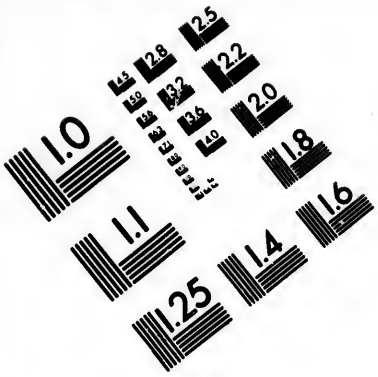

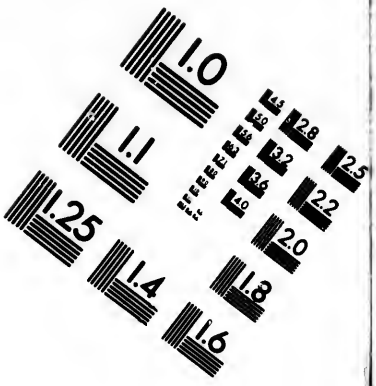

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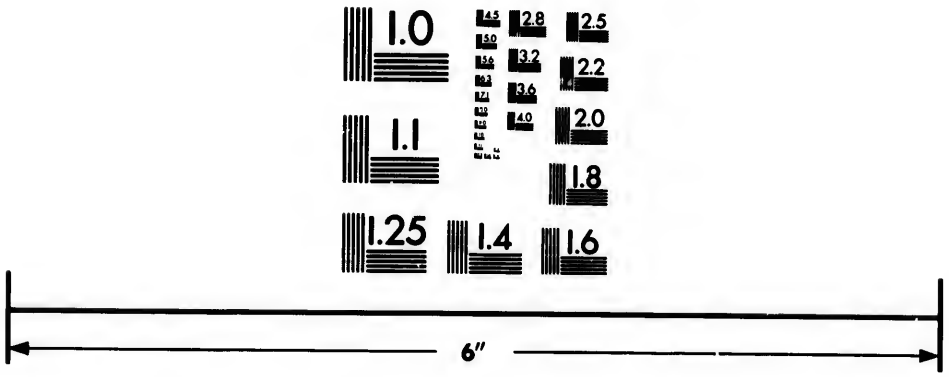

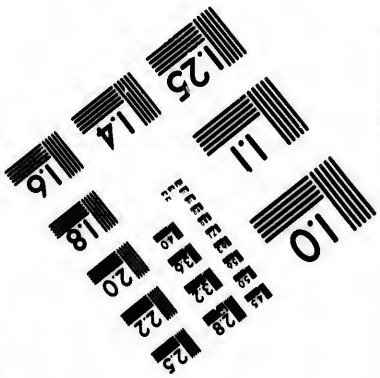

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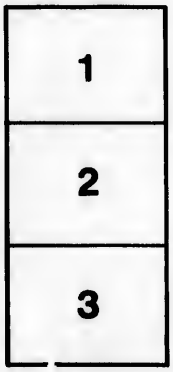

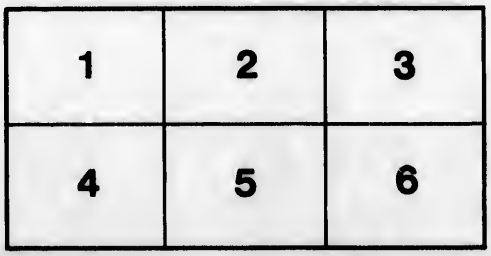

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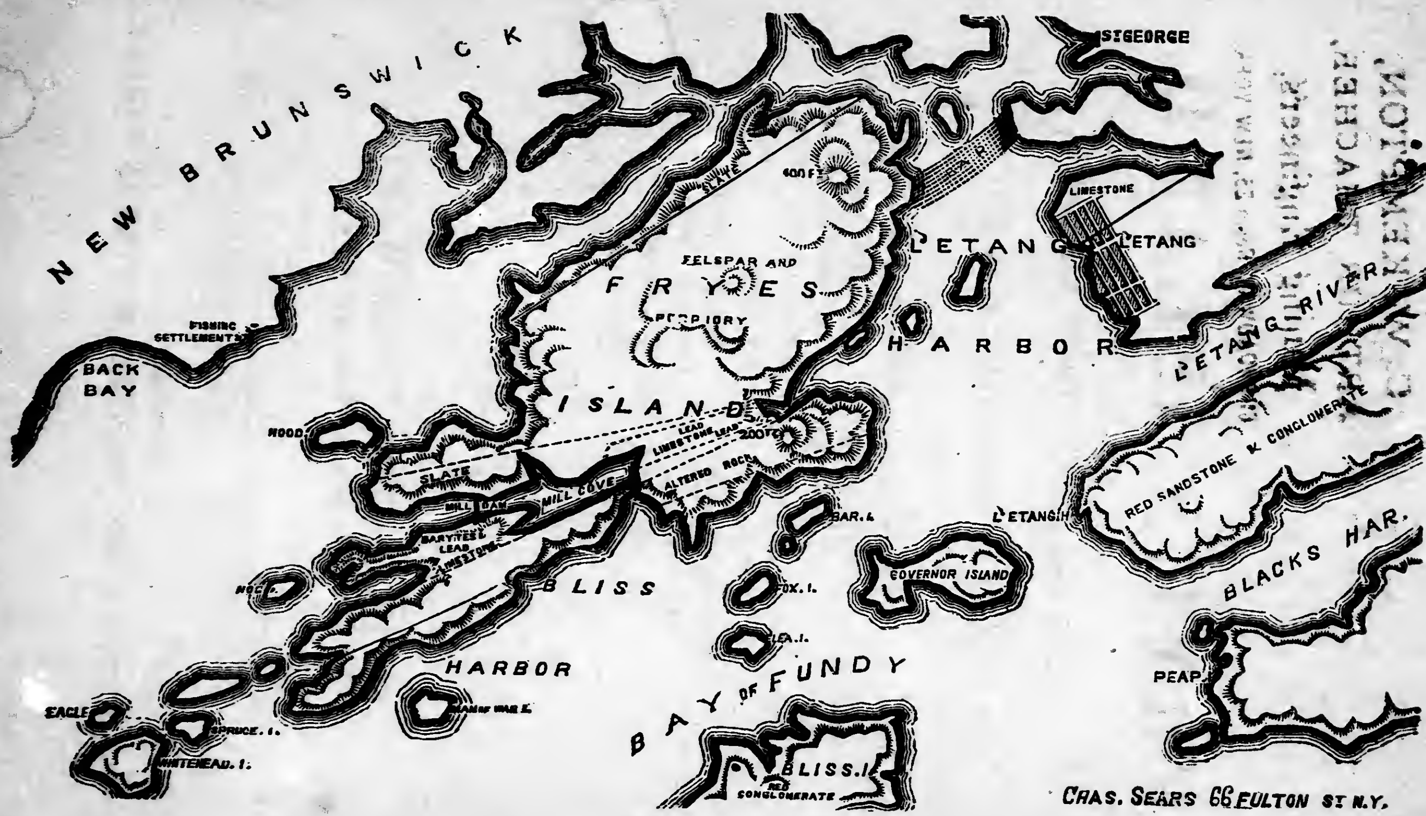
NEW BRUNSWICK
ST GEORGE
LIMESTONE
L'ETANG
L'ETANG
L'ETANG HARBOR
L'ETANG RIVER
SLATE
400 FT
FELSPAR AND
FRYES ISLAND
PORPHYRY
FISHING SETTLEMENTS
BACK BAY
WOOD
SLATE
LEAD
LIMESTONE
200 FT
ALTERED ROCK
MILL COVE
MILL DAM
BARYTES & LEAD
LIMESTONE
RED SANDSTONE & CONGLOMERATE
L'ETANG
BAR. I.
GOVERNOR ISLAND
BLACKS HAR.
FOX. I.
BLISS HARBOR
EAGLE
SPRUCE. I.
WHITEHEAD. I.
BAY OF FUNDY
BLISS. I.
RED CONGLOMERATE
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REPORT

ON

FRYE'S ISLAND,

ALSO CALLED L'ETANG ISLAND,

N. W. SHORE OF THE BAY OF FUNDY, N. B.

ITS MINERAL RESOURCES. AS SEEN ON A CURSORY EXAMINATION, ACCOMPANIED BY THE REPORT OF PROFESSOR BAILY, TO THE LIEUTENANT GOVERNOR OF NEW BRUNSWICK; CAPT. KEY, MINING ENGINEER AND SUPERINTENDENT; THE STATE GEOLOGIST OF THE PROVINCE OF NEW BRUNSWICK, PROF. HIND, AS MADE TO THE PROVINCIAL SECRETARY, AND THE STATEMENT OF HENRY FRYE, ESQ. THE PROPRIETOR OF THE ISLAND.

By DR. LEWIS FEUCHTWANGER,
Chemist, of New-York.

NEW-YORK:
D. MURPHY'S SON, PRINTER, 65 FULTON STREET.
1866.

REPORT.

Having collected in my late visit to Fryes Island a great variety of interesting and useful minerals from the surface, and brought to this city a number of barrels for inspection and special examination, became convinced that Fryes Island contains an inexhaustible supply of economical minerals, such as:

1. Sulphate of Baryta, commonly called Barytes, of a snow white color and opaque, saw about 20 tons on the surface scattered at the opening of the vein.

2. Galena, or argentiferous lead ore, from several locations, yielding 84 per cent. lead and considerable silver.

3. Fluorspar, sometimes called the mother of metalliferous veins, of white and purple color and compact.

4. Limestone, white and blue, as also calcareous spar in great abundance.

5. Yellow Ochre, a large belt and deposit, a fine yellow pigment.

6. White Quartz or Flint, immense ledges for porcelain and potteries.

7. Auriferous Pyrites or gold bearing quartz. Besides common Iron Pyrites or Sulphuret of Iron, Copper Pyrites, Blende, Talcose Slate, Felspar, Porphyry, &c. &c.

Fryes Island or L'Etang or Cailiff Island extends three and a half miles in length, and one mile in width, is situated on the S. W. coast of the province of New Brunswick, and S. E. of Mascaban Peninsula; joins the main land by a bar, passable from three quarter ebb to a quarter flood, or from three to four hours every tide. The distance of this island to Eastport, Maine, is about fifteen miles, and from St. John, N. B. about 45 miles. Geologically the Island belongs to the metamorphic series of rocks, or upper silurian and are similar to the

greater portion of the N. W. shore of the Bay of Fundy; they are composed of quartzitic, felspathic, shistose, trappean and calcareous rocks, with many mineral veins running through it.

The general direction of the strata is E. N. E. and W. S.W. dipping nearly vertical, sometimes inclining N.W. and at others S. E. as may be seen by the annexed map. On the N.W. side hornblende rock and purple slate and conglomerate skirt the shore, followed on the S. E. by felspathic porphyritic rocks of great thickness at the N. E. and narrowing to the S.W. where it is succeeded by shistose strata. Abutting on the slate is a band of crystalline limestone averaging near 1000 feet in thickness, varying in color from white to dark blue, this is followed by a band of slate; then comes a ridge of highly altered rocks, rising at the highest elevation to the height of 200 feet; against this on the S. end shore of the island lies shaley, sandy and calcareous strata, mostly in thin beds, much contorted, containing fossils belonging to the silurian series (favosita gothlantica.)

Several lodes of fine white barytes, quartz and fluorspar are visible on the surface, but the valuable metalliferous veins were not known before the summer of 1862; after the discovery of the *barytes vein*, which, from distance looked like snow, displayed an 8 foot vein, and from thence galena was discovered at several points. In the same lode of barytes are also seen fluorspar, quartz, oxide and sulphuret of iron, with manganese in dentritic form; it turns off easterly across a limestone strata, at an angle of 60°, and joins another vein about 10 feet distant on S. E. side, both carrying barytes, but not having gone into the ground the contents are not sufficiently known save the quartz and calcareous spar, which with the barytes compose the outer surface.

A great many outcroppings appear S. W. different from others hitherto seen, such as cellular quartz, containing oxide iron with defined walls of limestone, others again have a good wall of quartz and fluorspar, having lead, copper and zinc in small patches. A cut was made lately about three feet deep, and a pure white and purple and greenish fluorspar and galena was struck in a small string and is accompanied on each side by a decomposed limestone.

Several veins of both laminated and broken up ochre occur

at an elevation of the limestone ridge at the head of the mill pond.

The mill cove is an arm of the sea, having a flowage of about 50 acres with head of water from 18 to 20 feet according to the rise of the tides, and this will give abundant never failing water power for preparing the minerals or ores for market as well as for manufacturing purposes. In the felspathic rocks many veins of white quartz occur but of not so regular a structure as that found in the limestone. The slate also has veins and is full of iron pyrites, a vein of a foot thickness of sulphuret of iron has lately been found in the southern part of the island. It will be seen on a fair and impartial examination that Fryes Island has given prima facie evidence of a vast mineral deposit in its bowels, and requires but the developement, and cannot but prove very profitable to those entering into its merits. The further proof of the appreciation of the valuable deposits on this Island are herewith given by Professor Bailey, who reports to the Lieutenant Governor of the Province on the Mines and Minerals of New Brunswick, as follows:

"Fryes Island, called also L'Etang, is separated from the main land by what is known as the Black Bay, a sheet of water perhaps a quarter of a mile wide at the point where we crossed, there we found the lead lodes situated in a bed of compact almost crystalline limstone, forming a part of the metamorphic series of rocks, which occupy and traverse the south eastern shore of New Brunswick; the lodes are composed of quartz, principally with fine white heavy spar or barytes and a little fluor. This lode, at the point where it is now laid bare was by measurement about 8 feet wide. It has been uncovered in part for about fifty feet, having in its length a varying thickness of from six to eight feet, at the point where the lode has been uncovered another lode approaches from the S.E. and joins the first, whose course is about E.N.E., this 2d lode has a thickness of about six feet, and like No. 1 is composed of barytes and quartz. In the angular space included between the two, the country rock limestone again appears. Lode No. 2 is surrounded by a bed of ironstone and slate about three feet wide and this again by three feet more of limestone; then follows lode No. 3 six feet wide, composed of the same material as before

and pursuing a course nearly parallel to No. 2; the remainder of the rock is covered with soil. Besides the lodes just described indications of others have been found but have not been thoroughly explored. The point above referred to is but a few yards distant from an arm of the bay, left bare at low water, but filled at high tides, across which a tide dam was once constructed, but soon gave way, being completely destroyed by the ravages of the marine worms; there is a kiln within a few feet of the lodes and some lime has been burnt there. The locality is very favorably situated for the working of either lead or limestone, as the rock or ore could be readily shipped within a very few feet of where it is first raised. Indeed the working of the two might be profitably done in conjunction, provided the amount of lead should prove considerable, a point upon which without further exploration it is impossible to decide. The beds of Barytes will also prove valuable. So far as I could judge from the indications thus exposed, the prospects are very favorable for an abundant supply of lead, and I can hardly doubt that it will be found in quantity on this Island, especially as it is now being raised to advantage in the vicinity of Eastport, Me."

"The main lode has a course about E. N. E. being nearly unformable in direction to the limestone strata, many of which somewhat softened and decomposed are found enclosed in the quartz, fluor, which constitute the filling matter of the lode. The other lodes are parallel to each other and approach from the S. E. The barytes is white and tabular, and the fluor is found of a violet or amathystine color, resembling the variety called chlorophane. On the shore at a short distance a lode is seen pursuing the same easterly course as the main lode already described, and is probably continuous of it, a little further on are numerous quartz lodes passing through slates and associated with numerous trapdykes; the slates are highly pyritiferous. Limestone also appears and alternates with chlorite and talcose slates; this limestone at one point was seen to be well charged with galena; still further around the tongue of land where these lodes occur are seen some beds of verde antique, forming a good and handsome marble, and also some seams of asbestos."

Capt. Key, Superintendant of Mines and Mining Engineer, speaks of the survey made by him of L'Etang Island, thus:

"Several large mineral lodes have been discovered on the shore of the S.W. extremity. Two large veins or lodes have been opened embedded in crystaline limestone, these veins are from 6 to 10 feet thick, containing quartz, calcareous spar, sulphate of barytes, fluor, galena, iron pyrites and blende, imbedded in crystaline limestone. Several tons of minerals have been broken from this place, containing a considerable quantity of galena or lead ore of good quality. Ten feet south of this pit is another large lode running a little more northerly and forming a junction with the last named lode, a short distance east of the present openings, where a deposit of minerals may reasonably be expected."

"From the very strong and mineralized appearances of the lodes, containing so much fluor (which is a great feature) and surrounded with other most influential characters, I should not be feel surprised at meeting with some rich silver ore, and the great advantage on every side for water power, to make the ores marketable as well as for transit, it gives this Island one of the greatest advantages desirable for the saving of land carriage as well as for the easy development of its mineral resources, which if properly carried out will undoubtedly remunerate the outlay of capitalists."

The Rev. William Elder, A.M. states that he met Capt. Key in the neighborhood who informed him that he had hardly ever seen more undoubted indications of an abundant deposit of galena of good quality, and has expressed his convictien that the ore would ere it reached a great depth be found to carry a considerable quantity of silver; the same opinion was independently expressed by Capt. Simmons, who is a practical miner of great experience and high standing; Capt. Key stated to him that were such a mineral property as L'Etang in Wales it would be held to be worth a large sum of money. The barytes or heavy spar, which forms one of the matrix rocks of the galena is of snow white color, and that mining operations in L'Etang could be carried on with great economy as regards the price of labor, &c. and with every facility either for the smelting or shipment of materials.

Prof. A. A. Hays, of Boston, speaks of the ores and the results of his analysis:

"*Galena* in quartz; a soft fine granular galena which yielded him 83% per cent. lead. *Gold Quartz* yielded him 126 grains of gold fron 2000 parts or pounds, all the gold was contained in the pyritous iron present and none in the metallic state, it is probable however if this ore could be found and separated from the quartz, it would prove highly valuable. In the quartz it is diffused in small proportion.

As regards the limestone which when burnt yields a very pure material, and is highly praised for all chemical purposes and mortar and cement, of which 15000 barrels alone are annually sent by Mr. Randall of L'Etang tothe Boston market, and it is so remarkably pure that 100 parts yield after burning 54.30 quicklime, and according to Dr. Jackson the L'Etang marble contains 98 per cent. carb. lime, which is considered far superior to Thomaston Lime.

Fryes Island can furnish easily 100.000 barrels to be delivered in New-York, and realize a very large profit, for Mr. R. informed me that he paid for freight 25c. per barrel to Boston, barrel and material to burn does not cost 30c. and which sold for $1.62 the barrel."

In Prof. Hind's Report on the Geology of New Brunswick, which was made to the Provincial Secretary in 1865, as State Geologist, the following remarks were made in regard to Fryes Island:

"Fryes Island lying S. E. of Mascaban Peninsula, is remarkably interesting in its geological aspect. Some of its limestone and grits in the eastern side are fossliferous, on the western side the limestone is crystaline. The lead veins have not yet been sufficiently explored or opened to express an opinion of their probable productiveness, but the minerals with which they are associated, fluorspar and sulphate of baryta, the fine ochres on the walls of a trapdyke, the denuded surface of the limestone itself, and the fossliferous character of same portion of the belt, all invest the Island with peculiar interest, and creates a suspicion that the age of the rocks on Fryes Island may belong to the middle rather than the upper siluvian series."

As regards the barytes Professor Hinds states that the heavy spar or sulphate of baryta on Fryes Island is likely to become

commercially valuable, the facilities for obtaining the material and for exportation being unusually good, and furthermore he relates that this mineral (Barytes) is extensively used in the arts as a paint, both by itself and for mixing with other pigments as an adulteration, for which purpose it is fitted by its great weight. It enters into the composition of the cheaper kinds of white lead paint, sometimes to the extent of seventy-five or eighty per cent.; for this purpose the native sulphate of baryta is crushed, and if necessary boiled with dilute muriatic or sulphuric acid to remove any metallic oxide which may discolor it, after which it is ground to a fine powder. An artificial sulphate of Baryta is also manufactured by precipitation, and is sold under the name of Permanent White or Blancfix, which is prepared from the native sulphate by igniting it with charcoal, by which a sulphuret of barium is formed, this by addition of muriatic acid is converted into chloride of barium, from which the sulphate is precipitated by sulpharic acid, the pigment thus obtained is much finer than that prepared by simply grinding the mineral. It is used as a water color, and also in the manufacture of paper hangings for giving a peculiar glossy surface.

Having now related in a condensed manner, the opinion expressed by impartial judges of the prospective mineral treasure of Fryes Island, a few closing remarks received from Henry Frye, Esq. the proprietor of the Island, who is quite a scientific man, and from whom I derived much information; the letter bears date St. George, 9th July, 1866.

"It may now perhaps not be amiss that I should write more fully as to the work that should be done for the commencement of operations, premising that as yet we know comparatively little of the ground; it is therefore necessary that a full survey should be made, so as to have a more correct knowledge of the best places at which to sink shafts and to drive; it cannot be thought of drifting from the barytes to the fluorhill, the distance is too great, being nearly half a mile. The strata at or around the barytes vein is covered with soil from one to four feet deep, which should be taken off before it can be decided where the proper place for sinking is; whether to go down on the lode or perpendicular and crosscut in case of their being more than the two veins now in sight.

At the head of the cove N. E. from the barytes an open cut through gravelly and claysoils, for say 100 yards, should be made to the foot of the hill wherein the fluor veins are situated, and an adit level driven across the hill intersecting all the veins. This cannot be expensive, the rock being limestone and of course no water to contend with.

"Before this is done the ground at surface should be examined, so as to get a good place for sinking a shaft for drawing and ventilating, and this should go on simultaneously with the drifting and could made in time to connect with the drift by the time it would be intersected. I consider the necessary work in discovering all the proper veins should be commenced at once, as it can be done by unskilled workmen, and the ground could be ready for inspection by the time active operations are commenced, which should not be put off any longer than is absolutely necessary, for it is important that some progress be made before frost sets in, then the work can go on comfortably during the winter. I think therefore that arrangements should be made at once for this preliminary work, the cost will be comparatively trifling and it will materially expedite after operations.

"I may state in conclusion that the Island is well adapted for agricultural purposes, the soil being good, and manure, both vegetable, mineral and marine, abundant; fish of various kinds abundant in the surrounding waters—indeed when all the advantages are enumerated, a site or locality for mining and manufacturing purposes, with the cheap labor ($1 per day,) may seldom be surpassed or even equalled.

It will be necessary to have a Provincial Act of Incorporation, thus giving general corporate powers, can be obtained at the Provincial Secretary's Office without any special legislation."

It may be proper also to state that from the records collected it appears that the Province of New Brunswick has granted this Island to William Paine, a retired physician of the British Army, who deeded it in 1822 to the father of Mr. Henry Frye, who received it by deed from him in 1845 or '46, and it is at present in his name, with an incumberance of a small mortgage, which may be paid off with the purchase money, and the ne-

cessary papers and vouchers for a clear conveyance can be had at all times.

Samples of the various minerals, lump and ground barytes, ground yellow ochre, blue and white limestone, auriferous pyrites, white quartz, sulphuret of iron, may be seen at my office.

Respectfully submitted,

LEWIS FEUCHTWANGER, M. D.
Chemist and Mineralogist,
55 CEDAR STREET.

New-York, July 22d, 1866.

Since writing the foregoing report, I received a letter from Dr. Pohle regarding the Galena, which yields a larger proportion of silver than what Dr. Hays obtained, but a less per centage of lead; it reads as follows:

LABORATORY OF JULIUS G. POHLE, M.D.,
(Formerly of and Successor to Dr. Jas. R. Chilton & Co.)
ANALYTICAL & CONSULTING CHEMIST,
489 Broadway, N. W. cor. of Broome St.

New-York, August 1st, 1866.

I have made a Fire Assay of a sample of Argentiferous Galena with associated gangue, from Fryes Island, N. B., for Dr. L. Feuchtwanger, and found it to yield by this process 64 per cent. of Lead. The Lead yielded by cupellation Silver, in the proportion of 17 ounces, 1 pennyweight and 18 grains to ton of 2000 of metal.

I have also analysed a sample of Iron Pyrites for the purpose of ascertaining whether it contains Arsenic. A very small trace only of this latter substance was detected, less than the $\frac{1}{30}$th of one per cent.

JULIUS G. POHLE, M.D.
Late of Dr. Jas. R. Chilton & Co.
Analytical Chemist.

It will be seen that the sulphuret Iron, which is in great abundance on Fryes Island, contains but a trace of arsenic, and bids fair to be valuable for the manufacture of Oil Vitriol, and an order for 1000 tons at $10 per ton has been tendered to me.

The Barytes, a ton of which I had ground dry, and exhibited to many practical Painters and dealers in Paints, has been universally pronounced equal to the English Floated Barytes and superior to any American.

LEWIS FEUCHTWANGER, M. D.

New-York, August 2d, 1866.

DR. LEWIS FEUCHTWANGER, NEW-YORK:

DEAR SIR,—Agreeably to your wish, I repaired to Frye's Island and spent fully six days in examining the deposits of useful minerals and their abundance, the report of which examination I herewith transmit to you.

Before entering, however, upon this task, I deem it necessary to declare that in all I have now to say I shall adhere strictly and purely to the truth. In speaking of statistics, of my labors, I shall neither embellish nor underrate facts and matters; that I vouch for the truth of every thing I say, every thing being exactly as represented. Furthermore, that I actually can execute all operations herein proposed, being certain of obtaining the corresponding results referred to, for which I hold myself personally responsible, as it is my fixed principle to express my opinions clear and without reserve; to describe matters which, from their very nature, leave no room for doubt, as such; while matters, the value of which have to be determined by examination, are described as such, although in such cases I shall give my personal view of these matters, together with my reasons for favoring such a view. I make these remarks simply because I know that some reporters speak favorably often of entirely worthless minerals, or endeavor to represent them as valuable by far-fetched, meaningless phrases, which express nothing positive, so that capitalists are frequently lured into enterprises where the loss of their investments may be predicted with certainty; as a matter of course such reports can only be pernicious to the credit and enterprising spirit in this branch of industry.

Mr. Henry Frye showed me his report about the geological situation of the minerals of that locality, which I found true and correct in all its details; I shall, therefore, confine my remarks simply to such parts of the same which refer to the useful minerals possessing value in our markets, taking due notice of the operative branch of this part of the report. I shall here follow the arrangements of Mr. Frye, who denominated systematically the location of the veins with numbers.

Vein No. 1.—Distinctly visible at the southwest end of the

island, where the same descends precipitately to the sea and is laid completely bare. It has a depth of ten feet, being 54 feet long at low tide, *i. e.*, visible clearly to the surface of the water, where the same is surrounded by chloritic slate, underrunning the surface of the water, or rather getting covered by the same. This vein consists chiefly of quartz, a small quantity of baryta, and a fracture exposes the occasional presence of the accessory iron and copper pyrites, galena and zinc blende.

Vein No. 2, likewise visible from the southwest end of the island, where it is traceable to the lowest slate of the level of the sea, possesses a thickness of three feet, consisting of the same minerals as Vein No. 1, with but the difference that the accessory sulphurets of iron, copper and lead are visible in far greater quantity on any fracture, forming already coherent pieces. This vein, No. 2, measured from the water surface at lowest tide to the hill side, which for some distance covers it with humus and trees, while on the west side of the same hill it re-appears, is 340 feet long, and on breaking it at different places I found throughout the same admixtures of iron, copper and lead as sulphurets.

Parallel to the two veins mentioned runs Vein No. 3, north, along the coast mentioned in the notes on Vein No. 2, at a distance of four feet from the last named, traceable over a distance of more than 500 feet, but three feet lower than the water level at high tide, which covers this vein three feet high; the vein, though, runs near the mill-dam under the island, where the same may be worked under ground, and of course also under water.

This vein carries galena quite distinctly, and in some places I found pieces containing, according to my estimate, as much as five per cent. of galena. In the middle it is about 6″ thick, in some places divided in several branches, where it appears, comprising those several branches, twelve to fifteen inches thick. Wherever I opened this vein I found galena, but hardly any pyrites of iron and copper. All three veins mentioned have a southwest course. 50° to northeast. The descent, as far as discernible on the two first veins on the hillside of the island, is almost vertical, somewhat inclined

towards the east, while it is difficult to indicate the degree of descent with accuracy. Nearer to the mill-dam, and visible only for a short distance along the coast, is a slate, slippery to the touch, (although it is not properly magnesian slate,) through which Vein No. 4 runs, consisting chiefly of fluor-spar, intermingled for some distance with rotten and disintegrated quartz, containing also traces of galena. The thickness of this vein varies from four inches to two feet, while its length is still unknown, it being covered for a great distance with vegetable mould; but a quartz vein, containing fluor-spar, and visible beyond the mill-dam, possibly, is the continuation of that vein, although this cannot be stated with certainty, its course deviating somewhat from the course of the former vein. In the same manner Vein No. 5 is visible for some distance along the shore, entering into the land, covered with humus, and being visible again about sixty feet from the shore. It appears to be 26 to 31 feet thick. All the places, where this vein was opened, showed compact, heavy spar (baryta) of excellent purity, which exhibited only on two places along its length galena, two feet thick, amounting from ten to fifteen per cent. of the former. Pieces of baryta, containing galena, weighing about five tons, were taken out, and are now lying on the spot.

This vein has already been laid open to a distance of 40 feet and along its entire width, while twelve feet of its outlaying northeast end have been drifted, without showing at that depth any diminution or change. On the contrary, it seems to enlarge at that depth, as if coinciding with the slope on the northwest end. On the eastern slope another wall of baryta was visible at the bottom of the shaft at the time of my departure, while at the opening of the shaft the baryta vein, where bordering on the lime vein, runs vertically down, increasing in thickness on both sides. At the depth of eight feet another substance made its appearance, containing no baryta, but carbonate of lime, while between the two substances yellow ochre is massed up, which slightly heated acquires a beautiful red color, equalling that of the common *caput mortuum*. The same ochre appears also outside of this vein, where the latter separates from its surrounding lime-

stone, and where, without any further expense, this valuable paint may be gained and brought to market as yellow ochre, burnt, or as red pigment.

The shaft at the upper opening is 26 feet wide, and carried down on but one side to a depth of twelve feet, while the other is but six feet deep; the accompanying line-vein not being touched, the bottom of the shaft was about four feet square in the clear when I left the place, so that, according to my estimate, 20 tons of pure baryta, and five tons of baryta accompanied by galena, besides twelve tons of pure baryta, but colored somewhat from mud of the shore water, so that this small distance furnished 37 tons of useful minerals besides the ochre, for the preservation of which no care yet had been taken. This deposit of baryta alone, if utilized in regular manner of mining, would, of itself, render mining operations in that locality profitable. Following up this Vein No. 5, I found it to cut through the mill-stream at its upper end, and to continue to the upper part of the island, where, though covered with ground and woods, outcroppings make occasionally their appearance, continuing the same course. I therefore concluded that the vein beyond the mill-stream, nearly one mile distant from the baryta vein, and containing fluor-spar, was the same Vein No. 5. This fluor-spar, beyond the mill-stream, appears to run in twoparallel veins, cemented, as it seems, by carbonate of lime. The entire vein, composed of the two small ones, measures eleven feet in thickness, and both sides of this vein are accompanied by a fine amethyst-colored fluor-spar, which occasionally has a pink hue, and of which, before my departure from the island, about six tons were taken out from a space of six cubic feet; the vein containing also near its limestone border a considerable quantity of galena, rising in quantity occasionally to over five per cent., while parts of the vein contain also pure baryta.

The appearance of galena and baryta at this spot imbedded in the fluor-spar, as also the appearance of the carbonate of lime in the middle of the vein on the one side, and the occurrence of a little fluor-spar in the first described baryta locality this side of the mill-pond, furthermore, the accurate course of

this compass of both veins, have convinced me that both veins are one and the same, extending over one mile in length, and from eleven to 31 feet thick.

About ten feet distant from the baryta mine, not quite parallel with the same, is the Vein No. 6, which appears to consist entirely of baryta. It is not opened at any place, but wherever I knocked off a piece, I found it to consist of baryta.

On the shore of the mill-pond several veins of galena are visible, which I pass, as they have a different course, and don't appear of much importance.

Following up on the other side of the mill-pond I come to Vein No. 7, (having referred to the part of that vein containing fluor-spar as belonging to No. 5, I shall not mention it here,) which is about five feet wide on the surface, containing fluor-spar. On removing a small part I found it to be a vein of fifteen to eighteen inches thickness, below which a cavity four inches deep was visible, containing a yellow ochre and carbonate of lime, but no fluor-spar, the latter falling northward 45°, over-flooding the lime, so that the part of the latter exposed on the surface has been taken for a fluor-spar vein, while the latter, although existing, stretches sideways from the vein exposed.

The brow of the hill contains vests of slate, bearing iron pyrites so far decomposed that now it appears simply to be a hydrate of an oxide of iron, quite soft, and easily convertible into ochre, or soluble even by softening in water. A very curious phenomena occurs at this spot, namely, a deposit of asbestos, the extent of which I am sorry not to be able to state, as I was driven from the spot by a heavy shower. But this is not the only spot on the island containing asbestos, although Mr. Frye showed me such also on the east side of the island.

No. 8 is a vein five feet thick, having a S. W. course 65°. No. 9 is eighteen feet distant from No. 8, six feet thick; course, S. W. 65°. No. 10 is 33 feet distant from No. 9, two feet thick; course, S. W. 60°. No. 11 is five feet thick, 34 feet distant from No. 10; course, S. W. 60°. No. 12 is eight feet thick, 22 feet distant from No. 11; course, S. W. 63°.

No. 13 is ten to fifteen feet thick, 34 feet distant from No. 12; course, S. W. 57°. No. 14 is six to ten feet thick, 48 feet distant from No. 13; course, S. W. 45°. No. 15 is fifteen feet thick, 38 feet distant from No. 14.

None of the last mentioned veins have been opened; all appear to contain quartz and a mixture of baryta and fluor-spar, with the exception of No. 10, which has been opened somewhat, and contains under the quartz covering beautiful white and amethyst-colored fluor-spar, with traces of galena. On looking over the occurrence of the veins, their capacity, the equality of their dip, the similarity of their contents, as well as the experience, that in Saxony and Bohemia, in Przibram, (Bohemia,) and on the Harz, the richest galenas, containing a great deal of silver, are chiefly accompanied by fluor-spar and baryta. I believe, not to say too much, in declaring, that the veins of the island referred to are worth being tested at their depths for the metals they contain, and I have all cause to expect the occurrence of rich galenas, especially as it occurs almost universally on the surface.

I see no reason for deferring this, as the baryta and fluor-spar present will pay the greatest part of, if not the entire, expense, and about the abundant presence of both those minerals not the slightest doubt can exist.

To this may be added the favorable circumstance that the veins are only small distances apart, and if, therefore, a shaft would be driven down to a depth of a hundred feet in the most promising vein, the veins in the vicinity could be cheaply examined at the same time. Should one or several of the veins appear worthy of being worked, the best of them might be used until it would be carried to the head or end of the mill-pond, where the ore might be transported over the mill-pond in flat-boats, to be re-loaded from there into larger ships. This much of the island L'Etang in regard to galena, baryta and fluor-spar.

This island possesses also a deposit of iron pyrites three feet thick, almost entirely free from foreign minerals. Its external appearance does not differ from the iron pyrites found in Colorado. I have not yet found time to examine them for gold, but supposed they are without any gold, and also with-

out any arsenic; it still would be good and cheap enough for the preparation of sulphuric acid, as its breaking will not cost over $4 per ton. 'I now come to the main part—the lime. A firm, pure and compact deposit of carbonate of lime commences on the southwest end of the island, is over 1,000 feet broad, and two miles and a half long. For some time already some of the land-owners burn lime, which they easily sell. I have myself used in the Lubeck mines and foundries, where I am superintendent, for the last five years, at least 200 bbls. of L'Etang lime for the construction of buildings, for the plaster of the walls, as well as for the melting furnaces and the chimneys, 110 feet high; and I preferred it to Rockland lime, not only because L'Etang lime was cheaper, but because it was richer, *i. e.*, would stand the admixture of a greater quantity of sand. The prejudice existing only here, east of Maine, according to which, L'Etang lime cannot be used to such advantage for plaster as Rockland lime, because the plaster cracks off on drying, has been contradicted by my own experience. I have used only L'Etang lime for the plaster of four new buildings, and the plaster of none of them showed cracks up to this day. It is only requisite to add a larger quantity of water to it in slacking it than to Rockland lime, because the former swells considerably more, showing its greater purity.

For the purest lime requires the most water in slacking, and the more water it consumes the more will it swell, while the most swelling lime will give the most lime paste; the greater quantity of which results only from an excellent purity of the limestone.

In proportion to its occurrence in Europe lime is here quite rare, and, as I am informed, New-York uses almost, or entirely, Rockland or Thomaston lime, from Maine, showing that no lime of considerable extent is nearer to New-York. Rockland has a considerable lime trade, and almost controls the market of the northeastern American continent. It is apparent, then, that even the sole presence of limestone renders the island L'Etang valuable, it having the great advantage of permitting the burning of lime on a large scale, in the easiest and cheapest manner, as the lime

deposits in L'Etang are surrounded everywhere by navigable water, and the kilns may be erected in any appropriate place on the shore, rocks for a foundation being present everywhere, so that neither the limestone, nor fuel, nor the burnt lime, would require carting, as the kilns may be erected directly in the limestone, while boats could procure fuel, and remove the burnt lime.

The next question then would be, which lime-kiln was the most appropriate. We should, of course, here think only of perpetually working kilns, and not of the primitive ones now in use. Of perpetual lime furnaces I know two kinds, namely, such in which the layers of lime and fuel are introduced alternately, and others which contain no fuel, but are merely heated by the flame of the fuel, which is burnt in a furnace alongside of the main kiln, and where no ashes or cinder become mixed with the lime. In the choice of those kinds of perpetual furnaces only the fuel can be of influence, and the kind of fuel, which can be obtained cheapest in those localities, will decide the question of the choice of furnaces.

Without endeavors to influence your plans, I herewith place at your disposal my experience relative to fuel. The difference of locality between Lubeck, Maine and L'Etang is but small, and you might find some information about the former useful in establishing your lime-kilns in L'Etang.

Coming to Lubeck in 1862, I found the price of a cord of soft wood, placed at our wharf, $2, and I concluded to raise steam, and to heat our melting furnaces with wood. This was hardly done, when the neighbors, finding they could sell us wood, raised the price to $3, and in the course of a year to $4 per cord, at which price I finally was served with a small measure, and forced to take green wood. As even this was furnished only at a time convenient to the sellers, I had to keep so large a stock of the same that it had fully time to dry, although the abundance of rain and fog in that locality rendered drying a difficult matter, requiring the constant attention of several men, and occupying an immense space, which was not very pleasant, considering the risks of fire. In fact, I did lose 250 cords at one time, through an incendiary; while the necessary transportable roof was a constant

source of expense, although it was indispensable, the value of green wood being merely one-half of that of the dry, to say nothing of stoppages and increased expenses in the shape of wages.

I used as much as three to four cords of wood to get steam of fifty pounds of pressure during the ten working hours, when I had to stop the engine frequently for want of steam, while a ton of coal would easily keep all the requisite steam, and the firing could be attended to by the engineer; saving, in this manner, the wages of a fireman. Consequent upon this experience, I don't recommend wood for lime-kilns. For melting galenas I use cupolas, without using any flux. This furnishes a lead containing slag, which I melt over occasionally, for which I chiefly used gas coke, from New-York, which, though, contained too much ashes and about one-quarter of their volume in cinders. As I used coke before 1862, in New-York, which left hardly any cinders, I conclude that the quality of gas coke is not always to be relied upon, and, therefore, should not advise their use for burning lime in L'Etang, especially as the price would render it impracticable, the freight from New-York, and perhaps duty, to L'Etang, being considerable. About anthracite coal I can express no opinion, as I have never used it. Most likely it would be well adapted for burning lime when used in alternate layers with lime. But this coal can, as far as I know, not be had in L'Etang from the British side, and its export from the United States would enhance its price. Anthracite, like coke, would answer well for a lime-kiln in New-York if the cost of transportation of limestone, and the loss of a great part of the lime market, were no obstacle to such an enterprise. I should then suggest to burn the lime in L'Etang with Nova Scotia coal, which is worth, at the wharf at Pictou, $2 50, in British money, while the freight will not exceed $2 per ton. For this, then, only a lime-kiln, with a furnace at its side, would be indicated; this I should prefer in all cases, as ashes and cinders cannot spoil the purity of the lime; further, because the limestone may be introduced in larger pieces into the kiln than if it is put in in layers with fuel, so that more "lump-lime," worth $2 12½, can be produced, and less "common lime," worth $1 70. The process

of burning can also be carried on with more exactness, as the lime can be withdrawn whenever burnt enough, which is impracticable where fuel and lime are in the same furnace. If here there is too little coal, the lime will not burn through, but remains stony, at least partly; but if there is too much fuel, the latter is wasted, increasing the cost of manufacture, while it is a great deal more difficult to regulate the fire and to control the process. The space in the kiln, with a separate fireplace, is also better utilized, the place of fuel being occupied by lime, which is then produced faster in the same space of time, the quantitative advantage of this furnace over the other being about fifty per cent., while the larger expenditure of fuel will not be over twenty per cent. over that of the other kiln.

In my own lime-kilns in Europe I never obtained from the kilns, containing fuel and limestone, over 10 startin (1,000 gallons) in 24 hours, frequently less than that, while the kilns with separate fires produced easily 1,500 to 1,600 gallons, the cost of fuel being in the former case 10 fl. and 12 only in the last per day, while the use of superheated steam increased the production to 2,000 gallons without using additional fuel. In the kilns, with alternate charges of lime and fuel, I could not make use of the steam, as I shall explain in the continuation of my report, which I shall transmit to you soon. I shall then also give you an estimate of the cost of working baryta, fluor-spar, &c., as well as the cost of the lime-kilns.

I shall then also enlarge upon cement lime, which I cannot do to-day, knowing that analyses of such minerals cannot always determine the value of such cements. I have seen very good cements differing greatly in their composition, while I have seen others of almost identical composition, of which the one was good, the other poor. I deem it the best trial to burn and grind such a mineral, and find at once how it hardens and endures influences. For this purpose I took several minerals from Frye's Island, and shall report to you as soon as I have finished my experiments.

Very respectfully your obedient,

SIMON REITER.

West Lubec, 20th November, 1866.

JAMES F. WENMAN, Esq.:

Dear Sir,—On the 6th inst. I had the pleasure to proceed with Lewis Feuchtwanger, M. D., Alexander Trippel, metallurgist, 18 Exchange Place, and Ant. Piez, chemist of the Barytes Works, Union Course, Long Island, together with Thos. Fenner, Esq., of New-Jersey, and yourself, to Frye's Island, in Passamaquoddy Bay, New-Brunswick, to examine the same for minerals of economic value in this and other markets. At Eastport we were joined by Henry Frye, Esq., the proprietor of the island.

The general and extended report of the island had already been prepared by Dr. Feuchtwanger.

It was my pleasure to confirm this report in detail and general, as in all respects essentially correct.

The economic minerals, which appear to me to be of the most immediate importance, are as follows, viz.:

LIMESTONE for calcining and sending to Halifax, St. John, Boston, New-York and other markets.

The main body of limestone is from 100 to 200 yards wide, and runs N. N. E. and S. S. W. through the whole island. Much of it is nearly pure carbonate of lime, of white, drab and dove color. Some bands in it contain magnesia, judging from weather exposures, perhaps enough to make good hydraulic cement on burning and grinding.

This point should be tested by chemical analysis.

The limestone comes out boldly to the water, on either end of the island, thus offering great facilities for the erection of kilns and for shipping.

QUARTZ.—Quartz veins, of which there are in this belt of limestone eight or more of clear saccharine quartz. They are from five to fifteen or more feet broad, and from their freedom from iron and other impurities, fit them perfectly for glass blowing, pottery and other uses, where pure silex is wanted in the arts.

FLUOR-SPAR.—In the same belt of limestone there are VEINS OF FLUOR-SPAR OR FLUATE OF LIME. Of these I ex-

amined *three*. One of two feet wide, one of one and a half, and another which was much wider, but not so free from other mineral; outcroppings of numerous other veins were noticed.

Barytes.—This mineral, at the present of the highest importance. As I measured the principal vein, at the mill, it was five feet wide, with a "horse" coming up from the bottom, and having a vein of silver lead running parallel with it, on the west side, with fluor and silex accompanying.

The belt of limestone holding this vein and other veins of barytes, I found to be about fifty paces wide on the N. E., and three hundred and fifty paces long, until it dips beneath the waters of Back Bay.

Throughout its whole extent there are signs of barytes. Still further inland there is another belt of limestone, separated from the first by a belt of slate, which also contains a vein of barytes, which outcrops facing the S. E., and is visible between a core, near the foundation of an old house and the barn.

There are doubtless many other veins hidden in the deep foliage covering the land.

Argentiferous Galena, which, though not of major importance, may be sufficiently so to be worked with other minerals, and thus utilized.

The richness of the outcrop will warrant sinking to deeper depths to test the vein for richer deposits.

Yellow Ochre.—Of this mineral there appears to be a large quantity, and which could be saved while working some of the fluor veins, and perhaps also by itself.

Barytes and limestone I conceive to be of the greatest economical importance, and from either, or both of them, I doubt not a most profitable mining business can be established upon the island.

The ores of pyrites, both of copper and iron, with blende I have examined, and they appear very rich and pure; but

owing to the want of time, and the prevalence of rain, the veins of these minerals I did not explore.

Respectfully yours, &c.,

R. P. Stevens,
Mining Geologist.

New-York, Sept. 28, 1866.

New-York, *Sept.* 26, 1866.

Jas. F. Wenman, Esq.:

Dear Sir,—The drab-colored lime mentioned in the report of Dr. Stevens proves to be of more value than was at first anticipated, as it is a rich magnesian limestone, suitable for producing the best hydraulic lime or cement, and having half a barrel of the same on hand, will take the first opportunity of testing practically its qualities for that purpose. I have analyzed the lime last summer, and have now submitted another sample to my friend, Prof. Ferd. F. Meyer, an experienced analytical chemist, and he sends me to-day the following report:

42 Cedar-street,
New-York, Sept. 26, 1866.

Dr. L. Feuchtwanger, *Chemist:*

Dear Sir,—The N. B. limestone which you submitted to me for examination 21st inst. has the following composition:

Carbonate lime,.....	55.66	per cent.
" magnesia,.....	28.94	"
" iron,.....	1.08	"
Sand, clay, &c.,.....	13.40	"
Carbon,.....	.92	"
	100.00	"

(Signed,) Ferd. F. Meyer.

I shall report to you the results after a practical test has been made with that on hand.

I remain yours truly,

LEWIS FEUCHTWANGER, M. D.

Continuation of my Report of the 20th of November, 1866, *about the useful minerals and their uses on Frye's Island.*

In my last report I spoke of the burning of lime with superheated steam, and promised an explanation of the process and the use of the steam, which can only be employed in the kilns with a separate fireplace. Every practical and rational lime producer knows that lime requires a greater heat and exposure to it for a longer time with the greater amount of carbon or carbonic acid it contains. This may be surprising to men who know carbonic acid to be one of the weakest acids, and therefore easiest to be expelled, but practice teaches the opposite, and it is easier to expel one of the otherwise strongest acids, like sulphuric from gypsum, than carbonic acid from its combination with lime. This fact may easily be explained when we consider that the carbon has to absorb a great deal of oxygen before it becomes volatile as carbonic acid, and that the carbon is in a state in which it requires the strongest white heat, with access of air, in order to render the carbon volatile as carbonic acid, *f. i.* in the diamond; and we also find the coal in a state in which we cannot render it volatile at all, as in the graphite. But the carbonic acid of the lime escapes easier than is generally supposed, and the great heat required to expel it entirely, is due to the fact that the gas is a very heavy one, and after expulsion, surrounds the lime with a coat of gas, preventing the free escape of the carbonic acid in the interior of the lime. The escape of this surrounding carbonic acid is rendered difficult, because it requires a great heat to rarify it sufficiently to rise; on rising, it meets colder limestone, is cooled, rendered heavy again, and will cease to rise until the heat following will heat it up anew, and so gradually expel

it into the atmosphere. This slow process is facilitated by the introduction of superheated steam under the grates. The steam passes the burning coal, becomes decomposed into its elements, hydrogen and oxygen, of which the former burns with intense heat, and, being a very light gas, rises with great velocity, carrying along the heavy carbonic acid, while it unites with oxygen only very high up at the top of the kiln, where the resulting water can do no injury to the lime. The other constituent, oxygen, conduces to the complete combustion of the fuel, *i. e.*, the production of a high degree of heat. For this purpose the steam has to be dry, not condensed in the pipes; as in this case the heat of the fuel does not suffice to decompose the water into its elements, it enters the kiln in the state of steam, which is highly deleterious to the lower layers of lime, burned through already. According to my own experience, the lime produced in this manner surpasses by one-third that produced in the common way with the same amount of fuel. The advantages of this process are rendered impossible in those kilns charged alternately with lime and fuel, because in them the lowest part of the lime is already burnt and cooled, and would condense the steam to water, which is destructive to the lime. The introduction of the steam at the top of the kiln would render the use of clay pipes necessary, (iron would melt,) the small openings of which could hardly be kept open or their breaking prevented; while with the sinking of the top of the charge in the progress of the process, the steam would alternately strike the hot coal and the lime, which it would destroy. Not passing through burning coal, the steam would not be decomposed, it could not be evenly distributed over the entire mass by introducing it sideways, as is the case when it enters underneath and rises evenly through the entire mass, exerting its influence upon every single stone of the mass. After this somewhat voluminous, but, as I think, necessary explanation, I should be in favor of using the perpetual lime-kiln, with separate sideways fireplace, on L'Etang or Frye's Island, as it is the most economical. The expense of erecting either of the two perpetual kilns mentioned is about alike, the one with a separate furnace at its side requiring perhaps three

days more labor. I would also recommend to leave between the inner fireproof brick wall and the exterior stone wall an empty space of four inches, which could be filled out with ashes. This would give the twofold benefit of preserving the exterior wall, when the inner one should expand by the heat, from cracking, which would take place if both walls were in close connection, even if iron hooks were used in abundance to compress the walls.

The ashes also retains the heat better in the kiln, being a poor conductor of heat. I should further recommend, to use no mortar of any kind in the construction of the lining wall of the kiln, as also in the main furnace, both of which should be built entirely dry, so as to be movable under the influence of the heat, which would dry out and crack mortar, rendering the structure very loose. It would also be advantageous to construct the kiln, at least to a height of four feet, of soapstone, as the lime does not melt fast to the latter, which is the case with bricks, and then prevents the even descent of the lime, which occasionally is suspended in the kiln for several hours, until upon cooling it contracts and cracks off. The fall of the large mass then breaks it up to minute fragments, decreasing the volume and price of the lime, to say nothing of the loss of time.

In constructing this lower part of soapstone this interruption is prevented, as the lime descends regularly, preserving the size of the pieces which they contain in the kiln.

Are the dimensions of the kiln such that the fires on its side meet at the centre of the kiln, while its top is neither too high, nor too wide, nor too narrow, its capacity may be at least 100 barrels per day, but, with the use of superheated steam, could be increased to 125 to 135 barrels per day, while the kiln would stand for years. The only repairs, probably, required annually, would be the fire-arches, which could rapidly be repaired. I should also recommend, for coal as a fuel, the use of step-grates, (Trazzawosh,) as well as a funnel-shaped opening for the introduction of coal, which then would never cool down the fires, but would become red-hot before entering the fire-place, accelerating in this manner the process, while it produces a saving of fuel,

and preserves the grate-bars for a longer period, as they can be kept easier free from ashes and cinders than in the common arrangement of grate-bars.

The expense of such a kiln would, according to my local experience, be as follows:

Quarrying the stones, ...	$300 00
A charge of lime burned in the present kiln, .	200 00

SAND ON THE SEA-COAST.

Screening and carting, ...	50 00
Four bricklayers for 36 days, at $3 per day, .	432 00
Five brick-carriers, at $1 50 per day, ($1 Engl.,)	270 00
Fire-arches, &c., two men for ten days, at $3, .	60 00
Three iron doors, &c., at $20, ...	60 00
Grates, funnels, iron plates, ...	60 00
Three iron carts for carting the hot lime, at $40,	120 00
	$1,552 00

To this may be added the fire-bricks, 2,500 common bricks, arch-stones, and, if possible, soapstones, 1,000, of the size of common fire-bricks, of which I do not know the price, but which you can learn in New-York; besides, for about $100 scaffolding.

The manufacturing expenses, calculated for a daily production of but 100 barrels, would be about as follows per month:

Limestone per day, ten cubic feet, the quarrying would cost, at $25 per day, per month, . .	$750 00
Filling the furnace with limestone and barreling the lime, at $3 per day, ...	90 00
Two firemen, at $2 per day, ...	120 00
Coal per day, $10 at most, ...	300 00
Monthly expenses, ...	$1,260 00
Of the requisite barrels I don't know the price, but assume the same to be 25 cents per barrel,	750 00
	$2,010 00

Of the 100 barrels made per day, or 3,000 per month, 2,000 would be lump-lime, worth, at $2 00, ...	4,000 00
1,000 common lime, at $1 50, . . .	1,500 00
Total, ...	$5,500 00
Substracted from this, the monthly expenses of	2,010 00
Leaves a monthly profit of	$3,490 00

The most unfavorable result, then, could be $3,490 per month. When favorable, the same would be as follows:

130 barrels per day, or monthly, $3,900, of which 3,000, at $2, and 900 per $1 50, would give $7,350, monthly returns.

The additional expense for quarrying, barrels and freight would be but slight, and is compensated by the lower estimate of lump-lime at $2, instead of $2 10, and of common lime at $1 50, instead of $1 70. If lime should grow cheaper, the same would be the case with wages, provision, powder, &c. The expense of keeping steam is but slight, requiring only to heat the water to 60 pounds pressure, at which a small amount of fuel will easily keep it, as but little is consumed, the steam entering every furnace through twelve apertures of the size of a pin's head, so that one boiler can supply several furnaces.

If we count the cost of the first furnace at $2,000, the first month's expenses at $2,000, besides the capital, to get a stock of coal, storehouse for the finished lime, and wharfage again, at $2,000, this entire first expense would be $6,000, which would leave at once a net monthly gain of $2,000.

If, of those $2,000, $1,000 are further employed for the erection of new furnaces, steam-boiler, &c., &c., and $1,000 be distributed amongst the stockholders, three months would suffice to erect another furnace, and double the income. I should further advise, to buy or charter at least two schooners for the transportation of the lime, baryta, fluor-spar and quartz, besides the other ores, and pay to the captains, as customary here, one-third of the freight, to enable them to

pay off their men and to pay their expenses, and I feel confident that the return freight from New-York, Boston or Portland would more than cover the cost of transporting the lime. This much about lime, of which I believe I have spoken in a clear and distinct manner, vouching for all my statements, and being ready to carry them out accordingly. Baryta, fluor-spar and quartz can be placed at the wharf, ready for transportation, for $10 per ton, costing much less now, where they can be broken on the surface of the ground, while their production from shafts 100 feet deep will never cost over $10 per ton. As I don't know the present value of those things, I shall only add, that their quantities, present upon this island, are sufficient for *all future* demands. Many other trades might be carried on here successfully, but as this does not belong within the scope of this report, I shall speak of it to you at some future time. Whenever you should carry out this enterprise, I wish to participate with $1,000, provided I have the management of the matter in my own hands, and I should cheerfully invest more, or the entire sum, if I had it. But above named sum is always at your disposal. The cement lime I had not yet time to examine, but shall do so in the course of a week, and shall report to you about it.

I remain, respectfully, your obedient,

SIM. REITER.