz rocks, talcose, augitic and clay slates, slaty hornblende, and specular and micaceous oxides of iron, and embrace the tract between the granite on the south, and a line bearing north of west from the mouth of Carp river, to the centre of the west line of T. 48 N., R. 26 W. This tract is rolling, with frequent ridges, having

a direction nearly east and west, or bearing south of west, and elevated above the surrounding country from 40 to 150 feet. The greatest elevation above Lake Superior, as determined by the barometer, is 1001 feet. The timber is chiefly sugar maple, with some scattering pines, and other evergreens and birch.

The central portions of these ridges would seem to be trap, which is here capped, as well as flanked, by the metamorphosed rocks. Though no well characterized trap makes an outcrop, throughout this portion of the metamorphic region, the altered nature of the rocks plainly indicates the near approach of an igneous rock to the surface, and the dip of the rocks, though mainly north, at a high angle, exhibits a tendency in all directions from a central axis.

These rocks are throughout pervaded by the argillaceous red and micaceous oxides of iron, sometimes intimately disseminated, and sometimes in beds or veins. These are frequently of so great extent as almost to entitle them to be considered as *rocks*. The largest extent of iron ore noticed, is in town 47 north, range 26 west, near the corner of sections 29. 30, 31, 32. There are here two large beds or hills of ore, made up almost entirely of granulated, magnetic and specular iron, with small quantities of spathose and micaceous iron. The more northerly of these hills extend, in a direction nearly east and west, for at least one-fourth of a mile, and has a breadth little less than 1000 feet, the whole of which forms a single mass of ore, with occasional thin strata of imperfect chert and jasper, and dips north 10 degrees east, about 30 degrees. At its southerly outcrop the ore is exposed in a low cliff, above which the

hill rises to the height of 20 to 30 feet above the country, on the south. The ore here exhibits a stratified or laminated structure, and breaks readily into sub-rhomboidal fragments, in such a manner as will greatly facilitate the operation of quarrying or mining the ore.

This bed of iron will compare, favorably, both for extent and quality, with any known in our country.—The largest of the large ore beds of the state of New York, is estimated to be but 700 feet in breadth, by 1000 in length.

A more extended and minute examination will probably determine this portion of the metamorphic group to contain other ores, less in amount, but which are generally esteemed more valuable.

The northerly portion of the metamorphic group of rocks, and which may here be denominated the *trappose* portion, embraces the whole remainder of the group north of the portion last described, except a small tract of country occupied exclusively by clay slate rock, and whose extent will be hereafter noticed.

This division of the metamorphic region is characterized by the frequent occurrence of knobs or uplifts of greenstone and augitic trap, making their appearance rather irregularly over the country, and surrounded by altered sandstones and slates. These uplifts are doubtless disconnected from any common centre or focus of eruption; but it is evident that rocks of igneous origin, form the base of all the rocky elevations of the region, and the surrounding altered and slaty rocks flank their sides and dip in all directions from them, the trap being protruded into a series of low knobs. Around the bases of these are the metamorphic rocks, consisting mostly of

talcose, chlorite and clay slates. Quartz forms comparitively a small proportion of these rocks. The prevailing dip is northerly, about 80 degrees. Several of these knobs, in T. 48 N., R. 26 W., attain an elevation of 1058 feet above Lake Superior.

A hill of tolerably well defined granite makes an outcrop near the centre of this region, and in a low ridge, bearing in an easterly and westerly direction about two miles, but the granite is evidently of a trappose character. The hills of this region are generally timbered to their summits, and in many of them the rock does not come to the surface. The country is, in general, moderately rolling and beautiful. The timber is chiefly sugar maple, yellow birch, fir, hemlock and spruce, and the soil will, without doubt, prove fertile.

CLAY SLATE.

The rocks of the metamorphic group frequently graduate into clay slate, and it will be perceived, by reference to the map, that a well defined clay slate occupies a distinct tract in the region under consideration. This tract is almost wholly in T. 48 N., R. 26 W., and occupies an area of about five sections. The slate appears generally in low knobs, dipping northwesterly, and is highly argillaceous. The tract is timbered with a large growth of sugar maple and hemlock.

RED SANDROCK.

It will be perceived that this rock occupies a small portion of the country embraced in our first division.—

It is found skirting the primary and metamorphic rocks on all sides, and almost excluding them from the Lake coast.

As this rock occupies a larger area in the district of country, hereafter to be considered, no description of it will here be given. It may, however, simply be observed, that this rock is frequently found surrounding, and in contact with, the uplifted masses of igneous rocks, and is then invariably much altered both in appearance and texture, and may, under such circumstances, fairly be considered as metamorphic.

KEEWENAW POINT.

The subdivisions of the past season upon this part of the survey, include all that portion of Keewenaw Point lying north and east of Portage Lake, and this portion of the work will be separately considered.

Keewenaw Point may be said to be made up of three rock formations, trap, trap conglomerate, and red sand rock. Of these, the first mainly gives its peculiar character to the country, giving to it its mountainous aspect and general configuration, having been protruded by the operation of igneous forces into its present position; while the other rocks are sedimentary in their origin, and are found surrounding and resting against the other.

The accompanying map will exhibit, with much accuracy. the positions and extent of these rocks, in reference to each other, and to the town and section lines..

TRAP ROCKS.

It will be seen that throughout nearly the whole of

the portion occupied by these rocks, may be traced two distinct ranges of hills, which, commencing near the easterly extremity of the Point, run nearly parallel to the boundary of the trap. The summits of the more northerly range, preserve an almost uniform distance from the northerly boundary of trap, of about one and a quarter miles, while those of the southerly range average little more than a half mile from the southerly extension of the trap formation. These ranges, which are quite continuous from T. 57 N., R. 28 W., westerly as far as T. 57 N., R. 32 W., begin here to fall away, becoming also more irregular and broken as they approach the basin of Portage Lake. In fact, from the latter town, southwesterly, their character, as distinct ranges, is almost entirely lost, until they reappear at about an equal distance from the Portage Lake, on the other side of the basin. The continuity of the trap rocks, however is not destroyed, though its bounds are much narrowed.

The barometer work having been carried no further west from the extremity of the Point, than range 29, does not enable me to give the elevations of these ranges with completeness ; but it may be stated that the highest point found is in the southerly range, in T. 58 N., R. 29 W., where the trap rises into a knob having an elevation above Lake Superior of 876 feet. To this knob has been given the name of Mt. Houghton. The general elevation of the northerly range of hills is, however, somewhat the greatest, the knobs rising to from 400 to 600 feet.

These ranges present their steepest escarpments on their southerly sides, where they rise frequently into

cliffs of 100 feet nearly perpendicular, and, in one instance, in the southerly range, to nearly 400 feet. In general, they slope much more gently to the north, thus following the general inclination, or dip, which is common to all the rocks of the Point.

The portion of the trap district included between these two ranges, as far westerly as range 30, has a gradual descent in the valley of the Little Montreal river. Beyond this, westerly, it is more rolling and sometimes broken by knobs and ridges of trap, with some intervening swamps. The whole is, in general, covered by a sandy loam, and is clothed with an abundant growth of sugar maple, birch, fir, oak and white pine; the maple greatly predominating, wherever the soil is of sufficient depth. Where this soil is barely sufficient to conceal the underlying rock, cedar is the prevailing timber.

It will be observed that the Little Montreal river, above alluded to, has its course wholly between these two trap ranges, pursuing its course nearly across ranges 30, 29 and 28. This is the most considerable stream in the district under consideration. Though somewhat sluggish through the first half of its course, which may be said to occupy the most elevated part, or plateau, of the trap region, it becomes more rapid through ranges 29 and 28, and its course to the Lake shows a very considerable descent, probably of a about 300 feet, through the latter range.

The more northerly of these ranges of trap is very uniform in character, and while the rock of both the northerly and southerly ranges may be denominated greenstone, that of the latter is much the most compact. The rocks of the former range, have a very distinct-

ly chrystaline structure, passing from a very gradulated greenstone to a rock composed of chrystals of augite, or hornblende, and feldspar, with considerable intermixture of quartz, sometimes nearly forming an imperfect syenitic granite, and showing the identity of origin of the trap and granite rocks. These portions of the trap are extremely hard, and break with difficulty under the hammer.

The central portion of the more elevated knobs of the southerly range are frequently composed of a very hard and compact trap of a reddish color, which sometimes takes on the character of a trap breccia, or aggregate of small cemented angular pieces of rock, and may perhaps be denominated a trap porphyry.

Intermediate between these two ranges, the trap is sometimes compact, at others amygdaloidal, and occasionally granular; while, on the outer slopes of both ranges, it is almost uniformly amygdaloidal, and is frequently what may be denominated a true amygdaloid, having its cells filled with spar, quartz, epidote and other minerals.

In an economical point of view, the greenstone of the trap range is worthy of consideration, being well fitted for use as a building material, from its durability, and the ease with which, in consequence of its jointed structure, it may be quarried.

CONGLOMERATE ROCK.

Resting against the trap on its northerly slope, and extending from the extremity of Keewenaw Point westerly in T. 57 N., R. 33 W., will be found a rock for-

mation which is evidently of sedimentary origin, being composed of water worn masses, generally of the harder portions of the trap rock, held together by an exceedingly hard calcareous and argillaceous cement. It is evident that this rock was deposited around the base of the trap hills, beneath the waters, and has been subsequently elevated, for the whole mass dips northerly, or from the trap hills, at an angle of about 45 degrees.

At or near its junction with the trap, this rock rises into a very distinct and generally continuous hilly range; which may, in fact, be considered as the outcropping edge of the formation, rising on its northerly side in a steep escarpment, but sloping more gradually down towards the Lake, on the north. This ridge varies in elevation, the highest ascertained point being in T. 58 N., R. 27 W., and is 680 feet above Lake Superior. But this is much above the average elevation which will not be found probably to exceed 350 feet.

A marked difference is observable in the character of the country occupied by the trap and conglomerate rocks; for while the former exhibits a series of elevated knobs of a rugged and broken character, the latter presents a more uniform and rounded outline, and cedar, fir, and other evergreens, constitute a larger proportion of its timber.

MIXED CONGLOMERATE AND SANDROCK.

At a short distance northerly from the range last mentioned, may be observed another, but less elevated and continuous ridge, which is the southerly outcrop of the mixed conglomerate and sandstone formation. This

rock may, in fact, be considered as an upper member merely of the conglomerate, and differs from it only in being composed of alternating strata of coarse or fine materials, derived from the same origin. As the finer strata of this rock has been mistaken by some for the red sandrock, hereafter described, it is important to observe that a very marked difference exists between the two rocks; for, while the latter is made up of materials derived from the several rock formations of the country, and into which quartzose grains enter most largely, the former is wholly derived from the trap rocks.

This conglomerate and sandrock range probably nowhere exceeds 350 feet above the level of the Lake. It occupies the northern coast of Keewenaw Point, with some exceptions occasioned by trap dykes, within the limits alluded to as the extent, easterly and westerly, of the conglomerate rock formation.

In the hollow between these two ridges of conglomerate, and conglomerate and sandrock, lie several long and narrow lakes, and lines of swampy ground are not an uncommon feature.

The barometer work having been carried over a comparatively small portion of the Point, I have not been able to form any new estimate of the thickness of the conglomerate and mixed rocks. Those contained in the report of Dr. Houghton, made to the Legislature of Michigan in 1841, may be considered as sufficiently precise, which fix the maximum of the latter at 4200 feet, the former having probably a less thickness on the Point, though attaining near the Montreal river a thickness of 5260 feet.

TRAP DYKES.

I have already alluded to the fact that the granites of the more northerly portion of the primary district are traversed by dykes of trap, which have produced great changes in the rocks of that district, as also to the fact that the conglomerate and sandrocks are found traversed by similar dykes. On approaching Keewenaw Point, from the eastward, trap is seen apparently interstratified with the conglomerate and mixed rocks which constitute the coast, the whole dipping together to the north at an angle varying from 30 to 45 degrees.

A trap dyke of very unusual size makes its appearance on the eastern extremity of the Point, in section 10, and may be traced westerly, following the general curvature of the coast, into range 31 west. It has an average breadth of half a mile. In its westerly prolongation, this dyke first approaches the coast at Copper Harbor. It has here been broken across by the waters of the Lake; so that, while the conglomerate rocks are found composing the outer points, as well as the south side of the harbor, the trap is seen at its two ends and at the projecting points and island, and it forms the bar across the entrance.

Continuing westerly, this dyke cuts entirely across the conglomerate and sandrocks, at Agate Harbor, and from thence the coast is constituted of this rock, westerly as far as section 3, in T. 58 N., R. 31 W. Along this portion of its course it is found gradually thinning out, having at Grand Marais and Eagle Harbors a width of a few rods only, and thinning out entirely, or passing off into the deep water of the Lake, at the point above named.

The trap composing this dyke is partly compact and partly of amygdaloidal structure. At Agate Harbor, the trap is of this latter character, and the cells are filled with chalcedony, cornelian, jasper, quartz, &c. often forming agates of great size and beauty. This part of the coast is lined with islands at a few rods distance from the main shore, most of which appear to be portions of trap of a more hard and compact character, and which have resisted the action of the waters that have washed away the intermediate portions, thus forming a series of narrow and deep channels.

This dyke dips regularly with the conglomerate and sandrock in which it is included, to the north and northwest, at an angle of about 45 degrees.

RED SANDROCK.

This rock, the equivalent of the Potsdam red sandrock of the New York reports, it will be seen by the map, occupies the whole remainder of the portion of Keewenaw Point under consideration, skirting a large part of the trap range, on both sides, but having by far its broadest extension on the south side. It here lies in nearly horizontal strata, though at the coast a slight dip inland is observable, becoming more apparent as it approaches the basin of Portage Lake. In its approach to the trap, however, it is found more or less tilted from its original horizontal position, and is also very much altered by its contact with that igneous rock. The evidences both of the deposition of this extensive formation, in calm and shallow waters, and of the subsequent change induced in it by the trap rocks, when in a fused or heated state, are very apparent.

Receding from the trap ranges southward, the surface of the country underlaid by this rock is, in general, rolling, and timbered with sugar maple, hemlock, birch, spruce, fir and occasional large pines. The soil is a sandy loam, and in general of good quality. Approaching the Lake coast, the land falls gradually to a level, where the evergreens predominate over the maple, and the country is much cut up by marshes.

MINERAL VEINS.

In regard to this subject, I have deemed it unnecessary to enter into details, for the reason that the returns of the surveys, so far as the geology is concerned, relate rather to the general character of the region, and that the observations of the past season, so far as can now be determined, tend to confirm the facts which have been stated in considerable minuteness of detail, in the report made by Dr. Houghton, in 1841, to the Legislature of the state of Michigan.

It may, however, be observed, that the courses of many veins have been fixed with accuracy, and the veins themselves traced, in some instances, for several miles across the conglomerate and sandrocks, and into and across some portions of the trap. The observations thus made, are confirmatory of the fact first noted by Dr. Houghton, that the true veins of the district referred to, pursue a course nearly at right angles to the line of bearing of the trap range.

In concluding these brief descriptions, it may be proper to state, that the personal observations of the writer have been confined almost entirely to a somewhat

cursory exploration, made several years ago, while acting as assistant to Dr. Houghton, in his arduous labors in the geological commission of Michigan, and that he has been enabled to devote but a very limited time to the examination of the specimens collected, and of the notes returned. It is very probable that he may have omitted many facts of importance. It is only by special solicitation, and the apparent necessity of the case, that he has undertaken to prepare such general observations as seemed called for under present circumstances.

In attempting this duty, the undersigned cannot be unmindful of the very meagre and imperfect sketch here presented, when compared with whatever proceeded from that master mind, whose genius first developed, and whose indomitable energy tracked through all its difficulties, a system not only intricate in itself, but novel to science; and in a region at that time destitute of all the ordinary facilities for scientific investigation. To the same active and philosophic mind, we owe the system of the union of geological with the lineal surveys of lands of the United States, the first experimental results of which are now returned to this department.

In presenting these, it may not be deemed inappropriate to allude to to the general advantages resulting from the new system, as devised, and thus far successfully prosecuted, by Dr. Houghton.

The advantages of thorough geological and topographical surveys, are now so well appreciated, that they have been prosecuted to a considerable extent by foreign governments. Great Britian has already appropriated immense sums towards the accomplishment of a complete survey of that kingdom, which has as yet advan-

ced but a comparatively little way. And the geological surveys made by the United States, have made very fully and generally known the advantages of these undertakings. Fortunately, the system of rectangular surveying, adopted by the United States government, affords the best possible opportunity to accomplish, with little additional expense, what, under other circumstances, could be effected only at a much more considerable cost. The maps, both geological and topographical, herewith returned, will afford some evidence of the extreme accuracy, as well as the extent and minuteness of the results thus obtained.

In noticing some of the scientific results of the survey of the past season, the duty would be imperfectly performed, were I to omit calling attention to the unwonted accuracy with which the lines have been run. This accuracy has been attained by the exclusive use, by all the parties, of "Burt's Solar Compass;" an instrument to well known to need more than a bare allusion, but the great value of which has been more than fully confirmed during the surveys of the past season. This remark will seem justified, when it is considered that nearly the whole region of country traversed by these surveys, abounds with mineral attractive to the magnet; that the needle has been almost constantly acted upon by causes which produced deviations from the true meridian of the earth's magnetism, and often so powerfully as to completely reverse the direction of its poles. A variation fluctuating from 6° to 20° on either side of the true meridian, was not uncommon, through the length of an entire township; and it seems difficult to imagine how the lines could have been run with the ordinary

surveyor's compass. Other important advantages have been arrived at, from the use of this compass, of both a scientific and practical character; one of which only, will be here alluded to, viz: the means afforded by it of detecting the presence of certain rocks, over large areas, where no rocks are visible at the surface. This was particularly observable in the region of the great trap ranges, where it was almost uniformly found that the needle became deflected towards the mass of the trap hills, even though distant, and was more or less fluctuating, when passing over a country whose underlying rock was trap. The same phenomena were exhibited among the iron ore rocks of the metamorphic region.

Allusion may here be made to the increased importance given to the work of the past season, by the introduction of the barometer upon the lines, by means of which the elevations of the country are exhibited with a great degree of accuracy; a complete section being obtained on every line, and thus furnishing all that was needed to make a true, complete, and minute exhibit of the topography of the country. In another and more scientific point of view, the use of this instrument becomes highly important, from the means it affords of ascertaining the true dip and thickness of rocks; data, the importance of which are appreciated not merely by the man of science, but, as is well known, in the practical operations, more especially of the miner and engineer.

It may be allowed me, further, to allude to that commendable zeal and fidelity which has been exhibited by all those who have been associated with Dr. Houghton, as his aids, during these surveys, in furthering the plans

marked out by him, and by their numerous and close observations, assisting to perfect the knowledge of the geology of that interesting region.

BELA HUBBARD.

STANARD'S ROCK,

Was discovered by Capt. Charles C. Stanard, at four o'clock, P. M. August 26, 1835.

"The course to this rock from the east end or point of Manitou Island, is twenty-seven miles S. E. half E., and from Point Abbaye, forty-five miles E. by N. 3-4 N., lat. 47° 8′ north, long. 87° 24′ west from Greenwich.

"On both of my visits to the rock, the sea was too rough to allow me to land on it, but from the mast head of the vessel, it appeared to be about twelve or thirteen feet long, by five or six feet broad, and rising above the surface about three feet. On the south, southeast, east and northeast sides, the water is deep. On the west, southwest, and northwest sides, the water is quite shoal for some distance out; and from the rock about N. N. W. runs a reef to the distance of about eighty or ninety rods.

"The composition of the rock is the same as the trap of Point Keewenaw, This I learned from Mr. Mendenhall. I also saw a piece of the rock brought away by one of the sailors of the Algonquin.—*Capt. B. A. Stanard.*

GLOSSARY.

INCLUDING THE TECHNICAL TERMS USED IN THIS WORK.

Alluvion or Alluvium. Recent deposites of earth, sand, gravel, mud, stones, peat, shell banks, shell marl, drift sand, &c., resulting from causes now in action.—This term is generally applied to those deposites in which water is the principal agent.

Amorphous. Bodies devoid of regular form.

Amygdaloid. A trap rock which is porous and spongy, with rounded cavities scattered throughout its mass. Agates and simple minerals are often contained in these cavities.

Anticlinal. An anticlinal ridge or axis is where the strata along a line dip contrariwise, like the sides of the roof of a house.

Arenaceous. Sandy.

Argillaceous. Clayey.

Augite. A simple mineral of variable color, from black through green and gray to white. It is a constituent of many volcanic and trappean rocks, and is also found in some of the granitic rocks.

Basalt. One of the common trap rocks. It is composed of augite and feldspar, is hard, compact, and dark green or black, and has often a regular columnar form. The Palisades of the Hudson show the columnar aspect of trap rocks. The giant's causeway is cited as an example of basaltic rocks, and the columnar structure is there very strikingly displayed.

Blende. Sulphate of zinc. A common shining zinc ore.

Bluffs. High banks of earth or rock with a steep front. The term is generally applied to high banks forming the boundaries of a river or river alluvious.

Bog Iron Ore, or Ochre. A variety of ore of iron which has been deposited by water. Chiefly in low, wet ground.

Botryoidal. Resembling a bunch of grapes in form.

Boulders. Erractic group. Lost rocks. Rocks which have been transported from a distance, and more or less rounded by the attrition or the action of the weather. They lie upon the surface or loose in the soil, and generally differ from the underlaying rock in the neighborhood.

Breccia. A rock composed of angular fragments cemented together by lime and other substances.

Calcareous rocks. A term synonymous with limestone.

Calcareous spar. Crystalized carbonate of lime.

Carbonates. Chemical compounds containing carbonic acid, which is composed of oxygen and carbon.

Chert. A siliceous mineral, approaching to chalcedony, flint and hornstone. It is usually found in limestone.

Chlorite. A soft green scaly mineral, slightly unctious.

Chlorite slate. Slate containing chlorite.

Clinkstone. A slaty feldspathic or basaltic rock, which is sonorous when struck.

Cleavage. The separation of the lamina of rocks and minerals in certain constant directions. They are not always parallel to the planes of stratification, but are often mistaken for them.

Conformable. When strata are arranged parallel with each other, like the leaves of a book, they are said to be conformable. Other strata lying across the edges of these may be conformable among themselves, but *unconformable* to the first set of strata.

Conglomerate, Crag or Puddingstone. Rocks composed of rounded masses, pebbles and gravel cemented together by a siliceous, calcareous, or argillaceous cement.

Cross course. A lode intersecting a vein at any angle, and generally throwing the vein out of its course.

Cross. The best ore.

Chrushing. Grinding ores without water.

Cuniform. Wedge shaped.

Cross-cut. A method of discovering lodes by sinking pits in their vicinity, and driving transversely to their supposed direction.

Crop out and out crop. Terms employed by geologists and mining engineers, to express the emergence of rock, in place, on the surface of the earth at the locality where it is said to crop out.

Crystaline. An assemblage of imperfectly defined crystals, like loaf sugar and common white marble.

Dykes. A kind of vein intersecting the strata, and usually filled with some unstratified igneous rock, such as granite, trap or lava. These materials are supposed to have been injected in a melted state into great rents or fissures in the rocks.

Diluvium or Dilurion. Deposites of boulders, pebbles and gravel, which many geologists have supposed were produced by a diluvial wave or deluge sweeping over the surface of the earth.

Dip. Where strata are not horizontal, the direction in which their planes sink or plunge, is called the direction of the dip, and the angle of inclination, the angle of dip.

Dolomite. A magnesian limestone belonging to the primary class. It is usually granular in its structure, and of a friable texture.

Drift. A horizontal excavation in any direction under ground, for ore, ventilation &c.

Dead ground. The portion of lode in which the ore is dead or valueless.

Deen. The end of a level or cross cut.

Dropper. A branch where it leaves the main lode.

Driving. Digging horizontally.

Embouchure. From the French, signifying mouth or entrance, (of a river.)

Estuaries. Inlets of sea into the land. The tides and fresh water streams mingle and flow into them.—They include not only the portion of the sea adjacent to the mouths of rivers, but extend to the limit of tide water on these streams.

Fang. A niche in the side of an adit or shaft for an air course.

Feeder. A branch where it falls into a lode.

Fault. A dislocation of strata, at which the layers on one side of a dyke or fissure have slid past the corresponding ones on the other. These dislocations are often accompanied by a dyke. They vary from a few lines to several hundred feet.

Feldspar. One of the simple minerals, and next to quartz, one of the most abundant in nature.

Ferruginous. Containing iron.

Galena. An ore of lead composed of lead and sulphur.

Garnet. A simple mineral which is usually red and crystalized. It is abundant in most primitive rocks.

Gneiss. A stratified primary rock, composed of the same materials as granite, but the mica is distributed in parallel layers, which will give it a striped aspect.

Geode. Geodiferous. Geodes are small cavities in rocks generally lined with quartzose or calcareous crystals.

Economical Geology refers to the applications of Geological facts and observations to the useful purposes of civilized life.

Granite. An unstratified rock, composed generally of quartz, felpspar and mica, and it is usually associated with the oldest of the stratified rocks.

Graywacke, Grauwacke. A group of strata in the transition rocks; but the term has been so indefinitely applied, that other names will probably be substituted.

Greenstone. A trap rock composed of hornblende and feldspar.

Grit. A coarse-grained sandstone.

Gad. A small, pointed wedge, used in the mine for wedging off splits.

Gossan. Oxid of iron and quartz, generally occuring in lodes at shallow depths.

Gulph of ore. A very large deposite of ore in a lode.

Gumnies. Sands or workings.

Hornblende. A mineral of a dark green or black color, and which is a constituent part of greenstone.

Hornstone. A siliceous mineral approaching to flint in its character.

Horse. Is where a hard formation or the wall rock intercepts a vein.

In situ, In place. In their original position where they were formed.

Laminæ. The thin layers into which strata are divided, but to which they are not always parallel.

Line of bearing, is the direction of the intersection of the planes of the strata with the plane of the horizon.

Linear survey. A plan of surveying adopted by the United States government, by which the public lands are divided into rectangles, by straight lines.

Loam. A mixture of sand and clay.

Lodes. Cracks or fissures containing ore.

Leap. Is when a vein disappears suddenly by diminishing in quality or quantity.

Magnetic Meridian. A great circle passing through or by the magnetic poles of the earth; to which the *compass needle*, if not otherwise hindered, conforms itself. This "line of no variation," is not stationary, but shifts eastward or westward of the true meridian, during a term of years.

Mural Escarpment. A rocky cliff with a face nearly vertical like a wall.

Mammillary. A surface studded with smooth small segments of spheres like the swell of the breasts.

Matrix. The mineral mass in which a simple mineral is imbeded, is called its *matrix* or *gangue.*

Mechanical origin, Rocks of. Rocks composed of sand, pebbles or fragments, are so called, to distinguish them from those of a uniform crystaline texture, which are of chemical origin.

Metamorphic rocks. Stratified division of primary rocks, such as gneiss, mica slate, hornblende slate, quartz rock, &c., and which may probably be regarded as altered sedimentary rocks.

Metalliferous. Containing metals or metallic ores.

Mica. A simple mineral, having a shining silvery surface, and capable of being split into very thin elastic leaves or scales. The brilliant scales in granite and gneiss are mica.

Micaceous. In part composed of scales of mica.

Mica Slate. One of the stratified rocks belonging to the primary class. It is generally fissile, and is characterized by being composed of mica and quartz, of which the former either predominates, or is deposited in layers, so that its flat surface gives it the appearance of predominating.

Native Metals. Those portions of metal found in nature in a metallic, or uncombined state, are called native.

New Red Sandstone. "A series of sandy and argillaceous, and often calcareous strata, the prevailing color of which is brick-red, but containing portions which are greenish grey. These occur often in spots and stripes, so that the series has sometimes been called the variegated sandstone. The European, so called, lies in a geological position immediately above the coal measures."

Nodule. A rounded, irregular shaped lump or mass.

Ochre. See bog iron.

Old Red Sandstone. "A stratified rock, belonging to the carboniferous group of Europe."

Out-crop. See Crop out.

Oxid. A combination of oxygen with another body. The term is usually limited to such combinations as do not present active acid or alkaline properties.

Porphyry. A term applied to every species of unstratified rock, in which detached crystals of feldspar are diffused through a compact base of other mineral composition.

Primary rocks. Those rocks which lie below all the stratified rocks and exhibit no marks of sedimentary origin. They contain no fossils, and are the oldest rocks known. Granite, hornblende, quartz and some slates belong to this division.

Prospecting. Examining for and partially opening veins when discovered.

Pudding Stone. See Conglomerate.

Pyrites. A mineral composed of sulphur and iron. It is usually of a brass yellow, brilliant, often crystalized, and frequently mistaken for gold.

Quartz. A simple mineral, composed of silex.—Rock crystal is an example of this mineral.

Rock. All mineral beds, whether of sand, clay, or firmly aggregated masses, are called rocks.

Sandstone. A rock composed of aggregated grains of sand.

Schist. Slate.

Seams. "Thin layers which separare strata of greater magnitude."

Sedimentary rocks. All those which have been formed by their materials having been thrown down from a state of suspension or solution in water.

Septaria. Flattened balls of stone, which have been more or less cracked in different directions, and cemented together by mineral matter which fill the fissures.

Serpentine. A rock composed principally of hydrated silicate of magnesia. It is generally an unstratified rock.

Shale. An indurated clay, which is very fissile.

Shingle. The loose water-worn gravel and pebbles on shores and coast.

Silex. The name of one of the pure earths which is the base of flint quartz, and most sands and sandstones.

Silicious. Containing silex.

Simple Minerals—Are composed of a single mineral substance. Rocks are generally aggregates of several simple minerals cemented together.

Shaft. Is what is usually called a well. After drifting has progressed, shafts are required as ventilators, to free them from the smoke of blasts.

Slate. A rock divided into thin layers.

Stratification. An arrangement of rocks in strata.

Strata. Layers of rock parallel to each other.

Stratum. A layer of rocks ; one of the strata.

Strike. The direction in which the edges of strata crop out. It is synonymous with *line of bearing.*

Syenite and *Sienite.* A granite rock, in which hornblende replaces the mica.

Synclinal line, and *Synclinal axis.* When the strata dip downwards, in opposite directions, like the sides of a gutter.

Transition Rocks. A series of rocks which lie below the secondary and next above the primary, and are so called because they seem to have been formed at a period when the earth was passing from an uninhabited to a habitable condition. They contain numbers of characteristic fossils.

Trap—Trappean Rocks. Ancient volcanic rocks, composed of feldspar, hornblende and augite. Basalt, greenstone, amygdaloid and dolomite, are trap rocks.

Tuff or *Tufa.* "An Italian name for a volcanic rock of an earthy texture."

Unconformable. See conformable.

Veins. Cracks and fissures in rocks filled with stony or metallic matter. Most of the ores are obtained from metallic veins.

Veinstone. That mineral matter with which the ores or metallic contents of the veins are associated.

Wall rock. The hard rock which is almost universally found on each side of a vein.

LIST OF

NATIVE METALS AND ORES.

ABRIDGED FRON DANA'S MINERALOGY.

Native copper. Color. Copper-red. Ductile and malleable. Fracture, hackly. It consists purely of copper. Before the blow pipe it fuses readily; on cooling it is covered with a coating of black oxid. It dissolves readily in nitric acid.

Copper occurs in beds and veins accompanying its various ores, and sometimes associated with iron. It is frequently found in loose masses imbedded in the soil. This metal has been found native, throughout the red sandstone region of the United States.

The largest mass of native copper ever known, is the one they are now taking out of the vein worked by the Copper Falls Company, for which see notice of that company.

Blue Copper. Lustre—resinous, faint. *Streak*—lead-gray, shining. Color—indigo blue or darker.—Opaque. Sectile. Before the blowpipe it burns, before becoming red hot, with a blue flame, and fuses to a globule, which is strongly agitated and emits sparks; finally it yields a button of copper.

Argentiferous copper. Massive; impalpable. *Lustre;* metallic. *Streak;* shining. *Color;* steel-gray. *Fracture;* subconchoidal. Sectile. This species is of rare occurrence.

Copper Black. Disseminated, or coating other copper ores, in shining, botryoidal masses. *Color*; black or brownish black. Before the blowpipe it is infusible. With borax it affords a greenish slag.

Green Malachite or Green carbonate of copper. Lustre; adamantine, inclining to vitreous; fibrous varieties have often a silky lustre, and others are dull and earthy. *Streak;* green, paler than the color. Translucent—subtranslucent—opaque. *Fracture;* subconchoidal, uneven. Seldom observed in crystals. Before the blowpipe, it decrepitates, becomes black, and is partly converted into a black scoria. With borax, it fuses easily to a deep green globule, and ultimately affords a bead of copper. Dissolves with effervescence in nitric acid. It usually accompanies the other ores of copper. It is the principal ore that is worked for copper in the Wisconsin mines.

Vitreous copper or copper glance. Lustre; metallic. *Streak* and *color;* blackish, leadgray; often tarnished blue or green. *Streak;* sometimes shining. *Fracture;* conchoidal. Sectile. In the oxidizing flame of the blowpipe it melts, gives out fumes of sulphur, and emits glowing drops with a noise, coloring the flame at the same time blue. In the reducing flame it becomes covered with a coating and does not melt. If the sulphur is driven off, a globule of copper remains. In heated nitric acid the copper is dissolved, and the solution assumes a green color; the sulphur is precipitated.

Red copper ore or *Tile ore. Lustre*; adamantine, or sub-metallic—earthy. *Streak*; several shades of brownish red. *Color*; red, of various shades, particu-

larly cochineal red, occasionally crimson-red by transmitted light. Subtransparent—subtranslucent. *Fracture*; conchoidal, uneven. Brittle. Before the blowpipe in the reducing flame, or charcoal, affords a globule of copper. Dissolves with effervescence in nitric acid. *Tile ore* formerly included the earthy varieties. These usually present a brick-red or reddish-brown color, and are frequently mixed with oxide of iron.

Copper Pyrites. Lustre; metallic. *Streak*; greenish black—a little shining. *Color;* brass-yellow—subject to tarnish. Opaque. *Fracture:* conchoidal uneven. Rather Sectile. Before the blowpipe, on charcoal, it blackens, but becomes red on cooling. After a continued heat, it fuses to a globule which is magnetic. With borax it affords pure copper. Dissolves in nitric acid, excepting the sulphur, forming a green solution. A drop of liquid ammonia changes it to a deep blue. Its richness may in general be judged of by the color; if of a fine yellow hue, and yielding readily to the hammer, it may be considered a good ore, but if hard and pale-yellow, it is assuredly a poor one, being mixed with iron pyrites. Copper pyrites is readily distinguished from iron pyrites, which it somewhat resembles, by its inferior hardness; it may be cut by the knife, while iron pyrites will strike fire with the steel. The effects of nitric acid are also different. It differs from gold in being brittle, on account of which it cannot be cut off in slices, like the latter metal.

Sulphate of copper or *Blue vitriol. Lustre;* vitreous. *Color;* deep sky-blue, of different shades. Sub-transparent—translucent. *Taste;* metallic and nauseous. Somewhat brittle. It is soluble in water. A polished

plate of iron introduced into the solution becomes covered with copper. Blue vitriol is found in waters issuing from mines, and in connection with rocks containing copper pyrites, by the decomposition of which it is formed.

Sulphurate of copper See "*Vitreous copper.*"

Variegated copper. Lustre; metallic. *Streak*; pale greyish black, and slightly shining. *Color*; between copper-red and pinchbeck brown. *Fracture;* small conchoidal, uneven. Brittle. It speedily tarnishes when exposed. Before the blowpipe it blackens, and becomes red on cooling; at a higher temperature it fuses to a globule, attractable by the magnet. It is mostly dissolved by nitric acid. It occurs with other copper ores in primitive and secondary rocks, This species is a valuable ore of copper.

Crysocolla or *Copper green.* Botryoidal and massive. *Lustre*; vitreous, shining, earthy. *Streak*; white. *Color;* emerald and pistachio green, passing into sky-blue; often brown when impure. Translucent —opaque. *Fracture;* conchoidal. Rather sectile, translucent varieties brittle. Blackens in the interior flame of the blowpipe on charcoal, without melting.—With borax it melts to a green glassy globule, and is partly reduced. The same specimen of this mineral often presents very different appearances at its opposite parts; being sometimes of an earthy appearance, like decomposed feldspar, in one part, and translucent and brittle on the opposite, The differences of the several varieties are owing, more or less to impurities.

Emerald copper ore or *Dioptase*. *Lustre*; vitreous, inclining to resinous. *Streak*; green. *Color*; emerald-green; also blackish-green and verdigris-green. Tranparent—sub-translucent. *Fracture*; conchoidal, uneven. Brittle. Decrepitates in the blowpipe flame, tinging it yellowish-green; in the exterior flame it becomes black, and in the interior, red, but does not melt. It fuses with borax, giving it a green color, and finally is reduced. Insoluble in nitric, but soluble without effervescence in muriatic acid. It acquires negative electricity by friction when insulated.

Gray copper ore. *Lustre*; metallic. *Streak*; sometimes inclined to brown, but generally the same as the color. *Color*; between steel-grey and iron-black. Opaque. *Fracture*; sub-conchoidal, uneven. Rather brittle. The comportment of the different varieties before the blowpipe is somewhat various. They all give off fumes of antimony and arsenic, finally melt, and after roasting, afford a globule of copper. When pulverized, they dissolve with a little residue in nitric acid. The solution has a brownish-green color. Fuses very easily before the blowpipe.

Gold. *Lustre*; metallic. *Streak* and *color* various shades of gold-yellow, sometimes inclining to silver white. Opaque. Is the most ductile and malleable of all metals. The ores of gold in nature usually contain silver in different proportions. Copper is occasionally alloyed with gold. Native gold occurs in veins and in interspersed grains and laminæ, and occasionally crystallized in quartz, and is usually associated with talcose rocks. It is often found in the sands of rivers and valleys where it has been carried from disintegrated

auriferous rocks. It is also disseminated in grains or thin leaves in various metallic minerals, particularly iron pyrites.

Spathic iron. *Lustre*; vitreous—pearly. *Streak*; white. *Color;* ash-grey, yellowish-grey, greenish-grey, also brown and brownish-red; sometimes white.—Translucent, sub-translucent. *Fracture*; uneven.—Brittle. In the blowpipe flame it blackens, giving off carbonic acid, and ultimately an oxyd of iron is obtained, which is attractable by the magnet. Alone, it is infusible. It colors borax green. It dissolves with difficulty in nitric acid, and scarcely effervesces, unless previously pulverized. Exposure to the atmosphere darkens its color, rendering it often of a blackish-brown or brownish-red color. It occurs in many of the rock strata, in gneiss, mica-slate, greywacke, and in connection with coal formations. It is often associated with metallic ores.

Magnetic iron ore. *Lustre*; metallic—sub-metallic. *Streak*; black. *Color*; iron black. Opaque. *Fracture;* sub-conchoidal, shining. Brittle. Strongly attracted by the magnet and sometime possessing polarity. Before the blowpipe it becomes brown, and loses its influence on the magnet, but does not fuse. With borax in the oxydizing flame, it fuses to a dull-red glass, which becomes clear on cooling, and often assumes a yellow tint; in the reducing flame it becomes bottle-green.—Dissolves in heated muriatic acid, but not in nitric acid. Magnetic iron ore occurs in beds in primitive rocks, generally in gneiss or syenite, also in beds and isolated crystals in clayslate, hornblende and chlorite slates, greenstone and occasionally in limestone. No ore of iron is more

generally diffused than the magnetic, and none superior for the manufacture of iron. It is easily distinguished by its being attracted readily by the magnet, and also by means of the black color of its streak, or powder, which is some shade of red or brown in specular iron and brown iron ore. The ore when pulverized may be separated from earthy impurities by means of a magnet, and machines are in use in many parts of northern New York for cleaning the ore on a large scale.

Specular iron. Lustre; metallic and occasionally Splendent—massive varieties sometimes earthy. *Streak;* cherry-red or reddish-brown. *Color;* dark steel-gray or iron-black; impure varieties red and unmetallic. Opaque, except when in very thin laminæ, which are faintly translucent and of a blood-red tinge. *Fracture;* sub-conchoidal, uneven. Sometimes it is slightly attractable by the magnet; the volcanic varieties occasionally exhibit polarity. Infusible, alone, before the blowpipe; with borax it forms a green or yellowish glass. Dissolves in heated muriatic acid. This species includes the old species, specular iron and red iron ore, which are identical in chemical composition, and differ only in the state of aggregation of the particles. *Specular iron* includes specimens of a perfect metallic lustre; if the structure is micaceous, it is called *micaceous iron.* The varieties of a sub-metallic or non-metallic lustre, were included under the name of *red hematite, fibrous red iron;* or if soft and earthy, *red ochre,* and when consisting of slightly coherent scales, *scaly red iron* or *red iron froth.* Under this species must also be included the different clay or argillaceous-iron ores, many of which contain but small portions of iron; *reddle* or *red*

chalk, the common drawing material, which has an earthy appearance and a flat conchoidal fracture; *columnar* and *lenticular argillaceous iron*, distinguished by a columnar or flat granular structure. Specular iron occurs commonly in primitive rocks. The argillaceous ores form beds in secondary rocks. These varieties especially the specular, require a greater degree of heat to smelt than other ores, but the iron obtained is of a good quality.

Iron Pyrites. Lustre; metallic—splendent—glistening. *Streak*; brownish-black. *Color.*; a characteristic bronze-yellow, nearly uniform. Opaque. *Fracture;* conchoidal, uneven. Brittle. Strikes fire with steel. It becomes red in the oxydating flame of the blowpipe, and gives off fumes of sulphur; ultimately, there is obtained a globule of oxyd of iron which is attractable by the magnet. It is soluble in nitric acid, except a white residue. Some varieties are very liable to decomposition on exposure to the atmosphere. Iron pyrites occurs abundantly in rocks of all ages, from the oldest primitive to the most recent alluvial deposites. This species is of the highest importance in the arts, as it affords the greater part of the sulphate of iron and sulphuric acid of commerce, and also a considerable portion of sulphur and alum.

Manganiic. Lustre; sub-metallic. *Streak;* reddish-brown, sometimes nearly black. *Color;* dark steel-black, iron-black. Opaque; minute splinters cleared off sometimes exhibit a brown color by transmitted light, when exposed to the direct light of the sun. *Fracture;* uneven. Before the blowpipe alone it is infusible; with borax it yields a violet-blue globule. In-

soluble in nitric acid; in muriatic acid it gives off chlorine and dissolves without a residue. It occurs in veins traversing porphyry, associated with calcareous spar and heavy spar.

Black manganese. [illegible] *e;* sub-metallic. *Streak;* chesnut-brown. *Color;* brownish-black. Opaque. *Fracture;* uneven. In the oxydating flame of the blowpipe it affords an amethystine globule. Dissolves in heated muriatic acid, with the odor of chlorine.

Cuprous manganese. Massive in small reniform and botryoidal groups. *Lustre;* resinous. *Streak* and *color;* bluish-black. Opaque. Before the blowpipe it becomes brown, but does not fuse; to borax and salt of phosphorus it communicates amethystine and green colors, and the other characteristic indications of copper andmanganese.

Antimonial sulphuret of silver. *Lustre;* metallic. *Color* and *streak;* light steel-grey, inclining to silver white, also blackish lead-grey. Yields easily to the knife, and is rather brittle. *Fracture;* conchoidal—uneven. Before the blowpipe it emits copious white vapors and a slight sulphureous odor, after which, a white metallic globule remains. This species occurs at several localities on Lake Superior.

Native silver. *Lustre;* metallic. *Streak;* shining metallic. *Color;* silver-white; subject to tarnish, by which the color becomes greyish-black. Ductile. It fuses readily in the blowpipe flame, and affords on cooling, a globule, having an angular crystaline form. Dissolves in nitric acid and heated sulphuric acid. Native silver occurs principally in aborescences and filiform shapes, in veins of calcareous spar or quartz, traversing the primitive rocks.

Dark red silver ore. *Lustre;* metallic-adamantine. *Streak;* cochineal-red. *Color;* black, sometimes approaching cochineal-red. Translucent—opaque. *Fracture;* conchoidal. Sectile, yielding readily to the knife. Before the blowpipe it fuses and gives out fumes of antimony; ultimately a globule of silver is obtained.—Partially dissolves in heated nitric acid. The *dark red silver ore* occurs principally with calcareous spar, native arsenic, and galena. It is highly valuable as an ore of silver.

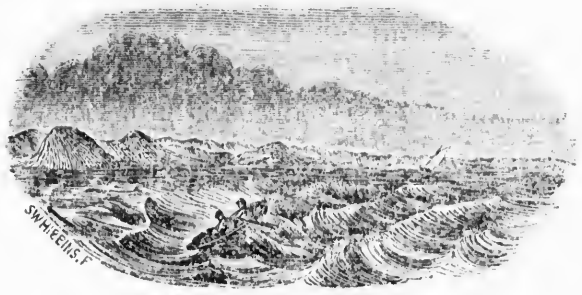
Light red silver ore. *Lustre;* adamantine. *Streak;* cochineal-red, sometimes inclining to aurora-red. *Color;* cochineal-red. Sub-transparent — sub-translucent.—*Fracture;* conchoidal—uneven. Before the blowpipe its behavior is like the preceding species, except that fumes of arsenic are emitted. It occurs with other ores of silver, galena, blende, pyrites and arsenic. It is an important ore of silver. Red orpiment, which it sometimes resembles, differs from it in having a yellow streak.

Carbonate of Zinc. *Lustre;* vitreous, inclining to pearly. *Streak;* white. *Color;* white, often greyish, greenish brownish-white, sometimes green and brown. Subtransparent—translucent. *Fracture;* uneven—imperfectly conchoidal. Brittle .Loses its transparency in the blowpipe flames, but does not melt; carbonic acid is driven off, and oxyd of zinc is obtained or passes off in white flakes. Dissolves with effervescence in nitric acid. It becomes negatively electrified by friction.—It is found both in veins and in beds, especially in company with galena and blende; also with copper and iron.

Siliceous oxyd of Zinc. *Lustre;* vitreous, sub-

pearly, sometimes adamantine. *Streak;* white. *Color;* white ; sometime blue, green, yellow or brown. Tranparent—translucent. *Fracture ;* uneven. Brittle.—Assumes electric polarity by friction or heat. When pulverized, it dissolves in heated sulphuric or muriatic acid, and the solution gelatinizes on cooling. In the blowpipe flame, it decrepitates, loses its transparency, inturneces, and emits a green phosphorescent light. It is infusible alone ; but with borax melts to a clear glass, which becomes opaque on cooling.

COASTING DISTANCES AROUND LAKE SUPERIOR.



View looking westward from a point a few miles west of Presque Isle.

	Miles.	Miles fm Sault.	Course,	REMARKS.
From Sault de Ste Marie				
To Pointe Aux Pins,	8		west	Good Landing.
Parisean Island,	15	23	n w	N and W sides of island rocky, dangerous landing. E and S sides good landing.
White Fish Point,	15	38	n w by w	Good landing.
From Sault de Ste Marie				
To Point Iroquois,	14		west	
Tonquamenon River,	19	33	w by n	Boat Harbor.
White Fish Point,	15	48	n by e	Good landing.
Two Hearted River,	22	70	w by s	Boat Harbor.
Grand Marais Harbor,	26	96	west	Vessel Harbor.
Hurricane River,	13	109	w by s	Sand beach—shoal water.
Miners' River,	17	126	s w by w	Pictured Rocks.
Williams' Landing on Grand Island,	11	137	s w by w	Vessel Harbor.
Riviere Aux Train,	10	147	w by s	Boat Harbor,
Laughing Fish River,	16	163	w n w	" "
Chocolate River,	11	174	west	" "
Riviere Du Mort,	6	180	n n w	Harbor for large boats.
Presque Isle River,	8	188	n w	Good Landing.
Garlic River,	8	196	n w by n	" "
Little Iron River,	9	205	n n w	" "
Yellow Dog River,	7	212	n w by w	" "
Pine River,	6	218	w n w	" "
Huron River,	8	226	w 1-2 n	Boat Harbor.
Point Abbaye,	7	233	n w by w	Good landing.
Methodist Mission,	15	248	s w by w	" "
Catholic Mission,	5	253	s w by w	" "
From Point Abbaye,				
To Portage River,	14	247	west	Five feet on the bar,
South end of Portage,	22	269	n n w	Vessels can come within 1 1-2 miles of this.

	Miles.	Miles fm Sault	Course.	REMARKS.
Across the Portage,	1	270	n n w	
From Point Abbaye				
To Traverse Island,	10	243	n w	Bad Landing.
Tobacco River,	16	259	n n e hf e	Boat Harbor.
Little Montreal River,	17	276	n e by n	Good landing a little to the east.
Copper Harbor,	18	294	n by w	Vessel Harbor.
Agate Harbor,	9	303	west	" "
Grand Marais Harbor,	4	307	w by s	Boat "
Eagle Harbor,	2	309	w by s	Vessel "
Cat Harbor,	2	311	w by s	Boat "
Eagle River,	5	316	w s w hf s	" "
Portage,	20	336	s w hf w	Good Landing.
Little Trout River,	8	344	s w by w	" "
Elm River,	11	355	s w	" "
Misery River,	5	360	s w	" "
Sleeping River,	4	364	w by s	" "
Fire Steel River,	8	372	w s w	" "
Flint " "	1	373	s w	" "
Ontonagon "	6	379	s w by w	Six feet over sand bar.
Iron "	12	391	w by s	Boat Harbor.
Carp "	16	407	w by s	" "
Montreal "	25	432	s w by w	" "
La Pointe, (Madeline Island,)	20	452	n w hf w	" "
St. Louis River,	72	524	west	Eight feet over the bar.
By way of north coast,	..	552		
Two Island River,	75	477	n e	
Grand Portage,	65	412	e n e	Good Landing.
Fort William,	40	372	n e by n	Vessel harbor.
Thunder Cape,	14	358	e s e	
S W end of Isle St. Ignace,	51	307	n e by e	
Slate Island,	50	257	east	
Pic River,	38	219	e hf s	Vessel Harbor.
Otter Cove,	36	183	s by e hf e	
Michipicoten River,	58	125	e by s	Boat Harbor.
Montreal River,	58	67	s by e	
Sandy Islands,	30	37	south	
Gros Cap,	21	16	s by e	Being 1076 miles around Lake Superior.
Pointe Aux Pins,	8	8	s e by e	

MINING COMPANIES.

LAKE SUPERIOR COMPANY—1200 SHARES.

Trustees—David Henshaw, Boston, Mass.; Lemuel Williams, do.; De Garmo Jones, Detroit, Mich.; Milton Coryett, Superintendent.

Lease No 2, Eagle river.

PITTSBURGH AND BOSTON COPPER HARBOR COMPANY,—6000 SHARES.

Trustees—Curtis G Hussey; Charles Avery, Pittsburgh, Pa.; Thomas M. Howe, do.; William Pettit do.; Thomas Jones, Boston, Mass.; Charles Scudder, do.;

Leases Nos. 4, at Copper Harbor, 5 Eagle river, and 6 between Eagle river and the Portage. Richard Jennings, Superintendent of Lease No. 5, David T. Hughs, Superintendent of Lease No. 4. On No. 5 is the far-famed "Cliff Vein" from which have been raised such wonderful quantities of native silver.

COPPER FALLS COMPANY—3000 SHARES.

Trustees—Henry Crocker, Boston, Mass.; Charles Henshaw, do.; George L. Ward, Chicago, Ill.; Joshua Childs, Superintendent. J. Shaply, financial and business agent.

Leases No 9, between Eagle Harbor and Eagle river. They are now taking from the vein on this location a large mass of native copper. As exposed it measures 13 feet in length, 10 feet in height and will

average about one foot in thickness. But one extremity has yet been found. The copper of this entire mass is perfectly pure and malleable.

EAGLE HARBOR COMPANY—2000 SHARES.

Trustees — Samuel A. Hastings, Detroit, Mich.; Samuel Barstow, do.; Samuel Coit, do.; Lewis Hall, do.; David French, Superintendent.

Lease No. 3, at Eagle Harbor.

NORTH AMERICAN COMPANY—3000 SHARES.

Board of Directors—President, Gurdon Williams, Detroit, Mich.; *Secretary*, Henry J. Buckley, do.; *Treasurer*. Gurdon Williams, *ex officio*, do.; Charles Howard, do.; Nelson P. Stewart, Pontiac, Mich.; Alfred Williams, do.; Horace C. Thurber, do.; Charles C. Hascall, Flint, Mich.; Thomas Richmond, Cleveland, Ohio ; John Bacon, Superintendent.

No. 7, Eagle river. The officers of this company are elected annually, on the second Monday in October.

BOHEMIAN COMPANY—2500 SHARES.

Board of Trustees—President, Ramsay Crooks, New York ; Edward Curtis, do.; William B. Maclay, do.; Zephaniah Platt, do.; John Owen, Detroit, Mich.; Simon Mandlebaum, Superintendent.

Lease No. 35, on Little Montreal river, Point Keewenaw.

BOSTON COMPANY—3200 SHARES.

Trustees—William Ward, Boston, Mass.; Dr. Thomas Jones, do.; Joab Bernard, Baltimore, Md.; Joseph L. Hempstead, Superintendent.

No. 15, between Copper and Agate Harbors. From the "White Dog Vein," on this location, they have raised a large mass of native copper, weighing about 900 lbs.

ONTONAGON COMPANY—2000 SHARES.

Trustees—John H. Kinzie, Chicago, Ill.; George C. Bates, Detroit, Mich.; Cogswell K. Green, Niles, Mich.; Julian Magill, Superintendent.

No. 98, on Ontonagon river. Nos. 68, 69, 70, 71, 72 and 73, at the head waters of Elm and Misery rivers. They are at work on No. 70.

ISLE ROYALE COMPANY—2000 SHARES

Trustees—Dr. Thomas Jones, Boston, Mass.; Charles Scudder, do.; George C. Bates, Detroit, Mich.; Cyrus Mendenhall, Superintendent.

Nos. 16 and 27, Copper Harbor. Nos. 28 and 29, Black river.

SUPERIOR COMPANY—3000 SHARES.

President—James D. P. Ogden, New York City; *Trustees*—Jacob LeRoy, do.; J. Townsend, do.; Mr. Green, Superintendent.

Lease No. 1, west of Copper Harbor.

NORTHWEST COMPANY—2500 SHARES.

Trustees—Charles A. Secor, New York City; Horace Greeley, do.; E. B. Hart, do.; D. D. Hart, Superintendent.

Lease No. 222, on Point Keewenaw.

THE DOUGLASS HOUGHTON COMPANY—5000 SHARES

Board of Directors—President, Elon Farnsworth, Detroit, Mich.; *Secretary and Treasurer*, Henry Ledyard, do.; Henry N. Walker, do.; Charles G. Hammond, do.; John R. Grout, do.

Nos. 64, 65, 66, 777, 780, 781, 784 and 785 in the iron region, 609, 652, 667 and 754 on Torch river, 666 and 733 Point Keewenaw, 60, 62, 63 and 254 on the Porcupine mountains, 750, 751, 755, 757, 759 and 778 on Elm river, and 742, 758, 760, 761, 762, 764, 765, 770 and 779 on Fire Steel river.

NORTHWESTERN COMPANY OF DETROIT.
3000 SHARES.

Board of Trustees—President, Zina Pitcher, Detroit, Mich.; Israel Coe, do.; Wesley Truesdall, do.; Samuel T. Douglass, do.

No. 8, Eagle river.

UNITED STATES COMPANY—3060 SHARES.

Board of Directors—President and Treasurer, James L. Lyell, Detroit, Mich.; Morgan Bates, do.; Alanson Sheely, do.; *Managers*, Andrew Harvie, do.; John Winder, do.; *Secretary*, W. J. Baxter, do.;—John Greenfield, Agent.

Nos. 50, 51, 52, 53, 54, 55 and 218, Ontonagon river.

ALBION COMPANY—3500 SHARES.

Trustees—S. Draper, Jr. New York; S. Jaudon, do.; Chauncey Bush, do.; *Secretary*, C. Livingston, do.;

No. 10, Point Keewenaw.

BALTIMORE COMPANY—3000 SHARES.

Board of Directors—President, Jonas H. Titus, Jackson, Mich.; *Secretary*, Walker Budington; *Treasurer*, Smith Titus; Andrew T. McReynolds, Detroit, Mich.; John McReynolds, do.

Nos. 133, 134, 135 and 136, on Ontonagon river.

NEW YORK AND MICHIGAN COMPANY—5000 SHARES.

Board of Trustees—President, Henry Ledyard, Detroit, Mich.; *Secretary*, William A. Richmond, do.: *Treasurer*, Levi S. Humphrey, do.; Charles G. Hammond, do.; Lucius Lyon, do.;

Nos. 181, 251, 252, 253 and 775 in the iron region, 651, 718 and 818 on Torch river, 61 Point Keewenaw, 776 Portage lake, 748, 749, 752 and 753 on Elm river. 769 Fire Steel river and 42 on the Porcupine mountains.

GLOBE COMPANY—4000 SHARES.

Board of Trustees—President, A. H. Newbould Detroit Mich.; *Treasurer*, James L. Lyell, do.; *Secretary*, William F. Randolph, do.; Pierre Teller, do.: E. F. Randolph, do.; James A. Van Dyke, do.

Nos. 447 and 448, on Ontonagon river. The officers of this company are elected annually, on the first Monday of February.

PENINSULA COMPANY—3500 SHARES.

Trustees—Henry F. Talmadge, New York; Theophilus Peck, do.; James S. Hunt, do.; *Secretary*, C. H. Amerman.

Nos. 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17, on the Ontonagon river. The officers of this Company are elected annually, on the first Monday in November.

FRANKLIN COMPANY OF VERMONT.—5000 SHARES.
INCORPORATED BY THE LEGISLATURE OF VERMONT.
CAPITAL $100,000.

Board of Directors—President, Francis E. Phelps, Detroit, Mich.; *Secretary*, Warren Currier, Windsor, Vt.; *Treasurer*, Israel Coe, Detroit, Mich.; Joseph D. Hatch, Samuel Peck, Saut de Ste Marie; John Watkins, Samuel Coit, Detroit, Mich.

Nos. 45, 46, 47, 48 and 49, on Huron river.

GREAT WESTERN AND LAKE SUPERIOR COMPANY
2000 SHARES.

Trustee.—William W. Johnson, Detroit, Mich.

Nos. 444, 445 and 446, on the Ontonagon river — The funds or property of this company are invested in one or three Trustees.

MACKINAC AND LAKE SUPERIOR COMPANY.
4500 SHARES.

Trustees—Ramsay Crooks, New York; Michael Dousman, Samuel Abbot, and Samuel K. Haring, Mackinac, Mich.; Justin Rice, St. Clair, Mich.

Nos. 27, 474, 475, 476 and 477, on Black and Presque Isle rivers.

ALGONQUIN COMPANY OF DETROIT—3000 SHARES.

Board of Trustees—President, Josiah R. Dorr, Detroit, Mich.; *Secretary*, Daniel P. Bushnell; *Treasurer*, Benjamin L. Webb, Detroit, Mich.; Curtis Emerson, and Michael E. Van Buren, Detroit, Mich.; Levi Allen, Buffalo, N. Y.; Charles Whittlesey, Cleveland Ohio.

Nos. 655, 656, 657 and 658, on Sleeping river. The officers of this company are elected annually on the second Monday of July.

BOSTON, NEW YORK AND LAKE SUPERIOR COMPANY—3000 SHARES.

Board of Trustees — President, Charles Noble, Monroe, Mich.; *Secretary* Benjamin F. Fifield, do.; *Treasurer*, Daniel S. Bacon, Dan B. Miller, do.

Nos. 44 and 411, on the Porcupine mountains.

MANHATTAN COMPANY—3500 SHARES.

President, E. Smith Lee, Detroit, Mich.; *Secretary*, Daniel Dunning; *Treasurer*, Theodore Williams, Detroit, Mich.; *Trustees*, Oliver M. Hyde, Thomas Palmer, Benjamin F. H. Witherell, and Richard J. Conner, Detroit, Mich.

Nos. 381, 382 and 383, on the Porcupine mountains. The officers of this company are elected annually on the first Monday of September.

PORCUPINE MOUNTAIN COMPANY—3000 SHARES

President, Benjamin F. H. Witherel, Detroit Mich.; *Secretary*, Samuel G. Watson, do.; *Treasurer*, Israel Coe, do.; *Trustees*, Thomas Palmer, Oliver M. Hyde, Alpheus S. Williams, and Mason Palmer, Detroit, Mich·; Henry Stanley; Arunna W. Hyde, Detroit, Mich.

No. 412, on the Porcupine mountains.

OLD SETTLERS' COMPANY—4000 SAARES.

Board of Directors—President, John R. Williams,

Detroit, Mich.; *Secretary*, Charles Peltier, do.; *Treasurer*, James Abbot, do.; James A. Van Dyke, Peter Desnoyers, Francis Cicotte, and Philip Aspinall, do.; Frederick S. Littlejohn, Cleveland, Ohio.; John B. Waring. do.

Nos. 346 and 347, on Misery river, 350, 351 and 354, on Iron river, 349, 352 and 353, on Carp river. The officers of this company are elected annually on the second Monday of October.

HAY'S COMPANY—3000 SHARES.

Board of Directors,—President, John Hays, Pittsburgh, Pa.; *Vice President* and *Secretary*, Andrew T. McReynolds; *Treasurer*, John McReynolds; Dr. Thomas B. Clark, and John H. Sinclair, Detroit, Mich.

The officers of this company are elected annually, on the second Monday of October.

JACKSON COMPANY—3100 SHARES.

Board of Trustees—President, Abram V. Berry; *Secretary*, Frederick W. Kirtland; *Treasurer*, Philo M. Everett; George W. Carr, and William A. Ernst, Jackson, Mich.;

The officers of this company are elected annually, on the first Tuesday in June.

NEW ENGLAND AND MICHIGAN COMPANY.
3000 SHARES.

Board of Trustees—President, David A. Noble; *Secretary*, Stephen G Clark; *Treasurer*, Horace L. Skinner; James Darrah, and Walter P. Clark, Monroe, Mich.

Nos. 246, 247, 248 and 249, on Portage Lake.

MINERAL CREEK COMPANY—5000 SHARES.

Board of Trustees—President, Isaac E. Crary; *Secretary*, George C. Gibbs; *Treasurer*, Digby V. Bell; Jarvis Hurd, and George Ketchum, Marshall, Mich.

Nos. 357 and 358, on the Porcupine mountains.

LAKE SHORE COMPANY—3000 SHARES.

Trustees—Aaron Clark, S. W. Anderson, Nathaniel Weed, A. B. Hays, and Marshall O. Roberts, New York city.

Location No. 2, between Eagle river and the Portage.

STE MARIE FALLS COMPANY—4500 SHARES.

Trustees—Samuel Ashman, Saut de Ste Marie; Peter B. Barbeau, do.; Stephen R. Wood, do.; John P. Richardson, do.; Philetus A. Church, do.

This company has secured four islands in the falls of Riviere de Ste Marie, as desirable, "locations" for erecting stamping mills, &c., and it is their humble opinion that, at these points, sufficient water power may be obtained for propelling a large amount of machinery.

FORSYTH COMPANY—3000 SHARES.

Trustees—John A. Kennedy, Charles A. Secor, and William F. Schmidt, New York city.

No. 361½, on Point Keewenaw.

SILVER AND COPPER COMPANY OF ONTONAGON RAPIDS—2500 SHARES.

Trustees—J. L. Graham, J. L. O'Sullivan, New York city, A. W. Cleason, do.

Lease No. 36, on Ontonagon river and two others on Iron river.

CHIPPEWA COMPANY—1100 SHARES.

Trustees—Edward Curtis, New York city; Joseph Bell, and Francis Crowningshield, Boston, Mass.

Locations 423 to 432 inclusive on Black river, 534, 535, and 628 Ontonagon river, 200, 202, 203, 322, 323 and 324, Keewenaw Point.

CHARTER OAK COMPANY—5000 SHARES,

Trustees—Elisha Tyler, Detroit, Mich.; Silas H. Holmes, do.; Jacob M. Howard, do.; Elisha Tyler, General Agent.

FRANKLIN COMPANY OF BOSTON—3000 SHARES,

Trustees—S. F. Coolidge, Samuel Hunt, T. J. Lobden, Boston, Mass.

Nos. 186, 187, 188 and 292, on Carp river, near Chocolate river.

ALGONQUIN COMPANY OF BOSTON—1500 SHARES.

Trustees—H. A. S. Dearborn. John N. Barbour, Boston. Mass.; and one other unknown; Treasurer, John N. Barbour. Ten locations.

NEW ENGLAND COMPANY—5000 SHARES,

Trustees—E. A. Raymond, Boston, Mass.; David Kimball, do.; E. W. Stone. do.; Clement Willis. do.; John Rayner, do.; J. B. Smith, do.; George Wheelright. do.; Frederick Libbey, Superintendent.

Nos. 384, 385, 386, 387, 388, 389, 390, 391, 392, 395, 396, 397, and 415, on Point Keewenaw.

ST, CROIX COMPANY:

Trustees—Rufus Choate, Boston, Mass.; Robert Rantoul, Jr. do.; Caleb Cushing, Newburyport, Mass.

One location, on St. Croix river, and several on Lake Superior.

CARP RIVER COMPANY OF BOSTON—6500 SHARES,

Board of Trustees—President, Charles Henshaw, Boston, Mass.; Treasurer, Joseph M. Brown, do.; John T. Heard, do.

NORTHWESTERN COMPANY OF FLINT—3000 SHARES.

President—R. D. Lamond, Flint, Mich.; Secretary, Felix B. Higgins, do.; Treasurer, Grant Decker, do.; Trustees, E. Vandeventer, do.; A. T. Crosby, do.

Nos. 311, 312, 313, 314, 315, 316, 317, 318 and 319, on Portage Lake, 326, 327, 328, 329, 330 and 331, on the Porcupine mountains, and three others.

CARP RIVER GOLD AND SILVER MINING COMPANY—3000 SHARES,

President—Michael Douseman, Macinac, Mich.; Secretary, John Prentiss, Detroit, Mich.; Trustee, H. T. Backus, do.

Several locations on Carp river, near Chocolate river.

MASSACHUSETTS COMPANY,

Trustees—William Freeman, Boston, Mass.; John T. Heard, do.; and one other unknown.

Nos. 13 and 14, on Point Keewenaw.

LAC LA BELLE COMPANY—2500 SHARES,

Trustees—S. Starkweather, James Brooks, and William W. Campbell, New York city.

Locations 81, 82 and 83, on Lac La Belle.

AMERICAN EXPLORING COMPANY—5000 SHARES,—INCORPORATED BY THE LEGISLATURE OF VERMONT — CAPITAL $100,000—COMPANY'S OFFICE ST, JOHNSBURY, VERMONT,

President—Francis E. Phelps, Detroit, Mich.; Secretary, Horace Paddock, St. Johnsbury, Vt.; Treasurer, Samuel Coit, Detroit, Mich.; Samuel Peck, Saut de Ste Marie, agent for Michigan.

The funds and property of this company are vested in a board of nine Directors.

COLUMBIAN COMPANY—3000 SHARES,

Board of Directors—President, David Smart; John Drew, Theodore Williams, Selah Reeve, and Elias .C Cromwell, Detroit, Mich.; Florence Mahoney, and Daniel C. Hyde, New York city.

Nos. 132, on Ontonagon rivers, and 398, 399, 400, 401, 402 and 403 on Misery river.

BLACK RIVER COMPANY—3000 SHARES,—INCORPORATED BY THE LEGISLATURE OF MARYLAND—CAPITAL $30,000,

President—John S. Smith, Baltimore, Md.

One three-mile location on Black river.

PITTSBURGH AND CHIPPEWA COMPANY—3000 SHARES,

President—James May, Pittsburgh, Pa.

Five or six locations in the vicinity of Lac La Belle.

MICHIGAN COMPANY—3000 SHARES,

Board of Directors—President, Origen D. Richardson; Secretary, Don C. Buckland; Treasurer, Abraham B. Matthews; Gideon O. Whittemore, Alfred J.

Boss, Ephraim S. Williams, and Moses Wisner, Pontiac, Mich.

Nos. 221, 222, 223, 259, 268, 467, 468 and 469, on the Montreal river. The officers of this company are elected annually, on the first monday in January.

BOSTON AND DETROIT COMPANY—3000 SHARES,

Trustees—Charles Scudder, Dr. Thomas Jones, Charles L. Bartlett, and William Underwood, Boston, Mass.; George C. Bates, Detroit, Mich.; This company has three three-mile locations on Point Keewenaw.

MARSHALL AND BOSTON LAKE SUPERIOR COMPANY—5000 SHARES.

Board of Trustees—President, Henry W. Taylor; Secretary, George S. Wright; Treasurer, Charles T. Gorham; Digby V. Bell, and Robert Cross. Marshall, Mich.

Nos. 217, on Carp river, near Chocolate river, 355, on Iron river, 464, Ontonagon river, 465 and 466, and two others.

UNION COMPANY.

Trustees—John J. Palmer, Robert Hyslop, Ramsay Crooks, and Daniel S. Miller, New York city; Charles W. Borup, La Point, Lake Superior.

COPPER ROCK COMPANY—3000 SHARES.

Trustees—Theodore Olcott, and Thaddeus Joy, Albany, N. Y.; Lucius Tuckerman, Chicago, Ill.

Nos. 113, on Ontonagon river, 530, Black river, 539, 540 and 541, on Tobacco river, Point Keewenaw.

GREEN MOUNTAIN AND LAKE SUPERIOR COMPANY—3500 SHARES.

President—A. S. Williams; Secretary, E. Smith Lee; Treasurer, Alex. W. Buel; Trustees, Oliver M. Hyde, and Edward Doyle, Detroit, Mich.; James K. Hyde, Sudbury, Vt.; Edward Jackson, Brandon, Vt. Henry Stanley, West Poultney, Vt.; Pitt W. Hyde, Castleton, Vt.; Russell Gage, Detroit, Mich.

No. 413, on the Porcupine mountains.

Keewenaw Company of Boston, 2500 shares.

Cuyahoga Copper Smelting Company, of Cleveland, Incorporated by the Legislature of Ohio.

Ohio Copper and Silver Smelting Company, of Cleveland. Incorporated by the Legislature of Ohio.

HOPE COMPANY—5000 SHARES.

Board of Trustees—President, E. B. Bostwick, Grand Rapids, Mich.; Secretary, John Almy, Detroit, Mich.; Treasurer, Wm. A. Richmond, do.; Benjamin Merritt, New York city; A. N. Hart, Lapeer Mich.

Nos. 299, 300, 301, 302 and 303, on the Porcupine mountains, near the Lake, and 57, 58 and 304, on Montreal river, and three others.

ÆTNA COMPANY—3000 SHARES.

Board of Directors—President, J. L. Whiting, Detroit, Mich.; Secretary, William M. Snow, do.; Treasurer, Samuel Coit, do.; Frederick Wetmore, do.; H. D. Garrison, do.; Trustees, Zina Pitcher and Theodore Williams, Detroit, Mich.

No. 546, on Salmon Trout river, and one other on Ontonagon river.

NEW YORK AND LAKE SUPERIOR COMPANY.

6500 SHARES.

President—Governeur Kemble, Cold Springs, N. Y.; Trustees, Henry Morris, New York city; Joseph Tuckerman, do.; G. V. Dennison, Albany, N. Y; Edward Learned, Watervliet, N. Y.; Andrew Talcott, General Agent.

Leases 18 and 31, Point Keewenaw.

CYPRUS RIVER COMPANY—5000 SHARES.

President—Henry Morris, New York city; Trustees, Jonathan J. Coddington, do; Anthony J. Constant, do.; William Kemble, do.; Joseph Tuckerman, do.

Lease No. 26, on Montreal river. Locations 27 to 32 inclusive, 34, 35, 36, 39, 490 to 498 inclusive, 506 and 507 on the Porcupine mountains, 556 to 581 inclusive, on the Huron mountains, and 536 which last covers the islands of trap off Agate Harbor.

MONTREAL RIVER COMPANY—5000 SHARES.

Trustees—Samuel Ward, New York city; Augustus Belmont, do.; James Phalen, do.; Thomas Dixon, Boston Mass.; Charles G. Hammond, Detroit, Mich.

Leases 19, 22 and 23, on Montreal river.

PHŒNIX COMPANY OF DETROIT—5000 SHARES.

President and Treasurer, ex-officio. Peter Desnoyers, Detroit, Mich.; Secretary, M. E. Ames; Directors, Henry Park, Pontiac Mich.; ——— Bissell Detroit, Mich.; Thomas W. Bristol, do.

Locations 219, 220, 221, 222 and 269 on Montreal river. The latter number calls for the tract occupied by No. 259, and does not appear on the map.

PENSYLVANIA COMPANY OF DETROIT.—3000 SHARES.

President and Treasurer, ex-officio, D. E. Harbaugh, Detroit, Mich.; Secretary, A. H. Adams, do.; Trustees, J. A. Armstrong, do; Michael Douseman, Mackinac, Mich.

Locations 548, 549, 550 and 551, Portage Lake.

PITTSBURGH PORTAGE LAKE COMPANY—4000 SHARES.

Trustees—John Hays, Pittsburgh, Pa.; Harvey Childs Alleghany City, Pa.; James B. Murray, do.; James Robinson do.

Location 543 Portage Lake.

BUFFALO COPPER MINE COMPANY—3000 SHARES.

Trustees—Walter Joy, Buffalo, N. Y.; John L. Kimberly, do.; Samuel T. Atwater, do.

Location 137, Point Keewenaw.

ROCHESTER COMPANY—3500 SHARES.

Trustees—A. Champion, Rochester, N. Y.; Addison Gardner, do.; F. Whittlesey, do.

ATLANTIC AND LAKE SUPERIOR COMPANY.
5000 SHARES,

Trustees—Philip Hone, New York city; R. M. Blatchford, do.; H. G. Stebbins, do.; Secretary, Theodore S. Draper, do.

TRAP ROCK RIVER COMPANY OF MOUNT VERNON,
3000 SHARES.

Board of Trustees—President, Rollin C. Hurd, Mount Vernon, Ohio.; Secretary, Samuel J. Updegraph, do.;

Treasurer, James Huntsbury, do.; Nathan Updegraph, do.; Ebenezer G. Woodward, do.; Johnson Elliot, do,; Columbus Delano, do.

Location 320, Point Keewenaw. The officers of this company are elected annually on the first Tuesday of March.

OHIO TRAP ROCK SILVER AND COPPER MINING COMPANY—5000 SHARES.

Board of Trustees—President, Joshua Hanna, Pittsburgh, Pa.; Secretary D. M. Blackstock, do.; Treasurer; Warick Martin, do.; ——— Stephens, do.; Leonard Hanna, do.

Location 360, Point Keewenaw.

PHILADELPHIA AND LAKE SUPERIOR COMPANY, 4000 SHARES.

Trustees—Garrick Mallory, Philadelphia; J. Washington Tyson, do.; Bernard Hoopes, do.

Locations 18. 19, and 20, Point Keewenaw, 513, 514, 515, 516 and 518, Presque Isle river and 512 and 519, Ontonagon river.

MINERAL UNION COMPANY—4000 SHARES.

Trustees—Benjamin H. Brewster, Philadelphia; James Joy, Jr. do.; Alexander Cummings, do.;

Locations 143, 145, 146 and 148, Misery river, 78 and 79 Granite Point, and Sections 22, 26 and 28 T. 56 N., R. 33 W. between Eagle river and the Portage.

WASHINGTON COMPANY OF DETROIT—3000 SHARES.

President—Levi Cook, Detroit Mich.; Secretary, Levi B. Taft, do.; Treasurer, Henry Doty, do.; Direc-

tors, Levi Cook, D. Thompson, H. D. Garrison. D. Dunning, F. W. Lawrence, Detroit Mich.

Location 130 Fire Steel river.

ALLIANCE COMPANY OF LAKE SUPERIOR—3000 SHARES.

President—Joseph. B. Varnum, James Phalen, Edward B. Center, New York city.

Lease 17, Little Montreal river.

GRATIOT COMPANY—3000 SHARES.

President—James P. Ogden, New York city ; Trustees, Jacob LeRoy. J. Townsend, do.

Lease 11, Little Montreal river.

PORTAGE COMPANY OF MARSHALL—1000 SHARES.

President—Asa B. Cook, Marshall, Mich.; Secretary, and Treasurer, James M. Parsons, do.; Trustees, Zenas Tillotson, Robert Williamson, Darins Clark, do.; A. W. Spies, New York city.

Locations—99, 461, 462, 477, 478, 479, and one other on Portage Lake.

URAL COMPANY OF MICHIGAN—3500 SHARES.

Board of Directors—President, Edward Lyon, Detroit Mich.; Secretary, William Walker, do.; Treasurer; Israel Coe, do.; William A. Richmond, F. W. Lawson, do.; A. N. Hart, Lapeer, Mich , E. B. Bostwick, Grand Rapids, Mich.; D. M. Hinsdale, Pontiac Mich.; S. Chamberlain, do.

Locations 409, 410, 414 and 459 Ontonagon river.

CLINTON COMPANY OF DETROIT—1000 SHARES,

President—Israel Coe, Detroit, Mich.; Trustees,

Henry Ledyard, Alfred A. Hunter, Horace Hallock, Silas M. Holmes, do.; Secretary, J. Nicholson Elbert. Detroit, Mich.

Lease 32 Little Montreal river.

THE MINING ASSOCIATION OF LAKE SUPERIOR—4000 SHARES.

Board of Trustees—Alpheus Sherman, New York city; Edward Ferris, Frederick R. Lee, do.; Samuel P. Brady, Detroit, Mich.; Treasurer, D. W. Townsend, New York city; Secretary, Elias Nexsen, do.; Manager, John Hawks, Keewenaw Point, Lake Superior. E. H. Warner, General Agent, New York city.

Locations 22 and 23, Tobacco river, and four others.

PENSYLVANIA AND LAKE SUPERIOR COMPANY—2000 SHARES.

Board of Trustees—President, David R. Porter, Harrisburgh, Pa.; Secretary, Alexander Ramsey, do.; Treasurer, George Nagle, Philadelphia; Joseph Anthony, Williamsport, Pa.

Lease 41, on the Porcupine mountains.

ALGOMAH COMPANY OF CLEVELAND—2000 SHARES.

Board of Directors—President, John Crangle, Cleveland, Ohio; Treasurer, John F. Warner, do.; Secretary, Luther O. Mathews, do.; Richard Winslow, Harvey Johnson, do; Henry J. Buckley, Samuel A. Hastings, Detroit Mich.

Location 267 Montreal river. The officers of this company are elected annually on the second Monday in January.

THE CLEVELAND COMPANY—3000 SHARES.

Board of Directors—President, John W. Allen, Cleveland, Ohio; Secretary and Treasurer, John Erwin, do.; Erastus F. Gaylord, Arthur Hughes, do.: Michael Douserman, Mackinac, Mich.;

DETROIT COMPANY—3000 SHARES.

Board of Directors—President, Oliver Newberry, Detroit, Mich.; James A. Armstrong, Edward Lyon, do.; Treasurer, Gurdon Williams, do.; Sanford M. Green, Pontiac, Mich.; Secretary, Henry J. Buckley, Detroit, Mich.

Locations 255 and 256 on the Porcupine mountains. The officers of this company are elected annually on the first Monday of January.

PRESQUE ISLE COPPER AND SILVER COMPANY OF CLEVELAND. 3000 SHARES.

Trustees—B. F. Smith, M. L. Hewit, William Milford, T. B. W. Stockton. President, Horace A. Ackley; Secretary, Robert T. Parks; Treasurer, S. W. Treat.

Locations 441, Granite Point. The officers of this company are elected annually on the first Monday of June.

PERUVIAN COMPANY OF DETROIT—4000 SHARES.

Board of Trustees—President, Simon Mandlebaum, Lake Superior; Secretary, Thomas C. Sheldon, Detroit, Mich.; Treasurer, J. H. Morris, do.; Curtis Emerson, do.; A. N. Hart, Lapeer. Mich.; Levi Bacon, Pontiac, Mich.

MEDORA COMPANY—1500 SHARES.

Trustees—Augustus Belmont, New York city; Samuel Ward, do.; Fulton Cutting, do.

Locations 719 to 727 inclusive, Portage Lake.

CHIPPEWA COMPANY OF PITTSBURGH—10000 SHARES.

President—P. McCormick, Pittsburgh, Pa.; Secretary, James B. Murray, do.; Treasurer, James May, do.; Managers, Wilson McCaulis, Morgan Robinson, Harvy Childs. George R. Wright, do.

Locations—90, 91, 92, 93, and 296 Lac La Belle, 104, 283, 284, 404, 405 and 406 Portage Lake, and five others and three three-mile locations on Isle Royale.

PENNSYLVANIA COMPANY OF PITTSBURGH—10000 SHARES.

President—James R. Moorehead, Pittsburgh, Pa.; Secretary and Treasurer, James B. Murray, do.; Managers, William Robinson, Jr., Harvey Childs, G. Warner, Tobias Myers, do.

Locations 43 Iron river, 449 Ontonagon river, 84, 86, 108 282, 321 and 378 on Portage Lake, and two others.

EL DORADO COMPANY PITTSBURGH—5000 SHARES.

President—Tobias Myers, Pittsburgh, Pa.; Secretary and Treasurer, C. M. Painter, do.; Manager, Nicolas Voegtly, do.

Locations 87, 88, 99, 105, 106, 107, 281, 285 and 369 Portage Lake, and two others.

PORTAGE LAKE AND COPPER RIVER COMPANY—3000 SHARES.

President—John White, Milwaukie, W. T.; Secretary and Treasurer, Charles Gray, do.

Location 421, Portage Lake.

VULCAN COMPANY OF DETROIT—3000 SHARES.

President—William Norton, New York city; Vice President, O. F. Cargill, Detroit, Mich.; Treasurer, William B. Wesson, do.; Secretary, William R. Noyes, Detroit, Mich.

Location 813, Montreal river.

ST. CLAIR COMPANY OF DETROIT—5000 SHARES.

President—Albert Crane, Detroit, Mich.; Secretary J. P. C. Emmons, do.

Location 339, Montreal river.

NATIONAL COMPANY OF PONTIAC—3000 SHARES.

Board of Directors—President, George W. Rogers, Pontiac, Mich.; Secretary, Henry C. Knight, do.; Treasurer, James A. Weeks, do.; Henry W. Lord, Henry B. Marsh, Jeremiah Clark, do.; Shadrack Gillet, Detroit, Mich.

The officers of this company are elected annually on the first Monday of January.

ST. CROIX AND MISSISSIPPI COMPANY OF NEW ORLEANS. 4000 SHARES.

Board of Trustees—President, Thomas Barret, New Orleans; Treasurer, M. Carathers; Charles Rice, do.;

Nine locations upon St. Croix river and its tributaries,

and two, five miles from the Mississippi, twenty-five miles above Prairie du Chien.

ARGENTINE COMPANY OF DETROIT—3000 SHARES.

Board of Trustees—President, Shubal Conant, Detroit, Mich.; Secretary and Treasurer, A. S. Porter, do.; Oliver Newberry, Wesley Truesdall, do.

Location 537, Misery river.

CUMBERLAND COMPANY OF DETROIT—2000 SHARES

Trustees—Alfred H. Hunter, Detroit, Mich.; John Winder, John W. Strong, Jr., David Smart, M. M. Williams, Alexander Davidson, Frank Woodbridge, Theo. Williams, Charles N. Ege, do.

Location T., Point Keewenaw.

ASTOR COMPANY OF DETROIT—3000 SHARES

Board of Directors—President, James M. Smith, Grand Rapids, Mich.; Secretary, E. T. Nelson, do.; Treasurer, Gurdon Williams, Detroit, Mich., Edward Lyon, J. F. Porter, C. H. Avery, H. J. Buckley, O. F. Cargill, do.

The officers of this company are elected annually on the first Monday of February.

THE ISLE ROYALE AND OHIO COMPANY—12000 SHARES

Directors—Philo Scoville, Cleveland, Ohio; John C. Wright, Cincinnati, Ohio; Samuel Medary, Columbus, Ohio; Truman P. Handy, Cleveland, Ohio; Charles Stetson, do.; John Erwin, do.; Charles H. Williams, Toledo, Ohio; John W. Allen, Cleveland, Ohio;

Treasurer, Otho Klemm; Trustees, Charles H. Williams and John Erwin.

Nine three-mile locations on Isle Royale.

WESTERN NEW YORK COMPANY—3500 SHARES

Trustees—Artemas Doane, Newark, N. Y.; Stephen Culver, Orville Hart, do.; Treasurer, Eliab T. Grant, do.; Secretary, George W. Scott, do.

Locations 740, Montreal river, 687, 688 and 741 Fire Steel river.

SILVER RIVER COMPANY—1000 SHARES

Board of Trustees—President, Clark Mason, Newark, N. Y.; Secretary, George W. Scott, do.; Treasurer, Eliab T. Grant, do.; John Coveantry, do.; Stephen Culver, do.; Algernon Merryweather, Pontiac, Mich.

Locations 806 and 808 Huron Bay.

BOSTON AND LAKE SUPERIOR COMPANY OF BOSTON. 2000 SHARES.

Trustees—Thomas A. Dexter, Augustus Aspinwall, George W. Cooley; Clerk and Treasurer, William Aspinwall, Boston, Mass.

Lease No. 13 Point Keewenaw and nine others.

DEAD RIVER AND OHIO COMPANY—3000 SHARES.

Trustees—President, W. A. Adair, Cleveland, Ohio; Secretary, George E. Freeman, do.; H. A. Ackley, do.; Treasurer, M. L. Hewitt, do.

The officers of this company are elected annually on the first Monday of January.

ROSENDALE COMPANY—3500 SHARES.—INCORPORATED BY THE LEGISLATURE OF NEW YORK—CAPITAL $350,000.

President—John R. Livingston, Jr., New York city; Directors, Abraham Vanderpool, John Lawton, Theophilus Peck, ——— Ransom, ——— Smith, do.; Secretary, ———Driggs, do.

Locations 422 Ontonagon river, 671, 697, 695, 728 and 729 Point Keewenaw.

BOSTON AND LAKE SUPERIOR COMPANY.

Trustees—Charles Brett and Alfred Randall, Boston, Mass.

Locations 408 on Iron river, and 440 on Presque Isle river.

EMPIRE COMPANY—6500 SHARES.

President—John R. Livingston, Jr., New York city. Secretary, Joseph D. Riggs, do., James B. Campbell, Agent.

[Those persons interested, noticing errors or omissions in the preceding list of Mining Companies, will confer a favor, by addressing the author at Eagle River, Lake Superior.]

No. 1.

LIST OF LOCATIONS AND LEASES,

up to July 17, 1846, with number, name and residence and date of Lease.

NOTE.—The horizontal line in the column of numbers, refers to list No. 2, for the numbers not in the column. The cross against a number, refers to list No. 3, and implies the loss of the tract by interference with a location previously made, and that it does not appear by its number on the map. The letter (a) following a name, designates a location made by application after the 17th of July, 1845, and (p) designates one made previous to that date.

No. P.	NAME.	RESIDENCE.	No. L.	DATE OF LEASE.
	RWCarson&J&WWilson		1	May 13, 1811,
	RWCarson&J&WWilson		2	" " "
	RWCarson&J&WWilson		3	" " "
	Husseys, Avery&Raymond		4	" " "
	Husseys, Avery&Raymond		5	" " "
	Husseys, Avery&Raymond		6	" " "
	Joab Bernard	Baltimore Md	7	May 24, 1811.
	DeGarmo Jones	Detroit Mich	8	" " "
	David Henshaw	Boston Mass	9	Sept. 6, 1845.
	Charles H Gratiot		10	June 1, 1844.
	Daniel F Hitt		12	June 17, "
	E Snyder & E D Turner		13	Sept. 17, "
	James Hunt		14	" " "
	Edward Taylor		15	Nov. 18, "
	Alexander J Coffin		16	" 22, "
	Henry R Schoolcraft	New York City	17	June 21, "
	James W Glass		18	Feb. 21, 1845.
	Radcliff Hudson		19	" 27, "
	S Vischer Talcott		20	" 28, "
	Garret V Denniston		21	" " "
	Edward Learned Jr		22	March 7, "
	William J Marlett		23	" " "
	Hezekiah Bradford		24	March 20, 1845.
	Levi A Lockwood		25	" 24, "
	Isaac H Reed		26	" " "
	Henry R Schoolcraft	New York City	27	" 26, "
	Aaron Frost		28	" 27, "
	James VanKleeck		29	" " "
	Leonard B VanKleeck		30	April 10, "
	Benjamin E Green		31	" 12, "
	Andrew Talcott		32	" 4, "

No. P.	Name.	Residence.	No, L.	Date of Lease.
	Levi McKeen		33	July 5, 1845.
	James A McKeen		34	" 9, "
	Samuel E Mandlebaum		35	" 22, "
	Simon Mandlebaum	Copper Harbor	36	" 25, "
	John Lockwood Jr		131	Jan. 9, 1846.
	Benjamin C Arnold		140	" " "
1	William Pettit	Pittsburgh Pa		
2	Joseph Pettit	Hanhover Ohio	115	Nov. 19, 1845.
3	Nicholas Miniclier	Ance Keewenaw	301	
†6	W J Welles p	Detroit Mich	89	Sept. 16, 1845.
†7	Thomas Biddle p	" "	90	" " "
8	Freeman Norvell p	" "	91	" " "
9	Daniel A Phoenix p	New York	109	" " "
10	Chauncey Bestor	Washington D C	147	" " "
11	John A Smith	" "	148	" " "
12	John V Watson	Detroit Mich	110	" " "
13	James Higgins	" "	111	" " "
14	R R Richards	" "	112	" " "
15	Abraham Morrell	New York	127	Oct. 31, "
16	Chauncey Bush	"	113	Sept. 16, "
17	Thomas W Tucker	"	114	" " "
18	Theodore Titus	Philadelphia	219	Dec. 30, "
19	Martin Coryell	"	226	" 18, "
20	Loyd W Bickley	"	264	Feb. 5, 1846.
21	Chauncey S Payne	Detroit Mich		
22	Addison Stewart	" "		
23	Grant Decker	" "	376	
24	Justin Higgins	" "		
25	Hammond Whitney	Boston Mass	11	Sept. 19, 1845.
26	Joshua Childs	Lake Superior	126	Nov. " "
27	R D Cutts	Washington D C	209	Feb. 2, 1846.
28	Govenenr Kemble	Cold Springs N Y	192	" " "
29	Henry Morris	New York	193	" " "
30	William Kemble	"	194	" " "
31	Girard W Morris	"	195	" " "
32	Joseph Blunt	"	210	" " "
33	Andrew H Ward	Massachusetts	41	Sept. 16, 1845.
34	William H Hudson	New York	202	Feb. 2, 1846.
35	Lawrence Waterbury	"	228	" " "
36	James M Waterbury	"	229	" " "
37	Christopher Douglass	Wisconsin		
38	John Henshaw	Massachusetts	38	Sept. 16, 1845.
39	Thomas Cowles	Connecticut	230	Feb. 2, 1846.
40	William Ward	Massachusetts	37	Sept. 16, 1845.
41	Richard Adams	Virginia	60	Oct. 20, "
42	Lucius Lyon	Detroit Mich		
43	William Robinson Jr	Alleghany Pa	129	Dec. 29, "
44	Charles M Humphry	Michigan	131	Nov. 19, "
45	Samuel Peck	St Joseph Island	99	Oct. 17, "
46	Abner Sherman	Mackinac Mich	98	" " "
46½	W R Bernard p	Copper Harbor	57	Sept. 16, "
47	Reuben Chapman	Mackinac Mich	122	Oct. 17, "
48	George F Randolph	Illinois	186	Dec. 17, "
48½	Almarin B Paul	St Louis	86	Sept. 16, "
49	Alba Jones	Unknown	100	Oct. 17, "
50	Cornelius Wickware p	Detroit Mich	50	Sept. 16. "
51	Randall S Rice p	" "	51	" " "
52	John Winder p	" "	52	" " "

No. P.	Name.	Residence.	No. L.	Date of Lease.
53	Morgan Bates p	Detroit Mich	53	Sept. 16, 1845.
54	Andrew Harvie p	" "	54	" " "
55	Robert E Roberts p	" "	55	" " "
56	Placidus Ord p	Saut Ste Marie Mich	218	Dec. 17, "
57	Charles Colton	Monroe "	306	
58	James E Skinner	" "	307	
59	C C Douglass	Lake Superior		
60	C Comstock	Rome N Y		
61	Levi S Humphry	Monroe Mich	79	Nov. 6, 1845.
62	John Stryker	Rome N Y		
63	John Wilkinson	Syracuse N Y		
64	James Roy	Watervliet N Y		
65	David B Jewett	West Troy "		
66	Edwin C Litchfield	Watervliet "		
67	A H Geisse p	Detroit Mich	58	Sept. 16, 1845.
68	John H Kinzie	Chicago Ill	72	" " "
69	George C Bates	Detroit Mich	73	" " "
70	A H Hanscom	Pontiac "	77	" " "
71	C K Green	Niles "	74	" " "
72	John Norvell	Detroit "	76	" " "
73	Joshua Howard	" "	75	" " "
74	William L Helfstein	Chicago Ill	138	" " "
75	Gurdon Campbell p	" "	317	
76	Alex W Magill p	" "	56	Sept. 16, 1845.
77	Julian Magill p	" "		
78	Thomas L Wharton	Philadelphia	265	Feb. 5, 1846.
79	William G Alexander	"	345	
80	Thomas Edwards p	Saut Ste Marie Mich		
81	William Haddix p	Copper Harbor	156	Dec. 20, 1845.
82	J B Campbell	" "	157	" " "
83	Lysander Richardson p	" "	158	" " "
84	James R Morehead	Pittsburgh Pa	160	Feb. 5, 1846.
85	W B Engherst	" "	168	Dec. 20, 1845.
86	J B Morehead	" "	334	
87	Barnes Ford	" "	166	Feb. 5, 1846.
88	L W Tappan	Boston Mass	46	Aug. 5, 1845.
89	James May	Pittsburgh Pa	325	
90	P McCormick	" "	326	
91	James B Murray	" "	255	Jan. 21, 1846.
92	Thomas Scott	" "	327	
93	Leo Tibbatts	Newport Ky	328	
—				
97	D H Holbrook	Chicago Ill		
98	Joseph L Hempstead	Lake Superior	78	Sept. 16, 1845.
99	H E Davies	New York	40	Aug. 5, "
100	Henry Edwards	Boston Mass	42	" " "
101	Charles Stoddard	" "	43	" " "
102	John Tappan	" "	45	" " "
103	Charles Tappan	" "	44	" " "
104	Tobias Myers	Pittsburgh Pa	331	
105	Jacob Myers	" "	162	Dec. 26, 1845.
106	C Painter	" "	321	
107	N Vocthey	" "	161	Feb. 5, 1846.
108	Griswold E Warner	" "	163	Dec. 26, 1845.
109	James M Drake	New York		
110	John Eddie Jr	"		
111	Charles A Coe	"		
112	Alfred Pell	"		
113	James Paul p	Ontonagon	320	

No. P.	Name.	Residence.	No. P.	Date of Lease.
114	J J Boyd	New York	154	Nov. 19, 1845.
115	Edward Hinker	"	153	" " "
116	L S Saurez	"	39	Sept. 16, "
117	J DeRuyter	"	69	Oct. 17, "
118	A H Mickle	"		
119	M Dougherty	"		
120	W Chamberlin	"	340	
121	M X Harmony	"	95	Oct. 16, 1845.
122	Gilbert Hopkins	"		
123	William Curell	"		
124	Willis Hall	Albany N Y		
125	George K Sistare	New York	68	Sept. 16, 1845.
126	Alex Jones	"		
127	Thomas P Kettel	"		
128	Edgar Chandler	"		
129	William Warder	Springfield Ohio		
130	Amos F Hall	Detroit Mich		
131	J Burgess p	Ripley Ohio	63	Sept. 16, 1845.
132	C Y Richmond p	Cleveland Ohio	85	" " "
133	Omar D Conger	Jackson Mich	266	Dec. 24, "
134	M Titus	" "	267	" " "
135	Platt S Titus	" "	268	" " "
136	J H Titus	Detroit "	269	" " "
137	Theodore Chapin p	Buffalo N Y	96	Oct. 16, "
138	George R Griswold	Detroit Mich	271	Dec. 20, "
139	E J Roberts	" "	145	" " "
140	K Dygert a	" "		
141	Charles Richmond p	Aurora N Y		
142	John Marsh	" "		
143	J Campbell	Philadelphia		
144	George Moran	Detroit Mich	146	Dec. 27, 1845.
145	Thomas McCully	Philadelphia	261	" " "
146	B H Brewster	"	232	Feb. 5, 1846.
147	A Gouin a	Detroit Mich		
148	William J Craus	Philadelphia		
149	P G Dox	Albany N Y		
150	Edward Larned	Watervliet N Y	87	Sept. 16, 1845.
151	Charles G Larned	" "	88	" " "
152	J H Hitchcock	" "	97	Oct. " "
153	S W Caulkins p	West Troy N Y		
154	Riley Hayford p	Watervliet "		
155	D Thornton p	West Troy "		
156	S Maynard	Richmond Va	368	
157	C B Wheelock p	Green Bay		
158	D Hamilton	Watervliet N Y		
159	Charles Kinyon p	" "		
160	T Williams p	Newburgh "		
161	James Eights	Albany "		
162	A Fuller p	Washington D C		
163	H Atwood p	Mt Clemens Mich		
164	A Ashley Jr a	" "		
†165	R Miller	Richmond Va		
†166	J J Roberts a	Newburgh N Y		
167	John Brown	Detroit Mich	81	Sept. 16, 1845.
168	E Prentiss	" "	80	" " "
169	R S Cox	Washington D C	149	" 22, "
170	Charles Bradley	" "	150	" " "
171	M St Clair Clarke	" "	151	" " "
172	C J Nourse.	" "	152	" " "

No. F.	Name.	Residence.	No. L.	Date of Lease.
173	G Lambley a	Copper Harbor	93	Oct. 22, 1845.
174	Patrick Quinn a	" "		
175	William H Howe	Pittsburgh Pa	92	Oct. 22, 1845.
176	John Chester a	Detroit Mich		
177	T Picket a	Copper Harbor		
178	John Corneo a	Sault Ste Marie		
179	J Darrah	Monroe Mich	153	Dec. 17, 1845.
180	J M Sterling	Unknown	207	" " "
181	J G Clark	"	206	" " "
†182	J Sahl a	Copper Harbor		
183	James Adams	Washington D C		
184	S B Bourneau	" "		
185	H B Sweeney	" "		
185½	Samuel T Douglass	Detroit Mich	91	Oct. 22, 1845.
186	J J Peavey	Maine		
187	Cornelius Boyle	Washington D C		
188	G Sweeney	" "		
189	H Knollman a	Copper Harbor		
190	F Wallner a	" "		
†191	K Muller a	" "		
192	J Lindere a	" "		
193	J Mymner a	" "		
199	F Webster	Boston Mass	346	
200	F Marsh	New York		
202	Henry Quinn	Washington D C		
203	Charles W Marsh	Boston Mass		
205	Thompson Tyler	Washington D C	116	Jan. 2, 1846.
206	James Wynne	Baltimore Md	117	" " "
207	Thomas Donoho	Washington D C	118	" " "
208	A Crawford a	Copper Harbor		
209	N Bodwin a	Green Bay W T		
210	William O'Brien a	Copper Harbor		
211	Paul Deige a	Detroit Mich		
212	L C Forsyth a	" "		
213	A Olds a	St Joseph "		
214	Chris Babe a	Detroit "		
215	D Munger	Marshall "	360	
216	C T Gorham	" "	362	
217	H W Taylor	" "	361	
218	Horace Jacobs p	Copper Harbor	169	Jan. 6, 1846.
219	G O Whitemmore	Pontiac Mich		
220	Isaac Butterfield	" "		
221	H Parke	" "		
222	E B Wales	" "	337	
223	C C Parkes	" "		
224	Adam Clark	Unknown		
225	W J A Bradford	Davenport Iowa		
226	W M Ord p	Sault Ste Marie		
227	Cyrus Underhall	La Pointe W T	179	Oct. 31, 1845.
			302	
246	W C Sterling	Monroe Mich		
247	W P Clarke	" "	303	
248	W W Prentiss	" "	304	
249	H L Skinner	" "	305	
250	W P Clarke Jr	" "	208	Dec. 27, 1845.
251	Charles G Hammond	Detroit "	62	Oct. 17, "

No. L.	Name.	Residence.	No. L.	Date of Lease.
252	R Gillett	Detroit Mich	61	Oct. 17, 1845.
253	Henry Ledyard	" "	71	" " "
254	John R Grout	" "	315	
255	Gurdon Williams	" "	298	
256	Alfred Williams	Pontiac "	300	
257	N P Stewart	" "		
258	H C Thurber	" "	367	
259	S Stevens	" "		
260	Justin Herrick	Maine		
261	J F Webb	Washington D C	119	Jan, 2, 1846.
262	A Knowles	Maine		
263	Rufus Parks	Wisconsin		
264	Isaac Page	Augusta Maine		
265	S L Harris	Maine	356	
266	N Sargent	Philadelphia		
267	Henry J Buckley	Detroit Mich	299	
268	O D Richardson	Pontiac "		
269	J M Williams	" "		
270	W Webber a	Copper Harbor		
271	H Tally a	" "		
272	J Ewing a	" "		
273	J Colbeck a	" "		
274	F Berryman a	" "		
275	C Rundert a	" "		
276	C Hoffman a	" "		
277	Charles Henshaw a	Boston Mass	123	Oct. 31, 1845.
278	R Choate	" "	180	Feb. 5, 1846.
279	J H Adams	" "	254	" " "
280	Charles Sendder	" "	181	" " "
281	C W Painter	Pittsburgh Pa	165	Dec. 30, 1845.
282	J Painter	" "	167	Feb. 5, 1846.
283	J Graham	" "	329	
284	R Swan	" "	330	
285	A B Haine	" "	164	Dec. 30, 1845.
286	J A Constant	New York	196	Feb. 2, 1846.
287	J Tuckerman	"		
289	James Davis	Boston Mass		
290	S Bartlett	" "		
291	James Davis	" "		
292	Fred W Davis	" "	358	
293	P S Shelton	" "		
294	Thomas Dixon	" "		
295	J Hanna	Pittsburgh Pa		
296	V Saunders	Ghent Ky		
298	W Burnett p	Copper Harbor		
299	J S Farrand	Detroit Mich	308	
300	W A Richmond	" "	309	
301	William Hale	" "	310	
302	F A Harding	" "	311	
303	E Brooks	" "	214	March 9, 1846.
304	J R Brodhead	New York	233	Feb. 12, 1846.
305	A Livingston	"	159	
311	H S Hay a	Detroit Mich		
312	J J Rinched a	" "		
313	S Green a	" "		
314	J Anderson a	Utica N Y		

No. P.	Name.	Residence.	No. L.	Date of Lease.
315	E Moran a	Detroit Mich		
316	F La Clare a	" "		
317	J Brinkman a	" "		
318	O Leming a	" "		
319	William Miller a	" "		
320	Nathan Updegraff	Sidney Ohio	70	October 15, 1845.
321	J Painter	Pittsburgh Pa	344	
322	J W Webb	New York	349	
323	G A Barstow	Boston Mass	270	Jan. 29, 1846.
324	C W Cutter p	Portsmouth N H	296	
325	William Hays	Ohio	222	Dec. 17, 1845.
326	A J Trumbull	Flint Mich		
327	C E Dewey	" "	104	Sept. 22, 1845
328	Elias Williams	" "	105	" " "
329	E Vandeventer	" "	106	" " "
330	W Moon	" "	107	" " "
331	Daniel D Dewey	" "	108	" " "
332	W Richards a	Copper Harbor		
333	George Beris a	" "		
334	W H Langridge a	" "		
335	H N Howard a	Pontiac Mich		
336	P Hogan a	" "		
337	A Merryweather a	" "		
338	W H Mercer a	" "		
339	E Trufont a	Mt Clemens Mich		
340	D Burt a	" "		
341	John Wylde a	" "		
342	Norton Wyckoff a	" "		
343	J Raymond a	Detroit Mich		
344	A D Turbush a	" "		
345	C E Shepard	Aurora N Y		
346	J L Cuyler	" "		
347	J B Dumont	Allegan Mich	276	Jan. 2, 1846.
348	D C Littlejohn	" "	277	" " "
349	G H Littlejohn	" "	281	" " "
350	J B Warren	" "	279	" " "
351	F J Littlejohn	" "	278	" " "
352	F S Littlejohn	" "	282	" " "
353	Ezra Willis	" "	283	" " "
354	Christopher Willis	" "	280	" " "
355	T Jones	Boston Mass		
356	Thomas J Whittemore	Cambridge Mass		
360	J A Peck	Pontiac Mich		
361	J Glenn	Baltimore Md		
361½	Robert A Forsyth	Detroit Mich	49	Sept. 16, 1845.
362	W C Glenn	Baltimore Md		
363	E T Ellicott	" "		
364	Andrew Ellicott	" "	369	
365	Elias Ellicott	" "	170	
366	E Chassaing	" "		
367	L De Milham	" "		
368	Benjamin Ellicott	" "	371	
369	J P Murphy	Pittsburgh Pa	190	Feb. 5, 1846.
370	John Davis a	Copper Harbor		
371	T Perry a	" "		
372	H Sturdy a	" "		
373	E C Rann a	Ontonagon		
*374	W W Spaulding a	Copper Harbor		

No. P.	Names,	Residence.	No, L.	Date of Lease.
375	James Carle a	Copper Harbor		
376	C Lewis a	" "		
377	R Jennings	Cleveland Ohio		
378	C Cherry	Pittsburgh Pa		
379	D Kendall	Platesville W T		
380	M Wallace a	Copper Harbor		
381	H N Munson	St Clair Mich	141	Dec. 29, 1845.
382	J B Watson	Detroit "	316	
383	L Palmer	" "	220	Feb. 16, 1846.
384	R Hall	Boston Mass	236	Jan. 27, 1846.
385	J Lilly	" "	237	" " "
386	A Fisk	" "	238	" " "
387	D Kimball	" "	239	" " "
388	N Waterman	" "	240	" " "
389	E W Stone	" "	241	" " "
390	A Randall	" "	242	" " "
391	S Curtis	" "	243	" " "
392	J H Sears	" "	244	" " "
393	V Brown	" "	47	Aug. 12, 1845.
394	Elias E Davidson	" "	48	" " "
395	A W Benson	" "	245	Jan. 27, 1846.
396	E A Raymond	" "	363	
397	M Kimball	" "	246	Jan. 27, 1846.
398	S C Watts a	Copper Harbor		
399	E F Gleason a	" "		
400	J O Williams a	" "		
401	M Sayer a	" "		
402	L Southbird a	" "		
403	L Shawern a	" "		
404	W H Boyer	Reading Pa	139	Nov. 1, 1845.
405	W R Gormley	Pittsburgh Pa	332	
406	W W Dallas	" "	350	
†407	J R White	" "	338	
408	Frederick Libbey	Boston Mass		
409	R Hosmer	Pontiac Mich		
410	T Ten Eyck	" "		
411	Thomas Palmer	Detroit Mich	132	Dec. 29, 1845.
412	Edward Doyle	" "		
413	O M Hyde	" "		
414	O Chamberlain	Pontiac "		
415	J Alexander	Boston Mass	247	Jan. 27, 1846,
416	N G Kartright	New York		
417	H H Hale	Glastenbury Conn		
418	C H Talcott	" "		
419	J L Boswell	Hartford "	187	Feb. 2, 1846,
420	J P Cunningham	New York		
421	M Mathews a	Carthage N Y		
422	J Blauvelt a	Albion Mich		
423	William A Cheever	Boston Mass		
424	D A Hall	Washington D C	347	
425	E Harriman	Tennessee		
426	Edward Curtiss	New York		
427	W G Snether	Washington D C		
428	William Cameron a	Saut Ste Marie		
429	P La Riviere a	Mackinac Mich		
430	D Millett a	" "		
431	L Cantains a	Saut Ste Marie		
432	Charles Bourassau a	Mackinac Mich		
433	Charles Merrit a	Battle Creek Mich		

No. P.	Names.	Residence.	No. L.	Date of Lease.
438	H Hubbard a	Chicago Ill		
439	Thomas H Purden p	Hillsborough Va	59	Oct. 22 1845.
440	J F Gleason	Thomastown Md	339	
441	C B Marian	Monroe Mich	82	Oct. 16, 1845.
442	M P Marvin	" "	83	" 17, "
443	T H Hawley	" "	84	" " "
444	A Godard	Detroit "		
445	C Holmes	" "		
446	W W Johnson	" "		
447	J A Vandyke	" "		
448	J P Teller	" "	297	
449	P Hussey	Ohio		
†450	D D Davis a	Copper Harbor		
†451	E Jones a	" "		
452	Milton Mason a	Independence Ohio		
453	D O'Connor a	Rome N Y		
†454	B Swaney a	Hanover Ohio		
455	William White a	Pittsburgh Pa		
456	C Kidder	Baltimore Md	101	Dec. 18, 1845.
457	W Robinson Jr	" "	102	" " "
458	G Crosby	" "	103	" " "
459	J S Allen	Pontiac Mich		
460	S Chamberlain	" "		
461	J M Parsons	Marshall "	172	Dec. 27, 1845.
462	H A Tillotson	" "	318	
463	A L Hays	" "		
464	A C Parmlee	Hastings Mich		
465	C Kellogg	Marshall "		
466	R Cross	" "		
467	A L Leland	Pontiac Mich	338	
468	L Bacon	" "	175	Dec, 12, 1845.
469	W J Nelson	" "	184	" " "
470	A B Mathews	" "	173	" " "
471	B O Williams	Owasso "	203	" " "
472	O F Wisner	Pontiac "	185	" " "
473	J C Smith	" "	221	" " "
474	John Almy	Grand Rapids Mich		
475	J Richmond	Aurora N Y		
476	S K Hurring	Mackinac Mich		
†477	A W Spies	New York		
†478	B Banks	Marshall Mich		
†479	M Sonls	" "		
480	H H Sylvester	Washington D C		
481	R C Weightman	" "	120	Jan. 2, 1846
482	G C Thomas	" "	341	
483	James Adams	" "	342	
484	S B Boarman	" "	343	
485	H B Sweeny	" "	121	Jan. 2, 1846.
486	W W Rowe	Bangor Md		
487	C O Record	" "		
488	M S Palmer	" "		
489	E Bacon	Pontiac Mich	174	Dec. 13, 1845.
490	W W Hudson	New York	216	Feb. 2, 1846.
491	R Niles	" "	235	" 18 "
492	J M Oakley	" "	201	" " "
493	J Otis	Hollowell Me	252	" " "
494	Alexander H Howard	" "	251	" " "
495	William S Lee	Detroit Mich		

No. P.	Name,	Residence.	No. L.	Date of Lease.
496	R K Page	Hallowell Me	253	Feb. 18, 1846.
497	H M Smith	New York	198	" 2, "
498	M B Maclay	" "	231	" " "
499	R M Morrison	Manhattan Ohio	351	
500	J G Thurber	Monroe Mich	135	Dec. 27, 1845.
501	A E Wing	" "	352	
502	Charles Noble	" "	353	
†503	J Q Adams	" "		
504	H Smith	" "		
505	E Jewett	Lockport N Y	257	Feb. 9, 1846.
506	Thad. W Patchin	New York	272	" 2 "
507	R D Hubbard	Hartford Conn	189	" " "
508	Thomas Lamb	Boston Mass	64	Oct. 7, 1845,
509	M H Simpson	" "	65	" " "
510	H Swift	" "	66	" " "
511	J Stickney	" "	67	" " "
512	R Bell	Philadelphia	262	Jan. 29, 1846.
513	H T Titus	"	217	Dec. 29, 1845.
514	W McConnell	"	263	Jan. 29, 1846.
515	James Hay Jr	"	259	Dec. 29, 1845.
516	J H Cowden	Williamsport Pa		
517	H A De France	Philadelphia	218	Dec. 29, 1845.
518	J M Erwin	"		
519	G W Guthrie	"	260	Dec, 30, 1845
520	A G Benson	New York city		
521	G A Dwight	" "		
522	Charles King	" "		
523	E Kingman	" "		
524	H B Loomis	" "		
525	S P Lyman	" "		
526	William Morell	" "		
527	H J Raymond	" "		
528	J D Olmstead	Boston Mass		
529	Thomas Snowden	New York	295	
530	F Richmond	G'd Rapids Mich	374	
531	Peter Morey	Detroit Mich	375	
532	H Olmstead	Boston Mass	136	Dec. 30, 1845
533	G R Hazewell	Ohio	191	" " "
534	G E Cheever	Boston Mass		
535	B H Cheever	Washington D C		
536	W Hawes	Zanesville Ohio		
537	Chas T Murdock	Boston Mass		
538	Theodore Olcott	Albany N Y	227	Jan. 20, 1846
539	Thaddeus Joy	" "	223	Dec. 18, 1845
540	Lewis Joy	" "	224	" " "
541	C T Chamberlain	Allegany	225	" " "

No. P.	Name.	Residence.	No. L.	Date of Lease.
542	Chas. C Cushman	Maine		
543	James Robinson	Pittsburgh Pa	128	Dec. 26, 1845
544	G H Whitney	Cambridge Mass		
545	H D Oliphant	Boston "	142	Jan. 26, 1846
546	Allen Shepard	" "	143	" " "
547	F A Elliot	" "	144	" " "
548	H T Backus	Detroit Mich		
549	D E Harbaugh	" "		
550	William D Wilson	" "		
551	J Robinson Jr	Pittsburgh Pa		
552	J R Bowman	Pontiac Mich		
553	J H Sinclair	Detroit "	354	
554	John McReynolds	" "	275	March 3, 1846
555	A T McReynolds	" "	355	
556	Wells Holley	Geneva N Y	176	Feb. 2, 1846
557	J M Holley	Stanford Conn	171	" " "
558	P Vanderwort	New York	273	" " "
559	William M Clark	" "	183	" " "
560	Nathaniel Jarvis	" "	215	" " "
561	J J Codding on	" "	204	" " "
562	R C Weetmore	" "	212	" " "
563	M Kimball	Hallowell Me	249	" " "
564	Ichabod Nutter	" "	178	" " "
565	H W Childs	New York	250	" " "
566	H H Hale	Glastenb'ry Ct		
567	C H Talcott	" "	284	March 19, 1846
568	J P Cunningham	New York		
569	J A Constant	Dobb's FerryNY	196	Feb. 2, 1846
570	J Tuckerman	New York	197	" " "
571	J L Boswell	Hartford Conn	187	" " "
572	F W Ogsbury	New York	213	" " "
573	Robert Benson	" "	285	
574	E Blunt	Delaware City	177	Feb. 2, 1846
575	E Douglass	New York	199	" " "
576	Alfred Douglass	" "	200	" " "
577	J A Iseline	" "	182	" " "
578	N G Kartright	" "	211	" " "
579	W J Staples	" "	188	" " "
580	H B Foy	Albany N Y	313	
581	J C Ayres	New York	205	Feb. 2, 1846
582	H Walbridge	Lockport N Y		
583	H O'Riley	New York		
584	Charles W Borup	La Pointe W T	124	Jan. 6, 1846
585	C H Oakes	" "	125	" " "
586	Thomas Card	Manhattan Ohio	256	" 21, "
587	P S Sandford	Painsville "		

No. P.	Names.	Residence.	No. P.	Date of Lease.
588	Wm W Thompson	Pontiac Mich	176	Jan. 16, 1846
589	Geo. Mendenhall	Cincinnati	274	" " "
590	H E Perry	Detroit Mich	348	
591	S Clark	Kalamazoo Mich	324	
592	S R Brooks	New York		
593	James Ganson	Jackson Mich	133	Dec. 12, 1845
594	O B Dibble	Detroit "	130	" 17, "
595	D Parker	Bangor Me	294	
†595½	M Mann	Marshall Mich	322	
596	J Palmer	Bangor Me	393	
596½	E C Noble	Marshall Mich	323	
597	S P Dinsman	Bangor Me	292	
597½	John N Barbonr	Boston Mass		
598	A Haynes	Bangor Me	291	
598½	N A Barrett	Boston Mass		
599	L E Dunn	Bangor Me	290	
599½	J W Sullivan	Boston Mass		
600½	T B Dix	" "		
601	B Dyer	Bangor Me	289	
602	F Blackman	" "	288	
602½	J L Tucker	Boston Mass	286	
603	J B Marsh	Bangor Me	287	
603½	Isaac Hill	Concord N H		
604	T O'Hara	Kentucky		
605	Jesse E Dow	Washington D C	234	Feb. 23, 1846
606	S G Watson	Detroit Mich	364	
607	John Norton	Buffalo N Y		
608	Albert Rndolph	Pittsburgh Pa	258	Feb. 23, 1846
609	Thos. W Bristol p	Detroit Mich		
610	William Jivet a	" "		
611	S Smith a	Unknown		
†612	A Grover a	"		
†613	W Smith a	"		
†614	H D Rogers a	Philadelphia		
615	A Thomas a	Wyota W T		
616	W H Monroe	Jackson Mich		
617	Erastus Hurd	Middleport N Y		
618	Jarvis Hurd	Marshall Mich		
619	G Ketchum	Detroit "		
620	G C Gibbs	Marshall "		
621	J Craig	Middleport N Y		
622	A S Baker	" "		
623	Washington Hunt	Lockport "		
624	S Works	" "		
625	P M Everett	Jackson Mich		

No. P.	Names.	Residence.	No. L.	Date of Lease.
626	J Hawks a	Rochester N Y		
626½	J Ketchum a	New York		
†627	J Peters a	Unknown		
628	J Brooks	Washington D C		
629	Benjamin C Cox a	St Clair Mich		
630	W Hall a	Albany N Y		
631	A Ledger a	Unknown		
632	G A Swan a	Copper Harbor		
633	E S Rockwell a	Jackson Mich		
634	J Taylor a	Fort Wilkins		
635	S Richmond a	Adrian Mich		
636	T Skillington a	Saut Ste Marie		
637	J Ward a	Ontonagon		
638	W L Whiting a	Chicago Ill		
†641	J L Rodgers a	Unknown		
642	W S Saunders a	"		
644	L S Treat a	Aurora N Y		
645	C L Spiker a	Unknown		
646	G Knapp	Racine W T		
647	G R Given a	Copper Harbor		
648	B Chapman	Mackinac Mich		
649	Thos W Herron a	Copper Harbor		
650	John Steward a	Saut Ste Marie		
651	James B Hunt	Pontiac Mich	349	
652	E B Litchfield	New York		
653	J Lathrop	Maine		
654	John Dickey	Pensylvania		
655	D P Bushnell	Detroit Mich		
656	M E Van Buren	" "		
657	E J Van Buren	" "		
658	C H Carey	" "		
659	F W Wrighter	New York		
660	John Satterlee	" "		
661	R Greenfield	Hyde Park N Y		
662	J Hinchman	" " "		
663	A Ward	Sing Sing "		
664	J A Parker	Hyde Park "		
665	D Collins Jr	Hyde Park "		
666	H G Hubbard	Utica "		
667	S W Higgins	Detroit Mich		
668	E H Carmichael	Richmond Va		
669	S S Williams	Philadelphia		
†670	J S Milford	Fred'cksburg Va		
671	C S Kendig	Hornsburgh Pa		

No. P.	Name.	Residence.	No, L.	Date of Lease.
672	William Porran	Tonawanda Pa		
673	W B Townsend	New York		
674	J S Skinner	Washington D C		
675	J H Whitcomb	Boston Mass		
676	J Kearon	Washingtou D C		
677	L S Coryell	Mt Hope Pa		
678	R Kearon	Washington D C		
679	J McCabe	Pontiac Mich		
680	T J Hunt	" "		
681	J E Hyde	" "		
682	Z B Knight	" "		
683	Bela Hubbard	Detroit Mich		
684	George W Fish	" "		
685	David Bush Jr	" "		
686	R Bishop	" "		
687	Alonzo Ferris	" "		
688	J Cowdin	New York		
689				
690	T Ackert	Hyde Park N Y		
691	J Van Vliet	" " "		
692	G Manning	" " "		
693	G T Swift	Mt Clemens Mich		
694	W W Niles	New York		
695	J D C Stoutenburgh	Hyde Park N Y		
696	G J Abbott	Washington D C		
697	John Mulford	Hyde Park N Y		
698	R L Prickhard	" " "		
699	T W Day	Hartford Conn		
700	M M More	Washington D C		
701	H C Murphey	Brooklyn N Y		
702	G W Stanley	Augusta Me		
703	S Irving	New York		
704	J E Harvey	Washington D C		
705	E Eld	New Haven Conn		
706	R J Ingersoll	" " "		
707	H Eld	" " "		
708	John Oakford	Philadelphia		
709	John Watson	Detroit Mich		
710	James Watson	" "		
711	C O Flynn	" "		
712	C C Jackson	" "		
713	C Carson	Pensylvania		
715	J Hall	Philadelphia		
716	J Baldwin	Elmyra N Y		
717	Thomas Willis	Philadelphia		
718	D C Holbrook	Detroit Mich		
719	E B Wetherbee	Flint "		
720	William Blades	Detroit "		
721	A Brush	" "		
722	J N Elbert	" "		
723	R D Lamond	" "		
724	D J Campau	" "		
725	H C Walker	Flint "		
726	J B Walker	" "		
727	Thomas O Fowler	New York		
728	Charles M Prevorat	Philadelphia		
729	J B Sutherland	"		

No. P.	Name.	Residence.	No. L.	Date of Lease.
731	William Belt	New York		
732	Levi M Arnold	Poughkeepsie		
733	Peter Godfroy	Monroe Mich		
734	J H Brown a	Mt Vernon Ohio		
735	G G Foster	New York		
736	B F Bush	Flushing Mich		
737	John Owen	Detroit "		
738	R R Gurley	Washington D C		
739	W J Moorhead	New York		
740	D C Moorhead	" "		
741	G C Pomeroy	Albany N Y		
742	Isaac Lewis	Monroe Mich		
743	Geo F Maynard	Richmond Va		
744	Robert Miller	" "		
745	H Fisher	" "		
746	J Richardson	Boston Mass		
747	Thomas Fletcher	Philadelphia		
748	Edward R Collins	New York		
749	A Belmont	" "		
750	R Nims	Monroe Mich		
751	R R Schekee	Georgetown D C		
752	J Collins	New York		
753	M Livingston	" "		
754	S M Fox	" "		
755	M Willett	Georgetown D C		
756	Calvin Blythe	Philadelphia		
757	M S Brown	New York		
758	J T Merritt	" "		
759	W H Merritt	" "		
760	S T Fairchilds	Cazenovia N Y		
761	B Merritt	New York		
762	M L Drake	Pontiac Mich		
763	Edward D Ellis	Detroit "		
764	B C Whittemore	Pontiac "		
765	M F Merritt	New York		
766	W P Way	Philadelphia		
767	J T Whitecar	"		
768	William Talbott	New Brighton Pa		
769	G Coggshall	Grand Rapids Mich		
770	W Hoyt	Pontiac "		
771	A A Boyce	Lockport N Y		
772	J Brownfield	Southbend Ind		
773	S M Beeson	" "		
774	J Beeson	Niles Mich		
775	S M Johnson	Detroit "		
776	Thomas Leonard	Monroe "		
777	William B Wells	Utica N Y		
778	J B Plumbe	Albany N Y		
779	E Lyon	Detroit Mich		
780	D Wager	Utica N Y		
781	S C Hammond	Ypsilanti Mich		
782	T P Tucker	St Clair "		
783	J L Freeland	Philadelphia		
784	A D Rathbone	Grand Rapids Mich		
785	C Britton	St Joseph "		
786	G P Way	Philadelphia		
787	A J Bergen	New York		
788	C J Bergen	" "		
789	H Hunt	Detroit Mich		

No. P.	Name.	Residence.	No. L.	Date of Lease.
790	J Mitchell	Bridgewater Pa		
791	G W Lester	Detroit Mich		
792	Two Stickney	Manhattan Ohio		
793	C C Devoe	Hyde Park N Y		
794	J A Stoutenburgh	" " "		
795	W Herrick	" " "		
796	G Harrison	Monroe Mich		
797				
798	W W Deane	Monroe Mich		
799	J B Robb	Boston Mass		
800	T P Chandler	" "		
801	J Kearsley	Detroit Mich		
802	A W Williams	Owasso "		
803	J M Knight	Buffalo N Y		
804	J W Foster	Zanesville Ohio		
805	T G Bradford	Boston Mass		
806	G M Dewey	Flint Mich		
807	W J Daniels	Toledo Ohio		
808	C L Dibble	New York		
809	E T T Martin	Utica N Y		
810	G H Hazleton	Flint Mich		
811	H L Whipple	Detroit "		
812	H C Linabury	Pontiac "		
813	H C Knight	" "		
814	H Higgins	Detroit "		
815	E H Thomson	Flint "		
816	James S Kingsland	Monroe "		
817	J A Hale	" "		
818	S Ward	New York		
819	F M Wyman	Monroe Mich		
820	J C Miller	" "		
821	D V Bell	Marshall "		
822	I E Crary	" "		
823	H P Adams	Milford "		
824	D V Edsil	Manhattan Ohio		
825	F Farrand	Jackson Mich		
826	E B Bostwick	Grand Rapids Mich		
827	L Day	South Bend Ind		
828	E Hurd	Middleport N Y		
829	D Swift	Detroit Mich		
830	E Gustorphs	Missouri		
831	H D Marsh	Unknown		
832	J B Williams	New York		
833	J L Carpenter	Pontiac Mich		
834	J Denton	Ann Arbor Mich		
835	A Freeman	Middleport N Y		
836	J G Bond	Detroit Mich		
837	W W Murphy	Jonesville		
838	F A Swift	Jackson Mich		
839	John Griswold	Detroit "		
840	S Murphy	Monroe "		
841	E Lawrence	Ann Arbor "		
842	T Tillotson	Marshall "		
843	A B Cook	" "		
844	A Clark	" "		
845	D Clark	" "		
846	R Williamson	" "		
847	L Wilson	" "		
848	A Turner	" "		
849	P E Robinson	Philadelphia		

No. P.	Name.	Residence.	No. L.	Date of Lease.
850	G S Wright	Marshall Mich		
851	E Bradley	" "		
852	B Humphrey	" "		
853	Davis Hurd	Reynah's Brsin		
854	J W Squires	Grand Rapids Mich		
855	H N Church	Pontiac "		
856	E S Williams	" "		
857	M Dayton	Lockport N Y		
858	W P Daniels	Toledo Ohio		
859	F W Kirtland	Jackson Mich		
860	B Phelps	Pontiac "		
861	J Butterfield	" "		
862	H Hurd	Lockport N Y		
863	H Parke	Pontiac Mich		
864	T B Myers	New York		
865	G B Field	" "		
866	D C Walker	Utica Mich		
867	G Spencer	Pontiac "		
868	W T Mitchell	Detroit "		
869	E F Cook	Farmington		
870	M Cadwallader	Buffalo N Y		
871	D Wallis	Pontiac Mich		
872	J R Smith	Monroe "		
873	J Hale	" "		
874	H V Man	" "		
875	E A Burrill	Lockport N Y		
876	F H Stevens	Troy Mich		
877	S M Stelle	Unknown		
878	J S Rowland	Detroit Mich		
879	A S Kellogg	" "		
880	H A Rood	" "		
881	J W Carr	Jackson "		
882	S T Carr	" "		
883	H J Stow	Buffalo N Y		
884	D Evans	Lockport N Y		
885	Joseph Compton	Middleport N Y		
886	David M Hinsdale	Pontiac Mich		
887	John McMorran	Lockport N Y		
888	Nathaniel Niles	Washington D C		
889	Charles Mathews	New York		
890	Egbert Benson	"		
891	William H Kuntz	York Penn		
892	George Miench	" "		
893	John Hough	Pensylvania		
894	Henry Schrivner	"		
895	Thomas White	Pittsburgh Pa		
896	R Godfroy	Monroe Mich		
T	J C D Williams a	Unknown		
r	John Kemp a	Wyota W T		
t	James Thomas a	Unkown		
u	C Nolen a	"		
v	W H Parks a	Ottowa Co. Mich		
xv	S Ketchum a	Marshall "		
xix	D S Bacon	Monroe "		
xx	J L Dutton	" "		
xxi	J B Dutton	" "		
xxii	A W Brockway a	Saut Ste Marie		
xxiii	C A Watson a	New York		
xxv	J Beaugrand a	Buffalo N Y		
xxvii	L Perdranvills a	Copper Harbor		

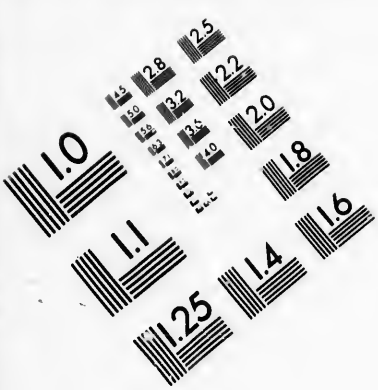
No. 2.

LIST OF PERMITS,

Which have been withdrawn and relocated with the numbers, which having been dropped, or not used, do not appear on the map. This list does not embrace any conflicting locations

Original No.	Name.	Present Number.
4	D Ruggles	311 to 319 inclusive
5	W P Ruggles	719 " 727 "
94	H Higgins	814
95	G H Hazleton	810
96	E H Thomson	815
194	C Bourassau	432
195	L Cantains	431
196	D Millet	430
197	W Cameron	428
198	P La Riviere	429
201	W A Cheever	423
204	D A Hall	424
288	J Ward	637
357	D V Bell	821
434	J E Hyde	681
435	J McCabe	679
436	Z B Knight	682
437	T J Hunt	680
714	A Pell	112

The first or original numbers of these Permits have been dropped, and are not on the map, and numbers 228 to 245 inclusive, 297 306 to 310 inclusive, 358, 359, 600, 639, 640, 643 and 730 have either never been used or have been withdrawn.



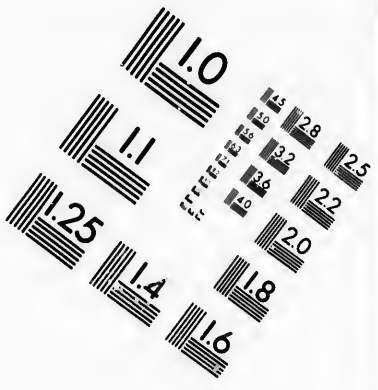
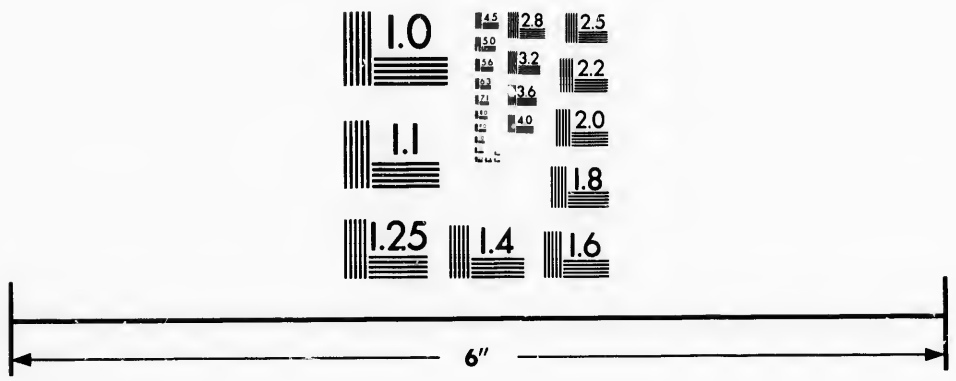
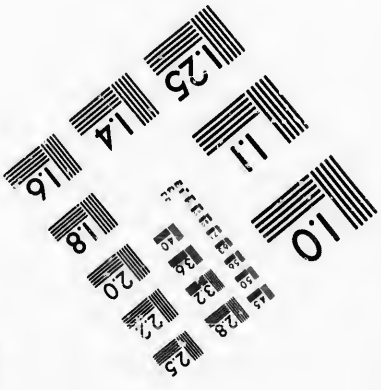


IMAGE EVALUATION TEST TARGET (MT-3)





Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

No. 3.

LIST OF THE LOCATIONS

Which by the new and correct map, are found to conflict with others previously made, with the part nearly which will be lost. Those lost in part only, appear by their numbers on the map.

No.	Name.	With what Conflicts.	Part lost.
6	W J Wells	Location 227	all
7	T B Biddle	" "	all
8	F Norvell	" "	1-2
9	D Phœnix	" "	1-4
10	C Bestor	" "	1-4
11	J A Smith	" "	1-6
xxv	J Beaugrand	" "	all
52	J Winder	" "	1-3
165	R Miller	Lease 34	all
166	J J Roberts	" "	all
182	J Sahl	" 20	all
191	K Muller	" 71	all
266	N Sargeant	" 134	all
269	J M Williams	Location 259	all
295	J Hanna	" 9,10,11,12,13,14,97,373	2-3
301	W Hale	" 258	1-2
302	F A Harding	" 257	1-2
303	E Brooks	" 256	1-2
342	M Wyckoff	" 341	1-3
373	E Raume	" 295	1-3
374	W W Spaulding	" 295	all
404	W H Boyer	" 246, 99, 317, 315	7-8
405	W R Gormly	" 246	1-3
406	W W Dallas	" 246, 248	3-4
407	G R White	" 248, 99, 100, 246	all
410	T Ten Eyck	" 595	1-3
438	H Hubbard	" 295	1-3
450	D D Davis	" 99, 315, 393	all
451	E Jones	" 99, 100, 247, 393	all
454	B Sweeney	" 51, 52, 55, 438	all
461	J M Parsons	" 247	1-2
462	H A Tillotson	" 100, 101	3-4
465	C P Kellogg	" 449	3-4
477	A W Spies	" 311, 84	all
478	B Banks	" 84, 88	all
479	M Soule	" 317, 315, 311	all

No.	Name.	With what Conflicts.	Part lost.
490	W W Hudson	Location 255	1-2
503	J Q Adams	" 295	all
504	H Smith	" 295	2-3
523	E Kingman	" 295	1-3
524	H B Loomis	" 295	1-3
525	S P Lyman	" 295	1-4
535	B H Cheever	" 224	1-3
545	H D Oliphant	" 105, 107, 372	3-4
546	A Shepard	" 372, 375	1-2
547	F A Elliot	" 107, 108	1-2
552	J R Bowman	" 100, 101, 248	3-4
553	J H Sinclair	" 371	1-4
555	A F McReynolds	" 370, 376	1-2
543	J Robinson	" 101,102,103,104,105,106,-[107,108,249	2-3
549	D E Harbaugh	" 101, 103	1-2
550	W D Willson	" 103	1-4
595½	M Mann	" 393, 394	all
596½	E C Noble	" 394	1-2
608	A Rudolph	" 370, 375, 376	3-4
611	S Smith	" 695,734 and Lease 29	3-4
612	A Grover	" 729 " "	all
613	W Smith	" 728 " "	all
614	H D Rogers	" 320	all
622	A S Baker	" 16	1-3
625	P M Everett	" 370	1-2
626	J Hawks	" 623, 617	3-4
626½	J Ketchum	" 617	1-5
627	J Peters	" 227	all
631	A Ledger	" 108	1-4
633	G S Rockwell	" 370	1-4
635	W S Richmond	" 461	1-2
641	J L Rogers	" Previously made	all
648	B N Chapman	" 375	1-4
654	J Dickey	" 655, 656, 657, 658	1-3
656	M E Van Buren	" 399	1-3
658	Charles H Carey	" 657	1-3
670	J S Milford	" 137	all
687	A Ferris	" 831	1-2
688	Cowdin	" 831	1-4
742	J Lewis	" 832	1-3
Z	Clark Burnham	" Previously made	2-3