ON THE ROCK-SALT DEPOSIT OF PETIT ANSE: LOUISIANA ROCK-SALT COMPANY.

REPORT

OF THE

AMERICAN BUREAU OF MINES.

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BOARD OF EXPERTS,
AMERICAN BUREAU OF MINES,
NO. 44 EXCHANGE PLACE, NEW YORK, *Dec.* 24, 1866.

G. D. H. GILLESPIE, Esq., PRESIDENT OF THE BOARD OF TRUSTEES:

DEAR SIR:

The Board of Experts has the honor to transmit herewith its unanimous Report on the Salt Deposit of Petit Anse Island, Louisiana.

This Report is based upon the preliminary examination of Mr. C. ELTON BUCK, of this Board, and the notes of a more detailed investigation by Dr. C. A. GOESSMANN, Consulting Correspondent of the Bureau, who was charged by the Board with the duty of a personal study of the deposit, and an inquiry into its commercial relations.

FOR THE BOARD OF EXPERTS,

R. W. RAYMOND,
Secretary.

J. P. KIMBALL,
Vice-President.

ON THE SALT DEPOSIT OF PETIT ANSE ISLAND, LOUISIANA.

Petit Anse Island is situated in Parish St. Mary, in Louisiana, in Long. 91° 51′ West of Greenwich, and 29° 52′ North Latitude, about four miles north of Vermilion Bay, and nine and a half miles, by the present road, south of New Iberia. The distance to the latter point, however, is only about seven miles by air line.

The island consists of 2240·48 arpents of upland. An arpent—the old French measurement employed in Louisiana—is about one-seventh less than an acre.

Fifteen hundred arpents are at present under cultivation, the remainder being woodland, pasture, roads, &c.

The island is divided between two owners, Judge D. D. Avery, and Mr. John Hays, the property of the former including 1,380 arpents of the upland, and that of the latter comprising the remainder, 860 arpents.

A luxuriant growth of forest trees, consisting of magnolia, live oak, hickory, gum-tree, maple, hackberry, black walnut, and cypress, covers a portion of the island. Of these varieties, cypress is the most abundant, and furnishes the principal building material.

The immediate vicinity of the island is occupied by extensive sea marshes and cypress swamps, stretching west and southwest from six to to twenty miles. To the north, for about two miles, the surface is covered with tall sea-grasses and scanty brush; to the east and southeast, for many miles, the swamps are covered with heavy cypress forests.

From the highest point of the island, a hill on Hays's property, 180 feet above the tide-water level, the eye commands a wide prospect, comprising, on the west, the Vermilion Woods, nearly up to Vermilionville, Miller's Island, and a broad sheet of prairie, with dwelling houses, and groves of timber; on the north, the forests of Bayou Teche, as far as Jeaneretts, and the Au Large Prairie; on the east, the Cypremort Woods; and on the south, the Gulf of Mexico.

The only land communication with the island is a plank road, crossing the Bayou Petit Anse and the marshes to the north for nearly two miles, and continuing as a prairie-road to New Iberia. The plank road is of recent construction, having been built during the late war to accommodate the salt transportation of Petit Anse.

The nearly circular form of the island, and a surface configuration varied by hillock, valley, ravine, pond, pasture, forest, and cultivated field, give it a picturesque appearance, in the midst of swamp and prairie.

The general trend of the hills is N. N. W., and S. S. E., with which the valleys mainly correspond. This leading configuration has been somewhat modified by the sudden and heavy rains of the Gulf coast, which have not only lowered the height of the hills, and filled up to some extent the valleys, but also produced, by the action of torrents, new channels and ravines, with their own subordinate topographical features. It is difficult, in particular cases, to distinguish the older from the more recent action. Probably all the present surface features have been affected by the same causes; although there is evidence that the terrain has been exposed to glacial action, of which more will be saip hereafter.

The top soil is an umber-colored sandy loam, generally a foot or more in depth, and underlaid by a subsoil of sand, more or less coarse, frequently containing lenticular clay-masses of various size.

The agricultural products of Petit Anse are mainly cotton, sugar cane and corn.

The fertility of the soil is very great. It is claimed that it produces two to three hogsheads of sugar—1,400 pounds each—to the acre. Oranges, sweet potatoes, and garden vegetables of every variety, may be cultivated with great success, many kinds yielding annually three crops.

Springs are sparingly distributed, and only flow during the rainy seasons. Several attempts have been made to obtain more permanent supplies of water, by sinking wells; but, as might have been expected, with very limited success; since the only conditions of supply depend upon surface percolation, and the imperfect reservoirs afforded by occasional masses of clay. These sources are, at the best, naturally inadequate; and for long periods they fail entirely. The main supply of fresh water is therefore derived from cisterns, and natural or artificial ponds, in which the rain is collected.

The temperature of the island is at no time of the year oppressive. According to data obtained from Judge Avery, the maximum heat is 90°–95° F.; and the lowest for many years has been 19° F.; the average

being about 65°–70° F., taking day and night the year round. March and April, the latter part of November, and the first part of December, are the more rainy seasons. The situation of the island near the Gulf coast renders the rains sudden and severe, frequently torrent-like.

Other meteorological phenomena of a violent or unusual character are, comparatively speaking, unknown. The only recent instances on record are the partial destruction of a crop by storm in 1856, and a hurricane which visited a neighboring parish in 1862.

The families of Messrs. Avery and Hays are at present the only residents of Petit Anse. Of these, the oldest inhabitant is John Hays, a Pennsylvanian by birth, who settled on the island in 1790, at the age of fifteen, and has lived there seventy-six years. He relates that on his arrival he found the island covered with dense forest, and not only uninhabited, but totally without traces of human habitation. The Indians then living in the vicinity were the Attakapas. He invited them repeatedly to join him in hunting the bear, panther, wild-cat, and deer; but they refused, saying that the spot had once been the scene of a great calamity to their race, and that they had never since visited it.

From the numerous relics which have been discovered in the recently excavated salt-pits, it is evident that this island was inhabited before the period of which we have any historical record. Jesse McCaul, digging for salt springs, many years ago, is said to have found, two feet below the surface, an Indian earthen spoon, and a buckhorn; also a nearly entire skeleton of a supposed mammoth (portions of which were afterwards sent to the Smithsonian Institution). Numerous arrow-heads of stone, and other Indian remains, have also been discovered from time to time; and in the recent excavations, pottery and basket-work have been exposed in considerable abundance. The baskets are bag-shaped, and constructed of split wild-cane, quite similar in style and material to the Indian baskets of the present day. Mr. D. M. Avery has found two pots, fitted into each other, one foot in diameter at the top, $9\frac{1}{2}$ inches at the bottom, and 8–9 inches high. The immense quantity of fragments of pottery already found on the island leads to the supposition that it was manufactured on the spot by a resident population; and, indeed, Mr. Avery found what he considered a furnace, originally built in the side of a ravine. The part remaining, 6 feet long and 6 feet high, indicated an

oval shape. The front wall and fireplace had been undermined and washed away, and the remainder has now suffered a similar fate, so rapid are the changes produced by pluvial influences in this region.

Deductions based upon the juxtaposition or superposition of these bones of extinct species (supposing them to be clearly established as such), relics of human industry, and accumulations of vegetable decay, require much caution, since the locality is, and has evidently always been, subject to great and rapid superficial changes; and as the material now found in the valley where the salt-pits are located is to a considerable depth the same which formerly covered the hillsides, it is obvious that no conclusions as to relative age can be drawn from mere difference of level. The layers now exposed by the pits may be the washings from many different strata, and contain remains of widely varying antiquity.

The surface formation along the N. O., Opelousas & Great Western Railroad, from Algiers towards Brashear City, belongs to the Mississippi Delta, consisting of clay bottom lands, frequently overgrown with cypress and live-oak forests.

The surface-soil, an intermixture of organic matter with the original deposit, is black and plastic, and from six inches to one foot in depth, and underlaid by a light-colored clay, which is characteristic for the whole region. The surface is generally below the level of the Mississippi, and protected by levees; but it rises gradually towards Brashear City, where the banks of the Atchafalaya are some fifteen feet high. This rise continues westward along the Teche, and an interstratification of gravelly soil between the surface and the clay bottom makes its appearance. Along the Bayou Teche, the land is sufficiently elevated to be secure against overflow, and is occupied by numerous sugar plantations. This district is known as the "Garden of Louisiana." At New Iberia, the banks of the bayou attain a height of nearly twenty feet.

The characteristic delta-clay is found underlying all the lands surrounding Petit Anse Island. Being comparatively impermeable to water, it prevents natural drainage, and portions of the prairies between Petit Anse and New Iberia are often overflowed after heavy rains, thus seriously obstructing communication. This evil could be obviated by artificial drainage, but nothing of the kind has ever been attempted.

The peculiar features of the formation of Petit Anse Island are:

1. The occurrence of superficial strata entirely different from the delta-clay, preserved, probably, by their elevation, from the general denudation of the region.

2. The occurrence of rock-salt as an underlying deposit.

These two features will be considered in their order.

Petit Anse Island is one of five elevations which occur in a N.W. —S. E. line, amid the otherwise level delta lands of this district. They are: Dupuy Island, Petit Anse, Weeks Island, Cote Blanche, and Belle Isle. Upon the other four, no explorations have been made to ascertain their geological character. It may be that they are also patches of the same formation preserved on Petit Anse.

The surface-soil of Petit Anse, as has been observed, is dark loam. Beneath it occur layers of coarse and fine sand, gravel, and clay in lenticular masses. In some places the sand is cemented by peroxyd of iron, and friable pink sandstone, and arenaceous concretions of peroxyd of iron are frequently observable. These various materials are irregularly stratified, generally in curved lines, as if resulting from the action of currents and eddies. They do not conform to any one definite direction or order, but occur in different succession, and sometimes reversed. In short, they display all the phenomena of deposits subjected to the action of currents, sometimes direct, sometimes obstructed. A reversal of the order of deposition is observable in those localities where more recent denudation and re-deposition might be naturally presumed to have taken place. It is difficult to determine what is the original, and what the modified stratification.

The stratigraphical changes have been produced by currents, exposure to weather, and occurrences of tough clay-masses, a single circumstance of such unimportant character being sufficient to set in operation a train of ever increasing change. The heavy rains of the Gulf coast have been of course the principal agents in these later processes. The sand and pebbles are of decided silicious character, and much water-worn. The drift contains no carbonates and no protoxyd of iron, but worn fragments of erratic rocks, silicified wood, and even boulders of 60–70 lbs. weight occur in it. One boulder of porphyritic diorite was observed by Dr. Goessmann, which had been taken from one of the pits on the island. It weighed some 70 lbs. This is probably the most southerly boulder yet discovered in the Mississippi Valley. Prof. Hilgard has discovered but one other locality south of Vicksburg.

All these phenomena of constitution and configuration correspond most closely with the description given by Prof. Hilgard in his Report on the Geology of the State of Mississippi, and in later papers, of the formation to which Prof. Safford, of Tennessee, first gave the name of the *Orange Sand*. The recognition of the Orange Sand upon Petit Anse is confirmed by Professor Hilgard after an examination of the specimens collected by Dr. Goessmann upon the island.

The actual exploration of these strata has been confined to a limited area, within one valley and its branches, at the southeast corner of the island, where the salt-pits are located. In opening these pits, according to the account of the workmen, the material passed through was the same as that exposed on the hillsides, namely, gravel and clay, containing remains of vegetation similar to that of the neighboring marshes; *i. e.*, sedge and marsh grass—in tolerable preservation. The salt was found immediately covered by a dark fetid clay, 2 to 2½ feet thick, full of marsh grass and gravel, and containing also the bones of extinct animals.

For purposes of more accurate observation, a pit 5 by 3½ feet in size was dug, under the direction of Dr. Goessmann, 30 feet from the present shaft house (see map).

This exposed the following section:–

	Ft.	In.
Surface-soil (black).	1	2
Lighter colored sandy soil.	2	0
Dark sandy soil (containing pottery, vegetable remains, ashes, charcoal, and burnt clam-shells),	1	0
Coarse sand and gravel.	0	6
Sand, with clay (dark; full of vegetable remains and pottery).	0	6
Reddish sand (here and there cemented with hydrated peroxyd of iron), gravel and pottery.	5	0
Sand (containing nodules of clay, and well preserved parts of common wild cane-roots and stems). Sand (changing to greenish blue from reduction of the peroxyd of iron) and water from the N. W. corner of pit.	1	6
[At this point (11 feet) it was necessary to timber the pit, to keep out quicksand from the layer above described. This is the most troublesome stratum to pass through which occurs on the ground.]		
	11	8

	Ft.	In.
Brought forward	11	8
Blue clay with abundant vegetable remains, pottery, and burnt clam-shells.	2	0
Coarse gravel without clay.	1	6
Clay, gravel and sand (greenish yellow, very hard and tough, containing wild cane).	1	0
Clay (greenish yellow with gravel, and interspersed with drift sand).	3	0
SALT.	19	2

Immediately overlying the salt, the clay for one or two inches has a black color, as if bituminous. This is probably caused by infiltration of surface waters through the humus above.

The water, tested at a depth of 14 feet, was strongly saline, showing at 56° F., 40° salometer, representing 10 to 11 per cent. of saline matter. Analysis of these solid constituents shows this to be a solution of the underlying salt.

Dr. Mallett, who had very favorable opportunities to see some of the larger pits open and to observe a greater area of the salt, states that the deposit bears decided marks of erosion by the action of water, that its surface is undulating, and that the mass itself is dry, and receives moisture only by percolation through the soil—a statement which is confirmed by Judge Avery and Col. H. S. Greenleaf. The saline character of the water in the pit dug by Dr. Goessmann seems to confirm those observations, since neighboring pits were full of water, which had absorbed salt from below; and, as they are higher in situation than the pit referred to, the brine naturally finds its way into the new excavation. Dr. Goessmann observed that the water came into this pit at the rate of about 4 feet in 24 hours.

Further evidence as to the configuration and extent of the salt deposit is afforded by the tables given in the Appendix, and by the maps and diagrams herewith transmitted, viz.:—

A map of the island—correct as to outlines.

Topographical map, with borings.

Tabular statement of borings.

Profile of surface.

These are all the work of Mr. Herwegh, a Swiss engineer, and are considered trustworthy, with the exception of the internal features noted

The entire absence, up to this time, of all appearance of successive deposition in the salt of Petit Anse, indicates that it is an accumulation from re-solutions, not from an original marine brine. Salt lakes and pools fed by springs, and forming accumulations of this character, are now active in various parts of the world—in Northern Asia, Hungary, Siberia, Ceylon, Algiers, and Brazil, and on a more extended scale in the Dead Sea, Elton Lake, and Great Salt Lake, though in the latter the deposition of salt has not yet taken place.

If, in the deposit of Petit Anse, there ever were soluble impurities, such as chloride of potassium, calcium, and magnesium, to any considerable extent, they were in the uppermost portions, which have, undoubtedly, been carried away by erosion. There is abundant proof that this salt deposit was formerly exposed on the surface, as in the case of the salt deposit of Wieliczka, and the rapidity with which fresh water in the pits attacks and dissolves it, indicates the extent to which erosion may have been carried. A stop was put to this action by the accumulation of diluvium, which, being highly argillaceous, protected the salt from further destruction.

The Salt occurs as a solid crystalline rock, of a saccharoidal texture, the individual crystals being indistinctly aggregated, and interspersed with microscopic crystals of gypsum. It is dry, hard, and, so far as it has been explored, homogeneous. Its taste is purely saline, and its composition may be considered fairly represented by the following analyses, the first of which was made by the late Dr. Riddell, Professor of Chemistry in the University of Louisiana, and the second by Dr. C. A. Goessmann. According to these analyses, the dry salt contains, in 100 parts:

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layers of gypsum. These were bored to a depth of 87½ feet without reaching the floor of rock-salt. In the bore at Schöningen, at a depth of 1,710 feet, pure rock-salt, and at 1,721, anhydrite and gypsum were passed through; at the depth of 1,819 feet, rock-salt, with a little gypsum and anhydrite, again appeared. In the bore at Stassfurth the first traces of rock-salt appeared in anhydrite at a depth of 792 feet. Since that time 1,000 feet of rock-salt have been bored without reaching its floor.—*Bischof Chem. Geol.*, vol. i., p. 383.

The rock-salt of Northwich and Middlewich in Cheshire lies in two beds principally. The depth to the first bed at Northwich varies with the undulations of the land, and also slightly with the irregularity of the bed itself, from 96–159 feet. At Winsford the depth is 189 feet. The thickness of the upper bed varies at Northwich from 84–90 feet. Below this, and separated from it by a bed of indurated clay, 30 feet in thickness, containing thin beds of salt, occurs the second or great bed, 96 feet thick at Marston, and 225 feet thick at Winsford. At Northwich the first 60–75 of rock are impure, the salt being contaminated with much clay and bituminous matter. In the next 12 or 15 feet the salt is much clearer; and this portion only is worked. The clear portion corresponding to this is worked at Winsford at a depth of 210 feet in the rock. —*Muspratt's Chem as Applied to the Arts*, vol. ii., p 898.

	I.	II.
Chloride of Sodium . .	98·88	98·8823
Sulphate of Lime . .	0·76	0·7825
Chloride of Magnesium .	0·23	0·0030
Chloride of Calcium . .	0·13	0·0036
Moisture	...	0·3286
	100·00	100·0000

An analysis by Dr. Goessmann, of the rock salt of St. Domingo (Neyba), is subjoined for purposes of comparison. This salt contains in 100 parts:

Chloride of Sodium	98·33
Sulphate of Lime	1·48
Sulphate of Magnesia	0·06
Chloride of Magnesium	0·04
Insoluble (Clay).	0·01
Moisture	0·07
	99·99

By this and further comparison,[1] the salt of Petit Anse is distinguished for remarkable purity. Its superiority has, indeed, been already recognized in the Southern market.

So far as known, the discovery of the salt was made, in 1791, by John Hays, who found a spring while hunting. Soon afterwards, Jesse McCaul bought nineteen acres of land including this salt spring, and began the manufacture of salt by boiling. The supply was too limited, however, to pay the expenses of the operation; and, after digging several wells with little success, he abandoned the enterprise. The springs were then neglected until 1812, when the price of salt rose to such a height, in consequence of the war with Great Britain, that John C. Marsh renewed the production, continuing till 1815, when the price fell again, and he suspended his operations. Judge D. D. Avery, who subsequently

[1] For further comparisons of salts from different localities, and of the several commercial brands, see the excellent tables of Dr. Campbell Morfit, in *Muspratt's Chemistry as Applied to the Arts*, vol. ii., p. 905; also *New American Cyclopædia*, XIV., p. 297.

became owner of the island, commenced boiling again during the year 1861, when salt had become dear by reason of the blockade. For the purpose of increasing the supply of brine, Mr. John Marsh Avery, his son, attempted to deepen the wells, and, at the depth of 16 to 17 feet, on the 4th of May, 1862, struck the solid rock-salt. Mining by means of pits was soon introduced under the auspices of the Confederate government. The order in which the pits were opened, and other particulars concerning this period of activity, are given in a statement in the Appendix. Mining continued until an expedition, sent by General Banks, by way of New Iberia, attacked the island, April 17, 1863, and destroyed the works on the 20th of the same month.[1]

The amount of salt removed during these eleven months, according to Judge Avery's statement, was twenty-two millions of pounds. From four to six hundred men are said to have been working, day and night, in mining, barreling, and loading the salt in wagons. From one to five hundred teams are reported to have been at one time on the island, coming from every Southern State, and waiting for a supply. The various pits were worked by the owners, the government, and contractors. The average price of the salt was 4½ cents a pound.

The large pits remaining as the results of this extraordinary activity are not only useless for any rational system of mining, but, by admitting quicksand and water, may become sources of great inconvenience, unless carefully filled up, or converted into shafts.

It is certain that the mode of mining in pits, as hitherto carried on, would be wholly impracticable for any length of time; since to continue a large production in this manner would require a constant increase in the number and size of the excavations, and expose the salt to contamination from sand, and to the action of rains, which could not fail eventually to destroy the mines, and reduce operations to the old basis of boiling. A consideration of still more immediate and vital importance is furnished by the peculiar shifting nature of the overlying strata, which cannot be disturbed extensively without incurring the danger of slides of a disastrous nature.

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[1] A previous attempt in November, 1862, made by way of Vermilion Bay, in gunboats, had proved unsuccessful.

For commercial reasons, also, the salt should be mined dry, in order to avoid the expense of subsequent drying. Indeed, there remains but one method of permanent mining; namely, that by well-constructed shafts, and protected galleries in the salt itself. The extraction of salt will be carried on by workings upon the plan of so-called compartments or squares, supported by walls and pillars, as in the mines of Wieliczka in Poland, and of Vic and Dieuze in the east of France. On no account should the earth-strata immediately overlying the deposit, or on either side of it, be disturbed, except by the necessary shafts. Some of the present pits may be turned to advantage as shafts, or at least rendered harmless by such an alteration.

The proper course is, first of all to bore to the bottom of the salt (or, if unexpectedly thick, as far as practicable), for the purpose of disclosing not only its thickness, but also its stratigraphical conditions. Should the mass prove free from layers of clay or gypsum, the question of the position and kind of workings will depend principally upon considerations of permanent economy and mine-construction. If, on the other hand, such layers be encountered, their position will determine the level of galleries and mode of operations. The conformity of the rock-salt of Petit Anse to the general rule, of the occurrence of gypsum as a floor to such massive deposits, may be expected. Should the bottom of the salt be struck within a depth of 200, or even 300 feet from the surface, a main shaft should be sunk as deep as practicable without penetrating the gypsum base so as to let in water, and galleries laid out at a low level. Should the thickness of the rock-salt much exceed this limit, workings deeper than 200 to 300 feet would be long deferred. This depth of shaft would give two or three tiers of workings, and the protection of an ample roof to the uppermost, and powerful barriers between those on different levels.

The common practice of reversing the proper order, and working the upper levels first, should be avoided. Indeed, the low cost of sinking in the rock-salt of Petit Anse, and the speed with which it can be carried on, remove the inducement which exists in the case of deep mining in hard rock, to gain time and save expense by subverting the true economy of the mine.

It is believed that by a suitable location of shafts, one main or engine-shaft may be made to suffice for drainage and hoisting for many years to come. Accessory shafts for ventilation and provisional hoisting (bucket-ways and man-shafts) may be sunk as convenience requires, with reference to an ultimate plan.

The present shaft of the Company may be cribbed, and sunk deeper, and made, perhaps, to serve as a main, or as an auxiliary, shaft, according to the plan adopted.

A thorough system of surface drainage should be one of the first undertakings, in order that the washings of the hills may not sink into the earth, or accumulate as they now do in temporary ponds near the mines.

There are no serious engineering difficulties to be overcome in undertaking such a system of mining; and the deeper the salt deposit extends, the easier it will be to open within it capacious and perfectly safe workings. The salt itself, so long as it is protected from the free action of water, is a strong and solid rock, which will offer no obstacles to steady mining.

Powder should not be used in the mines, since it blackens and pene-

trates the salt. Blasting should be but rarely resorted to, and, when necessary, some other compound, such as gun-cotton, or nitro-glycerine, should be substituted.

The machines used for under-cutting in European coal mines might be introduced to advantage, provided the salt retains its homogeneous character.

Pumps will be necessary in sinking shafts and in working the mines; but the chief object of the engineer should be not merely to pump water out of these workings, but, as far as possible, to prevent its entrance; since any influx will prove, not a constant, but a growing evil.

The salt may be ground and packed for market either at the mines, or at New Orleans, or eventually at New Iberia. It is well, however, to consider the advantage of keeping under one management the work both of raising the salt and its preparation for market, by locating a mill at the mines, and shipping ground-salt in sacks or barrels from the island. The comparative rates of labor probably favor this plan, and any extra power at the mines may be used for this purpose. By thus delivering marketable salt from the mines, repeated handling will be avoided, while the requisite bags or staves can be supplied by vessels returning from New Orleans.[1]

There are five miners' dwellings near the old pits, forming what is called Miners' Village. These will afford accommodation for five miners' families, and a number of boarders. They are planked and battened frame houses. Other dwellings will be required, so as to give to families separate tenements. The substantial shed over the Company's shaft can be altered into a regular shaft house. There is already a stable, at a convenient distance from the present works, capable of accommodating eight animals.

In addition to the improvements already made, the following expenditures will be required to inaugurate fully the plan indicated:—

1. On the Mines proper—

Work on the present shaft	$3,000	
Two additional shafts (estimated at 200 feet)	7,000	
Gangways (2,000 feet), and tools for mining	5,000	
Gangway tracks (2,000 feet, 16 lbs. T-rail)	1,600	
25-horse steam-engine, boilers, &c., with setting of same	10,000	
Pump and gear for engine shaft	2,500	
Horse-whims, &c., for two sub-shafts	1,500	
Cars for gangways	3,000	
Dump, with screen, &c.	2,500	
Covered shute at landing	3,000	
	$39,100—	$39,100

[1] At Stassfurth, the mills in use for grinding rock-salt are constructed like the common coffee-mill. Twelve of these grind, together, 300 centners (1,684 tons) per hour, or 2,835 pounds each. The ground salt from these mills then passes over horizontal mill-stones, by which it is converted to fine powder. This combined operation is performed at a cost of six pfennings (1¼ cents) per centner (113.426 lbs.)

2. On Mine transportation and surface improvements—

Railroad and track to new landing (½ m.)	7,500	
Cars for do.	6,000	
Mules	2,500	
New landing opposite mouth of Saline Bayou	5,000	
Superintendent's house	3,000	
Office, $500; store, $2,000; blacksmith's shop, $800	3,300	
20 miners' houses, @ $500; additional stables, $500	10,500	
	$37,800—	37,800

3. On general improvements—

Road to New Iberia, and road on island	$10,000	
Draining and filling up old shafts	2,000	
General contingencies of all kinds	30,000	
	$42,000—	42,000

4. On transportation to New Orleans—

Dredging channel, tug-boat, &c. (estimate not possible: it is presumed that this work, with the cost of warehouses, machinery for handling and crushing the salt, wherever located, will require a provision of, say)	$50,000—	50,000

5. Outlays in the nature of advances—

For stocking the store	$2,500	
For carrying on the general business, shipping salt, &c., until returns are made, a reserve of, at least	50,000	
	$52,500—	52,500
Grand total		$221,400

An eventual expenditure of $250,000 from the working capital should, therefore, be provided for, though it is evident that this sum need not be immediately laid out. Possibly some returns from sales may be obtained before the whole has been expended. At all events, there would be a considerable amount of salt on hand to the credit of the Company.

It remains to consider how the salt should be transported to commercial centres.

There are several routes by which the salt of Petit Anse may in future be carried to market. They are not all practicable at present, nor are those the most available now which will probably be the most advantageous hereafter. Several of these routes will be briefly described and discussed.

1. *Navigation by way of the Bayou Petit Anse, Vermilion Bay, Southwest Pass, and thence direct to New Orleans, Galveston, and other ports.* This route can be made available at less expense than any other, since it requires only one-half or three-fourths of a mile dredging in the bayou. If barges are used on the bayou, it will be necessary to establish a depot at Southwest Pass, and reload the salt in sea-going vessels. The best course, if practicable, would be to employ small schooners, which could navigate both the bayou and the sea, and thus avoid the necessity of reloading.

If it is desired to bring salt to market and realize its value, during the first year of operations, probably the best course for the Company would be to dredge the Petit Anse Bayou at its own expense, furnish a tug-boat, and then contract for carrying with individual captains of schooners. There is sufficient competition in the coasting trade to facilitate such an arrangement. It should not cost more than $3.00 a ton to carry salt, in this way, from Petit Anse to New Orleans or Galveston; and this without reference to the daily production of the mines.

2. *Railroad transportation to New Iberia, and navigation by the Bayou Teche to Brashear City on Berwick's Bay, and from there either by way of Berwick's Bay to New Orleans, or by the Atchafalaya and connecting bayous to the mouth of Red River.*

Transportation by this railroad from Brashear City to New Orleans is at present out of the question, as its use would require a re-handling

of the salt at Brashear City; and would also subject it to the excessive tariff of freights charged by the railroad company.

An important advantage presented by the New Iberia route would be its opening to the mines a traffic with that town, a point of future commercial importance, and convenient as a centre of supplies, and as a base for the mercantile operations of the Company.[1] This town is situated on the line of the projected extension of the Opelousas Railroad, and will therefore be a station on the great Texas route. The Houston Railroad is already constructed to the Louisiana line, and will be continued to New Iberia, to form a junction with the New Orleans, Opelousas and G. W. road. New Iberia may then, without difficulty, become a centre for the packing business, consuming the cattle of Texas and the salt of Petit Anse. Meanwhile, the Salt Company would find advantage in the facility of procuring workmen and materials; and, the railroad being once constructed from the island to New Iberia, salt could be transported to New Orleans by water more cheaply than in any other way, until the whole line of railway communication be complete, and the railroad company offer reasonable terms, which it does not at present seem inclined to do.

A second great advantage of the New Iberia route is the opportunity offered for shipping salt to the mouth of Red River, which is the best place for a main depot to supply the markets of the Mississippi Valley. This route requires surveys and thorough examination; but it is said by navigators to be practicable. It is not recommended as immediately available: but the fact that it may become so is an argument in favor of the New Iberia railroad.

Finally, the route *via* New Iberia has the great advantage of being an internal one, and putting the mines in direct communication with

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[1] New Iberia is situated in latitude 30° N., and longitude 91° 45′ W. of Greenwich, on the right bank of the Bayou Teche, the banks of which are, at that point, above 15–20 feet high.

The inhabitants of the town, from 1,500 to 2,000 in number, are largely of French descent.

The Teche is navigable up to this point for steamers and barges of considerable size.

The town is surrounded by a large area of highly fertile land, not subject to overflow, and cut up into small farms.

From this point run three weekly stages to Texas, and communication is had three times a week by steamer with Martinsville and Brashear City. It will be a most important station of the New Orleans and Houston Railroad, and is already a principal stopping place for Texan drovers. The main business is at present the lumber trade. Several saw-mills are in operation. The condition of affairs seems prosperous.

The prices of living are about the same as in New Orleans. Wages range as follows:—

White male labor, $25 to $30 per month, with board and lodging.

Colored male labor, $10 to $15 per month, "and found"—an item amounting to about $150 annually.

Colored female labor, $7 to $10 per month, "and found."

Fuel per cord, at dealers' rates, $2 to $2.50 per cord.

numerous local markets; whereas, in shipping by sea, all the products must go to one depot, and be re-distributed. By the assistance of direct communication with the interior, the Petit Anse salt could command all these markets with ease.

These facts render it certain that sooner or later the main communication of the island will be with New Iberia. The only objection to the opening of this route at once is the cost of the railroad (about eight miles) from the mines to that point, which ought to be deferred until the mines are in successful operation. It is therefore recommended that the route *via* Bayou Petit Anse be employed for the present, and the railroad to New Iberia be looked upon as a future necessity. The prairie road from the island to New Iberia should, however, be immediately improved, as, for many reasons, easy communication is desirable. The outlay of $10,000, to render this road permanent, would soon be reimbursed in the saving of time and labor in teaming; and the road would be available afterwards as a foundation for the railway.

The result of a mining enterprise, based on the Petit Anse salt deposit, depends—

1. On the character and extent of that deposit;
2. On the existing demand for the product of the mines;
3. On the possibility of competition with existing sources of supply.

The first of these heads has received sufficient explanation. Concerning the demand for salt, which ought not to be exceeded by the production, it may be remarked that the importations of English and West Indian salt into New Orleans, according to the commercial statistics of that port, for three years previous to 1860 (after which period the normal conditions were deranged by the war, and have scarcely yet been restored), were as follows:—

Year.	1857–58.	1858–59.	1859–60.
English salt . .	669,873	640,866	852,324 sacks.
Turk's Island salt .	168,557	183,935	368,620 "

These sacks contain about 210 pounds, or three bushels each. The quantity of English salt being assumed at 700,000, and that of Turk's Island salt at 200,000 sacks annually, and one-third of the English salt being subtracted as fine salt, we have a total importation of about 700,000 sacks—a little over 70,000 tons—of coarse salt imported into New Orleans. Allowing 30,000 tons for the rest of the Southern ports, we have a grand total of 100,000 tons per annum of that quality of salt with

which the Petit Anse rock-salt is especially able to compete. This represents a daily production of 350 tons, at the most; more than which will glut the Southern market. By great cheapness of mining, the Petit Anse salt can be carried into more distant fields, to compete successfully with foreign and native coarse salts upon grounds hitherto considered their own. The whole importation of English coarse salt, for instance, is stated to have been, before the war, four times as great as that of the single port of New Orleans.[1] It is a question to be determined hereafter, how far north the Petit Anse salt could be profitably sent. Doubtless, under the protection of the present tariff, its prospects are good; but an important question is whether, without protection, this salt can compete successfully with foreign importations, in the Southern market.

The Petit Anse salt is here considered as competing mainly with foreign salt, imported through the Southern ports. Hence, only the importation of English and West Indian "coarse-fine" at New Orleans, Charleston, Savannah, and Mobile, has been assumed as a basis of calculation concerning the market open to the product of Petit Anse. The extent of this market is limited by the cost of production and transportation. At present, St. Louis may be considered the northern limit, since at that place the English salt, transported *via* the Mississippi, meets the native manufactured salt of the Northern States. As has been already observed, it is uncertain how far beyond this present limit the Petit Anse salt can be profitably carried.

At Syracuse, solar or coarse salt amounts to about two-sevenths of the whole production; at Saginaw, about one-half. Ohio manufactures but a very small proportion of solar salt—mainly at Zanesville.

The working capacity of establishments for the manufacture of salt within the United States exceeds in every instance the demand of their respective markets. Syracuse could manufacture more than twelve million bushels; while Ohio and Michigan, it is claimed, could increase their production almost without limit. A monopoly, independent of cost of transportation, is therefore out of the question.

The statistics of production and consumption for the whole United States, previous to the war (in 1858), were as follows:—

New York	produced	7,000,000	bushels (@ 56 pounds).	
Ohio	"	4,000,000	"	"
Virginia	"	1,900,000	"	"
Pennsylvania	"	1,000,000	"	"
Kentucky	"	250,000	"	"
Florida	"	100,000	"	"
Texas	"	25,000	"	"
Massachusetts	"	15,000	"	"
Michigan	"	5,000	"	"
Illinois	"	5,000	"	"
Total home manufacture,		14,300,000	"	
Foreign importations,		17,165,000	"	
Total consumption,		31,465,000	"	

Equal to 881,020 tons.

[1] The yield of the Cheshire salt-field for 1864 was 58,030 tons of rock-salt, and 695,558 of refined, against 65,136 tons rock, and 754,700 refined, of the year previous. From Stoke and Droitwich, in Worcestershire, in 1864, the total supply was 167,000 tons, of which about 40,000 tons were exported. For the same year, 17,245 tons of rock-salt were raised at Belfast, Ireland.

From the United Kingdom of Great Britain and Ireland were exported to the United States the following quantities of salt: in 1862, 147,302 tons (£44,044); 1863, 69,181 tons (£26,977); 1864, 86,208 tons (£36,623).—*Mineral Statistics*, London, 1865.

For the present production full statistics are wanting. Virginia has fallen off largely, in consequence of repeated destruction of the works during the war. Michigan, on the other hand, has increased its annual yield, which is stated to have been, for 1866, 60,000 bushels of solar, and 1,650,000 bushels of fine, making in all 1,710,000 bushels, an amount which falls short, however, of the production of 1865, by 400,000 to 450,000 bushels.

In an official report to the Government by General Banks, in 1862, it is stated, that the average price in New Orleans of Liverpool ground, so-called, alum-salt, in sacks (commonly known as "coarse-fine"), has been, from on shipboard, during the last fifteen years, about 50 cents per sack of about three bushels (70 lbs.), or one quarter of a cent per lb., including the cost of the sack. This would be about $3 (gold) per ton for the salt alone—a price scarcely exceeding the cost at Liverpool. It is the well-known policy of English manufacturers to break down competition by selling at cost if necessary, until they have gained control of the market; and the opportunity of shipping salt as ballast almost without expense, in vessels coming for cotton, enables them, in the present instance, to sell at the above rates. Those rates are the lowest, however, that the English manufacturer will be able to afford; and if American mines can once compete with them, the market will be won. At present, the tariff gives a protection of 18 cents per 100 lbs. in bulk, and 24 cents in sacks, barrels, or other packages, or at least $3.60 (gold) per ton.

According to all the information which can at present be obtained, the cost of lump salt on board vessel at Petit Anse should not exceed $1 per ton, when the mines are fairly open;[1] and transportation to New Orleans (300 miles) should not exceed $3 per ton. The agent of the Mississippi Valley Towboat Transportation Company offers to carry the salt from New Orleans to St. Louis (1,200 miles), in sack or in bulk, unloading included, for $4 per ton, which amounts to $3.50 for the carrying alone. This compares very favorably with the propositions made to the Salt Company for the sea-transportation of less than one quarter the distance. The salt could be put in New Orleans, then, at a cost of $4 per ton, and in St. Louis at $8.

The estimate of $3 per ton, as the maximum cost of transportation from Petit Anse to New Orleans, is based:—

1. On the representations made to Dr. Goessmann by experienced navigators, not interested in any contract or scheme with the Petit Anse Company.
2. On the analogy of the coastwise coal-trade of the Atlantic States.
3. On the rates of transportation now ruling on the Lower Mississippi and the Gulf of Mexico.

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[1] The cost of raising salt at Stassfurth is something less than 2½ silver groschen (6 cents) per centner (113.426 lbs.); or about $1.06 per ton, which is the price at which it sold, without preparation, in 1864.

The estimate of one dollar per ton as mining cost is reckoned upon an annual yield of not less than 80,000, nor more than 100,000 tons.

Such a yield can be looked for only after the preparatory work of sinking shafts shall have been completed, and the driving of gangways made extensive progress. The production of the first year would only comprise the amount of salt removed in these preparatory workings. The regular shipping business of the Company may be deferred until the second year, or even later; or the salt may be shipped from time to time, as it accumulates. A uniform daily production during this period can scarcely be expected.

The greatest difficulty in connection with these estimates is the uncertainty of the present data concerning the extent—especially the thickness—of the deposit. In case this should largely exceed the present ascertained limits, the plan of workings could be proportionately extended, at a somewhat diminished ratio of original outlay; since many permanent improvements are made at the outset once for all, and, within certain bounds, the greater distribution of running expenses also follows from the greater scale of operations.

To approximate, therefore, to an estimate of the cost of production, the condition of settled and regular working must be given—a condition which depends altogether, as to time, on the skill and energy with which developments are carried on. Meanwhile, there seems no reason to doubt that a yield of 15,000 (or more) tons may be expected from the shaft and gangway workings, during one year of judicious and skilful development. This should be more than trebled the second year, and so on until one set of horizontal workings shall reach their highest capacity, approximately assumed at 80,000 to 100,000 tons.

Should the salt prove sufficiently massive or thick to admit a second series of workings, the hoisting capacity of the shaft will be the only limit to the production of one set of workings within double the maximum of the first tier (or 160,000 to 200,000 tons).

As a part of the cost of production, account is taken of salaries and wages, wear and tear of machinery, fuel, implements, and feed for animals; and of the interest on original capital expended in mining works proper. The interest on capital laid out in roads, vessels, dredging, warehouses, and other surface improvements, is not included, but must be made a lien on the profits of the enterprise.

In the absence of exact American precedents, it is believed that the conditions of labor and construction in American coal-mining afford the best analogy to the case under consideration, due allowance being made for the great difference in wages, in favor of the proposed enterprise.

A miner will probably take out in stall-workings from 8 to 12 tons of rock salt *per diem*, at an actual cost for wages, tools, and appliances, of 30 to 40 cents per ton. The margin between this sum and the ultimate cost of $1 per ton, amounting, as it would to some $50,000 per annum on a yield of 80,000 tons, is ample to cover all other expenses of production above enumerated, together with a reasonable allowance for contingencies.

It should be distinctly understood that the estimate given for this production does not apply to the cost of salt taken out in sinking and driving. This labor is to be regarded as permanent improvement, the expense of which, may, or may not be covered by the mineral extracted.

The present price of English "coarse-fine" salt in New Orleans is $16 per ton, of which perhaps $5 is the cost of the sacks, and $6 the United States duty, leaving $5 currency as the price of the salt.

It is evident that the salt of Petit Anse might possibly drive the English salt from the market without a tariff, but that with one it would certainly do so, by virtue of its superior purity and cheapness.

A few words are needed as to the prospects of increased demand in new directions, and the uses to which this salt is best adapted.

The applications of salt depend largely on its grain or physical con-

dition. For dairy purposes, fine-grained boiled salt is generally preferred; for table and other domestic uses, the market may be considered as equally divided between the two kinds; while for packing, the coarse, hard crystals of solar or rock-salt are almost exclusively used.

A field of unlimited extent may be opened in the use of salt for manufacturing purposes. A protective duty on foreign soda would create a home consumption of hundreds of thousands of tons of salt annually, for the soda manufacture alone.[1]

The facts above detailed indicate the true policy of a company undertaking to develop the resources of Petit Anse. That policy should be,—

1. To expend as little as possible in extensive outside investments before the mines are successfully in operation.

2. To take advantage of the tariff to obtain and hold the Southern market.

3. To proceed, after these results are attained, to open permanent routes of communication, and extend operations to the utmost limits warranted by transportation.

4. To encourage as much as possible the manufacture of soda in the South.

The construction of a railroad to New Iberia would require an outlay of some $150,000 apart from the expenditure for improvement of navigation, mines, machinery, buildings, wagon-roads, &c.—above estimated at about $250,000. For future enlargement of operations, the means should be drawn mainly from the earnings of the enterprise itself.

From the foregoing statement the following conclusions may be presented:

1. That the salt deposit of Petit Anse Island is one of superior quality, and already proved to be sufficiently extensive to afford a basis for mining on a large scale for many years, and that its real extent is indefinitely greater than has been so far discovered.

2. That a demand for such salt already exists, which would absorb a large production.

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[1] The consumption of salt in 1852, in the United Kingdom of Great Britain, for the manufacture of alkali, was 137,547 gross tons. This amount was used in the production of soda-ash, 71,493 tons; crystal soda, 61,044 tons; bicarbonate of soda, 5,762 tons; bleaching powder, 13,100 tons; total value of products, £1,234,580 By doubling these figures the present yield and value of the manufacture may be approximately determined—the manufacture in Lancashire having greatly increased of late years.—*Muspratt's Chem. as Applied to the Arts*, vol ii., p. 938.

3. That the English and West Indian salts, which now supply this demand in the Southern States, can be supplanted with ease by that of these mines; and with profit, so long as the tariff continues to afford protection.

4. That new demands may be created, increasing to an unlimited extent the consumption of this salt.

APPENDIX.

I.

From the following tabular statement of Borings, it appears that salt has been struck in Borings A, B, E, G, R, T, and U. To these must be added the working pits numbered on the map from 1 to 10. A line drawn through the outermost borings of this group, say from A to E, B, U, and A again, would inclose the space of about 144 acres, referred to in the text, as the area proved to be underlaid by salt.

Further discussion of the data afforded by this table will be found in Art. II. of this appendix.

The top of the piles at Avery's Landing are taken as high-tide level = 100.

Date.	Holes.	Level, High Tide = 100.	Depth.	Level of Bottoms below High Tide.	Remarks.
			ft.	*ft.*	
Aug. 3 and 4	A	114·27	35·00	20·73	Salt.
Aug. 6 and 7	B	108·22	40·00	31·78	Salt.
Aug. 9.....	C	111·04	37·00	25·96	
Aug. 10	D	100·08	38·00	37·92	
Aug. 11 and 13	E	105·21	31·50	26·29	Salt.
Aug. 13, 14, and 15	F	111·55	53·50	41·95	
Aug. 16, 17, and 18	G	110·37	31·00	20·63	Salt earth.
Aug. 20.....	H	102·59	36·50	33·91	
	I	98·89	46·96	48·07	
	K	126·65	42·00	15·35	
	L	128·92	34·00	5·08	Auger broke. (Sugar field.)
	M	128·56	35·00	6·44	Auger broke. (Sugar field.)
	N	115·32	21·25	5·93	
	O	125·77	44·00	18·23	
	P	121·65	41·00	19·35	
	Q	122·64	44·00	22·36	
Oct. 15 and 16.....	R	108·20	27·50	19·30	Salt.
Oct. 16 and 17.....	S	101·52	46·80	45·28	
Oct. 19	T	131·56	35·00	3·44	Salt.
Oct. 20, 22, and 23 .	U	135·63	33·90	1·73 above.	Salt.
	V	142·97	41·40	1·57 above.	
	W	125·35	47·30	21·95 below.	
	X	133·71			

II.

The comparisons made in the Report between Stations U and B, and Stations A and T, may be also extended to other opposite stations; for instance,

Station Q is 1,860 feet north of Station R.

At Q, we have: level of ground, 22·64 feet above tide; depth of hole, 45 feet; no salt at 22·36 feet below high tide.

At R: level of ground 8·2 feet above tide; depth of boring, 27·5 feet. Salt struck at 19·3 feet below high tide. A difference of at least more than 3·06 feet in the level of the surface of the salt.

Station G is 2,700 feet west of Station U. At G, salt earth was found 22·63 feet below tide. At U, salt was struck 1·73 feet above tide; giving a difference in level of 22·33 feet.

These comparisons indicate what has already been deduced from geological evidence, namely, that the surface of the salt presents no uniformly inclined plane, like a stratum upheaved or tilted, but slopes in different directions, having its highest discovered point at U, and probably owing its configuration entirely to erosive action. It follows, therefore, that the absence of salt in 16 borings, even supposing these borings to have been properly made, and, so far as they go, trustworthy, is no conclusive evidence of interruptions or sudden terminations of the deposit; but must pass for an indication of only local depressions in the surface. The question of its superficial extent is thus left open, with strong probabilities in favor of a much larger area than the one now ascertained.

III.

The following data, derived from a statement of Mr. John M. Avery, a son of Judge Avery, present a sketch of the history of the salt pits. Mr. Avery was charged by the Confederate General, D. Taylor, with the general superintendence of the works.

The pits were ten in number, and are ranged in the order of their age in the following table:—

No.	Name of Pit.	Depth at which Salt was Struck.	Depth in the Salt.	Remarks.
			ft.	
4	Judge D. D. Avery's Pit.	17 feet below the surface.	38	First discovery in Pit 4, May 4, 1862.
3	Hays & Barlow "	12 to 17 " " "	24 to 31	
1, 2	Confederate Govt. "	17 to 20 " " "	25 to 30	
5	Mississippi "	15 to 17 " " "	12 to 15	In none of the pits was there any change in the deposit at the lowest depth of working.
6	John M. Avery's "	15 to 17 " " "		
9	McIlhenny's "	14 " " "	10 to 15	
8	Georgia "	15 to 17 " " "	15 to 20	
10	Alabama "	17 " " "	12 to 13	
7	Opelousas "	17 " " "	10	

The present managers have opened an additional pit (called the "shaft house" upon the map) northwest of No. 4. It is said to be 20 to 30 feet deep. Salt struck at 17 feet below the surface—the pit now 9 to 10 feet in the salt. It is being worked by blasting, under the charge of Colonel Greenleaf.

Dr. Goessmann's pit was located near the "shaft house," in order to benefit by the bailing, which is continually going on in the above pit.

IV.

The present course of the salt trade can hardly be considered established, as the changes of tariff and irregularities in certain branches of exportation, influencing decidedly our importation of salt, are still active as disturbing causes. The main fluctuations are in the autumn season, when the peculiar condition of our export trade in cotton and grain facilitates a large importation of foreign salt.

V.

The cost of manufacturing salt is of course much higher than before the war. The difference, however, is of more consequence to the consumer than the manufacturer, since the duty on foreign salt enables the home product to compete with it.

The following statistics show the relative conditions of different establishments at different times. The cost of boiled salt depends mainly on the price of fuel and the rate of wages. Solar salt is generally somewhat cheaper.

Syracuse.—In 1857, one barrel of fine salt, containing 5 bushels or about 280 pounds, cost the manufacturer, barrel included, $1.05, and was sold at $1.25; the barrel cost about 26 cents. In 1865 the barrel of fine salt cost $3.27, and was sold at $2.35; the barrel and packing costing 50 cents. For further illustration see the *Annual Reports of the Superintendent of the Onondaga Salt Springs*—particularly the Report of January, 1866; also the *Report of the Committee of the Senate of New York on the manufacture of salt, March*, 1863; also *Testimony in Regard to the Distribution of Salt Water, the Manufacture of Salt, &c., before the Assembly Committee, February*, 1863.

Michigan.—Prof. Winchell stated, in 1862, the cost of making salt at Saginaw to be 64 cents per barrel of 5 bushels, without the barrel. In 1866, it is said that the cost of one barrel of fine salt delivered on board the vessel is $1.25 to $1.30, and the market price (in lots of 5,000 barrels) at Saginaw is $1.65 to $1.85. The price of the same lots at Chicago is $2.20 to $2.35; or, in car-loads, at Saginaw, $1.90 to $2.00 per barrel; at Chicago, $2.50 to $2.55 per barrel.

Freights from Saginaw to lake ports have been very high during the past year, ranging as follows:—

From Saginaw	to Chicago, per barrel	45–50 cents.
" "	to Milwaukee, "	45–50 "
" "	to Detroit and Toledo	40–45 "

Rates of freight from Syracuse *via* Erie Canal were, in 1862:—

To Chicago and Milwaukee, per barrel	22·2 cents.
To Lake Erie ports, per barrel	17·6 "

(*Vide Senate Report*, 1863, and *Testimony on the Distribution of Salt*, &c., p. 4–5.

VI.

The following table shows the policy heretofore pursued by the United States Government in relation to this manufacture:—

A.—Duties on Foreign Salt.

1789	to	1798—	6 cents per bushel of 56 pounds.
1798	"	1807—20	" " "

1807 to 1812—No duty.
1812 " 1830—20 cents per bushel of 56 pounds.
1831—15 " " "
1832 and 1833—10 " " "
1834 " 1835—9·4 " " "
1836 " 1837—8·8 " " "
1838 " 1839—8·2 " " "
1840 " 1841—7·6 " " "
1842 to 1846—8 " " "
1846 " 1857—An *ad valorem* duty of 20 per cent., which, considering the valuation of salt at the port of shipment, amounted, practically, to 1 cent. per bushel of 56 pounds.
1857—An *ad valorem* duty of 15 per cent.
1865—18 cents on 100 pounds in bulk, and 24 cents on 100 pounds in packages of any description, or from 10 to 13·5 cents per bushel.

The average duty on foreign salt has therefore been, since the formation of the Government, 10 cents per bushel.

B.—Internal Revenue Tax.

1866—On home-manufactured salt, a tax of 3 cents per 100 pounds, or about 1·7 cents per bushel. This leaves the protection of the tariff, at present, about 8·3 cents per bushel.

The only State tax now imposed on the manufacture of salt is that which the State of New York, owning the ground worked by the Onondaga Salt Reservation, collects from the manufacturers whom it supplies with brine. This tax amounts to 1 cent per bushel; but it can hardly be considered a burden, as the State assumes the expenses of pumping, inspection, and superintendency, and delivers the brine at the respective works.

VII.

The present prices of salt in the various markets of the country are given below. In order to understand the bearings of these figures, it is well to keep in mind the following facts:—

One bushel of coarse salt weighs from 70 to 75 lbs.
One bushel of common fine salt (boiled) weighs from 56–60 lbs.
One bushel of salt, when not otherwise specified, is assumed to equal 56 lbs.
One sack of English coarse-ground salt is equal to three bushels of 70 lbs. each, or 210 lbs. The Chamber of Commerce at New Orleans has established a standard of 204 lbs., allowing 6 lbs. for loss of weight.
One car-load of salt is usually considered equal to 82–83 sacks of 204 lbs. each, or about 16,800 lbs.
Fifty lbs. of salt are considered necessary, at New Orleans, for packing one barrel of pork.
The usual ton employed is the light ton, of 2,000 lbs. avoirdupois, or 28·57 bushels of 70 lbs. each. The English or heavy ton (2,240 lbs.) is taken as equal to 30 bushels of coarse salt (70–75 lbs.)
One barrel of common fine salt (boiled) contains 280 lbs., or 5 bushels (56 lbs. each). A barrel of coarse salt contains the same quantity by weight, and is estimated at 5 bushels of 56 lbs. each upon all price-lists, where other measure is not expressly mentioned.
The following statistics of market price are taken from the commercial lists of the dates specified:—

New Orleans, Dec. 8, 1866.

English coarse and fine salt per sack—
In store $1 85

In cargo, old	1 65–1 7
In cargo, new	1 75
Delivered in the city, coarse	2 10
Delivered in the city, fine	2 15
Turk's Island, per bushel	70–75 cts.

MEMPHIS, DEC. 10, 1866.

Coarse salt, per barrel of 280 lbs.	$3 25–3 50
Coarse salt, per barrel of 7 bushels	4 25
Liverpool, per sack	2 75–3 00
Liverpool, per barrel, fine	5 00–5 25

OXFORD, MISS., DEC. 10, 1866.

Liverpool fine salt per lb., at retail	4 cts.
One carload (82–83 sacks), from Memphis, costs	$30 00–32 00

COLUMBUS, KY., DEC. 13, 1866.

Kanawha salt, fine, per barrel, 280 lbs.	$3 00
Ohio Run salt, fine, per barrel, 280 lbs.	3 25

ST. LOUIS, DEC. 13, 1866.

English ground coarse, per sack, 204 lbs.	$2 50–2 65
Turk's Island coarse, per sack, 204 lbs.	2 20–2 30
Onondaga, per barrel, 280 lbs.	3 10–3 20
Kanawha and Ohio, per barrel, 280 lbs.	3 10

CINCINNATI, DEC. 14, 1865.

Ohio River Salt Co. and Kanawha Salt Co. sell—

Common fine salt, per barrel, 280 lbs.	$2 80
Dairy salt, per barrel "	3 25
Table salt, per barrel "	3 50
Turk's Island, per bushel	75–80 cts.
Liverpool coarse, per sack	2 50

SYRACUSE—PRICE LIST OF 1866.

At the works of the Salt Co. of Onondaga:—

Fine salt, per barrel of 280 lbs.	$2 35
Coarse screened, per barrel of 280 lbs.	2 40
Ground solar, per barrel of 280 lbs.	2 40
Factory filled dairy, per barrel of 280 lbs.	3 00
Fine salt, per bushel of 56 lbs., loose	38
Coarse, screened, per bushel of 56 lbs., loose	39
Solar, dairy, per bushel of 56 lbs., loose	48
Factory filled dairy, per bushel of 56 lbs., loose	49

NEW YORK, DEC. 29, 1866.

Onondaga F. F. dairy, per sack of 240 lbs.	$3 00
Onondaga solar, per bushel	55
Onondaga common fine, per bushel	45
"Ashton" English fine, per sack of 240 lbs. (dealer's jobbing prices, currency)	4 25
Liverpool ground and Turk's Island salt (dealer's jobbing prices, currency), per bushel of 70 lbs.	65–70 ct
Liverpool ground, wholesale, per sack, currency	1 90–1 5

VIII.

Captain Trinidad, of the U. S. Mail steamer, on the Bayou Teche, considered well informed, favors the opinion that, by means of strong barges and tug-boats, salt may be carried directly from Petit Anse *via* Vermilion Bay and the Mississippi, for 25 cents per sack to New Orleans, and for 54 cents to St. Louis.

The Atlantic Steamship Company of New Orleans offers to carry salt from that port, in quantities of 1,000 sacks, at the following rates:—

To Galveston, 40 cents per sack.
To Mobile, 45 cents per sack.
To Memphis, 35 cents per sack.
Above Memphis (to St. Louis), 35 cents per sack.

IX.

A. Distances from Petit Anse Island to

New Iberia—air line	7	miles.
New Iberia—by present prairie road	9½	"
Vermilion Bay—from the present landing	4	"
Berwick's Bay—from the present landing	84	"
Sabine Pass, Texas	120	"
New Orleans	304	"
New Orleans—from Southwest Pass, Vermilion Bay	275	"
Mouth of Mississippi	204	"
Mouth of Mississippi—from Southwest Pass	175	"

It is thought that five trips may be made within two months from Petit Anse to New Orleans.

B. Distances from New Iberia to Brashear City.

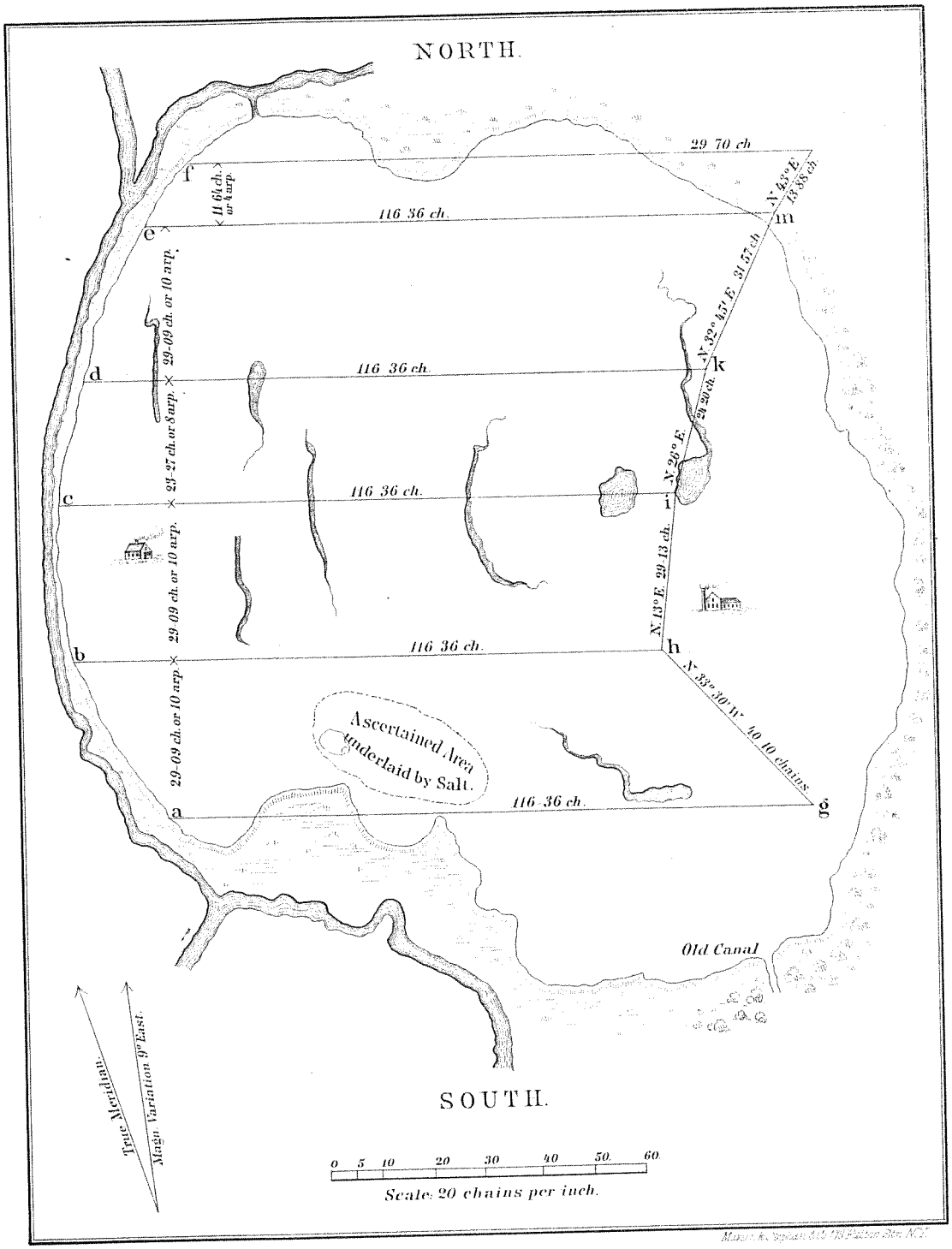
By steamer (Bayou Teche)	72	miles.
By present highway	56	"
By projected New Orleans, Opelousas and Great Western R. R.	46	"

C. Distances from Brashear City

To Algiers (opposite N. O.), by N. O., Opelousas and Gt. W. R. R.	80	miles.
To Galveston, by steamer	21	hours.

D. Distances from New Orleans

To St. Louis, by the Mississippi River	1,200	miles.



PLAN
OF
PETIT ANSE ISLAND.

AMERICAN BUREAU OF MINES.