



# ANTHONY F. LUCAS:

America's First Great Salt Dome  
Explorationist and His Role in the  
Development of the  
Louisiana Salt Mining Industry

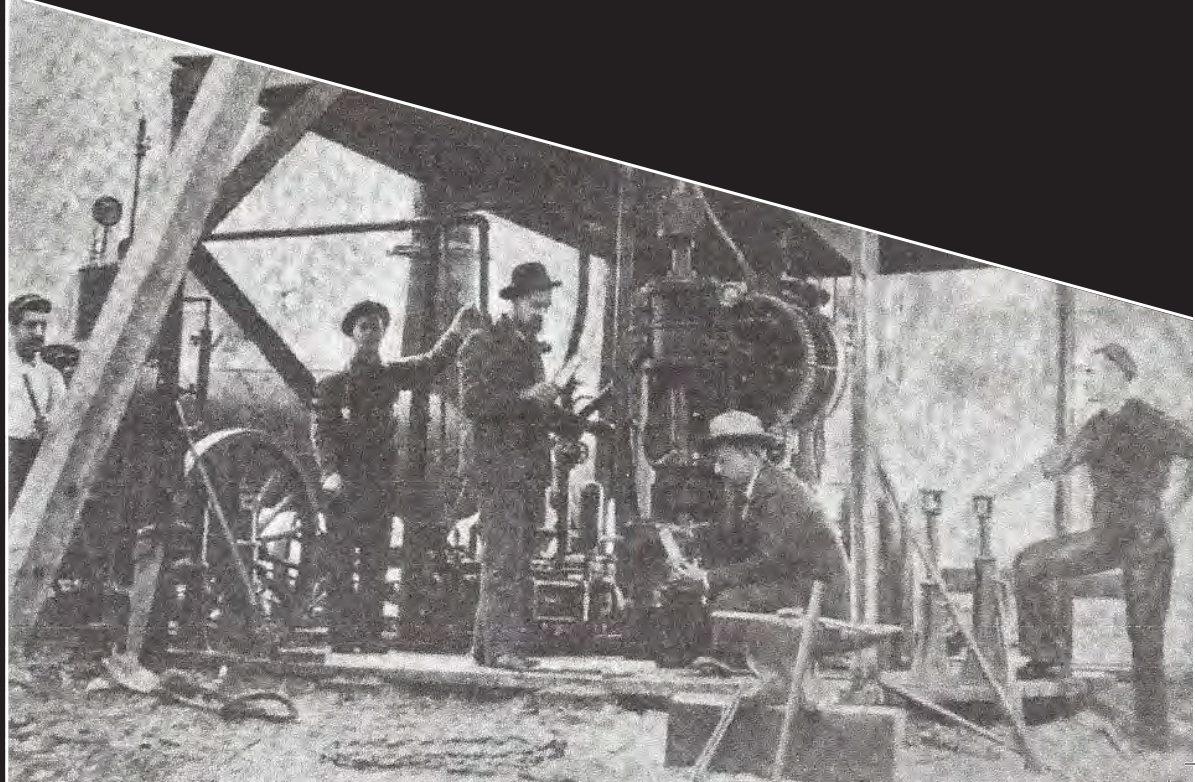
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Cover photograph shows Anthony Lucas (in foreground) and Joseph Jefferson (standing in center) examining core from Jefferson Island in 1896 [Rickard, 1917].

## PREFACE

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This Volume 3 in RESPEC's Mine History & Technology Development Series (MH&TDS) is an update and expansion of a paper that bears a similar title and was presented to the Solution Mining Research Institute (SMRI) at their meeting in Galveston, Texas, April 25–26, 2016. This expanded treatment was inspired by the abundance of material that could not be included in the SMRI paper because of length constraints. In addition, considerably more information has become available on the Anse La Butte salt dome.

This expanded treatment is ideal for RESPEC's MH&TDS, which consists of a series of white papers on historical development of salt-related industries. This paper is Volume 3 in the series and follows Volume 1, titled *The Advent of Bedded Salt Solution Mining in New York State: A Serendipitous Outcome of Early Oil and Gas Exploration* from December 2011, and Volume 2, titled *Avery Island's Place in the Development of the Nineteenth Century United States Salt Industry* from November 2014. The papers in this series are intended to provide information that may not be otherwise accessible. If you would like to receive copies of the first two volumes, please contact RESPEC.

In our preface to Volume 2, we referred to the LeRoy Salt Company, which was a brine-evaporation plant located in the LeRoy village in Genesee County, New York. Salt and brine were first discovered there in 1878, and salt production continued until 1928. The LeRoy Salt Company relied on steady supplies of naturally occurring brine that was found in contact with the up-dip terminus of the Salina Group salt beds. The LeRoy Salt Company history and the hydrogeology of the regional brine aquifer that supports it are now being treated in a paper to be presented at the World Salt Symposium that will be held June 19–21, 2018, in Park City, Utah.

This Volume 3 treatment of the role that Anthony Lucas played in developing the Louisiana salt industry includes contemporary newspaper accounts that add both precision to the chronology and colorful detail to the historical reconstruction. Digital copies of many old newspapers were accessed through *Newspapers.com* and the Library of Congress Chronicling America website. This paper also includes information on Avery Island that was provided by Dr. Shane Bernard, a historian and custodian for Avery Island, Inc. Information and photographs of early exploration at Anse La Butte were made available by librarian Dr. Jean Kiesel from the University of Louisiana Lafayette Special Collections. This paper also benefitted from a site visit to Belle Isle that was facilitated by Mr. Charlie von Dreusche of Cargill Deicing Technology. Special thanks are extended to these key individuals.

Thanks are extended to the management at RESPEC who have supported development of the MH&TDS, specifically, RESPEC's President (Mr. Todd Kenner) and Vice Presidents of Mining and Engineering (Mr. Kerry DeVries and Mr. John Morgan). Thanks are also extended to the leadership of the Sovereign Group of Companies who have permitted Dr. Goodman the time to take this effort to completion. Ms. Laura Fairhead and Ms. Kelley Morgan at RESPEC have worked tirelessly on several versions of this paper; without editorial guidance and diligence on the part of RESPEC's administrative staff in producing the final versions of all three volumes in the MH&TDS to date, these publications would not be able to serve their ultimate purpose.



## ABSTRACT

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Anthony Francis Lucas is most famous for his 1901 oil strike on the Spindletop Dome in Beaumont, Texas. Before that watershed moment in developing the US petroleum industry, Lucas helped pioneer mining engineering and exploration of southern Louisiana salt domes. His work at Avery Island, Jefferson Island, Belle Isle, Weeks Island, and Anse La Butte between 1893 and 1900 laid the foundation for significantly expanding the salt mining industry in Louisiana and molded an enthusiasm for oil exploration that would soon thereafter become his legacy.

### AVERY ISLAND

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Lucas arrived at Avery Island in 1893 at a time when the original mine was suffering extensive damage from water and sediment inflows. Lucas' efforts to keep the mine from flooding rendered him the US salt industry's first leak-control engineer. However, his efforts to save the first Avery Island Mine were ultimately futile because continued sinkhole expansion and mine inflows necessitated abandoning the mine by 1898. A deeper shaft was sunk for a new mine in 1899, and operations continue to this day.



Anthony F. Lucas  
[Beaumont Enterprise, 2012]

### JEFFERSON ISLAND

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In 1894, Lucas was contracted by Joseph Jefferson to assist in drilling a water well after the driller's cable tool rig encountered difficulties advancing through gravel. Lucas devised effective drilling methods, and rock salt was discovered in the well at 334 feet (ft) during 1895. Lucas then oversaw an exploration program that included drilling eight holes that ranged from 150 ft to 2,100 ft deep. Despite promising findings, salt production did not begin until 1923, after Jefferson's heirs sold the island to Kentucky capitalists.

### BELLE ISLE

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In exchange for a share in mineral rights, Lucas began exploring at Belle Isle in November 1896. The small, four-well exploration program at Belle Isle was a watershed moment in Lucas' career. There, Lucas first discovered the association of sulfur, natural gas, and petroleum with Gulf Coast salt domes.

The developers of the first salt mine at Belle Isle faced various challenges. Construction on the first shaft began in 1898. Soon after production started, the mine advanced through the edge of salt in December 1899, and quicksand and water flooded the mine. An attempt at constructing a second shaft was made in 1903–1904, but quicksand and water filled the shaft before miners reached the top of salt. Efforts to mine salt at Belle Isle were not successful until 1962.

## WEEKS ISLAND

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Myles & Company financed a five-well exploratory program at Weeks Island (Grand Côte) starting in 1897; salt was penetrated in the fourth hole at 276 ft. In July 1897, Lucas supervised an expanded exploration program that led to the organization of the Myles Rock Salt Company March 1898. By July 1898, construction on the first shaft had begun. In March 1902, the 600-ft level was reached, and drifts were opened both east and west of the shaft. Although the original salt mine is now closed, salt mining has been ongoing at Weeks Island ever since.

## ANSE LA BUTTE

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After learning of local gas seeps, Lucas began exploring Anse La Butte in 1899. Despite poor tools and meager financial support, he claimed to discover oil and salt but not under favorable conditions. Based on his poor early findings, Lucas abandoned his effort at Anse La Butte and went to Beaumont, Texas, to explore Big Hill, where he made his legendary discovery of the Spindletop Field on January 10, 1901.

Following Lucas' discovery, exploratory drilling at Anse La Butte intensified. Domal salt was penetrated for the first time in 1901, but oil exploration and production remained the focus at Anse La Butte during the first two decades of the twentieth century.

Between 1920 and 1930, two competing companies—the Lafayette Salt Company and the Star Salt Corporation—solution-mined at Anse La Butte to produce table salt. The Benners Salt Company (whose name later changed to the Lafayette Salt Company) was incorporated on September 1, 1917, with Harry A. Benners as its president, and drilled a test well in 1918. During the next 3 years, the company drilled three production wells within or near the northern boundary of the Flat Lake swamp. The first two production wells caved in quickly and produced little brine. The third production well, which was drilled in 1921, was drilled deeper than the previous two wells and produced brine until 1927 when the company abandoned operations at its plant on the Begnaud tract after producing enough brine to make 30,174 short tons of table salt.

The rival Star Salt Corporation drilled its well and began making table salt in 1923. Its single brine well was located in close proximity to the Lafayette Salt Company wells on the Begnaud tract. Their brine-evaporation plant was constructed off of the dome on Guidry Street in Lafayette, Louisiana. The brine was pumped from the well through a cypress log pipeline.

The Star Salt Corporation plant operated until 1930. During its 8-year life, 89,456 short tons of salt were produced. In total, 119,630 short tons of salt were produced by the two companies at Anse La Butte by 1930. Unable to compete with lower cost production at Avery Island, Weeks Island, and Jefferson Island, salt production then ceased until Gordy Salt opened its plant in 1941, which marked the start of the modern era of salt production at Anse La Butte.

# ANTHONY F. LUCAS

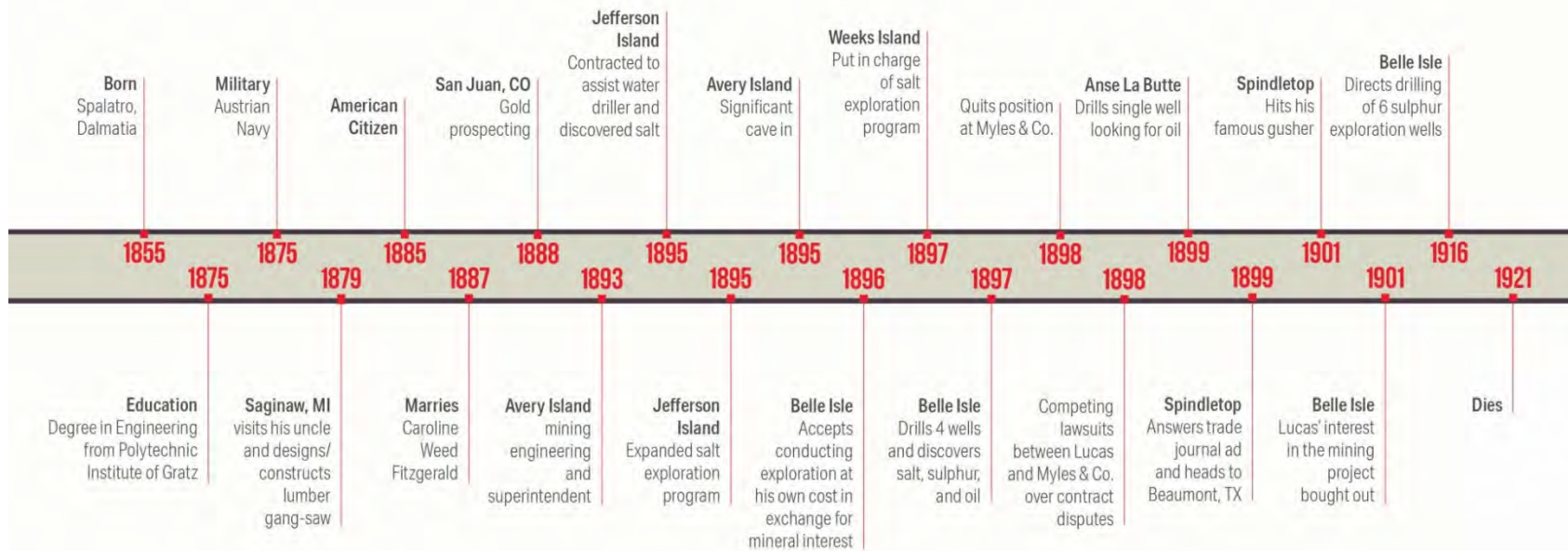


Figure ES-1. Timeline of Anthony Lucas' Salt Exploration Activities.





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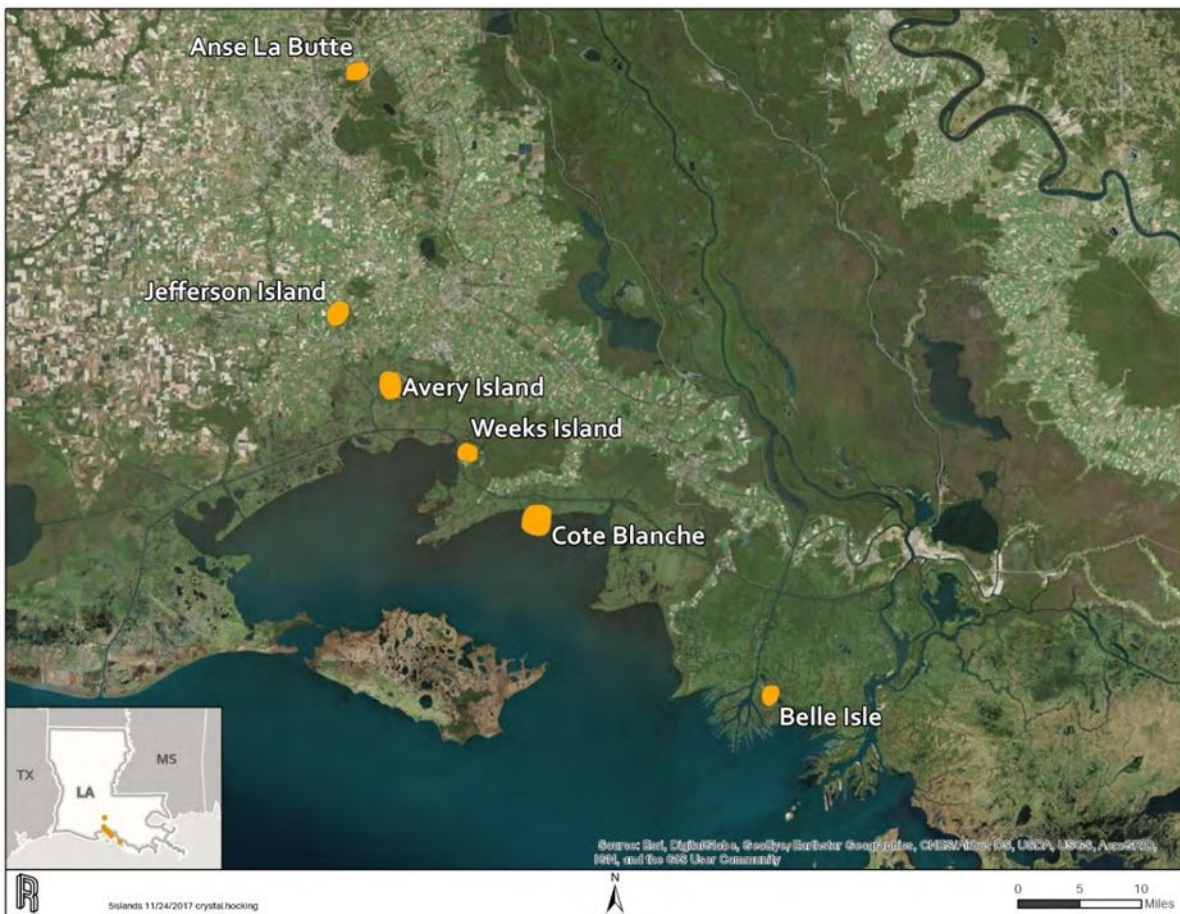


## INTRODUCTION

Anthony Francis Lucas (1855–1921) is most famous for his January 10, 1901, oil strike on the Spindletop Dome in Beaumont, Texas. Before that watershed moment in the development of the US petroleum industry, Lucas performed pioneering mine engineering and exploration of southern Louisiana salt domes. His work at Avery Island, Jefferson Island, Belle Isle, Weeks Island, and Anse La Butte (all shown in Figure 1) between 1893 and 1900 laid the foundation for significantly expanding the salt mining industry in Louisiana and molded his enthusiasm for oil exploration, which would soon thereafter be his claim to fame.



Anthony F. Lucas  
From McBeth [1918]

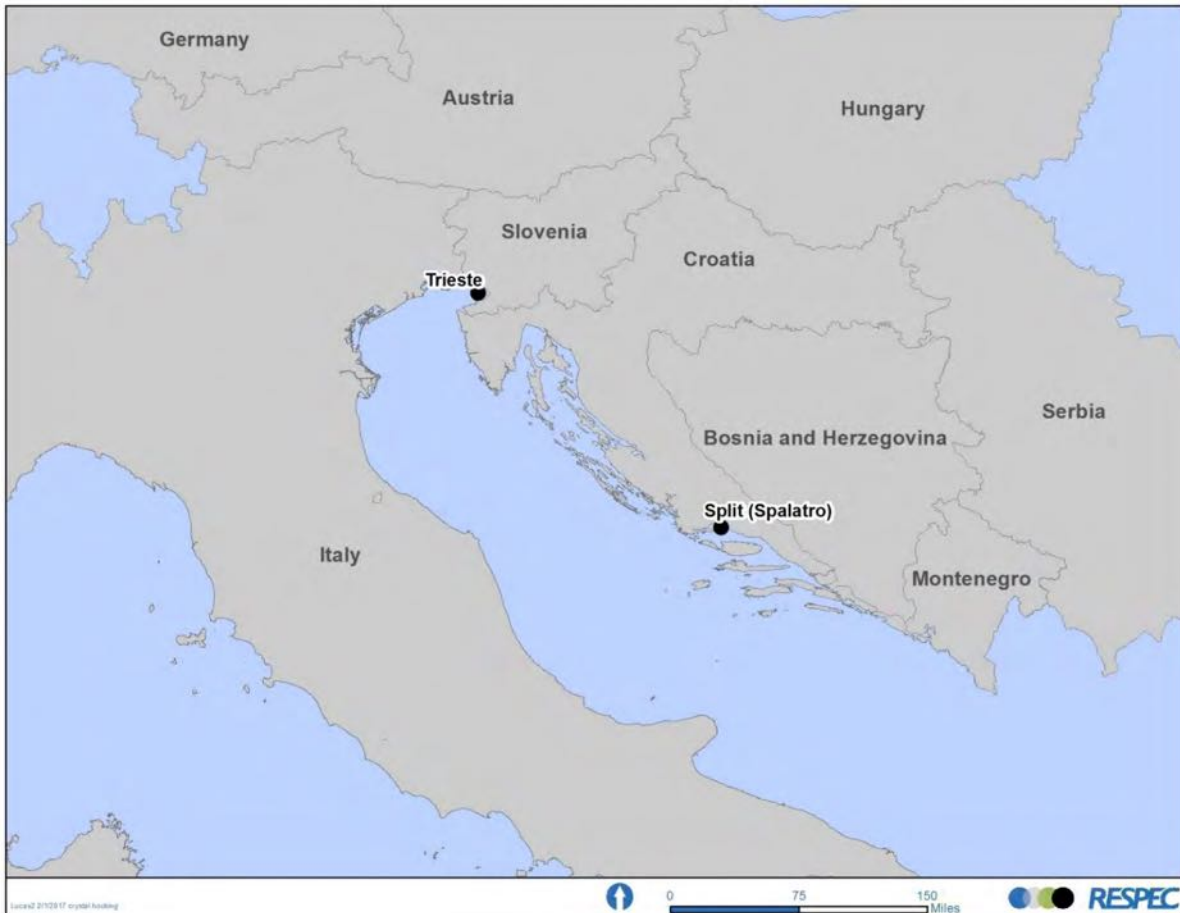


**Figure 1.** Map of Five Islands and Anse La Butte Salt Domes, Louisiana.



## LUCAS' EARLY YEARS

Anthony Francis Lucas was born as Antonin Francis Luchich in Spalatro, Dalmatia (now Split, Croatia), in 1855 and was of pure Montenegrin descent [Rickard, 1917]. He grew up in Trieste, then part of the Austrian Empire, and graduated from the Polytechnic Institute of Gratz at age 20 with a degree in engineering. Figure 2 is a map that shows the locations of Spalatro and Trieste.



**Figure 2.** Locations of Key Cities Split (Spalatro) and Trieste in Lucas' Early Years.

Lucas entered the Austrian Navy as a midshipman and was promoted to second lieutenant [Rickard, 1917]. He obtained a 6-month leave of absence from the navy in 1879 to visit an uncle in Saginaw, Michigan. At that time, Saginaw had a robust lumber industry, and Lucas' engineering prowess was sought by one local enterprise to assist with designing and constructing a gang-saw. Note that Saginaw's lumber industry was inextricably linked to its salt industry; wood offal from the saw mills was used to fuel the area's brine-evaporation plants for salt manufacture. The Saginaw Salt District was at its peak during the time that Lucas was there [Cook, 1916], and Lucas likely got his first exposure to the salt industry while working in Saginaw.



Near the end of his leave of absence, Lucas was offered an attractive position in the lumber industry at Saginaw, where he could earn three times as much as he had made as a lieutenant in the Austrian Navy [Rickard, 1917; McBeth, 1918]. He, therefore, requested another 6-month leave of absence, and in the meantime, applied for US citizenship. Lucas remained employed by a Saginaw lumber company for 3 years.

Lucas received his final papers for American citizenship in Norfolk, Virginia, on May 9, 1885 [McBeth, 1918]. Lucas married his American wife, Caroline Weed Fitzgerald, in 1887, went on an extended European honeymoon trip, and then relocated to Washington, DC, where he entered the mechanical and mining engineering profession [Linsley et al., 2002]. To launch his career, Lucas first traveled to the San Juan region of Colorado to prospect for gold. After 2 years of only marginal success, he returned to Washington, DC, to search for another opportunity in the mining industry. His job search landed him a position as a mining engineer in Louisiana at the Avery Island salt mine in 1893.

## AVERY ISLAND

The Avery Island Mine was the nation's first underground salt mine and has been in operation since 1869 [Goodman, 2014]<sup>1</sup>. A map of Avery Island in Figure 3 shows major topographical features and historical mining areas. At the time of Lucas' arrival in 1893, the salt mine at Avery Island (also known as Petite Anse and Salt Island) was under sublease by Myles & Company of New Orleans from the New Iberia Salt Company of New York.



Avery Island in 1895.  
Image provided by John Voight.

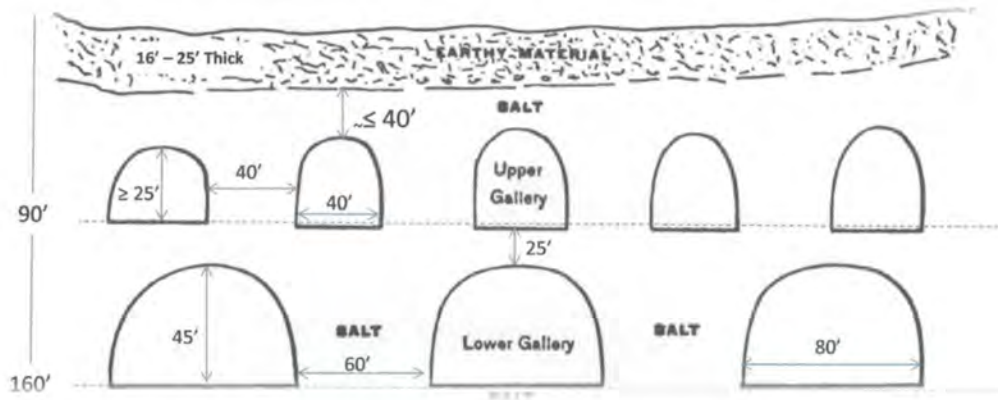


**Figure 3.** Map of Avery Island Showing Major Features, Original Tract Boundaries, and Historical Mining Area Locations (in the circle) [Veatch, 1899].

<sup>1</sup> A full treatment of early salt discovery, Civil War quarrying, and nineteenth century salt production at Avery Island is provided in Goodman [2014], which is the second volume in this series.

## TRIAL BY FIRE

The roof of the mine, with an upper level only 90 feet (ft) below the surface at its shaft and lower level at 180 ft (Figure 4), was suffering damage from water leaks that had first started in 1883 [Lucas, 1900; Goodman, 2014]. Lucas, with his hands full managing water and sediment inflows, became the salt industry's first de facto leak-control engineer. Lucas stated that the "mine and mill were in very bad condition owing to the fact that water had found its way into the mine and caused a large cave. The mill was antiquated. It required constant care to check the caving and water in the mine, and the ravages of salt on the mill machinery" [Rickard, 1917]. The desultory nature of the mining operation was attributed to earlier mining mistakes, the effects of economic "panic" (recession) during 1893, and low salt prices from overproduction by the northern operations in western New York and Michigan [Goodman, 2014].



**Figure 4.** Early Avery Island Mine Layout (Modified From Pomeroy [1888]).

In his 1900 paper, Lucas described his efforts to manage water and sediment inflows and roof caving in the Avery Island Mine:

*Numerous attempts were made to prevent or retard this caving—such as construction of mattresses of timber and brush, leaves, bagging, etc., which proved only temporarily effective. It became necessary at last to check the destructive caving by building a series of cribbings and shelves, and filling up the abutments with sacks full of sand. When a spring or water-course was definitely apparent, it was led out of harm's way in troughs. At the same time, rank grasses were planted on the surface, in the hope that their roots would hold the soil together. These devices can scarcely be said to have remedied completely the original errors of exploitation.*

For the 3 years of his tenure at Avery Island, Lucas kept production going despite challenging circumstances; Lucas described his mining method as [Rickard, 1917]:

*I opened drifts in virgin ground, adopting an overhead method of mining, feasible only under such conditions. A gallery was started with a 7-ft. under-cut, 50 to 60 ft. wide, and from 200 to 300 ft. long. After clearing away this broken salt in tram-cars the second under-cut was started, 18 to 20 ft. in height, and when this was cleared the final mining was begun with the aid of threepod ladders upon which light hand-drills were placed, drilling batteries of holes 10 ft. deep. Thus six or eight holes shot down hundreds of tons of salt. This method proceeded until, by the time the height reached 50 ft., no more ladders were needed owing*



*to the increased volume of the salt. The roof, of course, was arched toward the 40-ft. pillars left standing. Suspiciously loose slabs of salt were pried down or shot down to make the roof safe, and by the time the men had finished, there remained a mass of from 3000 to 5000 tons of mined salt ready to be trammed and hoisted to the mill. By this method not a board or stick of timber was used or needed.*

*When the mining in this chamber was completed, another under-cut was started laterally and thus had always in reserve one or more chambers of mined salt, say, 60 ft. wide, 60 ft. high, and 200 or 300 ft. long, each containing from 3000 to 5000 tons, at a cost of less than 14 cents per ton of salt mined.*

The markets for Avery Island salt at that time were meatpacking establishments in the northwest (25 percent), Chicago and St. Louis for refrigerating and salting hides (25 percent), and the remainder for satisfying the demands of Louisiana and neighboring states (50 percent) [Lucas, 1896]. New Orleans, Louisiana; Galveston, Texas; and Mobile, Alabama, were key ports for distributing Avery Island salt. However, steady delivery of salt to market was always in jeopardy because of water inflows into the mine and roof caving problems. Although Lucas did manage to continue delivering salt to market, production during his tenure was maintained at only 20,000–30,000 tons per year, which was barely half of the peak production during the 1880s [Parker, 1897].

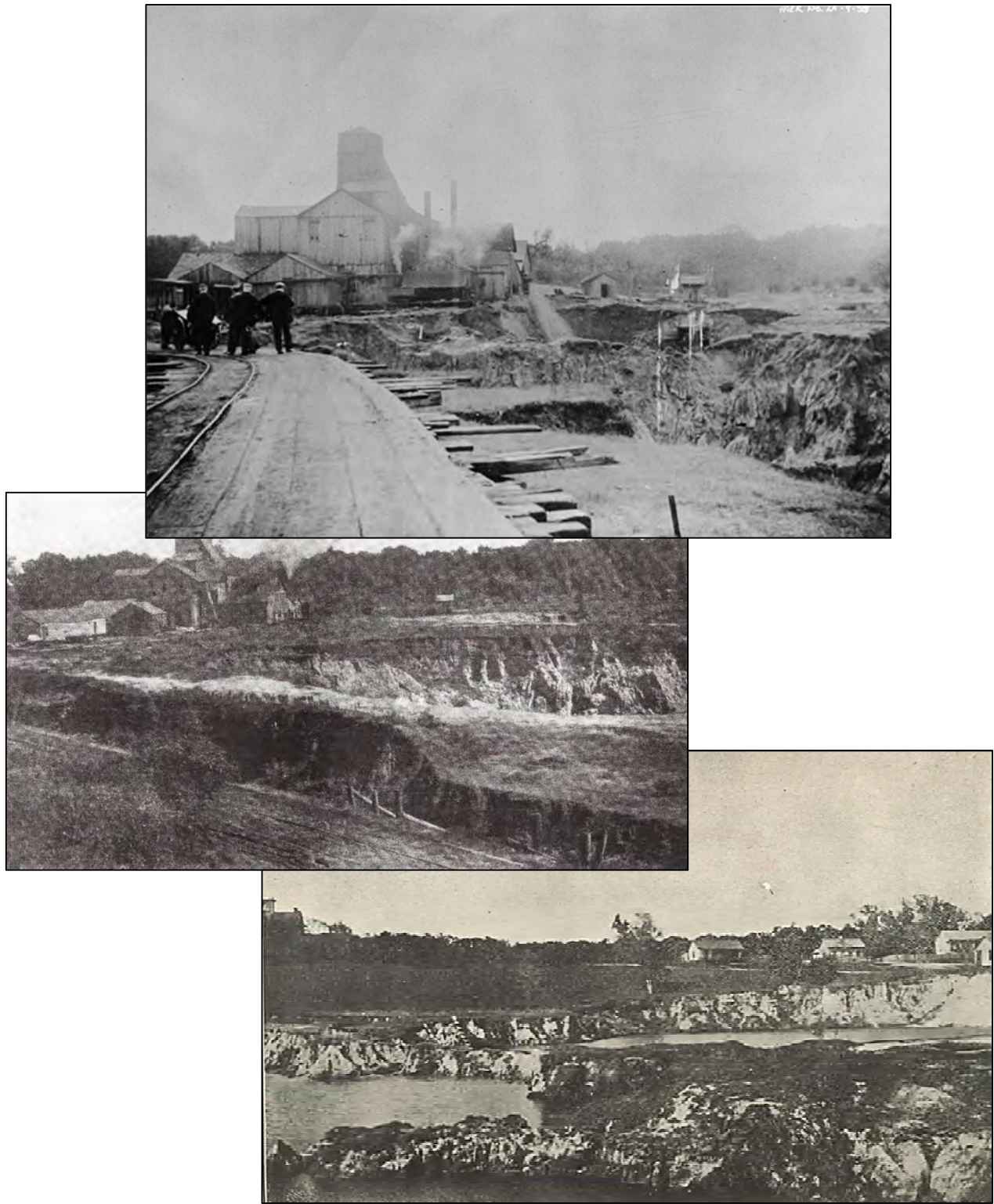
In March 1894, one of the many tour groups who would routinely visit the famous mine had to abandon plans because there were 5 ft of water in the mine, according to an article in the *New Orleans Weekly Times-Democrat*. Lucas [1896] explained that “continuous flooding of the upper level with fresh water and pumping out saturated brine caused the opening of new communications between the floor of the upper level and the roof of the bottom level, so that in July 1895, the lower level had to be abandoned. Operations are now confined to a small area of the old 90-ft level which can last but a limited time, provided no further cavings occur to stop the operations all together.”



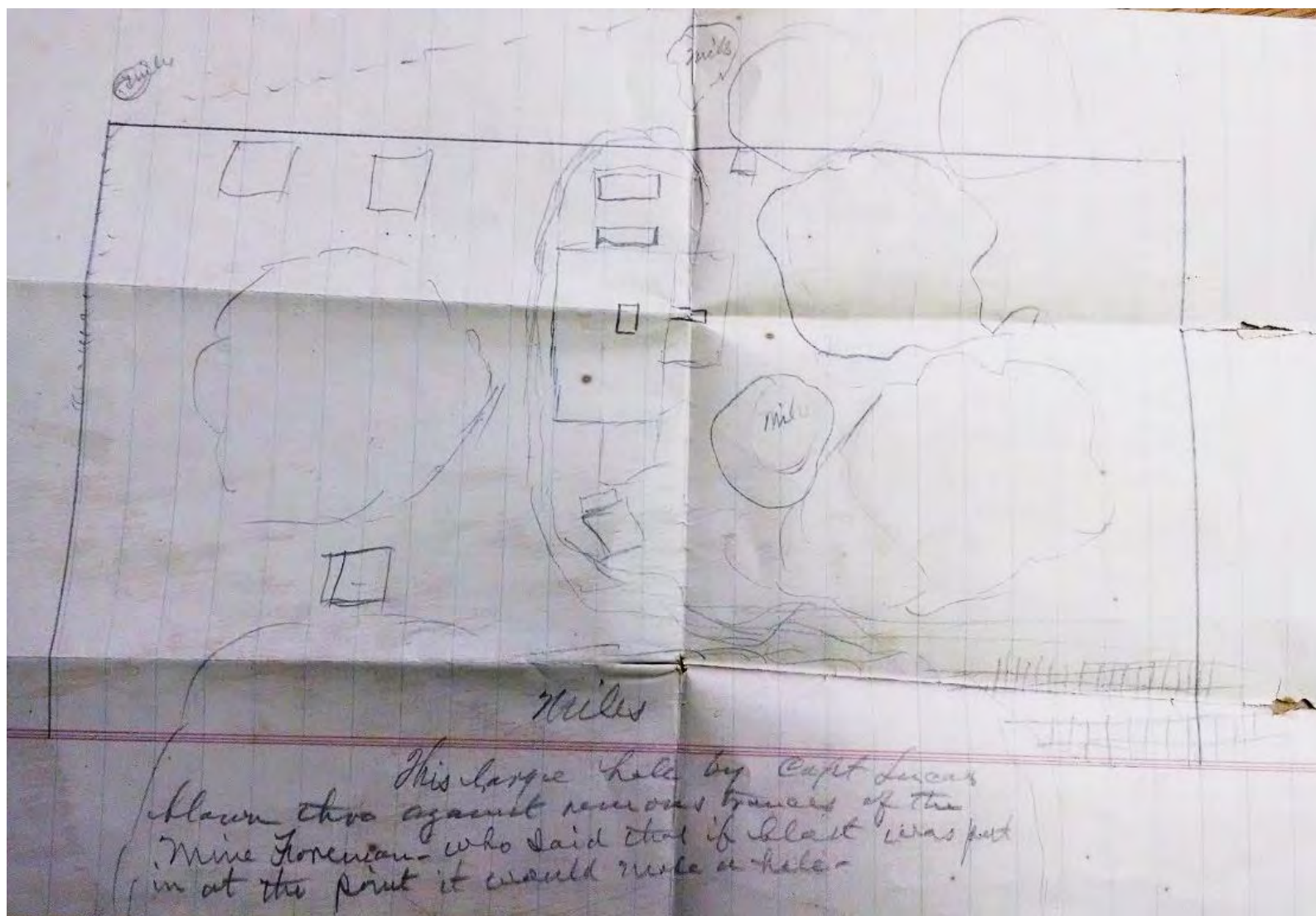
Dudley Avery  
Photograph provided by Dr. Shane Bernard.

Lucas' efforts to save the first Avery Island Mine were ultimately futile. On August 9, 1895, the Avery Island Mine suffered a significant cave-in, and a sinkhole formed over a production panel that damaged the rail spur on which product was sent out to market. A photograph of the damage is provided in Figure 5.

A week later, Dudley Avery, who represented the Avery family, filed a suit in the district court in New Orleans (soon thereafter moved to the Federal Circuit Court) against Gustave and Solomon Ranger, the principals of the American Salt Company and its successor (the New Iberia Salt Company), from whom Myles & Company had subleased the mine. The Avery family sued to terminate the lease and for damages that amounted to \$325,250. Myles & Company was not directly named in the lawsuit, although a contemporary sketch map of sinkholes around the shaft house by Dudley Avery (which is provided in Figure 6) includes notes confirming that Dudley Avery believed that Myles & Company and Lucas were responsible for the 1895 sinkholes.



**Figure 5.** Early Photographs of the Avery Island Salt Works and Mine Cave-In [Library of Congress, 2013; Lucas, 1896; and Harris, 1908].



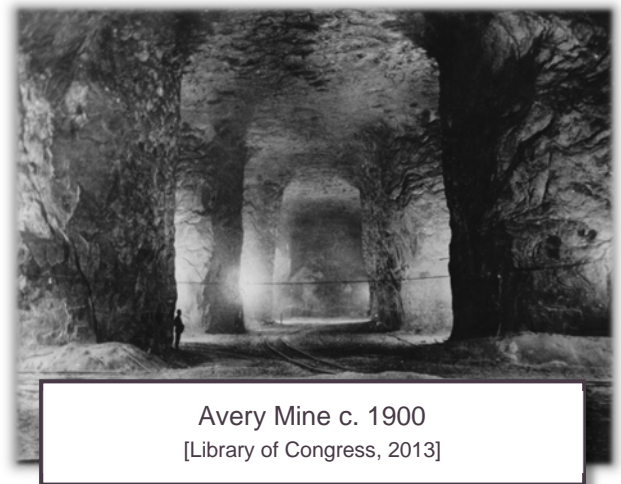
**Figure 6.** Sketch by Dudley Avery (Circa 1895) Showing Specific Sinkholes Alleged to Be Created by Myles & Company. Note reads “This large hole by Captain Lucas blown thru against remonstrances of the Mine Foreman – who said that if blast was put in at the point it would make a hole.”

Nonetheless, the matter was ultimately settled out of court, and Myles & Company appears to have remained in tolerable standing of the Avery family. Myles & Company held onto their sublease of the mine at least until July 31, 1896, when a settlement was negotiated between the New Iberia Salt Company and the Avery family. Lucas stayed in his residence on Avery Island at least through April 1896 and apparently maintained his business relationship with Myles & Company at that time. The Myles brothers would continue to be visitors and dinner party guests at Avery Island through May 1898. That being said, there was no future for the Myles & Company at Avery Island after their lease expired on June 30, 1898.

## THE FORMATION OF THE AVERY SALT COMPANY

By September 1897, Dudley Avery had announced plans to sink a new, deeper mine shaft. No documentary evidence is available to suggest that either Myles & Company or Lucas were invited to participate in developing the new Avery Island Mine. Instead, in 1898, the Avery Rock Salt Mining Company was organized by the Avery family to resume operations at the old mine and to sink a new shaft. The new mine was developed by Edward Fuller of Scranton, Pennsylvania, and the Retsof Mining Company of New York. Shaft sinking for the new mine started in January 1899. The shaft sinkers from Scranton had to fight water in sands near the contact with the salt, summer heat, and typhoid, which was contracted by drinking water from the bayou during a drought. Finally, however, the shaft was sunk to 518 ft [Howe and Moresi, 1931], and the hoist was made operational by October 31, 1899, when Edward Fuller wrote to the attorney, Mr. J. S. Clark of Philadelphia: "I am glad to advise you that we have finally succeeded in making the shaft absolutely tight. There is no water coming in and we are satisfied that we will have no further trouble. It is absolutely watertight, the breaker is finished, and we expect within a week to commence running salt through it." Photographs of the shaft-sinking efforts and the steam hoist are provided as Figures 7 and 8.

In his 1900 paper, Lucas mentions specifically that "The Avery Salt Mining Co., formed in July 1898, by the owners of the island, upon surrender of the lease held by the last operators, Messrs. Myles & Co., has been absorbed by the Retsof Co., of New York, which is now operating this interesting property, retaining the name of the Avery Co." On the advice of Edward Fuller offered to Dudley Avery, on October 23, 1905, the Avery Island Mine was sold to the International Salt Company.



Avery Mine c. 1900  
[Library of Congress, 2013]

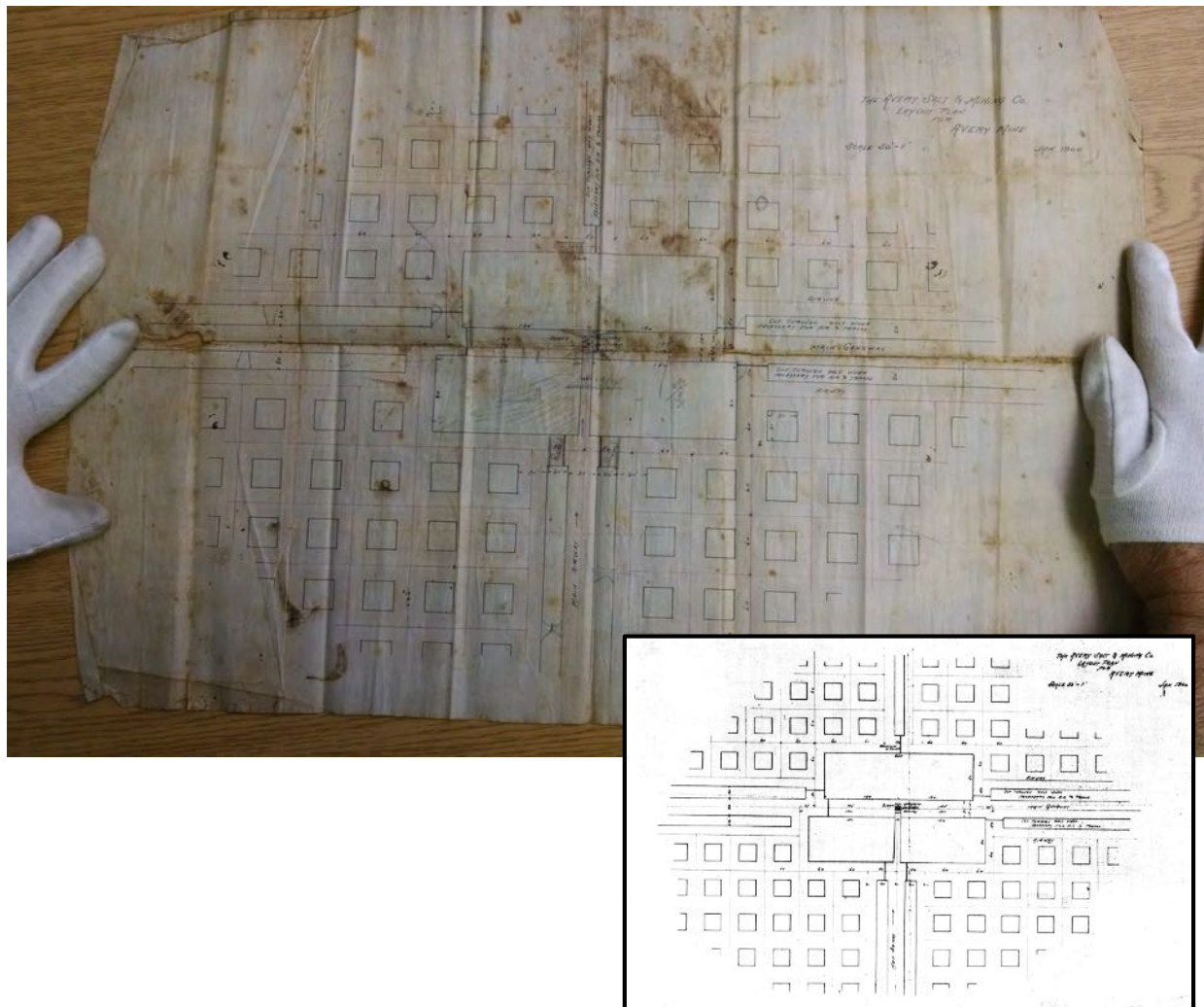
The "Steam Shaft," which was sunk in 1899 to the "500 Ft. Level" with its functional museum piece hoist, continues to serve the still-active Avery Island Mine. The shaft was protected by large pillars (Figure 9). Elongated "chain" pillars were used to keep main haul-ways open and stable. The early mine production areas were planned and developed using 30-ft rooms and pillars. This pattern is consistent with the Retsof Company's mine plan in western New York [Goodman, 2014]. This "small pillar" pattern was used at both International Salt Company-operated mines until approximately 1920 when mechanization and increased blasting efficiency necessitated increased ventilation and changing to larger pillars to accommodate efficient haulage of larger salt volumes.



**Figure 7.** Avery Island Shaft Construction, Taken March 23, 1899 [Library of Congress, 2016].



**Figure 8.** Steam Engine Hoist at Avery Island [Library of Congress, 2016].



**Figure 9.** January 1900 Avery Island Mine Plan (Courtesy of the Avery Island Inc. Archives).

In addition to changing to larger pillars around 1920, the company added ventilation shafts to both mines in 1922 [Howe and Moresi, 1931]. The change to large pillars and the air shaft at Avery Island are reflected in the mine plan as of 1925 (Figure 10).

What were Lucas and Myles & Company to do? At the beginning of the twentieth century, the Avery Island Mine was in the grasp of a powerhouse competitor: Scranton-based Edward Fuller. Soon after developing the Avery Island Mine, Fuller, who was firmly allied with the Retsof Company, merged the Retsof Company and the Avery Company into the newly formed International Salt Company. Lucas and Myles & Company would have to look beyond Avery Island to stay in the salt business.

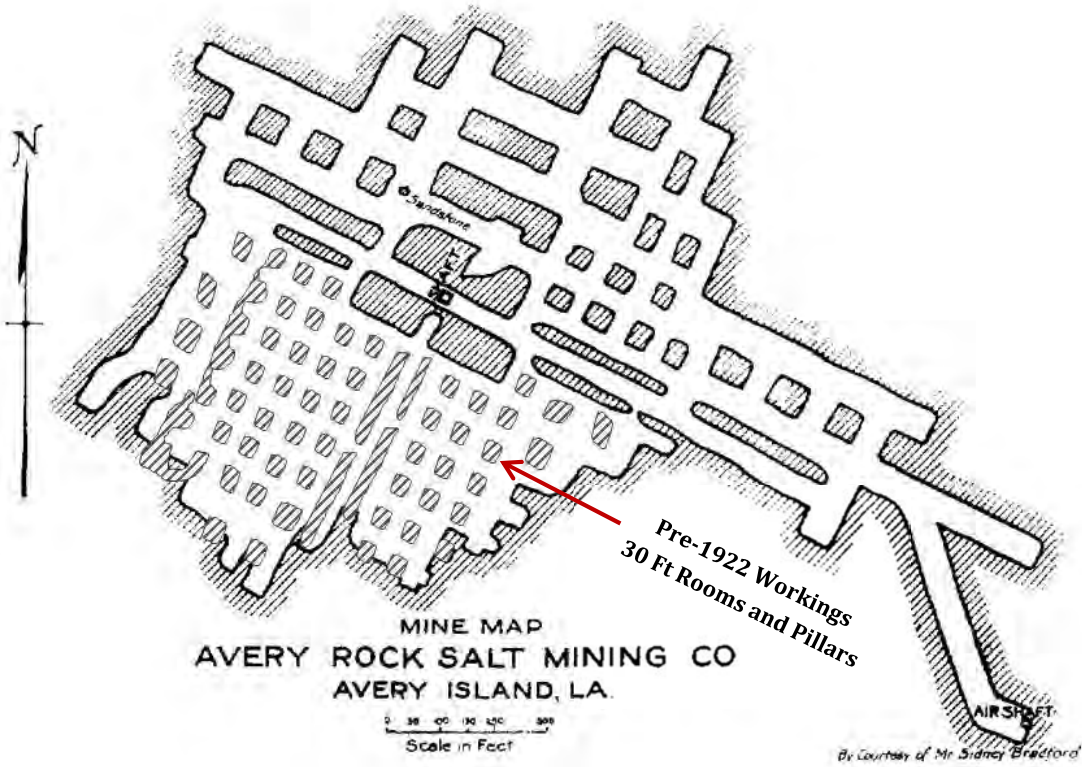


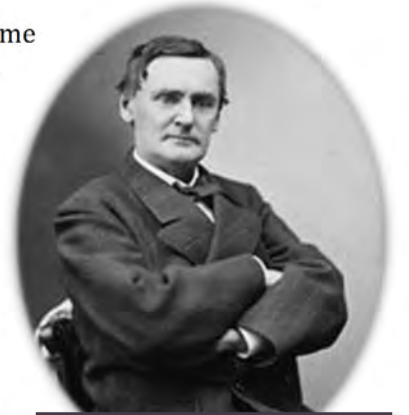
Figure 10. 1925 Avery Island Mine Plan (Modified From Vaughan [1925]).





## JEFFERSON ISLAND

While still employed by Myles & Company at Avery Island, Lucas became acquainted with Joseph Jefferson, a famous actor who owned the nearby Côte Carline “island.” A map of Côte Carline is provided in Figure 11. Jefferson’s Côte Carline had been previously known by different names (Orange Island, Miller’s Island, and Dupuy’s Island [Rickard, 1917; Howe and Moresi, 1931]), but because of his fame, the island would from the time of Jefferson’s purchase thereon be named after him.



Joseph Jefferson  
[Library of Congress, 2016]

### DEVELOPMENT OF A NEW DRILLING APPROACH

In 1894, Jefferson hired a driller to bore for water, but the contractor had been experiencing difficulties penetrating boulders and sand. “At this time, Mr. Jefferson asked me if I could see my way to help the contractor,” recalled Lucas to Rickard [1917]. “Although employed by the salt people, I accepted eagerly, and helped by introducing a method of driving the casing and succeeded in assisting the contractor to pass through the gravel bed. About 100 ft. deeper, we struck what appeared to be solid rock, but upon analysis, it proved to be an enormous bed of salt.”

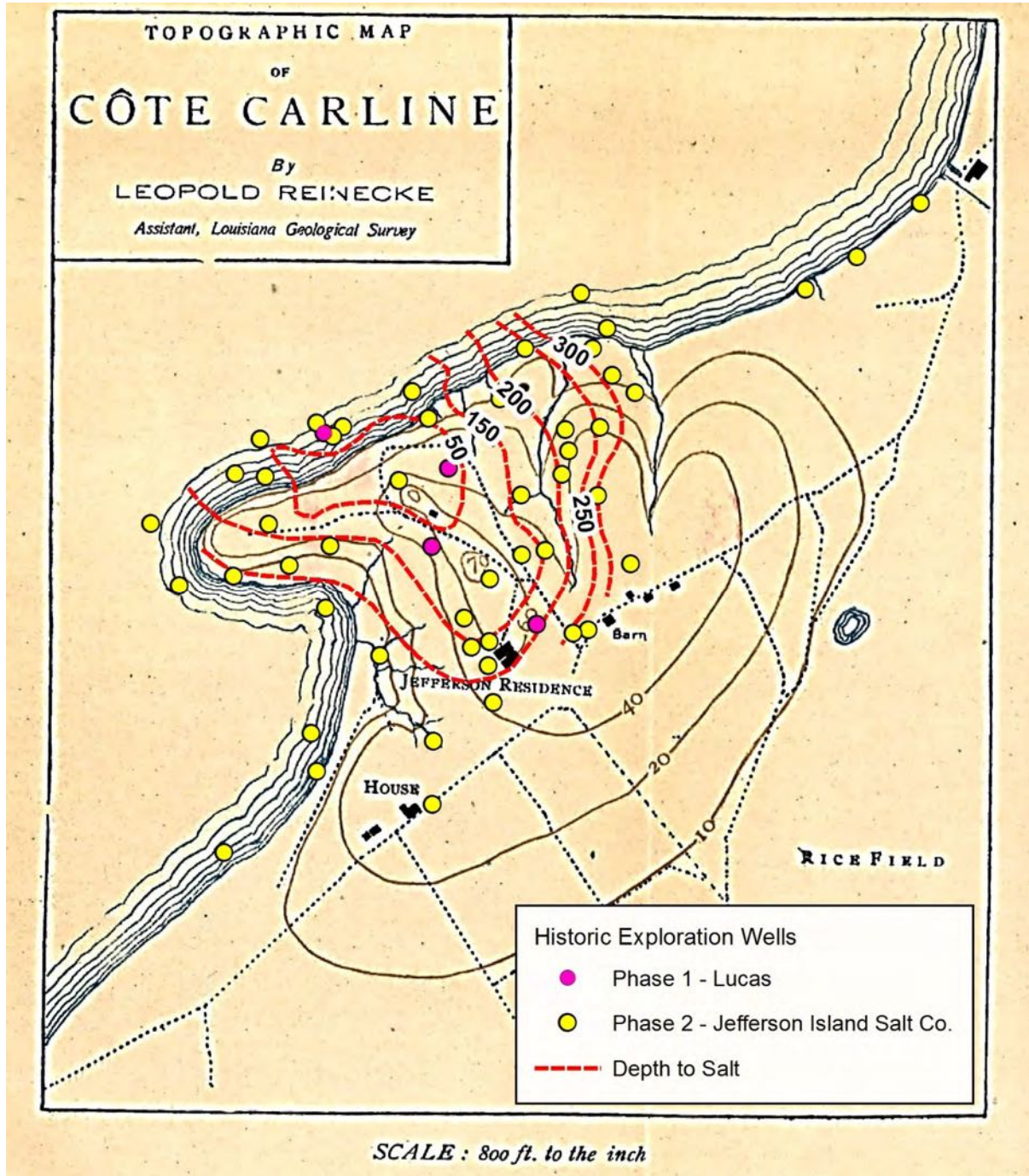
Lucas [1896] reported the salt to be discovered at a depth of 235 ft, but in his 1900 paper, Lucas cited the depth to be 290 ft. Veatch [1899] and Harris [1908] reported the depth to salt in the discovery well to be 334 ft. While which depth is accurate remains unclear, the announcement of the new discovery was made in the New Orleans *Times-Picayune* on March 30, 1895. On April 6, 1895, the *St. Martinville Weekly Messenger* reported “Captain Lucas, who is manager of the mines on Avery’s Island, told us that there is no doubt that salt has been found, that it is an excellent article, and that he believes it to be in large quantities. Capt. Lucas said he had made an examination and a report of the matter, but that this report he could not yet give out for publication. We have seen a small piece of the salt, which was given [to] Mr. L. Bazus by the engineer of the drill and Mr. Joe Landry. It is a clear beautiful piece of crystal rock, very much, so far as we can judge, like that on Avery’s Island.”

After that seminal discovery on Jefferson Island, Lucas continued to provide direction on an expanded salt exploration program during the summer of 1895. In his 1900 paper, Lucas summarized the objectives of exploration programs that were performed under his supervision as:

*The purpose of exploration is to determine for each deposit, first, the position of the nearest point to the surface; secondly, the area to which the operations of mining will be limited; thirdly, the most advantageous location for a shaft, and the nature of the ground through which it would have to pass; and fourthly (by means of cores from the diamond drill), the quality of the salt-rock in that locality.*

Lucas had to advance his exploration holes through both water-bearing, sand-rich, unconsolidated drift and into the salt. In his 1900 paper, Lucas described his overburden drilling approach at Jefferson Island as a jetting system. “A 6-inch (in) pipe was forced down with a pile-driver as far as it would go; then

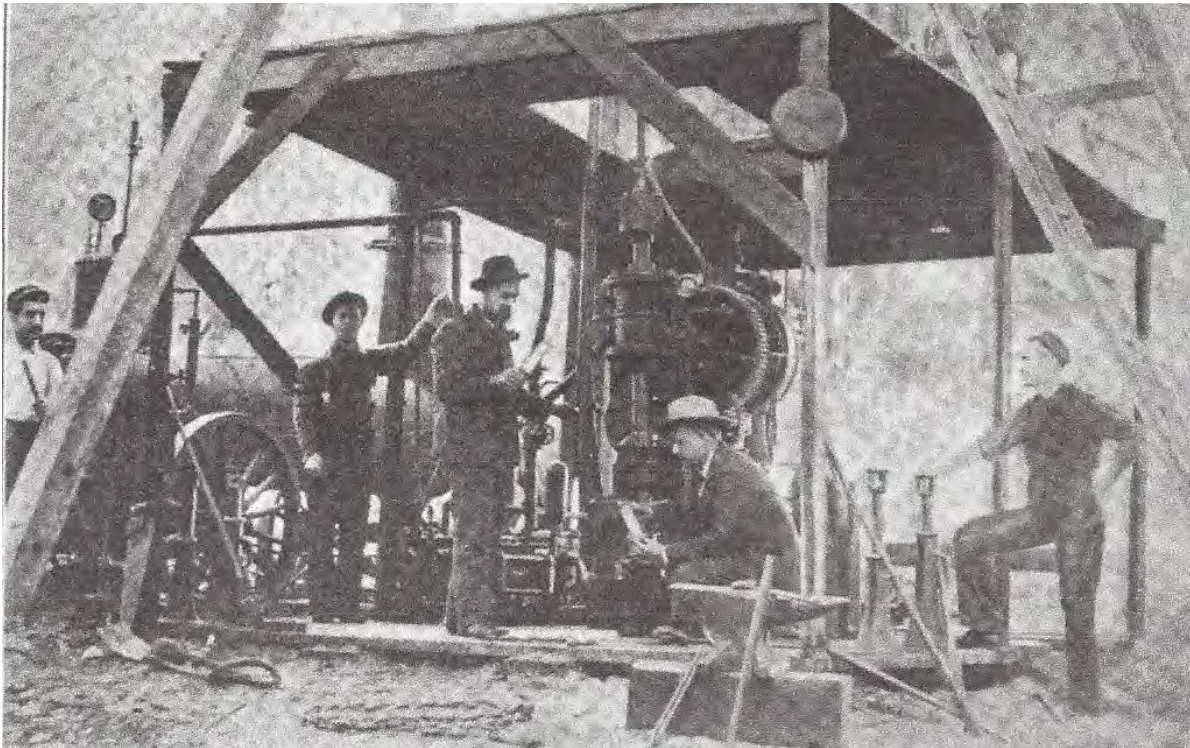
the ground below, in the axis of the pipe, was pierced with a jet from a 2-in pipe; then the lining was 'telescoped' with a 4-in pipe, driven through the 6-in pipe; and this process was repeated reducing the lining-pipe to 2.5-in diameter, until the salt was reached. This method proved slow and expensive and involved special uncertainties by reason of the impossibility of knowing exactly at what depth the salt would be encountered."



**Figure 11.** Map of Jefferson Island With Early Exploration Wells (Modified From Harris [1908] Using O'Donnell [1935] and Vaughan [1925]).

To characterize the salt at Jefferson Island, Lucas chose the best available equipment of the time. Likely at Jefferson's expense, he ordered a "Style B" diamond drill from the Sullivan Machinery Co. of Chicago which was designed specifically to extract 2-inch diameter salt core [Lucas, 1896; 1900]. Lucas cored salt using brine made from waste salt hauled from Avery Island [Rickard, 1917]. Reflecting back on the performance of his diamond drill, Lucas [1900] stated that "The diamond-drill used in these explorations...though roughly handled...required practically no repairs...This is, perhaps the more remarkable, since the water used in the drilling was saturated brine, the use of which, in this work, is necessary to prevent the diminution, by solution, of the 1 15/16-inch core obtained by drilling, and also prevent the enlargement, by the same cause, of the 2 1/2-inch hole made by the bit, and the consequent 'flapping' of the rod[s] at considerable depths."

As part of the exploration program, extending from the seminal discovery in March 1895 to April 1896, Lucas drilled eight holes that range in depth from 150 ft to 2,100 ft. Four of those holes reached salt (see Figure 11). Lucas reported depths to salt in those holes as ranging between 90 ft and 400 ft. In his deepest hole that was still in salt at total depth (TD) of 2,100 ft, Lucas noted that salt was found at 235 ft, "so that there is known to exist 1,865 ft. of pure salt crystals without the slightest appearance of interruption by any foreign substance." Figure 12 is a photograph of Lucas and Jefferson examining core from the exploration drilling.



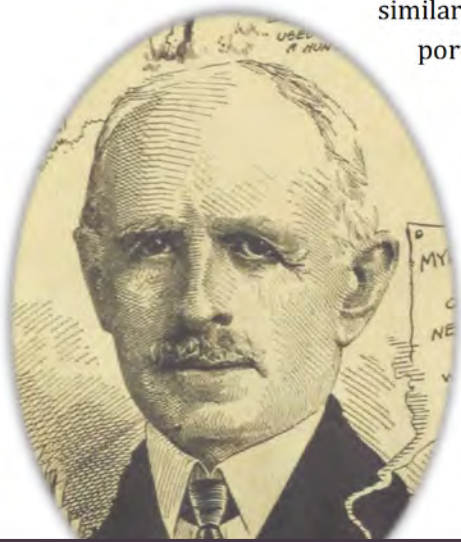
**Figure 12.** Lucas (in Foreground) and Jefferson (Standing in Center) Examining Core From Jefferson Island in 1896 [Rickard, 1917].

Lucas [1896] concluded his report on the Avery Island and Jefferson Island salt deposits with the following advice: "The geological conditions in which the salt is found and the experiences at Avery Island

salt mines shows that the work of opening a new mine on Orange Island should be entrusted to a careful mining engineer, who must make a critical study of the cause and effects of the failure at Avery Island and then profit by the mistakes there made." Who better than Lucas to serve in that capacity?

## PRE-POSITIONING FOR AN UNREALIZED OPPORTUNITY

Lucas was still employed by Myles & Company, which was operating the troubled mine at Avery Island, during the Jefferson Island exploration program. A nexus between Jefferson Island and the Myles brothers (Frederick F. and Beverly B.) had existed for some time; the Myles' revered Jefferson Island as a hunting spot for fowl and attended dinner parties there. Furthermore, Frederick F. Myles, then the President of Myles & Company, assisted in selling Jefferson Island after Joe Jefferson's death in 1905. Given the failing condition of the Avery Island Mine, Myles & Company may have considered Lucas' salt exploration work on Jefferson Island as being in the company's best interest. By 1895, there was sufficient appreciation that similarity in physiography between Avery Island and the other "islands" portended the presence of salt deposits beneath them.



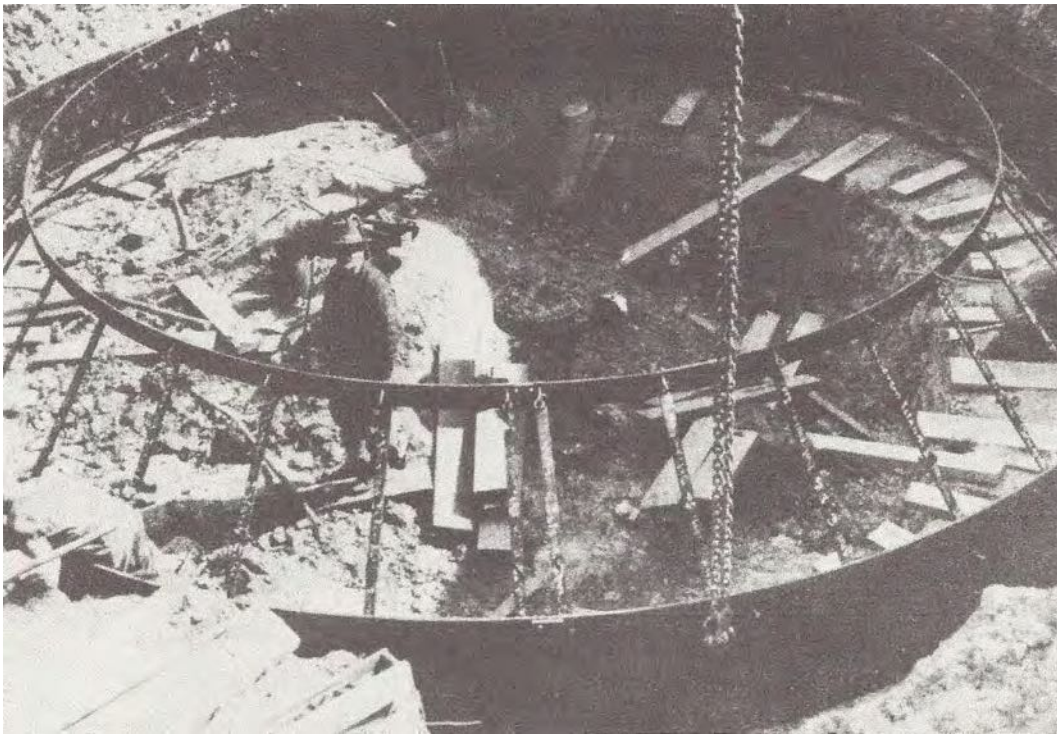
B. B. Myles, Myles Salt Company  
[Patrick, 1917]

Surely, the Myles brothers must have been positioning themselves to develop the salt resources beneath Jefferson Island through a lease relationship with Joseph Jefferson. After all, Myles & Company permitted its own mine superintendent (Lucas) to supervise the exploration program. No documentation has yet been found that proves who actually financed the program (beyond the likely purchase of the diamond drill by Jefferson), but it is certainly reasonable to suspect that Myles & Company may have financed the exploration. By the summer of 1895, Myles & Company had been making a name for itself in New Orleans by marketing specialty products (e.g., perfumed bath salts, pepper salt, celery salt, and premium table salt), but its ability to mine the raw salt feedstock at Avery Island was in jeopardy because of a severe mine cave-in during August 1895.

The demise of the first Avery Island Mine and the ensuing litigation over property damage and financial losses unfolded before Joseph Jefferson's eyes, and Jefferson likely did not want to see the same mining impacts affect his picturesque oasis at Jefferson Island. The expense associated with sinking a shaft through water-bearing sands atop salt could have also been a concern to Jefferson. Furthermore, Lucas' shipment of salt from Avery Island to produce brine for drilling led some locals to claim that he was deceiving Jefferson about the salt beneath his island (salting the mine, so to speak) [McBeth, 1918]. Despite the promising findings from Lucas' exploration program, Jefferson decided to leave the untapped salt resources on his namesake island to his heirs. Therefore, Lucas would not get the opportunity to sink the shaft and develop the mine, and Myles & Company would not get the opportunity to operate a Jefferson Island mine to replace the Avery Island Mine.

Reflecting back on his work at Jefferson Island, Lucas expressed his disappointment to Rickard [1917] that Jefferson stopped his exploration program when he did. Even though Jefferson allowed one hole to be drilled to 2,100 ft (still in salt), Lucas wanted to go deeper. Lucas lamented Jefferson stopping him at that depth and thereby “balking a possible study in geology, for I wanted to learn on which geological formation this salt was resting.” As of the 1890s, the true anatomy of Gulf Coast salt domes was still not fully understood. The thinking by some scientific-minded individuals at the time (apparently including Lucas) was that the salt deposits were part of a bedded stratigraphic sequence (despite recognition of their undulating upper surface and their near-vertical internal folding at Avery Island).

It would not be until about 1917, after Jefferson had passed away, that his heirs would sell the island to Kentucky businessman John L. Bayless, Sr., who formed the Jefferson Island Salt Mining Company in 1919 with Lawrence Jones, Sr. and Warner L. Jones [Diamond Crystal Salt Company, 1961]. The new company proceeded to conduct further drilling spearheaded by Thomas Moore of Houston, Texas, in 1919 and, based thereon, to sink a shaft that was 25 ft in diameter, circular, concrete-lined, and roughly 900 ft deep, as shown in Figure 13 [Vaughan, 1925; Diamond Crystal Salt Company, 1961].

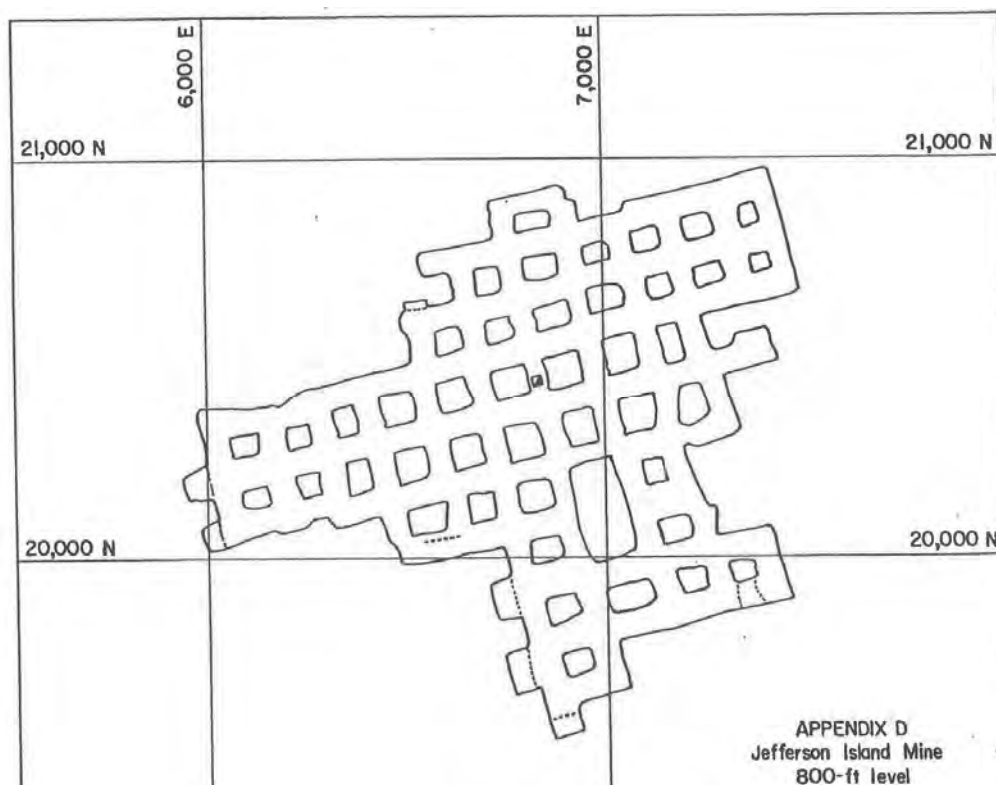


**Figure 13.** The 1919 Start of Shaft Construction at Jefferson Island [Diamond Crystal Salt Company, 1961].

A 2-ft thick shaft liner that consisted of asphalt-coated steel and concrete was installed. Figure 13 shows the start of the shaft sinking and steel liner. The shaft and buildings were constructed under the supervision of W. H. Tibbets. Salt production at the 800-ft level commenced in April 1923 [Howe and Moresi, 1931]. Figure 14 shows the shaft house in 1938, and Figure 15 shows a mine plan of the 800 level that was mined via large pillars from 1923 to approximately 1940 [Nichols et al., 1981]. Lucas passed away in September 1921, which was approximately 1½ years before the benefits of his early work at Jefferson Island would be realized through commercial salt production.



**Figure 14.** Shaft House at Jefferson Island.



**Figure 15.** Jefferson Island 800-Level Mine Plan (1923-1940) [Nichols et al., 1981].

## BELLE ISLE

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By late 1896, the business relationship between Lucas and Myles & Company appears to have started transitioning from collaborative to competitive. Because the recent find on Jefferson Island would, for the time, remain undeveloped despite the deteriorating conditions in the Avery Island Mine, Myles & Company had to act quickly to develop a new source of salt, preferably with Lucas' assistance.

The waning months of 1896 and the first 6 months of 1897 were certainly marked by intense interest in developing salt mines in Louisiana; as a consequence, demand peaked for Lucas' unequalled blend of salt mining experience and skill in exploration drilling. During this period, Lucas took part in two somewhat simultaneous drilling investigations: one at Belle Isle and one on Weeks Island. These exploration programs were conducted for competing interests—Mr. Withers at Belle Isle and Myles & Company at Weeks Island. Lucas took a financial stake in the development project at Belle Isle likely to the consternation of Myles & Company, who Lucas was more or less contemporaneously supporting on the competing project at Weeks Island.

### DRILLING FOR AN INTEREST

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According to vintage local newspaper articles, Mr. R. S. Withers, the owner of Belle Isle, visited Avery Island in July 1896 and proposed to Lucas that he should explore Belle Isle. A map of Belle Isle is provided in Figure 16. In exchange for conducting the exploration at his own cost, Lucas would receive an interest in all of the minerals discovered by him there. Lucas accepted the proposition and, after visiting Belle Isle and studying the nature and geologic characteristics of the island, started exploration in November 1896.

Having learned from his drilling experiences at Jefferson Island, Lucas improved his approach to advancing exploratory borings through the water-bearing sediments to the top of salt. As he recorded in his 1900 paper:

*In exploring Belle Isle and Grand Côte, the deposit was sounded by a more effective and economical method of sinking through drift-sand. A 4- or 6-inch pipe, with a simple cutter (made by 'ragging' the edge of a sleeve) at the lower end, is driven downward with a constantly revolving motion, while water is forced through it by means of a 'circulating-pump,' connected by hose with a 'wet swivel' at the top of the pipe. When necessary to add a new length of pipe, the length already in place is left to rest on the 'slip-tongues' against the sleeves, and (care being taken to make sure that the connections involved are in proper condition and clean) the swivel is quickly unscrewed from the standing pipe, and a new length, already provided at its top with a swivel and hose-connection to the pump, is screwed in; after which, the pump, which has been slacked for a moment, resumes its normal work. It is highly important that this operation should be rapidly performed, as a stoppage or prolonged diminution of the water-pressure in the hole may permit the caving of sand and muck, choking the circulation.*

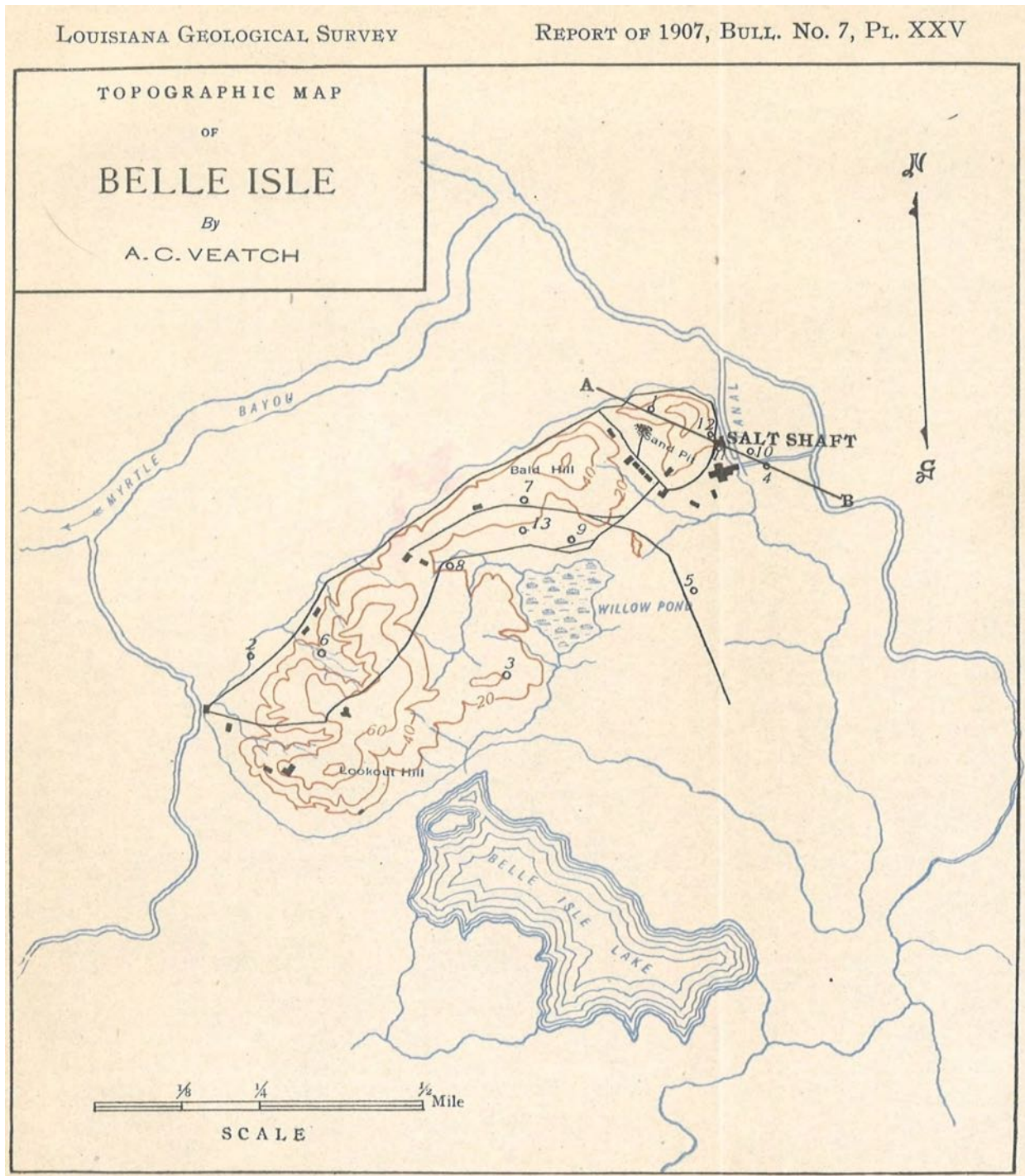
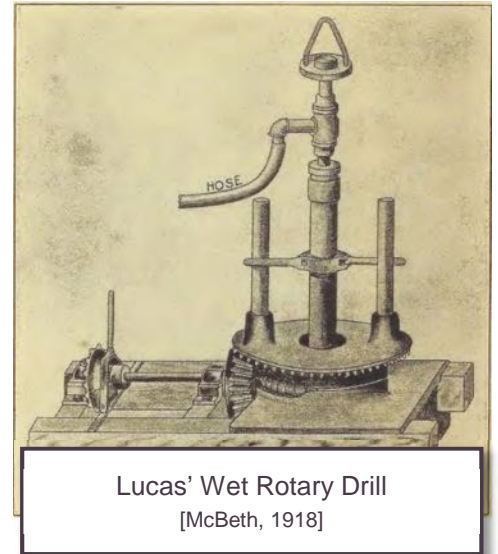


Figure 16. Map of Belle Isle and Early Exploration Wells [Veatch, 1899].



## DISCOVERY OF SALT DOME OIL

For coring to assess the purity of the salt, Lucas received approval from Joe Jefferson to use his reliable Sullivan Machinery “Style B” diamond drill. Lucas drilled four wells at Belle Isle by February 1897 and not only discovered salt but a deposit of sulfur and some oil as well. Lucas [1900] recounted that the unconsolidated materials overlying the salt beneath the southeastern part of the island were heavily impregnated with petroleum. As Lucas recounted to Rickard [1917], “The first well was a miss; the second well penetrated a 66-ft. bed of sulfur, and below that I discovered the matrix of a salt dome. By further boring I encountered oil-sand at 115 ft., and deeper down, at about 800 ft., I discovered a strong flow of petroleum gas. Resting there, I completed my contract, and acquired title to one-half of the mineral resources of the island.”



The locations of the four holes drilled by Lucas are shown on the map in Figure 17. The small, four-well exploration program at Belle Isle was a watershed moment in Lucas’ career. There, Lucas first discovered the association of sulfur, natural gas, and petroleum with Gulf Coast “islands,” which are the small inland hills that portended the presence of the salt domes. His interests in oil and sulfur were, thus, born at Belle Isle, and his new interests subordinated to second rank his commitment to developing salt mines, much to the dissatisfaction of those who relied so heavily on him for his skills as a mining engineer, mine superintendent, and salt explorationist.

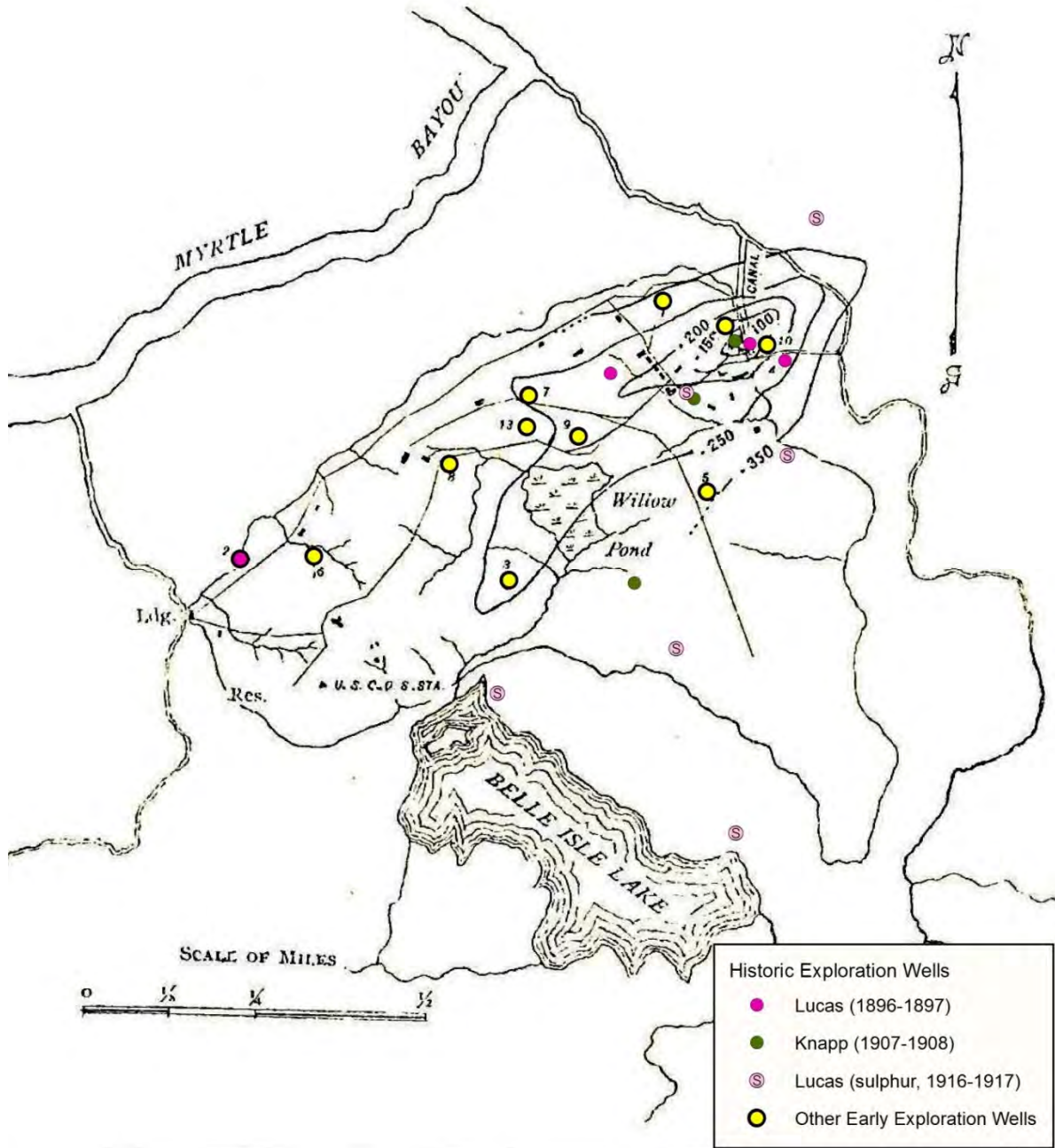
Nonetheless, those parties whose primary interest was salt were enthralled by the findings from Lucas’ exploration program at Belle Isle. Not since cotton baron Solomon Ranger of New York bailed his brother Gustave’s Avery Island Mine operation out of receivership in 1888 [Goodman, 2014] would the Louisiana salt industry see such an infusion of northern capital.

## MINE DEVELOPMENT CHALLENGES

The Gulf Company, which was presided over by Mr. C. B. Wiser, was formed by Chicago capitalists to undertake the sinking of the shaft for a new Belle Isle Mine. The Gulf Company drilled 13 additional exploration holes in 1898 to build on Lucas’ findings (see Figure 17). An early cross section of the dome that was published by Veatch [1899] and based on the combined Lucas and Gulf Company drilling programs is shown in Figure 18.

Everything was looking favorable at Belle Isle. Viewing Louisiana’s potential in the US market and Belle Isle’s specifically, Wiser is quoted as follows in an April 30, 1899, article in the Wilmington Messenger:

*There are 15,000,000 barrels of salt consumed in the United States every year. The consumption of salt and sugar is about the same; that is, one bushel per person. So far, the south has produced very little of the enormous salt production, the output amounting to about 20,000 to 25,000 barrels out of the 15,000,000 barrels consumed in the United States*

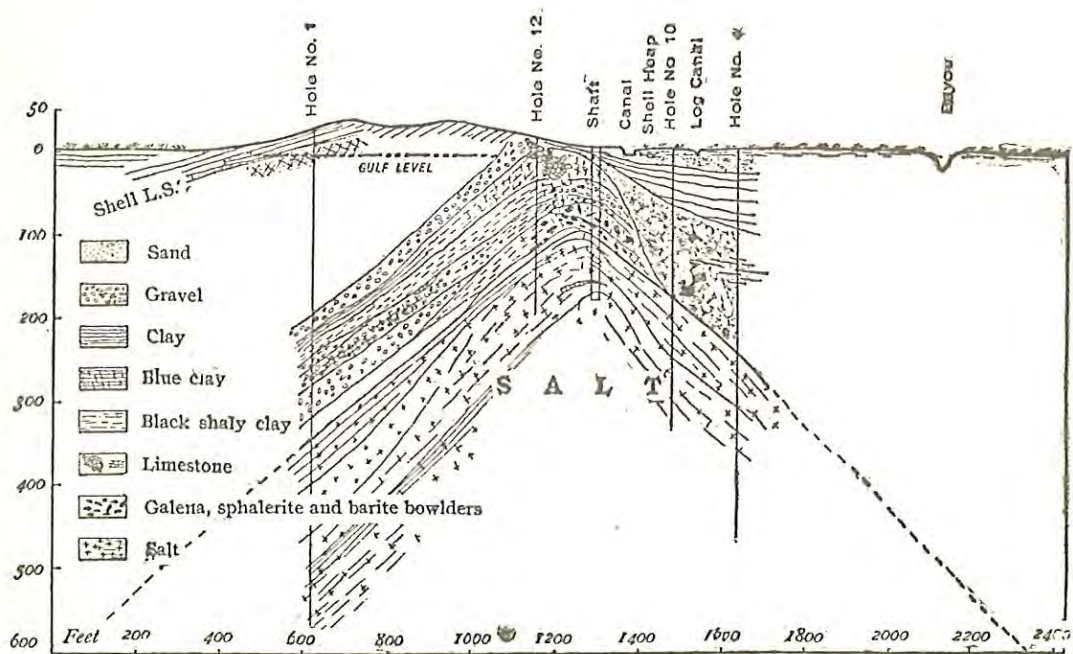


**Figure 17.** Contour Map of Depth to Salt at Belle Isle [Veatch 1899]. Salt contours were based on the Lucas and Gulf Company exploration programs that were completed in 1897 and 1898 and led to the first mine shaft sinking.

annually. It was for the purpose of getting into this great undeveloped field that this company of Chicago capitalists got together and took possession of the salt mines at Belle Isle.

The output will be about 500 tons a day. We have already spent \$150,000 in sinking the shafts and in getting ready for operations at Belle Isle, and we will spend, perhaps, almost that much more in the completion of the great plant which Louisiana will soon possess. I do not hesitate to say that the state of Louisiana will have the best salt mine in the country for several reasons, one of which is the water transportation which is available and which we will utilize to its fullest extent. The largest salt mines in the United States are today at Retsof, New York state, where the production amounts to 250,000 tons per year. Then there are two good mines in the state of Kansas, but they are not so extensive. The Retsof salt, however, in the matter of quality cannot be compared to the Louisiana Belle Isle product. The salt at Retsof has a dirty, dingy appearance; the Belle Isle salt is as white as snow, and it is almost chemically pure.

The salt industry is destined to become one of the greatest industries in the state of Louisiana, and in a short time the once unprofitable, unsalable Belle Isle will hold the key to the salt situation in the United States. It is our full intention to supplant a great portion of the English salt now coming to the United States. One of our first aims is to knock out this salt importation as much as possible. I believe all the salt we need can be mined and furnished from our home industries, and we are determined to do it. We are now arranging to put in an evaporation plant to make a fine table salt and the highest grades of the product. In the market this finer salt is called evaporated. The water transportation will enable us to compete with everything in the country. We are going to do all our shipping by schooners and steam vessels.

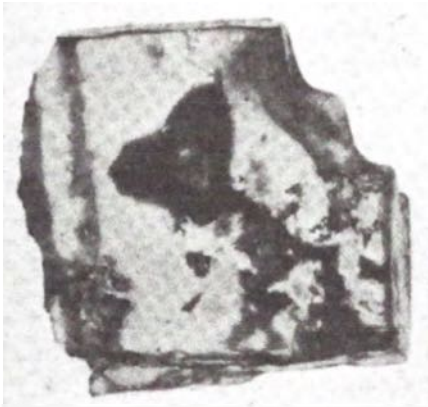


**Figure 18.** Cross Section A-B of the Belle Isle Salt Dome Based on the Lucas and Gulf Company Drilling Programs [Veatch, 1899].

That's quite a bit of braggadocio for sure. After all, Belle Isle salt at depth appeared to be every bit as good as, if not better than, the salt at Avery Island, and the local access to open water was a notable advantage for Belle Isle. However, the efforts to develop and operate the first mine there provide a remarkable reminder that nothing is guaranteed in the mining business.

Whereas Lucas went on to great success in the years following his Belle Isle exploration, the developers of the first salt mine faced challenge after challenge. First, land ownership was disputed in court. A lawsuit over ownership of Belle Isle was filed in July 1898 by the heirs of Francois Gonsoulin, who claimed to be the island's actual owners as recognized by the US Land Commissioners in 1875. That litigation did not end until late November 1901, with a decision in favor of the salt company.

Lucas visited the site in November 1898 to see how early shaft-sinking efforts were proceeding. Salt was reached in the 16-ft-diameter shaft at 112 ft in March 1899. Except for two fatal falls by workers in the shaft in April 1899, early work on the mine project proceeded smoothly while the land ownership litigation continued. By May, the shaft was down 175 ft [Veatch, 1899], but the salt was not as pure as salt that was seen in cores at depth. As Lucas described to Rickard [1917], "this particular salt was unmarketable because it was impregnated with oil and gas. In bailing out the salt-cuttings and dumping them on the floor, they would explode like popcorn. This was caused by the sudden liberation of gas coming in contact with the air. In my exploration of the various salt deposits of the Coastal Plain this was my only experience of the kind."



Crystal of Salt Showing  
Inclusion of Oil and Gas  
[Lucas, 1917]

The shaft had to go deeper, not only to get beyond the "onion-skin" layer of salt, but to ensure a stable, long-term mining operation. Lucas had already explicitly stated in published accounts that the shallow mine at Avery Island was caving in, because the borings that were completed there in the 1860s were inadequate to map the undulating relief on the top-of-salt surface. In his 1900 paper, Lucas recommended that new mine shafts "should be sunk at least 200 or 300 feet into the salt deposit." To advance through impure salt and to create a solid, stable roof for the Belle Isle Mine, the shaft had to go deeper.

Planning and constructing the new mine continued while the land ownership lawsuit played out. The Gulf Company was spending its cash at a remarkable pace. Acquiring vessels for salt transport by water, putting up plant buildings and tenant houses, and sinking the shaft rapidly depleted their financial resources, so additional capital was required. That infusion of capital was provided by Charles H. Randle and Fielding A. Randle of Alton, Illinois, sometime in late 1898 or early 1899. C. H. Randle became the new president of the company, and C. B. Wisner transitioned to general manager and maintained responsibility for the ongoing mine construction.

Lucas [1899] spoke glowingly about the Gulf Company's operation on Belle Isle in his paper on Louisiana rock salt that was presented to the American Institute of Mining Engineers in September 1899:

*Its plant is well advanced, and, having been executed with the aid of ample means, embodies, both above and underground, the best arrangements and devices that can be adopted by a skillful and far-sighted management for the production and handling of a large tonnage. A spacious canal has been cut, through which large steamboats can come directly to the great warehouse, so that steamers and barges can be mechanically loaded. As the main shaft is only 500 feet from the warehouse, the facilities for cheaply handling a large output are evidently complete. The shaft, which has three compartments, is now 400 feet deep, or 305 feet in solid and pure rock-salt; and the hoisting machinery is of adequately large capacity. The mill is nearly finished, as is likewise a large evaporating-plant, to be used in enabling the company (aided by its proximity to New Orleans) to compete with imported evaporated salt. The plant comprises also a barrel-factory, saw-mill, large electric plant, barges, and a number of steamboats, one of which is larger than any on the Mississippi.*

The New Orleans *Time-Picayune* reported that the Gulf Company shipped its first cargo of salt from the new Belle Isle Mine during the first week of October 1899. Several car loads of salt were headed to New Orleans and Nashville.

Just when things seemed to be going perfectly for the Belle Isle Mine, catastrophe struck. As reported in a December 13, 1899, article in *The Weekly Iberian*, “We learn that a few days ago after a blast in the salt mines at Belle Isle the water came pouring in so rapidly that workmen had to rush to the shaft elevator for safety, and ascend to the top. The mine is 410 feet deep, and the water is within 75 feet of the top. It is said pumps will be used to clean out the water.”

Lucas’ assessment of the mine-flooding event as conveyed to Rickard [1917] was as follows:

*They [the miners] started driving toward the interior of the deposit, searching for purer salt. When I heard what they were doing, I telegraphed at once asking if the drift was in the right direction, and if they had sounded with a diamond-drill in that direction.*

*Unfortunately, the next news was that they had passed through the salt and had penetrated quicksand. The mire of the marshes drove them out and they barely had time to save the men, thus losing the first shaft. It proved afterward that the salt in this locality formed a depression, 500 ft. westward, although it was connected to the main dome.*

As if the mine flooding were not bad enough, fire struck the surface facilities in late January 1900. As reported in a January 30, 1900, article in the *Times-Picayune*, “a disastrous fire at Belle Isle [occurred] early Sunday morning, just before day, in which the saw mill, the tool house and the boiler house, belonging to the Gulf Company, the Chicago concern owning the salt works at Belle Isle, were totally destroyed. The origin of the fire is unknown.” Fortunately, insurance covered the damages from the fire, and the buildings were quickly rebuilt.

Dealing with the mine flooding was a more enduring challenge. In an attempt to remove the water from the mine, a plan was developed to pump the water level down as far as possible (water eventually rose in the shaft to within 50 ft of the surface), freeze the water around the damaged drift, and then excavate the mass of ice up to the leak source, and dam it off with a masonry wall. Freezing expert William Sooy Smith was brought in to perform the task. The *Times-Picayne* described the plan as involving “the sinking of pipes across the chamber, possible two or three different rows, several feet apart. The original pipe is a

large one, say 8 inches. Then a smaller one is inserted, but it does not extend quite to the bottom. Then a chemical process of freezing is introduced through these pipes just as in an ice mill, until all the substances about the shaft are frozen hard. In this way the gush of water could be stopped and a wall of masonry put it.”

The anticipated time for the freezing to take place was 3 months. In the interim, Sooy Smith conducted additional exploratory work to refine the mapping of the top of salt and select a new shaft site. Officers of the Illinois Trust and Savings Bank visited the mine and stepped in to help the Gulf Company recover from both the fire and the mine leak with additional funding. Ultimately, the decision was made to sink a new shaft. During the process of selecting a new shaft location, the Gulf Company began its evaporation plant and, using brine from the flooded mine as feedstock, produced salt by mid-May of 1900.

## A SECOND SHAFT ATTEMPT

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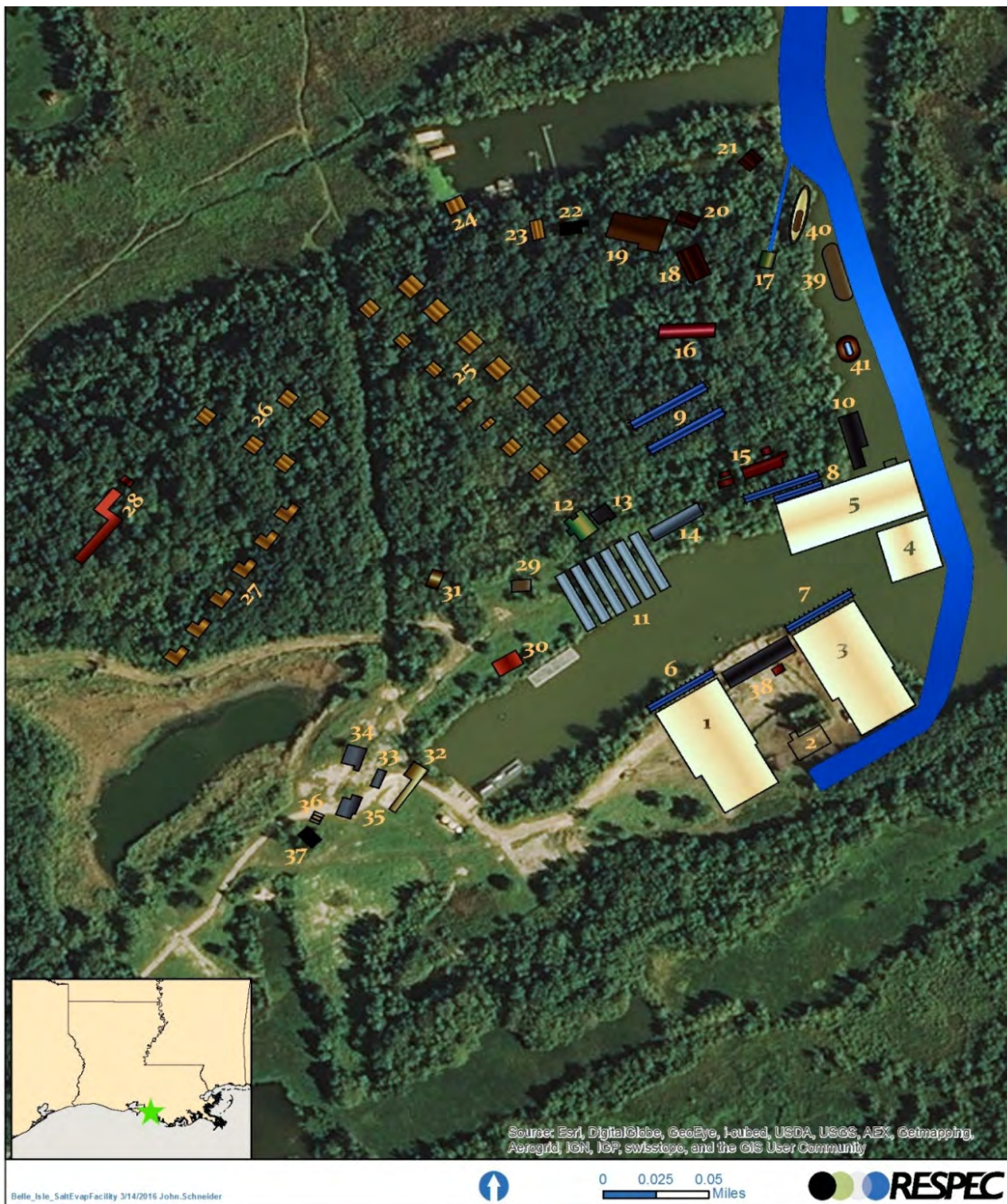
At this point, however, the Gulf Company principals decided to sell majority interest in the mine development project. A February 9, 1901, news briefs in the both *Engineering and Mining Journal* and *The Louisiana Planter and Sugar Manufacturer* reported that the controlling interest in the company had been acquired by steel and railroad magnate John W. Gates (also majority stockholder of the recently formed Texas Company) and some of his associates. Retsof Mine personnel from western New York were brought in to serve in a design-build-operate capacity. Charles Q. Freeman of the Retsof Mining Company of New York replaced C. B. Wisner as the manager, and Mr. Pratt served in the role of engineer to oversee the construction. Mr. Charles H. Root, who was also associated with the Retsof Mine, assumed responsibility for the transportation end of the Belle Isle business. During this time, the name of the company changed to American Salt Company. Lucas’ interest in the mining project was bought out for \$30,000 in bonds and \$5,000 in cash [Rickard, 1917].

Local newspapers reported that the news from Belle Isle after the sale was most encouraging. The new mining company had contracted a large volume of lumber and bricks from local merchants in August 1901. In June 1902, *The Daily Enterprise* newspaper (Beaumont, Texas) reported that “J. W. Barrett, one of the officials of the American Salt Company of Belle Isle, Louisiana, is in Beaumont today looking after some drilling material for the salt works in Louisiana.”

A map that shows the original and replacement shaft locations and the distribution of buildings that comprise the surface facilities is provided in Figure 19. The new shaft was anticipated to be constructed in 1903 in a fashion similar to that at the Retsof Mine, which was by then the largest and most successful underground salt mine in the country. A February 21, 1903, article in the *St. Martinville Weekly Messenger* quoted confident company officials as follows:

*We will be capacitated to do a greater salt mining business than any other mine in the country so soon as this shaft is through,” said Manager Freeman this morning at the Commercial Hotel. “It is no small task to put a large shaft down into the ground through quicksand, but it is one that in these modern days of engineering can be accomplished. We can then send down miners and work the salt up in large quantities just as coal is mined. We will be enabled to send salt up the Mississippi in barges and to ship it all along the*

- |        |                                   |            |                    |       |  |
|--------|-----------------------------------|------------|--------------------|-------|--|
| 1, 3-5 | Evaporation and storage buildings | 16         | Office             | 32.   | Barn and stalls                                  |
| 2      | Drying and packing house          | 17         | Dry dock           | 33-35 | Saw Mill   |
| 6-9    | Settling tanks                    | 18, 20, 21 | Laborers' quarters | 36    | Second Shaft                                     |
| 10     | Boiler house                      | 19         | Boarding house     | 37    | Electric plant and boilers.                      |
| 11     | Brick drying sheds                | 22         | Oil well           | 38    | Boiler and tall brick chimney                    |
| 12     | Store and post office             | 23-27      | Workmen's cottages | 39    | Hull of old "Osceola" used as laborers' quarters |
| 13     | Brick-making machinery            | 28         | Officers' quarters | 40    | Stern-wheel steamer in process of construction   |
| 14     | Barrel factory                    | 30         | Ovens              | 41    | First shaft; flooded.                            |
| 15     | Machine and blacksmith shop       | 311        | Barns              |       |  |



**Figure 19.** Salt Evaporation Plant and Buildings of the American Salt Company at Belle Isle (Modified From Harris [1908], originally by J. A. Pacheco, Louisiana Geological Survey).

*Atlantic coast in vessels. We can put salt directly into the ports of Mexico, Central and South America with shortest haul and at the lowest rates of transportation. Louisiana will take a front rank in salt producing States of the Union.*

*Our shaft will be completed in about ninety days," said Superintendent Barrett, "and at present the work is going on under the most favorable circumstances. The shaft is being finished under compressed air bulkheads and the men who are doing the construction are pushing the work rapidly. Our machinery and appliances are all modern and first class in every respect and when now about the middle of May we are ready to take out salt through the shaft we will have the best equipped mine in the country. The amount of salt we can take will be limited only by the demands of the market.*

The shaft-sinking crews soon ran into trouble. As described in a March 21, 1904, article in the Alton, Illinois, *Evening Telegraph* on the Belle Isle shaft, "at a depth of 98 feet, a bed of quicksand over 100 ft in depth [thickness] was encountered. At first the shaft was boxed in as the excavation proceeded and the work had progressed to a depth of 210 feet when, three weeks ago, the quicksand dropped down the sides of the framework inside the shaft and coming in at the bottoms compelled all the men to take to the bucket to save their lives. The shaft, 210 feet deep, filled up within 40 feet of the top and now all the excavating must be done over. To facilitate this work, a 100-ton ice machine was set up and the ammonia pipes run down into the quicksand to freeze it. It is hoped by the freezing process to solidify the quicksand so as to make it possible to gain on it. The situation is a most aggravating one as the shaft was within seven feet of a vein of pure crystal salt and it seems impossible to reach it."

The Retsof-style shaft, however, was never cleared. As Lucas explained to Rickard [1917]:

*I fully expected that the American Salt Company would put me in charge of their operations, but they did not make me the offer and I did not make any request. They sent a New York salt man [George Q. Freeman of Retsof] and began large operations, involving over two million dollars.*

*Unfortunately, the method of mining salt in Wyoming County, New York, was not adapted to the deposits of the Coastal Plain. They started another shaft westward, but made a series of woeful blunders. The salt did not occur so shallow there and they had to go down 276 feet before they reached it. On top of this salt they found a layer of about 30 ft. of bad quicksand through which they could not pass. They then employed an expert shaft-sinker, named Sooy-Smith, who employed a freezing process. Another unfortunate incident was that Sooy-Smith never put the brine-pipes in the salt; he stopped in this quicksand, so that when the mass was frozen, preparatory to mining, they were just as badly off and could not pass the quicksand. They spent a large sum of money, finally abandoning the effort. They then proceeded to explore for oil, and after a series of efforts gave that up.*

The filling of this second shaft with sand and water and the failure of the freezing process to seal the shaft terminated the turn-of-the-century efforts to develop a salt mine at Belle Isle, but not before significant dollars were expended.

The evaporated salt plant also failed because of the poor quality of the product. Lucas [1917] explained that thousands of tons of evaporated salt were produced, but "owing to the fact that the salt in this part of the island [where solution-mined] is much impregnated with oil and gas, it was found difficult to



crystallize it, and it was also left with rusty stains. The unconsolidated character of the of the overburden also permitted the escape of brine to the surface, which, in spots, threatened to cave; hence it soon became evident that this process would result in reducing the whole island to sea level, and salt-mining operations were therefore abandoned.”

The Belle Isle salt property soon turned into a rather eerie ghost town. As reported in a July 9, 1904, article in *The Weekly Iberian*:

*Last Sunday, July 2<sup>nd</sup>, an excursion party from Franklin and intermediate points was taken by steamboat and barge, to the island. From one of the excursionists we gathered the following information.*

*The operating company on the island has recently erected a new brick building 80 x 100 feet, by about 40 feet high, with walls about 3 bricks thick, from brick manufactured on the island by a steam plant. This building was designed for a complete drying plant for salt. Work on the building has been suspended before it was completed.*

*A battery of 16 new, large steam boilers have been put in; 8 of them are about complete and could be fired, on the other 8 the work has been stopped.*

*A tall brick smoke-stack has been erected and completed.*

*The old battery of 8 boilers is reported to have been cold for several months.*

*Quite a large village has been built of comfortable cottage homes, all openings screened. Nearly all of these are now closed and unoccupied.*

*An electric light plant was put in; a complete system of water works. These are kept in operation for the protection of the properties. Efforts were made to get good water by boring, but so far the efforts have developed only veins of water more or less salt. Consequently, the water works are supplied principally from the bayou, which is at times quite brackish.*

*Three steamboats have been tied up at the island harbor for some months.*

At the time of his visit during the spring of 1905, Harris [1908] reported:

*Everything was dormant so far as mining operations were concerned. The partially constructed boats were rotting at their wharves. The first shaft described by Veatch was marked only by a pond of water. Expensive machinery in the evaporating plants and machine shops as well as immense boilers by the score were rapidly rusting into worthless junk. The former post office and stores and houses for officers and men were in process of rapid decay.*

*On the hill to the north of this shaft, the effects of dissolving out salt from a mass overlaid by unconsolidated rock can be seen. An enormous funnel-shaped or crater-like hole in the ground now marks the place whence several thousands of tons of salt were obtained by the common method of pumping brine and evaporating it for salt. By this method that portion of the island underlaid by salt could soon be reduced to sea level and hence ruined.*

Lucas conveyed to Rickard [1917] that Belle Isle was sold at public auction and became the property of the New Orleans Mining Corporation. Vaughan [1925] reported that the New Orleans Milling and Mining Company acquired the property in 1906 and proceeded to drill two wells near the northern end of the island for oil.

## LUCAS RETURNS TO MAP BELLE ISLE

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Lucas [1917] refers to three additional oil exploration wells that were drilled in 1907–1908 under the supervision of I. N. Knapp (Figure 20). One of Knapp's wells reached a depth of 3,171 ft, with “gas pressure of over 1,000 lb encountered in the salt itself” and “rock-salt cuttings . . . [that] jump like firecrackers or popcorn” on the derrick floor [Lucas, 1918]. This presence of oil and gas in the salt and at such pressure led Lucas to conclude in his mind that hydrocarbons had originated and been forced up from a considerable depth [Lucas, 1918].



**Figure 20.** Photograph of Lucas, Driller Rattan, and Knapp Circa 1907 [McBeth, 1918].

By 1917, Lucas stated that the property had been recently acquired by a newly formed syndicate of New York capitalists who were interested in supplying sulfur for the war effort [Rickard, 1917]. During the winter of 1916–1917, Lucas directed the drilling of six wells to further explore the sulfur resources at Belle Isle on behalf of the syndicate. Although the findings of the exploration programs eliminated the prospects for economically viable sulfur mining, the additional boreholes allowed Lucas to refine his top-of-salt map (Figure 21) and cross section (Figure 22).

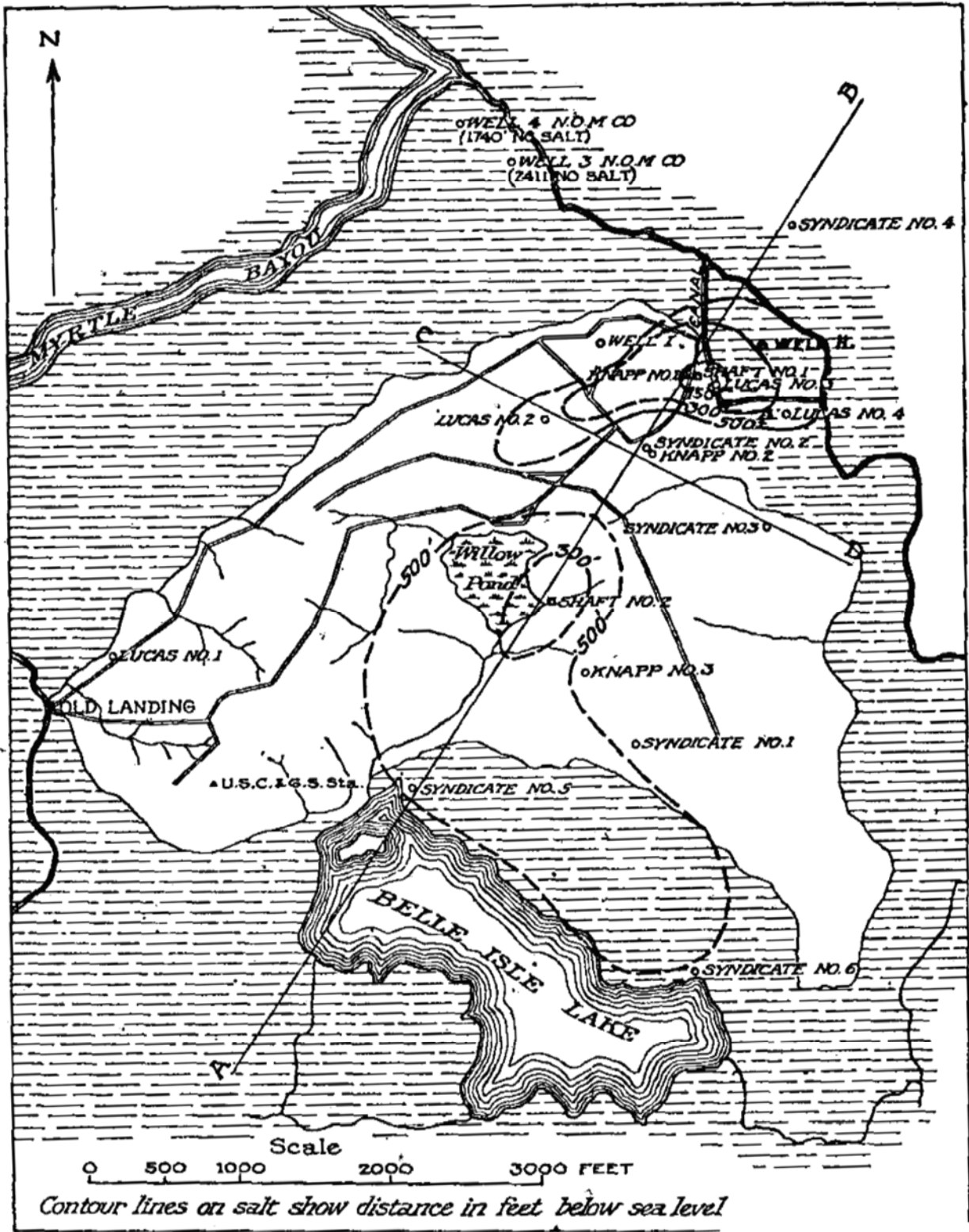


Figure 21. Salt at Belle Isle as Mapped by Lucas [1917].

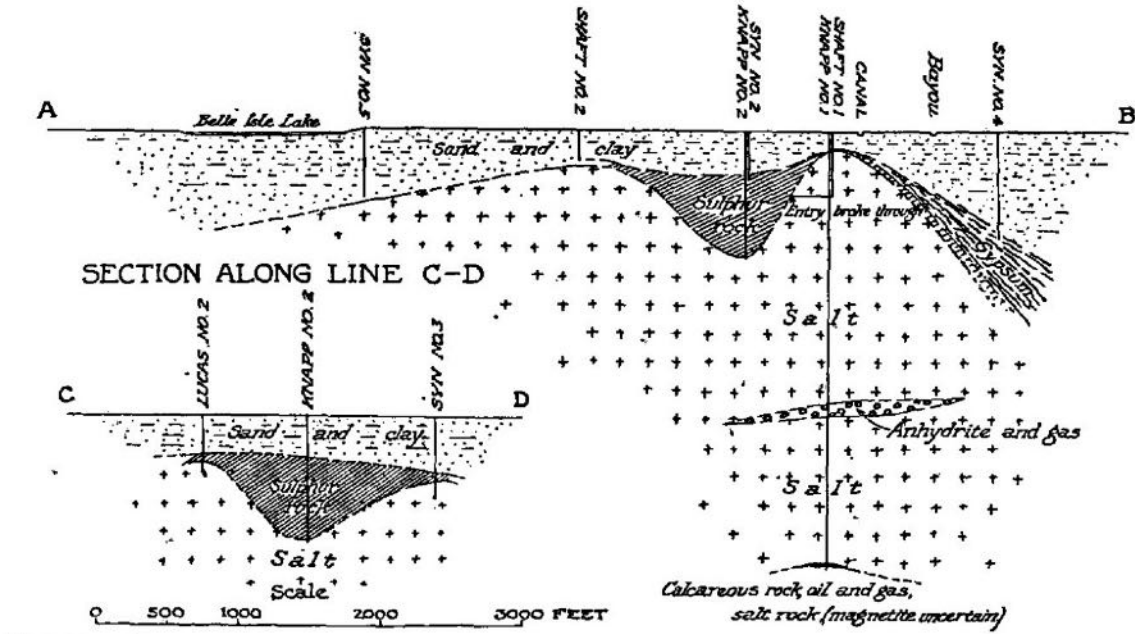


Figure 22. Cross Section of Wells at Belle Isle as Drawn by Lucas [1918].

Vaughn [1925] also makes reference to the syndicate as well as the Union Sulphur Company, which acquired the island in June 1921. The Union Sulphur Company drilled eight test wells, seven of which were completed and one of which was still in progress at the time of Vaughan’s report. Vaughan’s cross section A-B (Figures 23 and 24) was the most complete depiction of the steep northern margin of the Belle Isle salt dome at the culmination of the Lucas Era.

The Union Sulphur Company drilling activities complete the early chapter of mining and exploration at Belle Isle, of which Anthony Lucas was a major part. The next major chapter in Belle Isle mining history would not start until the early 1960s when Cargill developed its salt mine there. Site photographs of the remains of the old Belle Isle Salt Mine that were taken in 2016 are provided in Figure 25.

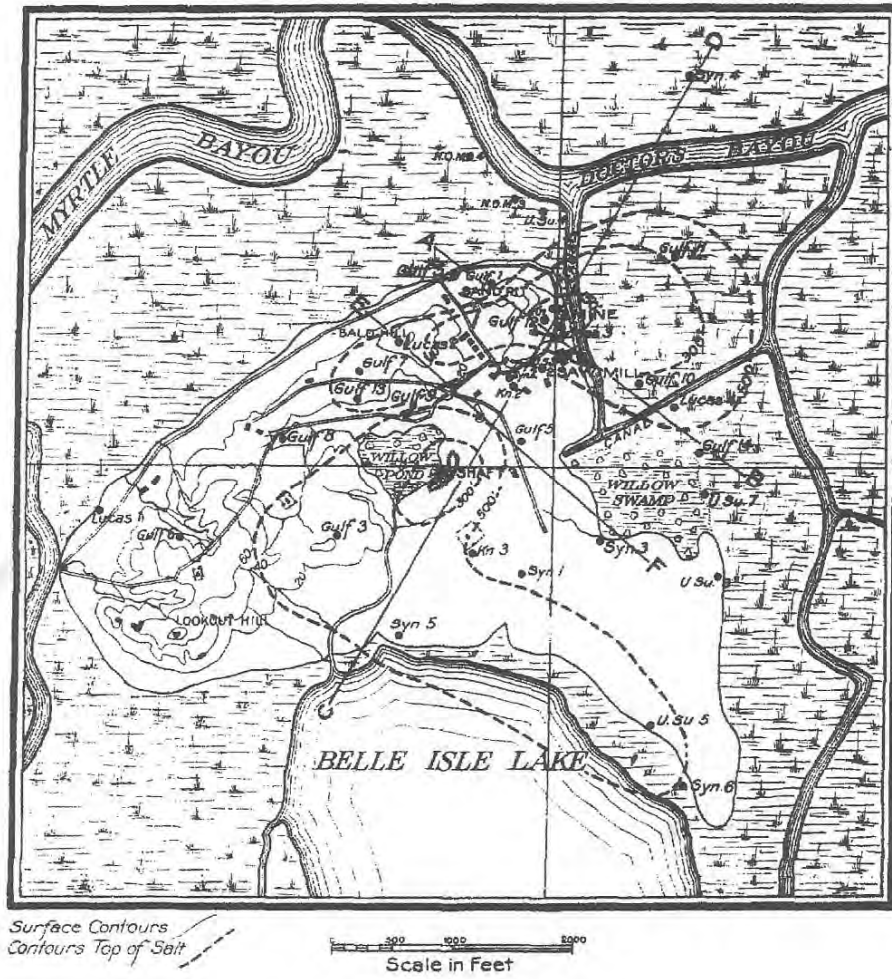


Figure 23. Refined Top-of-Salt Contour Map by Vaughn [1925].

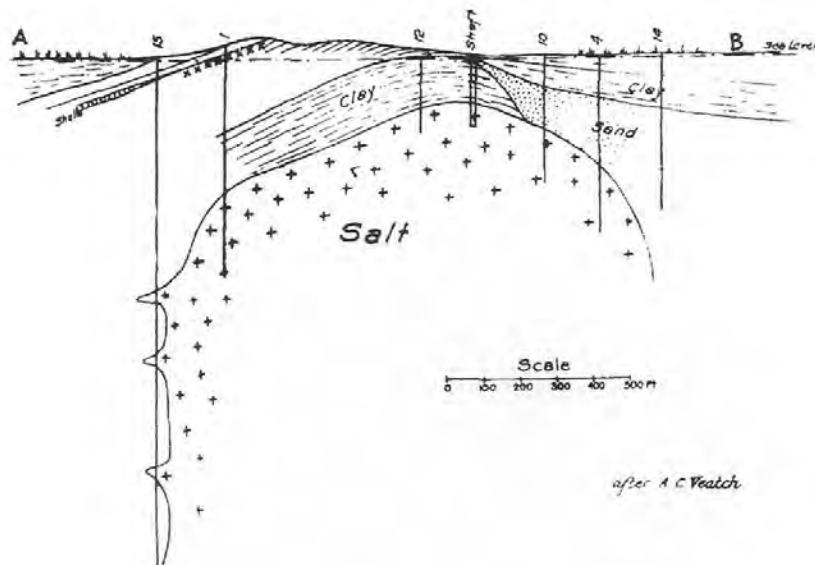


Figure 24. Cross Section A-B of the Belle Isle Salt Dome [Vaughan, 1925].



**Figure 25.** Photographs of the Remains of the Old Belle Isle Salt Mine.

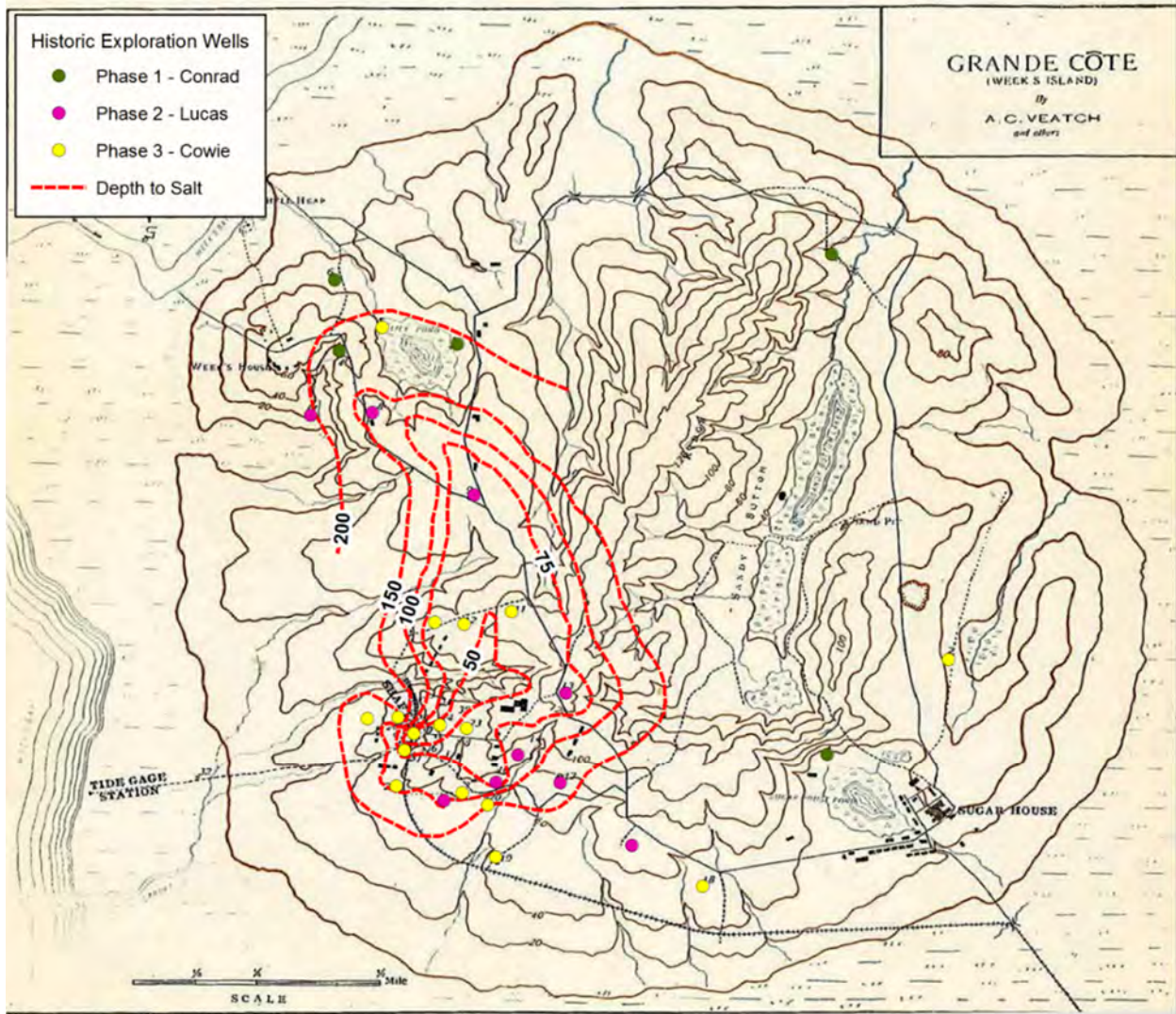
## WEEKS ISLAND

### THE RUSH FOR MYLES & CO. TO REPLACE AVERY ISLAND

After discovering salt on Jefferson Island in 1895 and on Belle Isle in 1896, Fredrick F. Myles of Myles & Company financed the exploration of Weeks Island (Grand Côte) in cooperation with the owners of the island (Major Gilbert L. Hall, his wife Lily Weeks Hall, and her sister Harriet Weeks). In March 1897, with Mr. N. Conrad in charge of the drilling, Myles & Company sank the first hole near the sugar house of the island's plantation (Figures 26 and 27). Conrad drilled five holes for Myles & Company and reported salt in the fourth at a depth of 276 ft on June 25, 1897 [Veatch, 1899].



**Figure 26.** Topographic Map of Weeks Island (Grand Côte) With Cross-Section Line Locations [Veatch, 1899].



**Figure 27.** Map of Weeks Island (Grand Côte) Exploration Wells (Modified From Harris [1908]). Salt depth contours from Veatch [1899].

After learning that salt had been discovered on Grand Côte or Weeks Island in Iberia Parish, a reporter questioned Major Gilbert L. Hall regarding the matter. On July 8, 1897, Major Hall reported the following facts to the subscribers of the New Orleans *Times-Picayune*:

*Yes, we have found salt on Grand Cote, and it is evident that it is there as a very large deposit. In fact, there are 2500 acres of hills on the island, and we have reason to believe that all of these are a vast salt deposit. The depth, of course, is unknown, but on an adjacent island, a boring of 2190 feet failed to penetrate the deposit.*

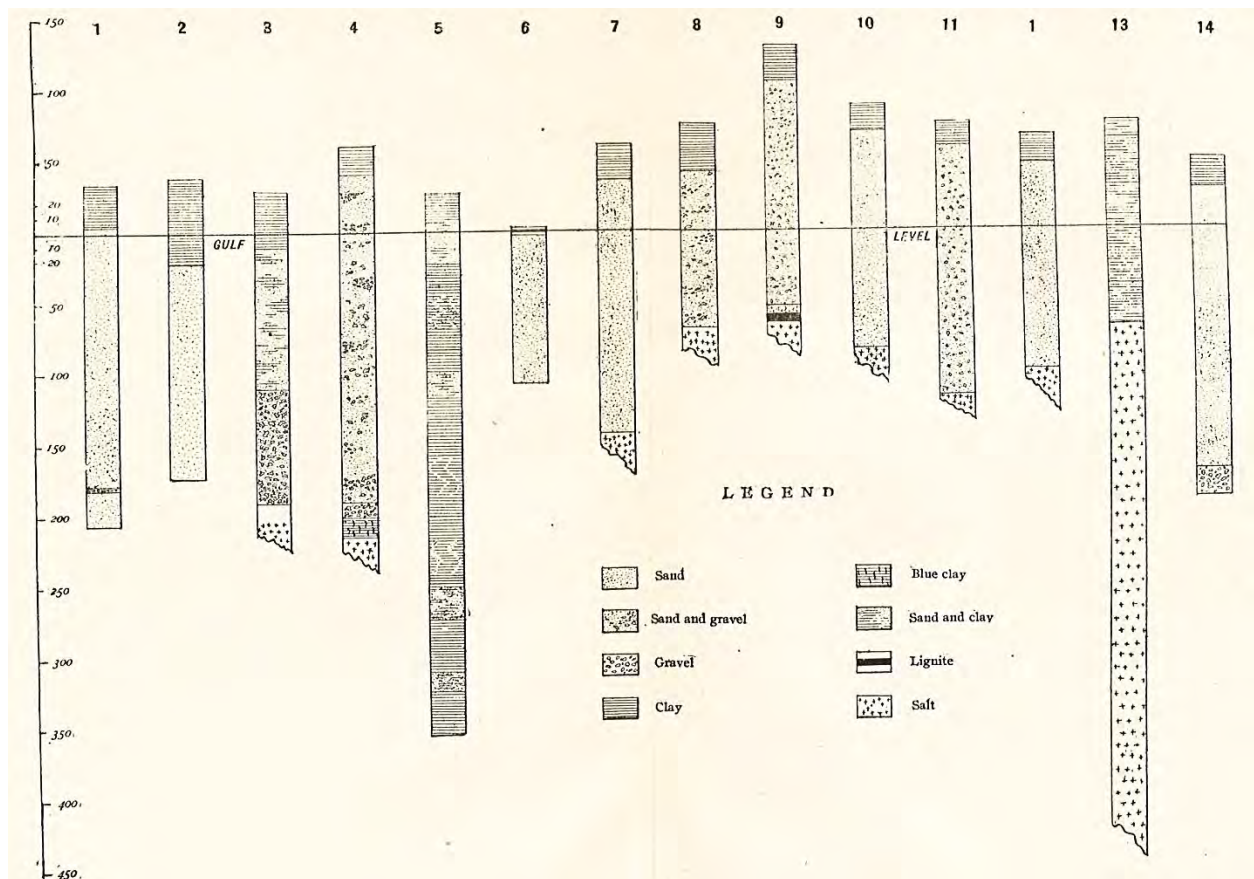
*Grand Cote, or Weeks' Island, as it is known, has belonged to the Weeks' family (my wife's ancestors) ever since 1802. The bought it from Chas. Le Blanc, who had his grant from the Spanish crown. In 1891 the plantation was sold for \$100,000, but we still held a mortgage which we foreclosed in 1896. We have always been under the impression that there was salt*



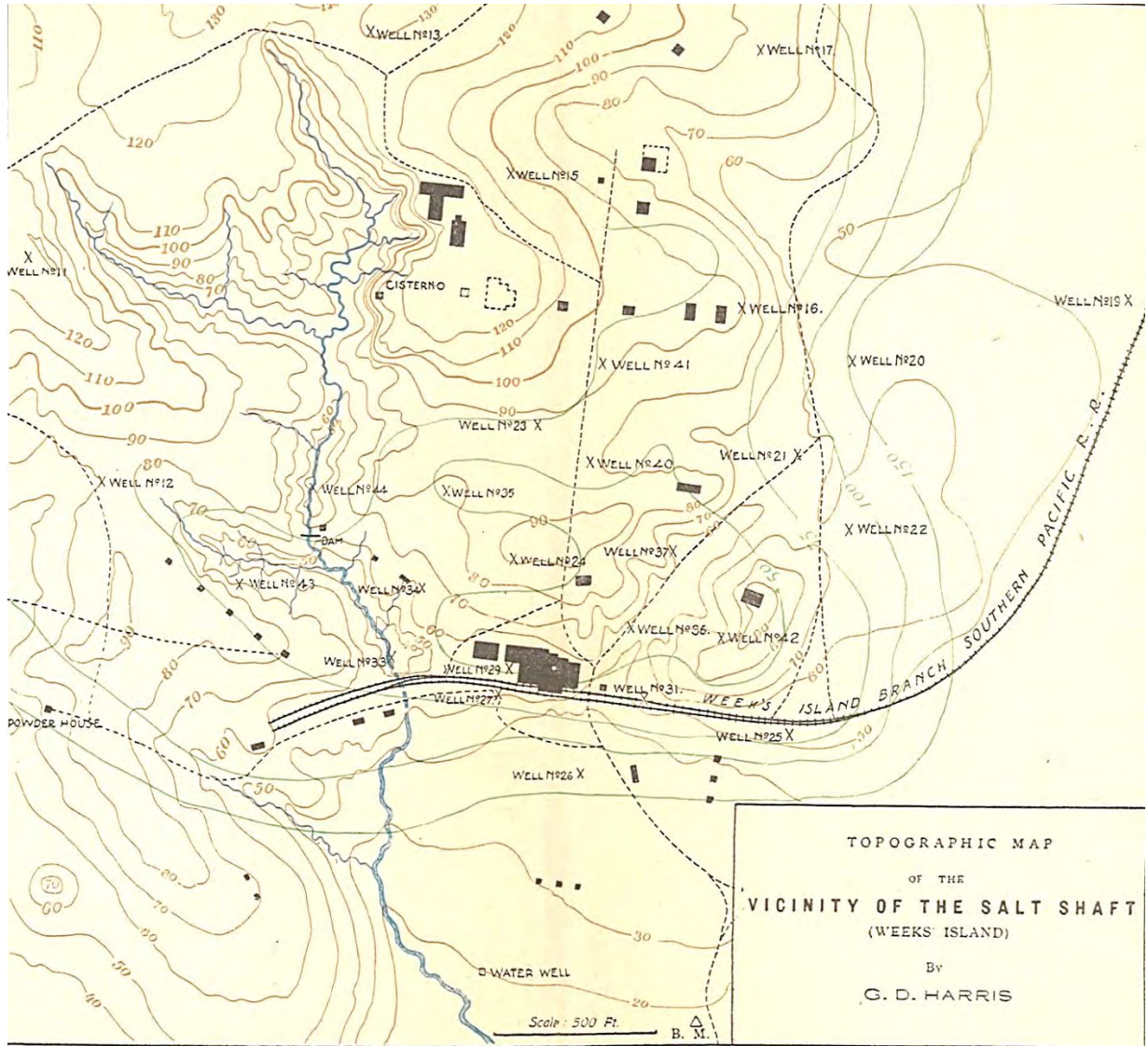
on the island, because of its conformation, which is very similar to Avery's and Jefferson's islands. There are many hills on it, and the geological survey shows some 200 feet high.

Some weeks ago the Myles Company undertook to bore for the deposit, and set their diamond drills to work. On last Saturday, they struck a solid rock of salt about 250 feet below the surface, the boring being from the top of the hill. They sent the specimens here which were pronounced by experts to be of a remarkable high grade purity. . . The salt deposit will, no doubt, be worked as a mine very speedily.

In July 1897, Lucas was put in charge of the salt exploration program. He struck salt in Well No. 7 at a depth of 205 ft late in August. In all, 14 holes were drilled as part of the initial exploratory programs by Conrad and Lucas [Veatch, 1899]. In late February or early March 1898, Lucas quit his position with Myles & Company. At that same time in March 1898, Myles Salt Company was organized and, under the direction of Scottish mining engineer George Cowie, 14 additional holes were drilled to determine the best location for a shaft. Figure 27 shows the locations of the wells that were drilled during 1897 and 1898. Figure 28 shows the stratigraphy in the wells that were completed as part of the Conrad and Lucas programs, and Figure 29 provides a map that shows where Myles Salt Company developed the shaft and mine surface facilities relative to the wells drilled. Figure 30 provides schematic cross sections through the dome based on the 1897–1898 exploration work.



**Figure 28.** Grand Côte Well Sections From the Conrad and Lucas Drilling Programs [Veatch, 1899].

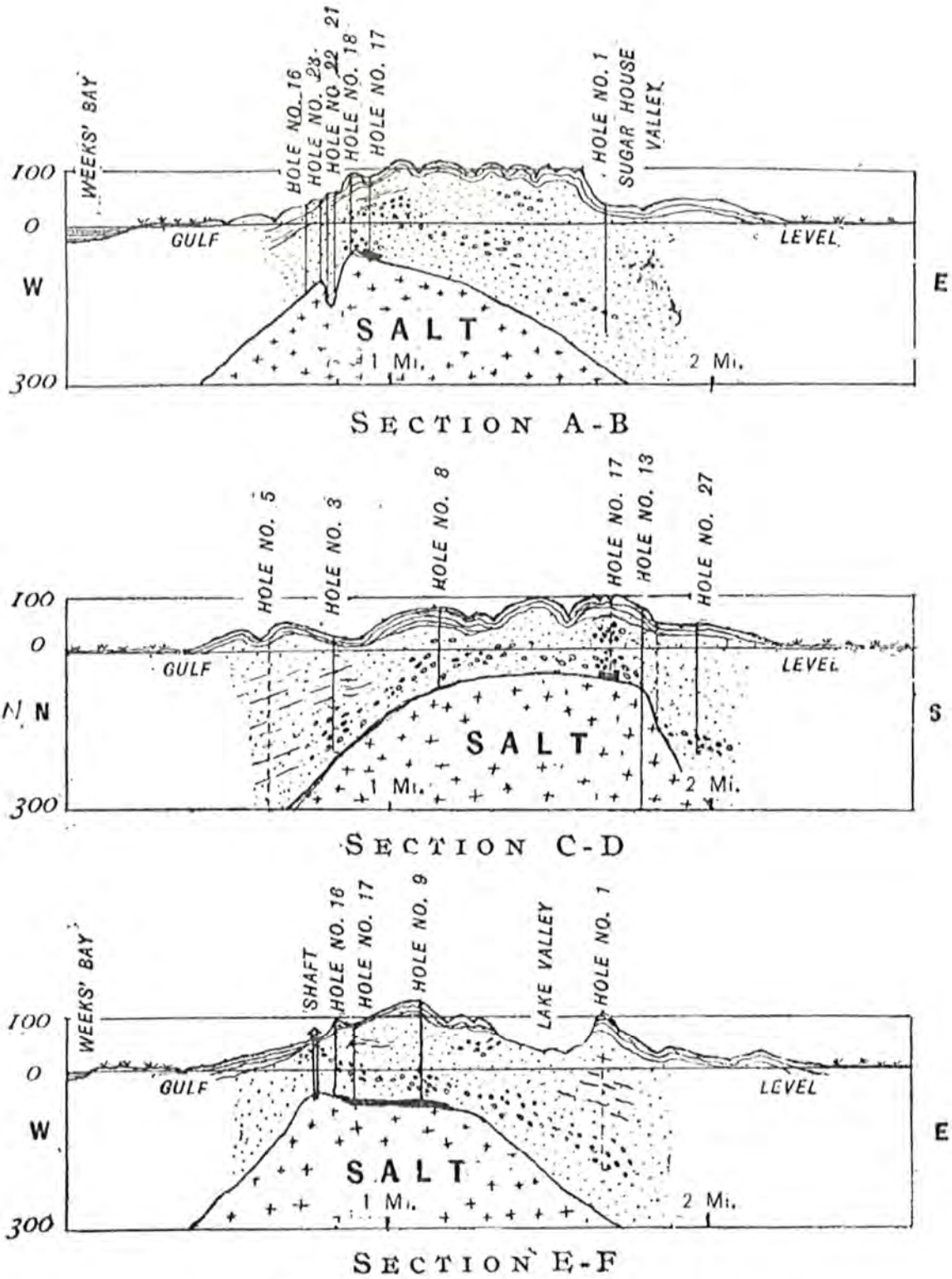


**Figure 29.** Close-Up Map of Weeks Island Near Mine Shaft [Harris, 1908].

Lucas did not have much to say regarding his work at Weeks Island in his publications. In his 1900 paper, Lucas did not even describe his own drilling program. That was left to Veatch [1899] and Harris [1908]. Instead, Lucas commented on the difficulty that the shaft sinkers were having with quicksand and that 5 miles of railroad needed to be built from the railroad terminal at Louisa to the island for the mine to be commercially successful. In his 1918 interview, Lucas simply stated, "I explored, meantime, Weeks Island, also in Louisiana, and there discovered a magnificent bed of salt now being worked with commercial success."

## DISSOLVING RELATIONS

One reason for Lucas' brevity on the Weeks Island program was that his relationship with Myles & Company was dissolving, and it wasn't an agreeable parting of company. Arguments erupted over money



**Figure 30.** Early Cross Sections of the Salt Dome at Grand Côte [Harris and Veatch, 1899]. See Figure 26 for cross-section locations.

and commitments to contracts, and competing law suits were filed in June 1898. A New Orleans newspaper reported on June 2, 1898, that "A. F. Lucas, Washington, DC, an expert mining engineer, who for years has been identified with the salt mine discoveries of Louisiana, having made some of the richest strikes yet recorded, is in the city . . . The immediate purpose of Mr. Lucas' trip to New Orleans at this time is to appear in a lawsuit in which he figures as the complainant and is brought against Fred Myles, the head of the Myles Salt Company, which sunk several shafts [test wells] at Grand Côte, or Weeks' Island. The suit is for \$5000 alleged to be due Mr. Lucas for services rendered, while he was working for Mr. Myles. Since the filing of his complaint the defendant has turned around and filed a counter-damage suit. The case will come up for a hearing to-day."

The details of the countersuit were revealed in the June 16, 1898, issues of the *New Orleans Time Democrat*:

***\$11,500 Wanted as Damages for Nonfulfillment of Contract.*** *A suit was filed yesterday in Civil Court on the alleged grounds of an employee failing to keep his contract with the Myles Salt Company, Limited, who are the successors of Myles & Co., who have been operating the Avery salt mines. The Myles Salt Company, Limited, will not operate the Avery mines in the future, as the expiration of the lease held by the old company in July terminates the existence of that corporation, and the new company expects in the future to work the Weeks Island deposit. The suit is brought against Anthony F. Lucas, who, it is alleged in the petition, is a temporary resident of New Orleans, but really a resident of Georgia. The amount claimed as damages is \$11,500.*

*In the petition it is stated that some time in the month of December F. F. Myles, the president of Myles Salt Company, Limited, having explored Grand Cote or Weeks Island and having discovered a deposit of salt there, determined to organize a corporation for the purpose of operating the mines and putting the salt on sale. President Myles, it is alleged, in behalf of the company, employed as engineer Anthony F. Lucas, who was to superintend the sinking of the shaft and the erecting of the works necessary for the mining operations, which he was to supervise generally. It is claimed in the petition that Lucas was to begin work when he was notified to do so, at a salary of \$300 per month, and that he was notified in January to begin work about the middle of February. Lucas came to New Orleans shortly after his notification, and on the 25<sup>th</sup> of that month he went into the service of the company, going to Weeks Island in Iberia parish, where he undertook to open the mines, sink the shaft, and generally superintend and direct the mining operations. Within a few days, the petition represents, Lucas abandoned his contract, quit the service of the company, and left the island, and refused to go on with his contract.*

*The Myles Company tell through their petition they had leased the salt mines at Avery Island, and that the lease would expire July 1, 1898, and that they were and would be the successors of the old company. One of the most valuable and necessary parts of the business, the petition declares, is the commercial connections of the old company established in various parts of the United States and the supplying of large contracts for salt. It was of the greatest importance that the Weeks mines should be opened and ready to furnish a supply to carry out contracts and to maintain the steady course of the business. They claim that Lucas had formerly been in the employ of the Myles Company as their superintendent in the operating*

*of the Avery mines, and knows of the creation of the new firm, and was informed of its affairs, and the importance of a speedy opening and operation on Weeks Island; that his refusal to carry out his contract and delayed the opening of the mines many months, a caused a loss from not making sales of salt, and impaired the ability to retain and to continue the business heretofore carried on by Myles & Co. They further allege that the loss in the amounts of the profits to be realized on the sale of salt was at least \$9000, and that they had to send their president elsewhere to find and obtain an engineer; that the traveling expenses have amounted to at least \$1000, and they have been compelled to keep a large force of men in idleness, which damage they estimate at \$1500.*

No documentary evidence has yet been discovered to indicate that the matter ever went to trial, which suggests that the matter may have been settled out of court. What is apparent, however, is that by the summer of 1898, the focus of Lucas' inquisitive mind had shifted from salt to hydrocarbons. His observations of oil and gas at Belle Isle had clearly whetted his appetite for petroleum exploration.

## A NEW SALT MINE

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In July 1898, after yet another round of exploratory borings to further refine top-of-salt mapping, Myles & Company started shaft sinking at Weeks Island under George Cowie's direction [Veatch, 1899]. Construction started without Lucas' involvement with the shaft at the site of Borehole No. 24, where the salt approached nearest the surface [Veatch, 1899]. As was the case with Avery Island and Belle Isle, quicksand posed a serious challenge to progress on the shaft sinking.

To overcome the problem, Myles & Company depended on using large sections of cast-iron tubing. These massive rings had been imported from France by the Calcasieu Sulphur and Mining Company, which was organized under General Jules Brady for an aborted effort to sink a shaft to mine sulfur near the head of Bayou Choupique around 1878 [Veatch, 1899; Agassiz, 1912; Howe and Moresi, 1931; Lynn, 1950].

Exactly how the cast-iron tubing was sized and installed varies to some degree by different accounts. Readily available published references include Veatch [1899], Harris [1908], and Agassiz [1912]. These references indicate that the tubing was either 10 ft or 11 ft in diameter and that the tubing came in 5-ft long sections. Salt had been reached by the time of Veatch's visit, but the watertight "joint" between the unconsolidated sand and the underlying salt had not yet been achieved. Work to complete that joint was undertaken in November 1900 and was finished by January 1901, which was well before the Howe and Agassiz accounts were written.

Contemporary newspaper articles provide further detail on how the tubing was used to deal with the quicksand and just how the tubing was installed. An October 27, 1900, article in the *New Iberia Enterprise* identifies C. A. Haskin and C. B. Halsted, both from Boston, as having "taken a contract for sinking a shaft for the Myles people in their salt mine already partly underway. The difficulty at Week's Island is that sand and water rise in the shaft and drive the workmen from the deposits. Mr. Haskin will introduce the new pneumatic system of laying the caissons, and by means of compressed air he will drive the water back, so the men can work in dry chambers. He believes that the deposits can be opened up in fine shape by this process, and General Myles has entered into a contract to that effect."

A November 10, 1900, article in the *Abbeville Meridional* states that “Work on the joint and shaft in the Week’s Island salt mine has begun. Charles A. Haskins, the pneumatic contractor, must finish them by December first next, or pay a penalty for every day that he is behind his contract thereafter. He has brought down compressors, air locks and other machinery.”

By January 1901, the tubing was in sufficiently that the excavation of salt from the shaft was started. A January 19, 1901, article in *The Weekly Iberian* read, “The first car load of salt from the Myles Salt Company’s mines on Week’s Island, in this parish, was sold on last Saturday to the wholesale house of Mr. Jules Dreyfus. This is the beginning of what promises to be one of the chief industries of this parish. It also indicates that the joint between the caisson and the salt beds has been successfully made water tight and that the work of mining will be energetically pushed from this on.”

The work by C. A. Haskins ensured that the watertight seal was completed by May 1901. By July 1901, the shaft sinking was progressing rapidly in the salt section. A July 27, 1901 article in the *New Iberia Enterprise* provides a remarkably detailed synopsis of the shaft sinking and lining:

*The problem of mining salt through quicksand has been solved. C. A. Haskins, a Boston contractor, last fall began the sinking of a twelve-foot caisson on Weeks Island, in Iberia parish, for the Myles Salt Company, and on the first of the month had the satisfaction of ascertaining beyond per-adventure that his plan had worked successfully and that salt mining through a stratum of quicksand was a practical possibility.*

*For something over two years various attempts have been made to reach the salt through the quicksand on Grand Cote, or Weeks’ Island, and while salt has been obtained, the mining of it in safety and in large quantities was practically prohibited by the treacherous formation some forty-three or more feet below the clay surface. All of these difficulties have been overcome by the sinking of this caisson and the later application of methods which have held it securely anchored in a bed of cement and salt.*

*By the accomplishment of this work the Myles salt mine will be able to turn out some 600 tons of salt per day, and salt of the finest quality, having a register of 99.88 per cent, or practically pure salt....*

*The process by which the caisson for the shaft was sunk and secured is interesting in many ways. The caisson is composed of circular steel bands some eighteen inches in height, and as one is sunk another is riveted to it, with pitch paper between to make it airtight, the earth being taken out as the caisson sinks down. It took forty-three feet of this sinking and mining to reach the quicksand when the water was forced back by the application of compressed air, the caisson in the meanwhile having been capped by an air-lock. The pressure at the distance below the surface was from eighteen to twenty pounds per square inch, so a very powerful pressure was necessary to keep the shaft clear of water, but this was done and passing through a stratum of clay overlying the salt stratum, the base of the caisson finally rested on the salt bed and was sunk some feet further into it. Below that the salt was penetrated and a wooden caisson, running from the water line fifty feet above, to a present depth of ninety-three feet below the surface, was put in and then the process of cementation began. First the rock salt was smoothed off and cut in, when it was heated to an intense heat by the flames from compressed air blow pipes and the cement, consisting of pitch and*

*asphalt, was poured over, filling up the interstices and sticking to every crack and cranny. Over this was laid a covering of cement, the whole not only securing the caisson, but making it absolutely air and water tight and permitting the uninterrupted work of the miners.*

*But the mining will not stop at this depth of 93 feet. Instead it will be sunk to a depth of three to four hundred feet, while the tunnels will be run out and big chambers be blasted and mined and the pure rock salt brought to the surface for distribution all over the United States and Canada. For this purpose the Southern Pacific Railroad company has already begun the construction of a spur some three miles out from its main line, and will have the work completed within the next three or four months.*

*A letter received Friday from Mr. W. B. Davis, who is now superintending the sinking of the shaft at these mines reports that a depth of two hundred feet has been reached and the work is progressing satisfactorily.*

*The salt product from the excavations for the shaft is accumulating into a large mass and makes the management wish for means of transportation, which will be delayed for some time yet, though the Southern Pacific spur to the mines will soon be underway.*

According to Superintendent W. H. Tibbets, reconstruction was to begin immediately and a temporary plant was anticipated to be in operation within a month. A permanent and thoroughly modern work of steel and stone was being planned and would be undertaken as soon as practical.

A May 25, 1901, article in *The Weekly Iberian* announced the completion of the watertight joint as follows: "Information was received here on Thursday afternoon by letter from Weeks Island that the contractors, who had undertaken to make a watertight joint in the shaft of the Myles Rock Salt Co., had admirably succeeded."

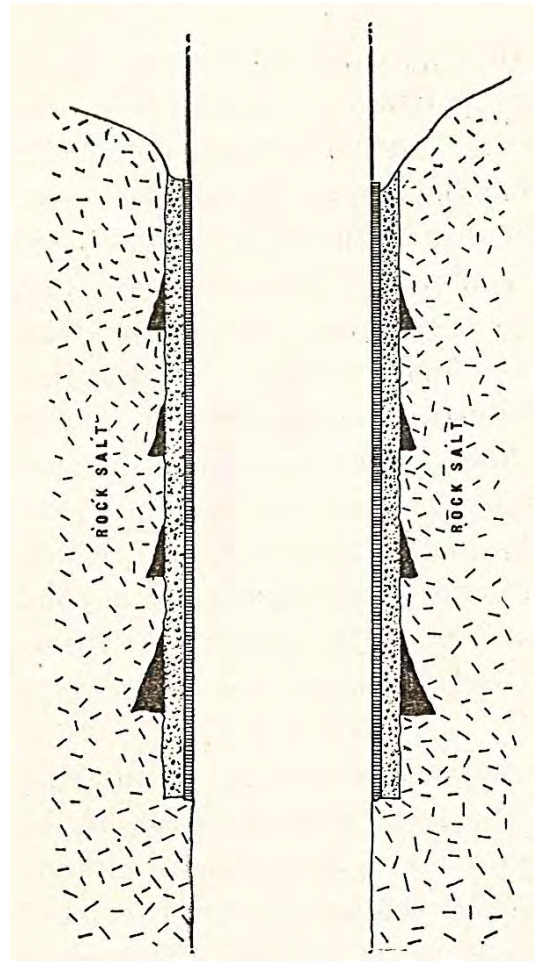
In July 1901, work was started on excavating a cylindrical opening for another 35 ft, then placing four asphalt rings in that section, followed by concrete, and lastly wood lagging, which is shown in Figure 31. Below 135 ft, a rectangular opening was excavated down through the remaining rock-salt section above the planned workings. The Myles Salt Company now had their shaft, albeit much smaller in diameter than the 20×10 ft "Retsof-style" shaft that was sunk at Avery Island and that which would be attempted by the American Salt Company at Belle Isle approximately 2 years later.

In March 1902, the 600-ft level was reached and drifts were opened both east and west of the shaft. The shaft, which was still in use for ventilation and emergency egress as of 1976 [Kupfer, 1976], had a total depth of 645 ft. Figures 32 and 33 show the early shaft and subsequent mill at the Weeks Island salt mine. Harris [1908] reported impure salt in the mine north of the shaft. To the west of the shaft, there was danger of reaching the dome's edge, but to the east, the salt quality was excellent with no obvious dangers ahead. Early mine plans are illustrated in Figures 34 and 35.

The Weeks Island Mine would go on to great success in Lucas' lifetime. By September 1907, output was 12,000 tons per month and increasing. A July 24, 1911, article in the *Monroe News-Star* nicely summarizes the early Weeks Island operation:

Over 40 test wells have been put down on Weeks Island to ascertain the form and topography of the upper surface of the salt deposit. When the location for the shaft was decided upon, 100 feet of 10-ft tubular casing was used in sinking the shaft to the salt mass. Below this is a rectangular shaft sunk to the extreme depth of 645 feet. Since that time wide chambers have been opened up, 72 feet in width as a rule, and carried up to a height of about 100 feet. Mining is first carried out by undercutting or blasting out triangular chunks of salt at floor level to about 8 feet height. Drills are worked by compressed air supplied from compressors in the powerhouse at surface. Layer after layer of salt is blasted out, the workmen reaching the extreme height by climbing to the top of the mass as it increases from blast to blast.

In the Weeks Island mines the crusher is operated underground. The salt is brought to the crusher by small dump cars drawn by a mule and dumped into a huge bin below from which place it is drawn into a five-ton self-dumping cage that makes the trip from bottom of the shaft to top of the mill and return in about four minutes. The capacity of the mine is about 75 tons per hour or 750 tons per 10-hour day. The mine is lighted by electricity. There is no fire damp or inflammable gas in either of the Louisiana mines [Avery Island and Weeks Island].



**Figure 31.** Illustration Showing the Manner by Which a Watertight Joint Was Created Between the Casing and Salt at Weeks Island, Louisiana [Harris, 1908].

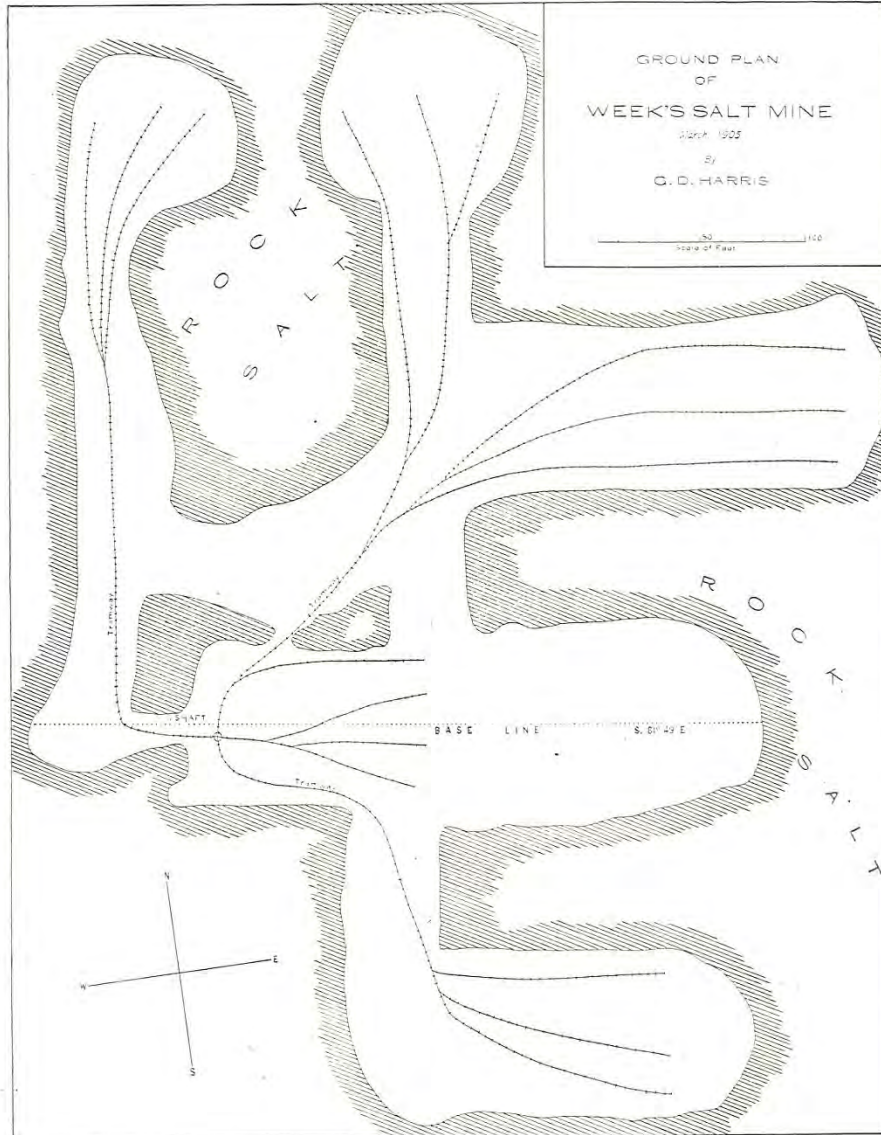




**Figure 32.** Shaft Sinking at Weeks Island Using Iron Castings from Aborted Calcasieu Sulfur Mine, April 1899. From left to right are G. Cowie (probable), F. F. Myles, and B. B. Myles [Veatch, 1899].



**Figure 33.** Original Myles Salt Company Mill at Weeks Island That Burned in 1919 [Harris, 1908].



**Figure 34.** Early Mine Plan at Week's Island Salt Mine [Harris, 1908].

Agassiz [1912] provided some interesting photographs that capture the essence of the operation (Figures 36 and 37). Product from the Weeks Island Mine was marketed by the Gunther Salt Company, which was the first distributor to sell Louisiana rock salt from its base in St. Louis, Missouri [Mente, 1937]. Beverly Myles (Figure 38) assumed the presidency of the company by 1913 and replaced his ailing older brother. In 1914, Myles Salt Company took control of all of Weeks Island after Emile Gajan sold his holdings to the company for \$50,000. When Frederick Myles passed away in 1915, his younger brother Beverly was left in charge of the company. Beverly Myles maintained control of the Weeks Island Mine until he sold it to Eugene Mente and Emanuel Benjamin in 1919 [Mente, 1937], which probably occurred after the fire that destroyed the surface plant in May of that year [Insley, 1922]. Lucas was still alive at the time of this transaction, but his thoughts on the sale of the mine are not recorded in any of his late writings or interviews.

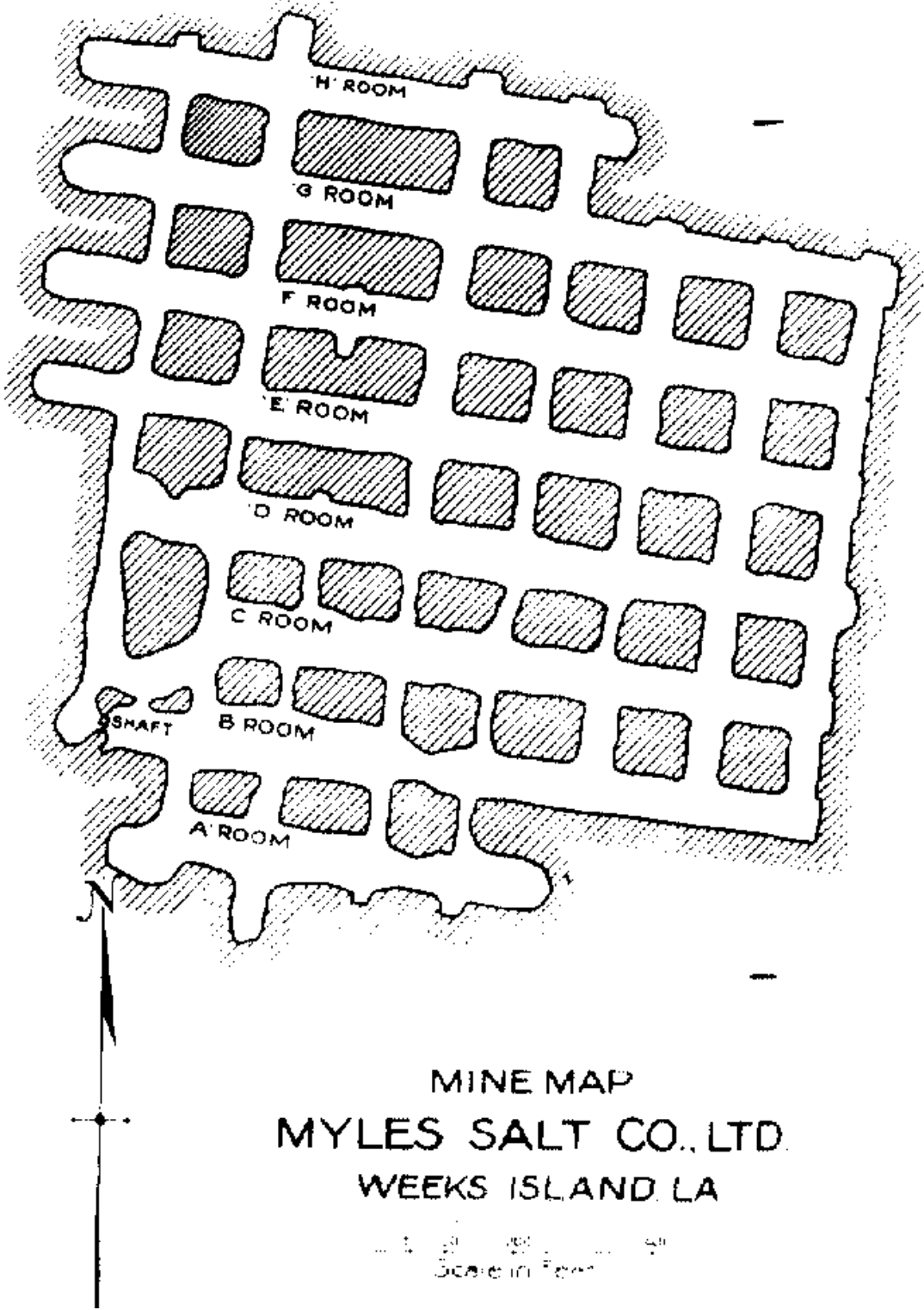
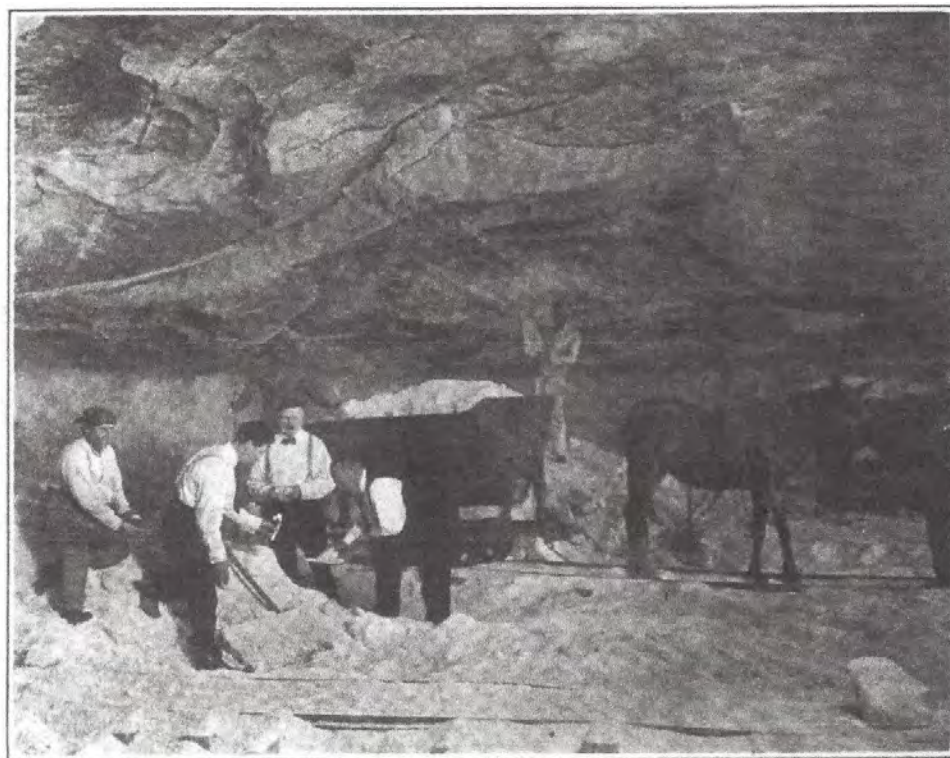


Figure 35. Mine Map of Myles Salt Mine at Weeks Island [Vaughan, 1925].



**Figure 36.** Air Drilling at Weeks Island Salt Mine [Agassiz, 1912].



**Figure 37.** Loading and Hauling of Blasted Salt in Mule-Drawn Cars at Weeks Island Salt Mine. From right to left are F. F. Myles, B. B. Myles, G. Cowie (probable), and an Unknown Underground Supervisor [Agassiz, 1912].

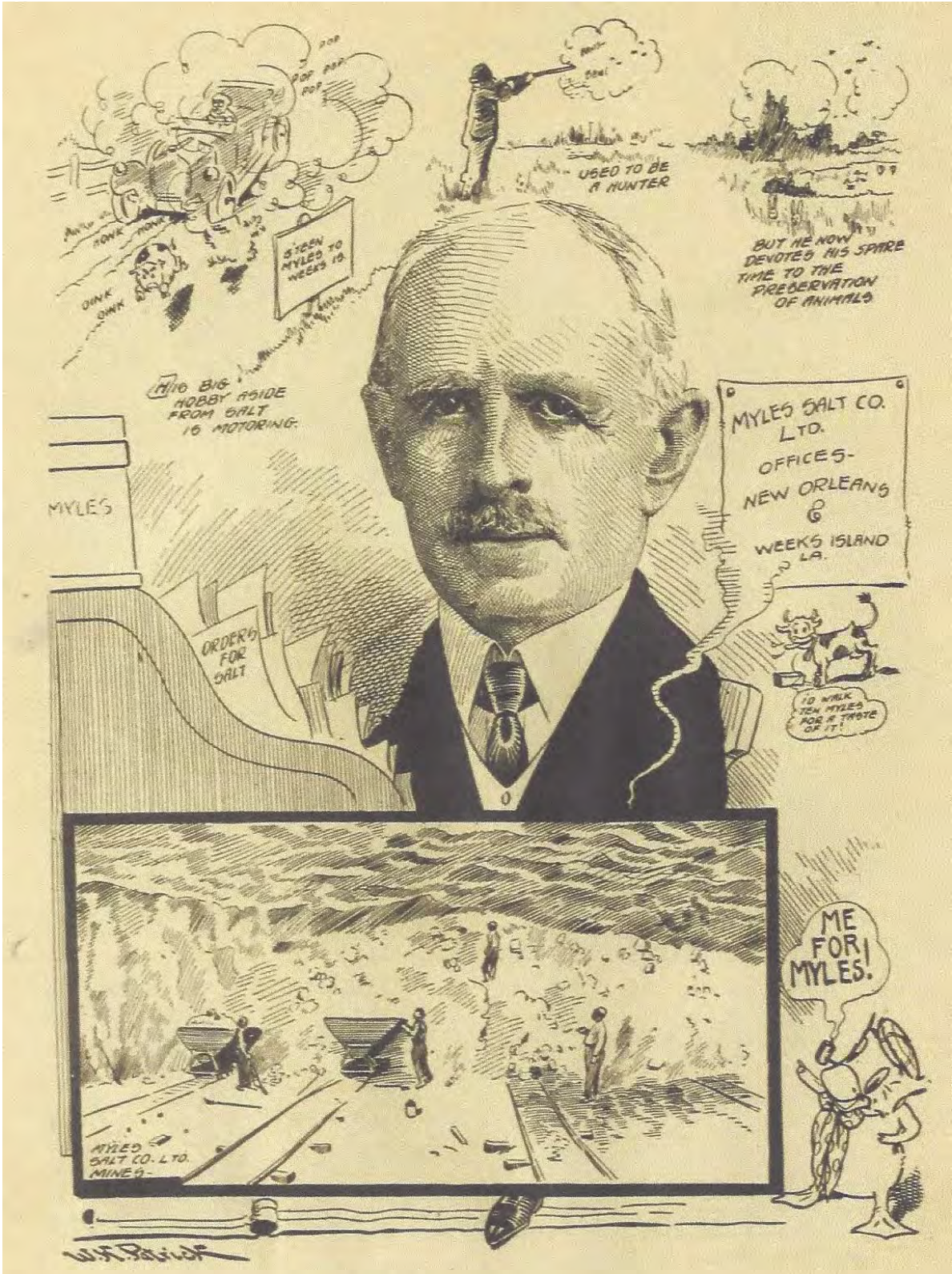


Figure 38. B. B. Myles, President of Myles Salt Company [Patrick, 1917].



## ANSE LA BUTTE

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The Anse La Butte salt dome is cited as one of the first areas in Louisiana to arouse the attention of the petroleum industry [Howe and Moresi, 1933], but relatively little has been published regarding early efforts to produce salt there. The salt dome is located 2 miles west-southwest of Breaux Bridge, St. Martin Parish, and 4 miles northeast of the City of Lafayette (Figure 1). Based on research into Lucas' work [Goodman and Hocking, 2016], and by explorationists who followed him [Goodman and Hocking, 2017], early concepts on salt solution mining and evaporation in Louisiana were laid out at the turn of the twentieth century. Because of the dearth of published literature, however, the dome may not be widely appreciated as a site where solution mining in Louisiana first successfully developed as an industry.

Historical research completed by the present authors to date suggests that Lucas' oil and gas discoveries at Belle Isle in 1898 likely piqued his interest in exploration at Anse La Butte. Contrary to the focus of his hands-on experience as an engineer at the Avery Island Mine, his seminal salt exploration work at Jefferson Island and Belle Isle, and his contributions to exploration and salt mine development at Weeks Island, Lucas' focus at Anse La Butte in 1899 was mainly on oil.

In his interview with Rickard [1917], Lucas explained that, before 1897, he lacked the funds to engage in oil exploration. When Belle Isle was purchased by the American Salt Company, however, Lucas was compensated \$30,000 in bonds and \$5,000 in cash for his interest in the mineral rights. These funds allowed Lucas “to study the accumulation of oil around salt masses, and [he] formed additional plans for prospecting other localities. Thus [he] began [his] investigations into the occurrence of oil on the Coastal Plain” [Rickard, 1917]. The petroleum finds at Belle Isle had transformed Lucas from a salt man to an oil man.

### THE LURE OF OIL

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Why did Lucas go to Anse La Butte? Historical research indicates that the hydrocarbon potential near Breaux Bridge was appreciated as early as 1893. A February 3, 1893, article in *The Times-Democrat* of New Orleans read:

*Anse la Butte, La. A Curious Discovery. Quite a sensation was created in the vicinity of Breaux Bridge at a place called Anse La Butte, by the discovery of water that becomes inflammable at the mere light of a match. Many people as sight-seers gathered there to witness the curious phenomena. The place is called Anse La Butte on account of its being an elevated tract of land or mound, and the conjectures are that it might be a coal mine, or perhaps, an oil well. The curious part is that the water bubbles and explodes at the light of the match, and even the ground around the flames and the ashes of the ground burned resembles coke.*

Howe and Moresi [1933] noted the presence of “surface indications of gas seeps and paraffin dirt” as evidence of subsurface petroleum. Harris and Veatch [1899] earlier referred to the “Natural Gas Spring,” which is located 2 ¼ miles from Breaux Bridge, that discharged gas in considerable quantities.

Lucas was actually not the first to prospect for hydrocarbons at Anse La Butte. Harris [1908] reported that “Paul [LeDanois] was the first to attempt boring, with the aid of a machinist, but he encountered some difficulties, and at a depth of 40 or 50 feet discontinued in the undertaking. In 1899, two iron pipes thrust into the ground for a few feet at this locality conducted gas to a height of 6 or 8 feet, where it was lit and at night furnished light for a local gathering,” which is shown in Figure 39. During the same year, Lucas was on the ground attempting to drill an oil well in spite of poor tools and meager financial support. Harris and Veatch [1899] were “watching for the results of his borings with interest.”



**Figure 39.** Gas “Wells” Near Breaux Bridge Which Were, at the Time, the Largest Gas Flows Reported in Louisiana [Harris and Veatch, 1899].

Lucas’ single Anse La Butte well, whose location is shown in Figure 40, was reported by Caracristi [1901] to have been drilled to a total depth of 523 ft on what would later prove to be the northern side of the dome crest. In the 252- to 284-ft depth range, the Lucas well penetrated oil-bearing clay and gravel. None of the tabulated stratigraphic information in Caracristi [1901] suggests that Lucas drilled into salt, although Lucas himself claimed that he discovered both oil and salt. In his tabulation on the Lucas well, Caracristi [1901] includes in his description “8 feet of salt water (rock salt doubtful) . . . 284 to 292 [ft].” A descriptive log of the Lucas well by Harris [1902] is very similar. He placed the oil-bearing clay and gravel in his Unit 5 in the 249- to 281-ft depth interval. The salt water (with the same “rock salt doubtful” note) was recorded by Harris in the depth range of 281–289 ft.

Because his early findings were less than spectacular, Lucas abandoned his effort at Anse La Butte and went to Beaumont, Texas, where he answered a trade journal ad by Patillo Higgins to explore for oil in 1899. There, his spectacular discovery at Spindletop Dome on January 10, 1901, elevated Lucas’ already admirable reputation as an explorationist to legendary status.





**Figure 40.** Early Map of Anse La Butte (Modified From Harris [1908]). Well A-1 is the approximate location of the Lucas well.

## EARLY OIL EXPLORATION AT ANSE LA BUTTE AFTER LUCAS

Exploration at Anse La Butte intensified after Lucas' gusher on the Spindletop Dome. New exploration companies were formed, and excitement was in the air. Even Guffey Petroleum (the Galey, Guffey, and Lucas partnership that brought in the Beaumont gusher) came to Anse La Butte. Developments in 1901 that were incited by the Spindletop discovery were conveyed in the *Lafayette Advertiser* advertisements and articles:

**May 11, 1901.** *Breaux Bridge Oil and Mineral Co., Limited advertisement. Capital Stock \$100,000. Albert Domengeaux, President. J. J. Burdin, Vice-president. Stock \$10 per share. In addition to valuable leases of land in different parts of the Parish of St. Martin, the company owns the Mineral Rights, unconditionally, on the largest and best situated tract of land in the vicinity of the Anse-la-Butte Gas Mound, two miles from Breaux Bridge and seven miles from Lafayette, where Captain Lucas found a superior quality of illuminating oil, tested as being 86 purity and 14 Asphaltum, at a depth of 350 feet.*

**June 15, 1901.** *Drilling at Anse La Butte has actually been commenced by the LeDanois Company, who have an up-to-date outfit on the premises. By this time, a depth of about 100 feet will have been reached. A large number of our people will await with anxiety the results which will be obtained at the Butte. The oil excitement started in February in this section, but the LeDanois Company are the first to begin actual operations.*

**Oct. 26, 1901.** *General Manager, Mr. J. C. McDowell of J. M. Guffey Petroleum, has visited Anse la Butte twice during September–October. Ground was selected to begin work at once, but some technicality prevented. We are glad to say that all difficulties are now removed and operations will begin without delay. Pipes are already on the grounds. The Pourcio tract is the one chosen for drilling. This is the place where oil was found bubbling up from a spring. If oil is to be had, the Guffey people will give us a gusher for a Christmas present.*

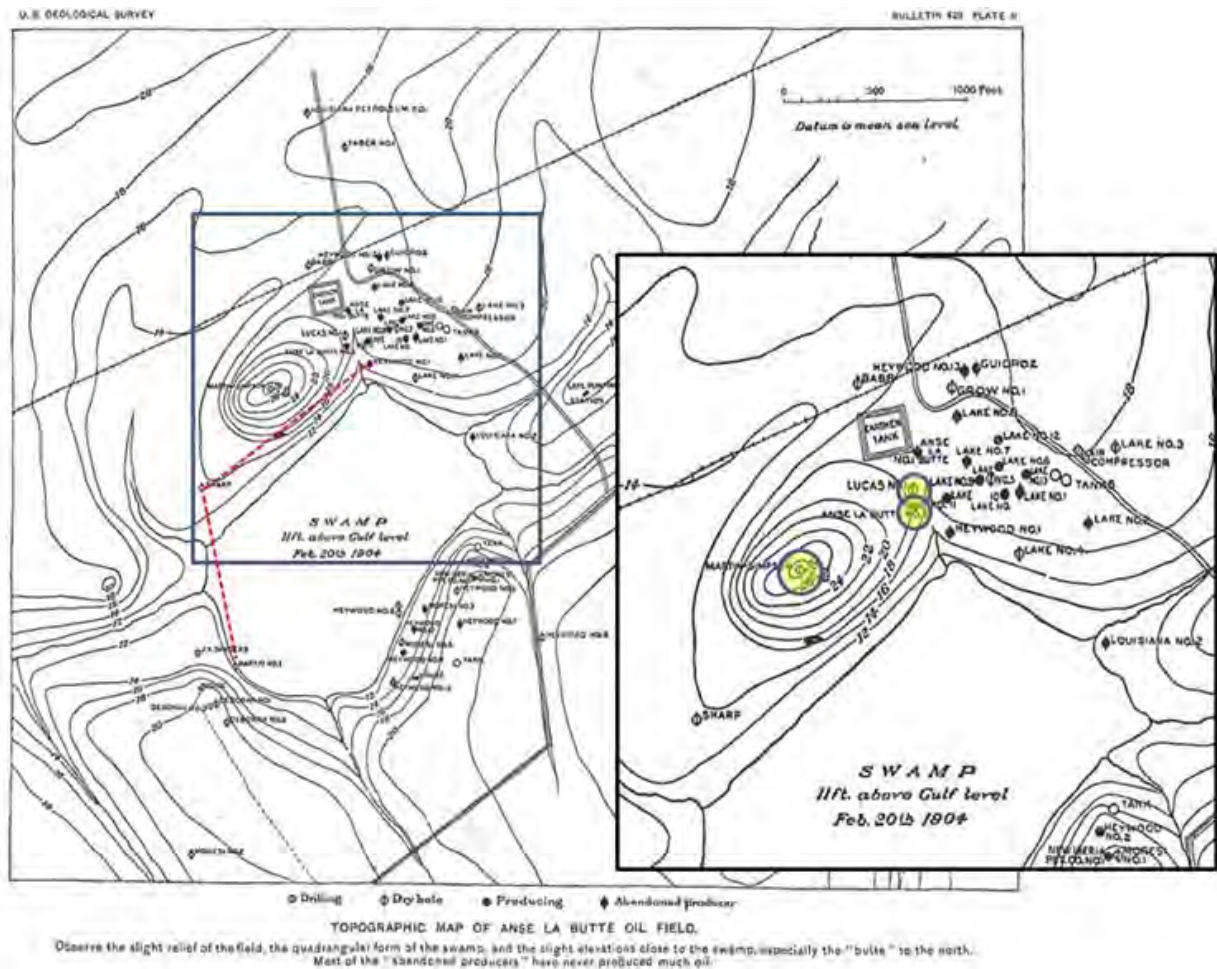
*Five wells are drilled or ongoing at Anse la Butte. The Guffey well, two wells by the Anse La Butte Co. with Capt. Moresi and one by another driller, and the Pioneer Company well.*

In keeping with the fervor of the time, the oil men—not salt men—confirmed the presence of rock salt at Anse La Butte. The Martin-Simpson (LeDanois Company) No. 1 Well, which is referenced in the June 15, 1901, article, was the first well to penetrate salt. The location of this well is highlighted in Figure 41, and a photograph of the well is provided in Figure 42. Martin-Simpson Well No. 1 penetrated salt at depths of 391–570 ft and again at 578–790 ft [Caracristi, 1901; Harris, 1902].

Caracristi [1901] wrote his seminal technical and economic analysis report on the Anse La Butte dome after the first two wells were drilled. Writing at a time when salt dome geometry was still not fully understood and having geologic information from only two wells, his cross section of the field is amusing in its inaccuracy (Figure 43) when compared to later mapping of the dome [Howe and Moresi, 1933].

Notwithstanding his poor early interpretation of the subsurface conditions, Caracristi outlined his assessment of both hydrocarbon and salt production potential at Anse La Butte. Of interest here is his chapter titled, "Description of the Most Approved Method of Making Salt," where he first described triple-effect, vacuum pan evaporation as the latest and most economical method of making salt through solution

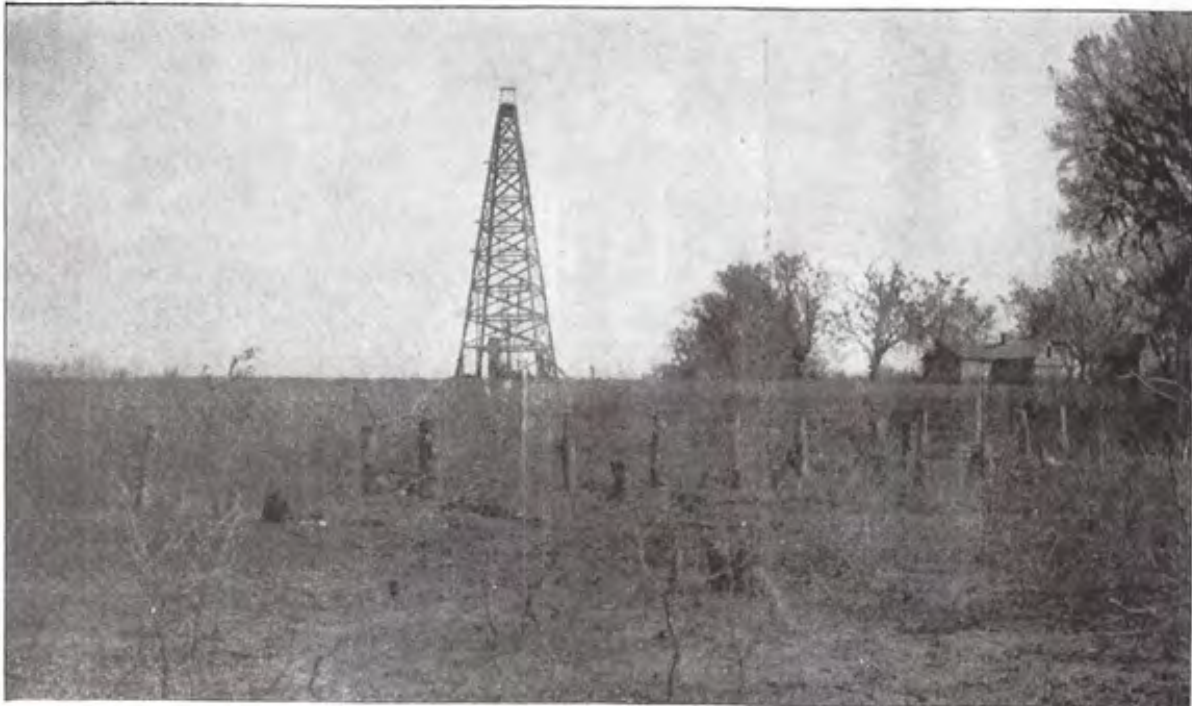
mining. Caracristi then cited open-pan evaporation as a second option, referring to the Lunge & Naville plant at Rottenmunster in Worttemberg (Baden-Wurrtemberg), Germany. Finally, he referred to the open, shallow-pan atmospheric evaporation process used at Syracuse, New York, as a low-cost option.



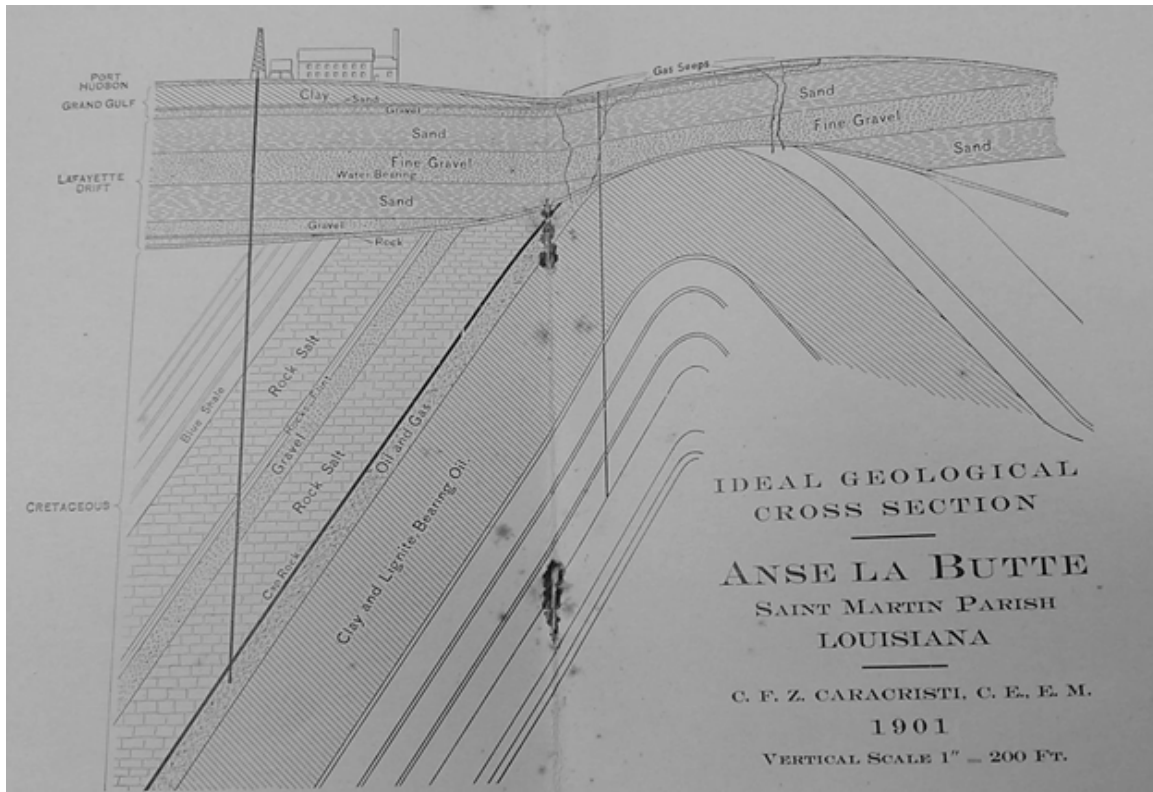
**Figure 41.** Early Map of Anse La Butte Showing Locations of Wells Drilled Before 1910. The inset map shows the locations of the original Lucas well and the first two wells drilled in 1901 that penetrated salt. A red dashed line connects the three wells used by Harris [1908] to sketch the first cross section of the Anse La Butte Dome (see Figure 44) (modified from Harris [1910]).

Unfortunately, Caracristi provides no suggestions on well design for solution mining in his report, which would have been insightful and of interest to this paper's audience. The then-recent attempts at solution mining at Belle Isle resulted in ground failure, and it would have been interesting to learn if adjustments in well design were being considered 1–2 years after the circa 1899 seminal efforts to solution-mine Gulf Coast salt at Belle Isle [Goodman and Hocking, 2016].

As an alternative to solution mining, Caracristi [1901] evaluated the feasibility of salt mining using a shaft. He stated that "The first strata of rock salt on your properties lies at a depth of 391 feet from the surface, and is 179 feet in thickness, making the depth of the proposed shaft 520 feet, to get into the salt

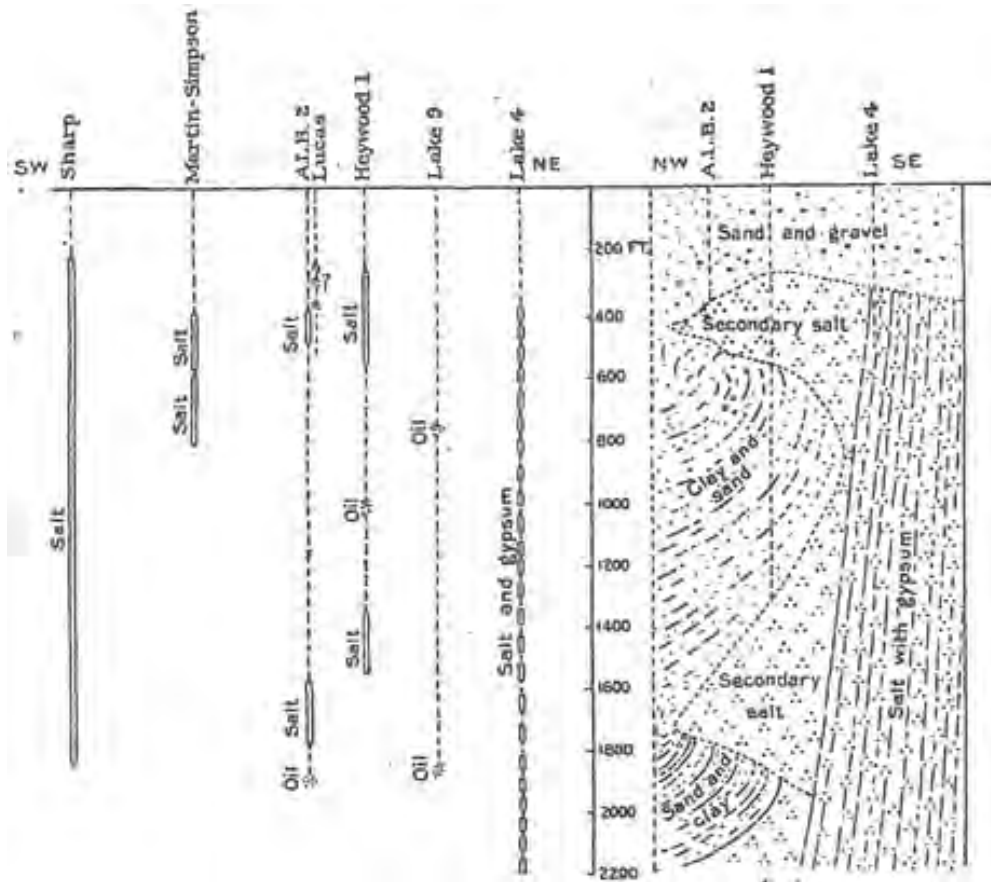


**Figure 42.** Photograph of the Martin-Simpson (LeDanois Company) Well No. 1 Drilled in 1901 Where Salt at Anse La Butte Was First Penetrated [Harris, 1902].



**Figure 43.** Early Conceptual Cross Section of the Anse La Butte Salt Dome [Caracristi, 1901].

rock far enough to do away with the possibility of having any water which could percolate into the mine through the body of rock itself.” He recommended using a plant capable of handling 500 tons per 10-hour shift and a 12-ft-diameter shaft. Similar to what had just then been successfully done at Weeks Island, Caracristi recommended that the shaft be lined with a metal caisson.



**Figure 44.** Conceptual Sketch of Small “Offshoots” on Northern Margin of Anse La Butte Dome (See Figure 41 for Well Locations) [Harris, 1910].

Sixteen years passed after Caracristi’s report before anyone acted on developing a salt production facility at Anse La Butte. The oil fervor remained high as of 1901 because of the excitement caused by the Spindletop gusher and the simple fact that the value of oil outweighed the value of salt. Explorationists continued on for some time with a singular focus on oil. As the number of wells increased at Anse La Butte, so did the understanding of the geometry of the salt deposit.

Anse La Butte Oil Company No. 2, which was started in 1901 and completed in 1902 (Figure 41), was the second well to penetrate the salt. Harris [1902] mentioned that this well was 1,500 ft in depth at the time of his visit but did not mention any evidence of salt penetration. Harris [1910] later reported that salt was penetrated at depths between approximately 283 ft and 383 ft and then again at 1,600 ft and at 1,784 ft (discrete salt interval thicknesses not mentioned); Howe and Moresi [1933] interpreted Harris to mean continuous salt from 1,600 ft to 1,784 ft. This well yielded an initial 30 barrels of oil per day (bpd) from a sand at 1,910 ft.

Heywood No. 1, which was drilled in 1902 at the northern corner of the Flat Lake swamp (Figure 41), was another early well that both penetrated salt and produced oil [Fenneman, 1906; Howe and Moresi, 1933]. Salt was penetrated at depths between 268 ft and 540 ft and at 1,350 ft to TD at 1,550 ft without being passed through. Initial oil production on the first day was 40 bpd and stabilized at 20 bpd by the time of Fenneman's 1906 report.

## GEOLOGY OF THE ANSE LA BUTTE DOME

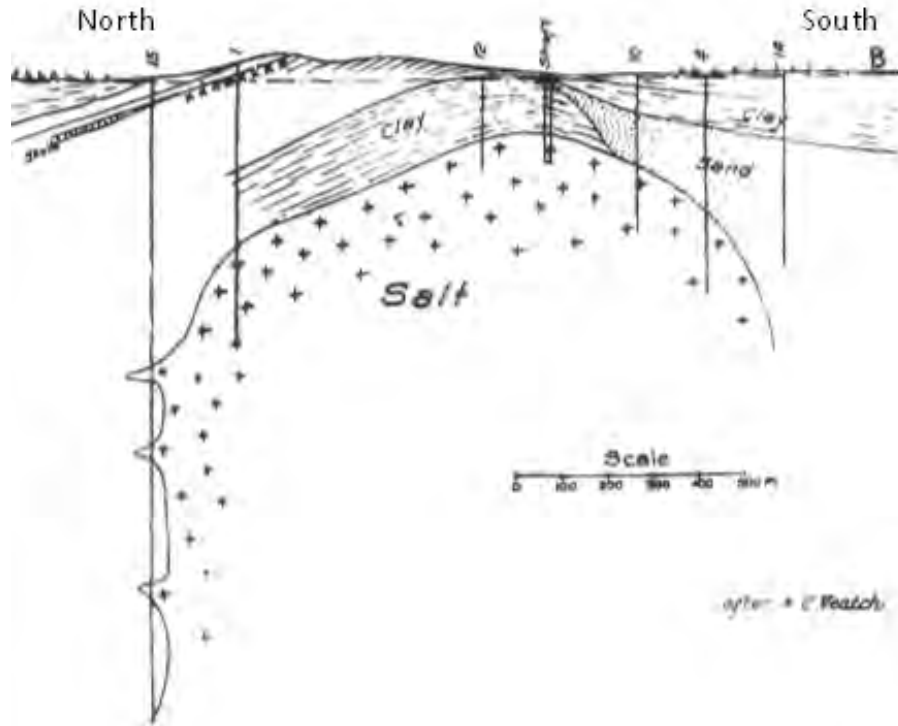
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In his treatise on rock salt, Harris [1908] published the earliest interpretive depiction of the Anse La Butte salt deposit that approaches modern understanding of dome geometry. His cross section is based on the Heywood No. 1 well (drilled in 1902), the Sharp or Heywood No. 4 well (drilled 1905), and the Andre Martin No. 1 well (drilled in 1906), which are shown in Figure 41; the cross section of Anse La Butte is provided as Figure 43. Except for the peculiar, shallow wings of salt such as the one depicted for Well A (Heywood No. 1), this early interpretation of the salt deposit is a reasonable rendition of a dome crest.

What became clear from the early wells that penetrated the salt was that the lateral boundaries of the Anse La Butte dome were irregular and that small-scale salt overhangs produced hydrocarbon traps. Harris [1910] provided a detailed conceptual sketch of the northern dome flank that integrated stratigraphic information from Anse La Butte No. 2 (drilled in 1901–1902), Heywood No. 1 (drilled in 1902), and Lake No. 4 (drilled circa 1906). The sketch is shown in Figure 44, and the well locations are shown in Figure 41. Fenneman [1906] referred to the small-scale salt protrusions as “offshoots.” He stated:

*It may well be supposed that such offshoots would be controlled to some extent, in form and position, by bedding planes. The diversity of depths and thicknesses of salt bodies, however, throws grave doubt on the theory that there are sedimentary beds of salt (such as interpreted by Caracristi [1901]), and suggests that the bodies here encountered are of secondary origin and that they follow lines determined by the movements of ground water, which, in turn, were influenced by the character and distribution of the sediments. Inasmuch as the oil is chiefly on the east side of the swamp and the salt on the west side, it would seem probable that, so far as there is a central oil body, it branches out to the sides in porous sands in forms similar to those of the body of salt, and that the Heywood Well No. 1 is located in a place where the branches of the salt body and the branches of the oil body are, in a manner, dovetailed. There is a similar occurrence at Belle Isle, where a well was drilled near the edge of the salt body.*

These small salt “offshoots,” which typically measure only approximately 200 ft thick, were interpreted to extend approximately 400 ft from the edge of the main salt stock. These small overhangs were of interest to the early oil men because of their trapping patterns and are, as noted by Fenneman [1906], similar to those interpreted by A. C. Veatch and subsequently sketched by Vaughn [1925] on the northern margin of the Belle Isle dome, which is shown in Figure 45.



**Figure 45.** Sketch of Similar “Offshoots” on the Northern Margin of the Belle Isle Dome (From Vaughn [1925] Based on Interpretations by A. C. Veatch).

## EARLY DEVELOPMENT OF OIL RESOURCES

Because of the remarkable surface evidence for the presence of hydrocarbons and the fervor of the time, oil would remain the sole extractive industry at Anse La Butte for the first two decades of the twentieth century. The expectations were remarkably high that Anse La Butte would yield the next Spindletop-type gusher. When Lucas returned in 1901, he told the *Lafayette Advertiser* that, “I think Lafayette Parish has a good chance to distinguish itself in the oil world” [Stickney, 2016]. A March 29, 1902, article in the same newspaper read, “We understand that a great oil expert, sent here by Messers Guffey and Galey [with whom Lucas was affiliated], has declared that in the course of 35 years' experience in oil matter in Pennsylvania, California and Texas he has never set his foot on ground which showed such splendid oil indication on the surface as right here, not even in Beaumont itself, and he is reported to have said that there is no reason to despair, as with such splendid surface indication oil MUST be there, only the difficulty lies in falling on it, and as to whether it is there in the form of a subterranean stream or lake remains to be seen.”

A July 22, 1903, article in the *Lafayette Daily Advertiser* stated that a “Southern Pacific well, down 1,400 feet, realized only salt water so far, but [is] expected to reach oil-bearing strata when ‘the salt bed is passed.’ Heywood No. 1 well gushed 30 feet high. Heywood No. 2 also producing. Optimism that Anse la Butte oil field will have the same production as the Jennings and Welsh fields.”

The expectations were very high, but in those early years, the Anse La Butte field failed to significantly deliver. A January 18, 1905, article in the *Lafayette Advertiser* observed that “Anse la Butte has been the target for sharp tongues and has stood more criticism than any other oil field in the South. The public may be right in some respects. They see oil men going to the field and coming back, they hear of new wells being drilled and still no gushers.” The bad luck streak was capped by the 1907 drilling of Lake Oil Corp. No. 4, when a gas blowout that ignited and burned the derrick [Howe and Moresi, 1933]. Stickney [2016] published a photograph that is likely of this well fire from the Special Collections at the University of Louisiana at Lafayette, which is shown in Figure 46.



**Figure 46.** Gas Blowout and Fire at Lake Oil Corp. No. 4 Well at Anse la Butte, Circa 1907. Photograph published by Stickney [2016] from the Special Collections at the University of Louisiana at Lafayette.

By 1907, the interest in Anse La Butte was fading. Other promising fields, such as Caddo, were causing attention to be directed elsewhere [Harris, 1910]. Coinciding with the downturn in enthusiasm for oil exploration at Anse La Butte, Harris [1908] completed his treatise on rock salt in Louisiana in which he promoted solution mining at Anse La Butte. Harris commented, “This region is usually styled the Anse-la-Butte oil field on account of the location here of a few successful oil wells and the many unsuccessful attempts that have been made to find oil. Approximately 6 out of the 28 wells known to the writer may be regarded as successes in a rather modest way. That there is a great salt mass at this place, dominating the geology of the region is well known.”



## TO BRINE OR NOT TO BRINE

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By the time of Harris' 1908 report, the thickness of the salt was known to be as much as 1,800 ft, but the 200-ft minimum depth to top of salt documented as of that time seemed to preclude viable rock-salt mining via a shaft. Harris [1908] then concluded that "the ordinary process of solution, bringing the salt to the surface in the form of brine, then evaporating the same for salt, would be perfectly feasible, and if the existence of a lake, finally, where there is now a swamp is not a serious consideration, the method of solution seems the proper one to follow, especially as evaporated salt commands a comparatively high price. The question of fuel is not serious, since oil and gas are on the field." The reference to the lake in place of the swamp after solution mining is based on the surface subsidence caused by early solution mining efforts at Belle Isle by the American Salt Company. A solution mining well was drilled and operated at Belle Isle around 1899; the well was drilled only into the upper part of the salt. Solution mining resulted in major ground subsidence around the well head, and brine discharge at ground surface.

Harris probably thought that, building upon Caracristi [1901], he had set the stage for salt solution mining as an alternative extractive industry to oil at Anse La Butte. However, his promotion would be thwarted for a while by a sudden change in fortunes for the oil men late in 1907.

## FINALLY A GUSHER

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A new discovery in the form of a gusher was made in November of 1907 in very close proximity to where Lucas had chosen to drill his 570 ft deep well at Anse La Butte in 1899. A November 19, 1907, article in the *Lafayette Advertiser* exclaimed, "Big Gusher at Anse La Butte. Lake Oil Co. Well Spouting 5000 Barrels a Day. On Land of Senator Robert Martin, and Near Center of Field. The Anse La Butte field has at last got a genuine gusher. About 100 yards from the Capt. Lucas well." This gusher well was Lake Oil Co. Well No. 7. Harris [1910] reported that the initial production was more likely in the 3,000–4,000 bpd range, but it renewed interest and commenced additional drilling operations at Anse La Butte.

Lucas had simply not been able to drill deep enough to the oil he suspected existed there. Had Lucas been better funded and equipped with more effective tools in 1899, Spindletop may never had happened under Lucas' watch or at least as early in the 20<sup>th</sup> century as it had.

By July 1908, Lake Oil Corp. had a second gusher with their Well No. 9, although the yield was a more modest 300 bpd [Howe and Moresi, 1933]. Still, the successes achieved by Lake Oil Corp in 1907–1908 created another frenzy. As a July 14, 1908, article in the *Lafayette Advertiser* described:

*Anse La Butte Busy and Active. The bringing in of the Lake Oil Company gusher in Well No. 9 has stimulated work at Anse la Butte. Lake Oil Company putting down their tenth well, about 75 feet east of the last gusher. A new company called the Guitroz is preparing to bore on the Patin tract formerly leased to the Heywoods. Several other wells are also in project. The Heywoods started to drill on the Patin and Babb tracts, but were served notices that suit had been brought to cancel their leases. The Guffey people, who had practically abandoned the field and were moving all their machinery and stock and were breaking up camp, since the advent of the big gusher, are moving back their material and reinstating their camp. The*

*J. Y. S. Oil Company is vigorously prosecuting work on their well. The Deborah Oil Co. have started their second well with Kitt Connelly as driller. He is said to be one of the best drillers in the Jennings field.*

The result of the renewed excitement was a crowded wellfield north of the swamp, which is shown in a photograph in Figure 47. The same field area is shown in map form with individual wells identified in Figure 41. Howe and Moresi [1933] list 110 wells that were drilled from 1899 to 1930. Some of these wells yielded commercial quantities of oil. Up until the end of 1932, the Anse La Butte field had produced 679,828 barrels of oil [Howe and Moresi, 1933].



**Figure 47.** Wellfield Located North of the Flat Lake Swamp at Anse La Butte as of 1910. Photograph from the Special Collections at the University of Louisiana at Lafayette.

## **BENNER'S SALT COMPANY: AN ABORTED SALT SHAFT PROJECT**

Enthusiasm for salt production at Anse La Butte did not materialize until 1917. Starting in March 1917, newspaper articles began to read as if salt (which had been known to exist at Anse La Butte since 1901) was a new find. New excitement surrounded the exploration by Andre Martin, where he drilled over 3,400 ft of salt without passing through it. Martin's discovery led first to the organization of the Benner's Salt Company, which then evolved into the Lafayette Salt Company and is documented in the following newspaper article chronology:

**March 10, 1917.** *THE WEEKLY IBERIAN* [NEW IBERIA, LOUISIANA]. *Another Great Louisiana Salt Deposit. The interesting news come from Lafayette, La., this week of the discovery within five miles of that attractive little city of what is believed to be the largest deposit of natural rock salt in the known earth.*

*The find was made in the Anse La Butte section of Lafayette Parish, where oil was discovered several years ago and a number of prolific wells yield the valuable fluid which plays such a large and ever-increasing part in the world's industries, and it was while boring for oil that Andre Martin of Lafayette city perforated the gigantic salt deposit. It is asserted that the*

*formation is at some points covered barely by 100 feet of earth, and therefore of easy access, while it has been perforated to a depth of 3400 feet without reaching the bottom of the bed.*

*A company has been formed with \$750,000 capital, all subscribed and paid up, and machinery for sinking and working of the projected mine has already been ordered, indicating that within the next few months the already [significant] salt output of Louisiana will be greatly augmented and a very notable addition be made to the state's vast natural resources and the volume of her products. The Donaldsonville Chief.*

*The discovery of the salt mine was made by Andre Martin of Lafayette while drilling for oil recently. The drill penetrated over 3400 feet of pure rock salt without passing through the deposit. Other test wells were then drilled in the adjacent section with similar results. In some sections the salt was found within 100 feet of the surface of the earth, thus demonstrating that it could be easily and cheaply mined.*

*Finding that the salt deposit was as valuable as oil, Mr. Martin began work to organize a corporation to mine the salt on a large scale. H. A. Banner, of the Weeks Salt Company, became interested with Mr. Martin and made an extensive investigation. The survey showed that the supply of salt was practically inexhaustible. Steps were then taken to organize the Anse La Butte Salt Mining Company, with Judge Julian Mouton, of Lafayette, as president.*

*Eastern and Northern capitalists promptly subscribed for all of the stock of the corporation, and none of the shares are now for sale. Contracts were made with the owners of the land to mine the salt on a royalty basis. The company now controls practically the entire salt deposit.*

*Machinery has been ordered and the first shaft will be sunk immediately. Within sixty days the company will have at least 250 men in its employ. Plants will be constructed for crushing the rock salt, and all grades will be manufactured for the market.*

**March 20, 1917.** *THE CHARLOTTE NEWS [CHARLOTTE, NORTH CAROLINA]. Rock salt deposits estimated at a total of more than 500,000,000 tons will be developed at Anse La Butte, La., by the Benners Salt Co., which has organized with \$350,000 capital. New Orleans, Chicago and St. Louis capitalists are interested, their plans providing for an initial plant with an annual capacity of 250,000 tons of salt. Borings show salt 150 feet below the surface, and the drills have passed through 3,463 feet of rock salt and are still in salt.*

**July 16, 1917.** *THE HERALD [NEW ORLEANS, LOUISIANA]. Benners Salt Company act of incorporation notarized July 17, 1917. Harry A. Benners, 700 shares, 69 Neron Place, New Orleans. R. Bruce Brough, 1 share, Lone Oaks Farm, R. F. D. No. 7, San Antonio, TX; Gabe S. Wegener, 700 shares, 119 Union Ave, Chicago, Ill.; James L. Nelson, 700 shares, 2300 Division St., St. Louis, Mo. L. A. Hubert, E. R. Mabry.*

**July 21, 1917.** *THE WEEKLY MESSENGER [ST. MARTINVILLE, LOUISIANA]. Salt Company Organizes. Contracts Are Considered For Plant and Shaft Costing \$300,000. Contracts for the sinking of a shaft and the erection of a manufacturing plant were considered Tuesday evening at a meeting of the directors of the Benners Salt Company, Inc., at New Orleans. The work will be carried on at the company mining field at Anse la Butte, St. Martin Parish, Louisiana.*

*The plant to be erected will cost \$300,000 and will be modernly equipped thorough for the production and manufacture of all grades of table, cooking and crude refrigeration salt.*

*Operation will begin at the earliest possible moment, and, according to present expectations, the plant will be running during the latter part of December.*

**Sept. 15, 1917.** *ABBEVILLE PROGRESS [ABBEVILLE, LOUISIANA]. Benner's Salt Company Begins Next Week. President H. A. Benners of the Benner's Salt Company has been on the ground at Anse La Butte for several days and it is understood will begin active operations next week, hauling material, etc. for sinking the shaft for his salt mine. Several test wells have been sunk and the salt bed struck at about 400 feet. No difficulty is anticipated in sinking the shaft and rapid progress will be made once the work is [started].*

*NEW YORK PRODUCE REVIEW AND AMERICAN CREAMERY, VOLUME 43, 1916, p. 1067. Harry A. Benners of New Orleans, has been sales manager for the Myles Salt Company for a good many years. Gabe S. Wegener, Chicago, Ill, Secretary, is President of the Hudson Mfg. Co., Chicago; James L. Nelson, St. Louis, Treasurer, is Secretary and Treasurer of the C. Nelson Mfg. Co., St. Louis. The mine is operated at Anse La Butte and the main office will be at New Orleans, La., with branches at St. Louis and Chicago.*

**Sept. 29, 1917.** *THE WEEKLY MESSENGER [ST. MARTINVILLE, LOUISIANA]. Benners Salt Co. Finances Project. H. A. Benners of New Orleans announced Saturday that the Benners Salt Company, of which he is organizer and president, has completed arrangements for amply financing the new salt mine which will develop at Anse La Butte, in St. Martin parish, and the contract will be let shortly for sinking the shaft. He stated the investment will ultimately total \$500,000 or more, and 250 men will be given employment. The company is capitalized at \$350,000, practically all of which has been subscribed, Mr. Benners said.*

*About fifteen test wells have been drilled, and it is estimated there are one to five billion tons of salt in the deposit. One test showed that the dome is 3,464 feet deep, and it may be much deeper, as the drilling was discontinued at this depth. The deposit at some points is only 161 feet beneath the surface, and test wells have proven there is salt beneath sixty acres of land.*

*The property is served by the Lafayette-Baton Rouge branch of the Southern Pacific. A move has been inaugurated for the construction of a government canal through the property, connecting Bayou Teche and Bayou Vermilion. Mr. Benners said that if the Government does not build the canal, his company will, in order to afford water transportation from the mine to New Orleans and other gulf ports. An evaporation plant will be operated for the production of high-grade table salt. There are several oil wells nearby. Mr. Bennet stated there is enough gas easily available on the property to furnish sufficient fuel for the plant.*

The shaft for the salt mine was never sunk. While what specifically transpired remains unclear, the March 23, 1918, article from *The Weekly Messenger* [St. Martinville, Louisiana] suggests acrimony among principal investors and inadequate stock purchases:

**March 23, 1918.** *Salt Company Affairs in Bad Shape. Harry A. Benner and Geo. C. L. Mayer, stockholders, have petitioned the civil district court of New Orleans for appointment of a receiver for the Benners Salt Co., lessees of certain oil or salt lands in St. Martin parish, to wind up its affairs. They allege that the domicile and funds of the company have been removed to Chicago without proper authority.*

*The Benners Co. is capitalized at \$350,000. But the petitioners claim that only \$192,000 of the stock has been subscribed for. Harry A Benners resigned as president at a meeting of the company last fall.*

In his report on salt, bromide, and calcium chloride projection in the United States, Insley [1922] provided state-by-state, salt-production statistics for 1919. For Louisiana, Insley reported that “Two plants in Louisiana produced salt in 1919. The plant of the Myles Salt Co., Weeks Island, was destroyed by fire in May, 1919. The plant of the Benners Salt Co. (Inc.), Lafayette, was not completed. The Jefferson Island Salt Co. expected to begin production about July 1, 1920.” Avery Island was the only producer for all of 1919, and the Weeks Island Mine produced until its operations were disrupted by the fire in May 1919. The first attempt to produce salt at Anse La Butte was a failure.

### **SOLUTION MINING OPERATIONS FROM 1920 TO 1930**

Although Benner's Salt Company never sank its shaft, the company did build an evaporation plant. Evaporated salt was finally produced at Anse La Butte between 1920 and 1930. In fact, two competing companies—the Benners Salt/Lafayette Salt Company and the Star Salt Corporation—solution-mined to produce table salt from evaporated brine [Howe and Moresi, 1933].

The Benner Salt Company, which was incorporated in 1917 [Louisiana Corporates, 2017] and changed its name to Lafayette Salt Company in 1922, was the first to operate. Development of the Benners/Lafayette Salt Company evaporation plant and some of the company's key people are documented in the following newspaper articles from 1919 to 1922:

**March 22, 1919. Benners Salt Co. Machinery Arrives.** *THE DAILY ADVERTISER* [LAFAYETTE, LOUISIANA]. *S. R. Parkerson, President of the Benners Salt Co., with a proven territory of thirty-five acres at Anse la Butte announced this morning that the machinery for producing salt had been received and the plant will be in operation on or about July 1. Work is under the direction of H. A. Benners, an experienced man in this line of work.*

*The railroad siding has been placed, an office building and shops have been completed and everything is being rapidly shaped up for the time set for the actual opening of this big industry which is destined to grow until it is one of the most important in the entire state.*

**June 17, 1919.** *MORGAN CITY DAILY REVIEW* [MORGAN CITY, LOUISIANA]. *A large salt mine at Anse La Butte is to be opened shortly by the Benners Salt Company. It will have an initial capacity of 100 tons a day. Officers are S. R. Parkerson, Lafayette, president; Peter Jung, vice-president; Wm. McL. Fayssoux, secretary, and Judge Mouton, A Krause and H. A. Benners of Lafayette.*

**Oct. 30, 1919. Salt Engineer For Mine Here. J. E. Hammond, of Cleveland, O., To Install Machinery and Start Operations.** *THE DAILY ADVERTISER* [LAFAYETTE, LOUISIANA]. *The Benners Salt Company, of Anse la Butte, has added another experienced man to its staff. He is J. E. Hammond, of Cleveland, O., who came here today to assume his duties at the mine.*

*Mr. Hammond reported to S. R. Parkerson, President of the concern, and after a brief conference, started for the plant. He will assist in erecting the machinery and will get*

operations underway. Mr. Hammond has more than twenty years of experience in his business and comes here well recommended.

Unless something unforeseen delays the company, it is expected to have the industry started by Dec. 1. The output will be marketed on a large scale.

**Sept. 9, 1920.** *THE DAILY ADVERTISER* [LAFAYETTE, LOUISIANA]. Prof. W. B. Stokes, successor to Prof. A. C. Bond, who resigned to become plant manager for the Benners Salt Company, has arrived in Lafayette.

**Sept. 24, 1920. Bensco Salt Success.** *THE DAILY SIGNAL* [CROWLEY, LOUISIANA]. The Signal has received a two pound sack of salt from the Benners Salt Co., Lafayette. The product came from the mine at Anse-la-Butte. We are indebted to Dr. F. R. Martin, of this city for the sample. H. A. Benners, vice president and general manager of the company, extends a cordial invitation to the people of Crowley and vicinity to visit the mine from 9 a. m. to 6 p. m. any day except Sunday. Ladies will be especially welcome.

**Feb. 15, 1921. Stockholders of Benners Company Meet.** *THE DAILY ADVERTISER* [LAFAYETTE, LOUISIANA]. The following officers were elected for the coming year: S. R. Parkerson, Lafayette, President. Dr. M. E. Saucier, Lafayette, Vice-President. J. B. Wille, Louisville, Secretary. I. B. Bendel, Lafayette, Treasurer.

The following stockholders were in attendance: H. A. Benners and Geo. C. L. Mayer, both of New Orleans; L. S. Leopold, J. F. Marx, and J. B. Wille, all of Louisville. I. B. Bendel, Julien Mouton, S. R. Parkerson, and Dr. M. E. Saucier, all of Lafayette.

It is planned to resume operations at the company's plant located about six miles from Lafayette, within the next few weeks.

**Jan. 20, 1922. Extensive Development of Salt Company in Which Local Men Are Interested is Proposed. Plans Under Way for Increasing Capital Stock of Benners Salt Company of Which S.R. Parkerson, Vice-President of First National Bank Is Head, And in Which About Half of Capital Stock Is Held by Lafayette Residents—Louisville Man Submits Proposition.** *THE DAILY ADVERTISER* [LAFAYETTE, LOUISIANA]. Extensive development of the Benners Salt Company, about half of the stock of which is held by Lafayette residents, with the remainder owned by Louisville and New Orleans parties, is proposed in plans which have been formulated and made public.

S. R. Parkerson, Vice-President of First National Bank, is president of the company, the plant of which is located at Anse la Butte.

In a statement which has been issued by Mr. Parkerson to the company stockholders, he advises that the interest of J. J. Kean, of Louisville, Ky., who has erected and operated several evaporating salt plants, has been enlisted in the project, and has submitted a proposition to subscribe for \$100,000 worth of stock, with the understanding that \$50,000 additional stock is raised among the present stockholders.

The proposition made by Mr. Kean is to be among the matters to come before the regular annual meeting of the company, which has been called for February 13<sup>th</sup>. Election of a Board of Directors for the ensuing year is also to be held at that time, and other matters to occupy the attention will include the following:

*To change the name of the corporation to Lafayette Salt Company; to increase the amount of stock; to ratify the proceedings of the Board of Directors held January 10<sup>th</sup> in regard to the contract entered into with Mr. Kean for the further development of the plant....*

*Under the terms of the contract Mr. Kean is to act as general manager of the company in the further development of its salt works.*

*The plan now in operation is a complete evaporating system with a tested capacity of forty tons a day.*

**Jan 28, 1922.** *THE DAILY ADVERTISER [LAFAYETTE, LOUISIANA]. Annual meeting of the Benners Salt Company, Inc. for election of Board of Directors to be held second Monday of February, 1922 at its office at No. 111 West Vermilion Street, Lafayette. As agreed by Board of Directors on January 10, 1922, voting to take place on name change to Lafayette Salt Company, Inc. Also to increase the amount of capital stock to \$750,000. Also vote on entering into the contract with J. J. Kean for the purpose of increasing the capital stock of the company and secure funds with which to further develop the Salt Manufacturing Plant of the Company as Anse la Butte. Charles L. Parkerson, Secretary of the Board of Directors.*

**Feb. 16, 1922.** *THE DAILY ADVERTISER [LAFAYETTE, LOUISIANA]. The re-organization plans of the Lafayette Salt company, formerly the Benners Salt company, are of great interest to all Lafayette Parish. Steps are now being taken to make this project one of the great developments of Southwest Louisiana and through the change in the title of the company that has been made by the citizens that have the welfare of this parish forever close to their hearts the name of Lafayette will soon be carried far and wide throughout the country.*

*The Lafayette citizens and their fellow stockholders that were interested in the Benners Salt company held fast and true through some trying days for their project. Their development work was under way at a most inauspicious time. The whole world was great upset, financial conditions were away off and through the combination of effects the general welfare of the project suffered.*

*Notwithstanding all of this the Benners Salt company stockholders kept quietly at work. They had an abiding faith in their project and recent events have proven that this feeling was well founded. The Lafayette Salt company is now on a firm foundation with development plans that will mean great things for Lafayette.*

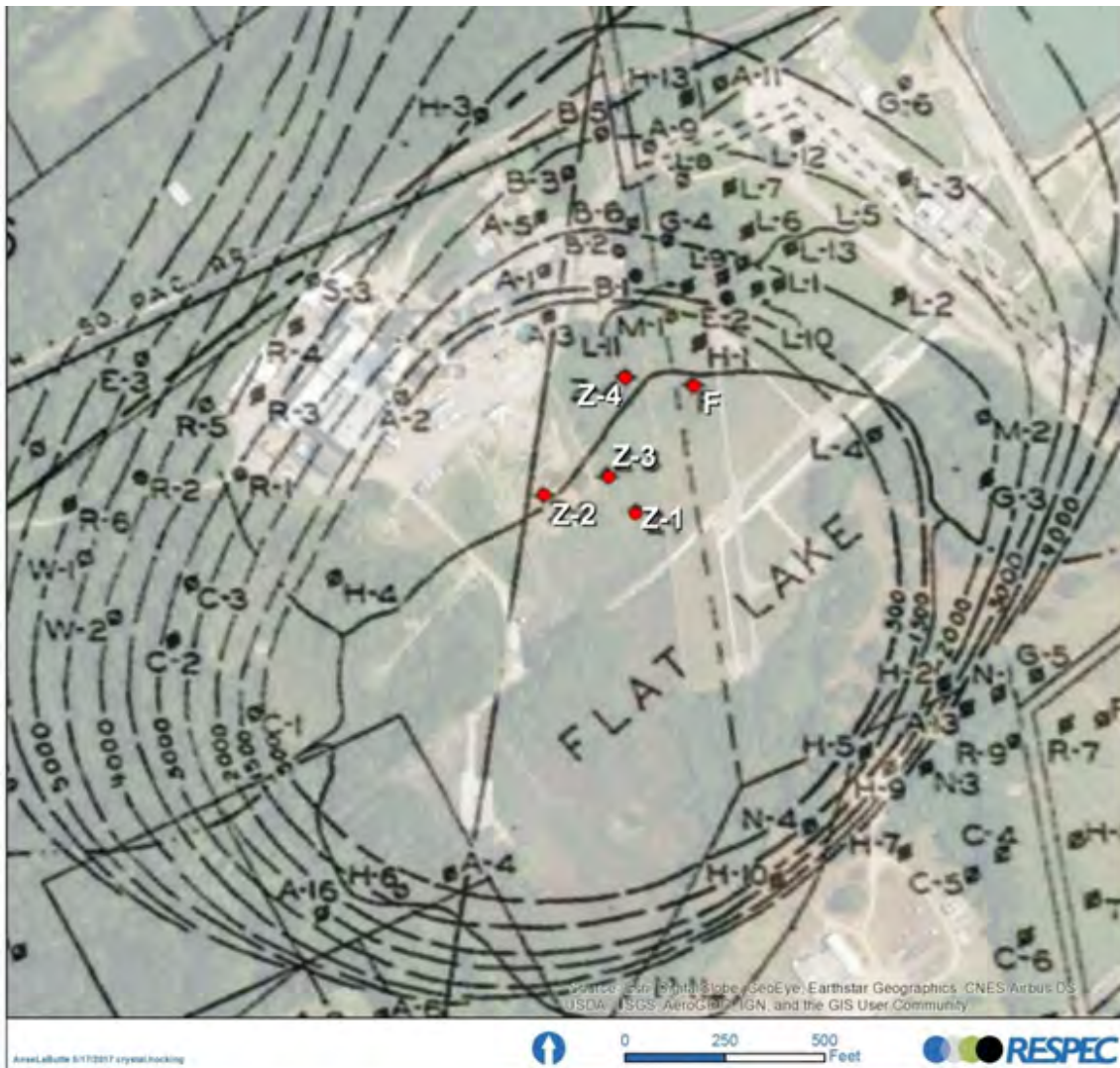
According to Howe and Moresi [1933], the company drilled four wells that were located within or near the northern boundary of the Flat Lake swamp listed in Table 1 and shown in Figure 48. The first well (Z-1) was their stratigraphic test well and was completed in 1918. The depth to salt in this well was 160 ft, and the TD was suspected to be 200 ft. The company then drilled three production wells. The first two production wells (Z-2 and Z-3) were drilled in 1920 and operated only for brief periods of time. These two wells were apparently cased no more than 40 ft into the top of salt (if at all). Howe and Moresi [1933] report salt intervals in these wells as 200–800 ft (TD) and 200–900 ft (TD), respectively. Howe and Moresi further note that both wells “produced a small quantity of brine and the well caved-in.”

The Lafayette Salt Company's third production well (Z-4) was completed in 1921 to a greater depth. Howe and Moresi record a salt interval of 200–1,800 ft (TD) and note that “this company obtained most of the brine from this well. Information obtained from H. C. Bond, Breaux Bridge.” The third production

**Table 1. Early Solution Mining Wells at Anse La Butte**

Well Name	Company	Location	Year	Depth (ft)	Comment
Z-1	Lafayette Salt Co.	Sec. 71 Flat Lake	1918	~200	Test well for salt; salt encountered at a depth of 160 ft
Z-2	Lafayette Salt Co.	Sec. 71 Begnaud Lake	1920	800	200–800 ft salt; produced a small quantity of brine and the well caved in
Z-3	Lafayette Salt Co.	Sec. 71 Flat Lake	1920	900	200–900 ft salt; produced a small quantity of brine and the well caved in
Z-4	Lafayette Salt Co.	Sec. 71 Begnaud Lake	1921	1,800	200–1,800 ft salt; this company obtained most of the brine from this well. Information obtained from H. C. Bond, Breaux Bridge
F	Star Salt Corp.	Sec. 71 Begnaud Tract	1923	1,600	240–1,600 ft

(a) Information obtained from H. C. Bond, Breaux Bridge.



**Figure 48.** Location of Lafayette Salt Company and Star Salt Corporation Wells (Modified From Howe and Moresi [1933]).



well produced brine until 1927 when the company abandoned operations at its plant on the Begnaud tract after producing enough brine to make 30,174 short tons of table salt marketed under the name Bensco Salt [Howe and Moresi, 1933]. Evaporative methods were simply too costly to compete with the mines at Avery Island, Weeks Island, and Jefferson Island. Although Howe and Moresi reported that the company survived until 1927, the operation apparently became insolvent as early as 1923. A June 8, 1923, article in the *Monroe News-Star* read:

**Nickerson Receiver. Shreveport.** *John C. Nickerson of Lafayette, has been appointed receiver of the Lafayette Salt Works by Federal Judge Jack. The salt company was recently made defendant in involuntary bankruptcy proceedings. The plaintiff, William Thomson, claims that the company owes debts aggregating \$100,000.*

The competing Star Salt Corporation drilled its one and only well and began making table salt in 1923. The brine well was located near the Lafayette Salt Company wells on the Begnaud tract and is labeled with “F” on the Anse La Butte dome map in Figure 48. The salt interval in the well was reported by Howe and Moresi [1933] to be 240–1,600 ft (TD). The Star Salt Corporation was formed late in 1922 with J. J. Kean, formerly of Lafayette Salt Company, as its head. A December 7, 1922, article in *The Daily Advertiser* reads:

**Details Are Being Completed For New Salt Plant.** *THE DAILY ADVERTISER [LAFAYETTE, LOUISIANA]. Organization and other details are now being completed, it is announced, in connection with the Star Salt Corporation, a new enterprise with headquarters here, and which is to be headed by John J. Kean, formerly general manager of the Lafayette Salt Company's plant at Anse La Butte.*

*W. S. Thompson, of New York, representing eastern capital interested in the new corporation, has been in this city for several days, supervising matters pertaining to the establishment of the plant, and is using temporary headquarters in the Bank of Lafayette Building.*

*The plans now being completed call for a deep well in the Anse La Butte section, from which the salt brine is to be piped to an evaporating plant to be constructed between the main building of the Baldwin Say Mill and Bayou Vermilion, the plan being to use steam from the mill to furnish power for the salt plant, which is to be of 200 ton capacity.*

*Election of officers of the new organization is scheduled for a meeting here soon, it is announced.*

The Star Salt Corporation evaporation plant was constructed off the dome. The plant was built adjacent to a lumber mill along Vermilion Bayou at the foot of the railway spurs that branched southeast off the main track of the Southern Pacific Railroad and located upstream from the railroad bridge on Guidry Street in Lafayette [R. Christopher Goodwin & Associates, 2003]. The brine was pumped from the well through a cypress pipeline to the plant site where it was evaporated in vacuum pans [Bradshaw, 2009]. Steam from an adjacent lumber mill was used to speed the evaporation process. The plant operated until 1930 surviving major flooding in 1927, which is shown in Figure 49; during its 8-year life, the Star Salt Corporation produced 89,456 short tons of salt [Howe and Moresi, 1933].

Between the two salt companies, a total of 119,630 short tons of salt were produced at Anse La Butte between 1921 and 1930 [Howe and Moresi, 1933]. The peak year was 1924 when, with both companies

operating, 26,836 short tons of evaporated salt were produced. Following a meager 5,906 short tons produced in 1930, solution mining ceased for over a decade until Gordy Salt opened its new plant in 1941. The Gordy Salt plant ushered in the modern era of salt production at Anse La Butte.



**Figure 49.** Star Salt Corporation (at Right) and adjacent Baldwin Lumber Company During the Flood of 1927. Water was reported to be 10 feet deep [Louisiana State University, 1927].

## CONCLUDING REMARKS

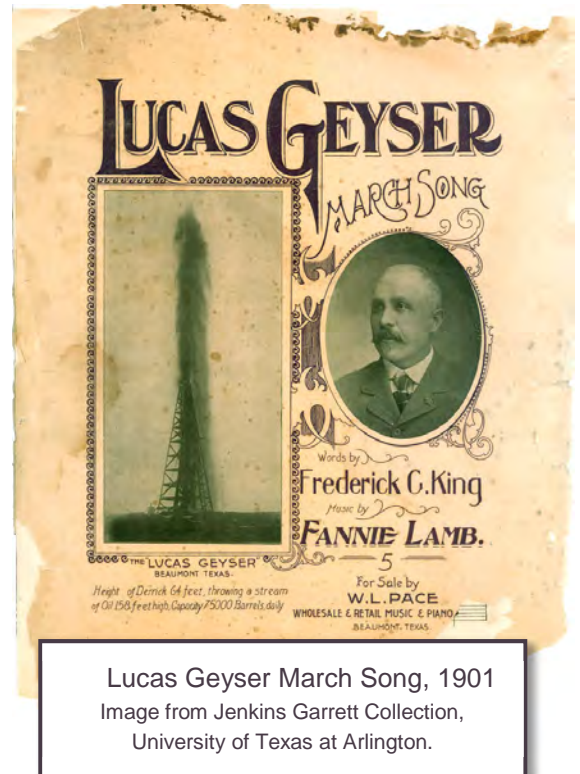
Following his discovery at Spindletop Dome, Lucas went on to consult in the United States, Europe, and Russia. Although he dabbled in salt and sulfur, Lucas remained focused late in his career on oil. In 1918, Lucas brought his understanding of salt dome geology and hydrocarbons to light in a remarkable theoretical paper. In that paper, Lucas also revealed a continued interest in the Belle Isle salt dome and hinted that the dome had not yet revealed its true economic potential.

Using Belle Isle as an example, Lucas [1918] postulated that “all salt-dome oil has a common origin; that it migrated up from considerable depth.” While Lucas erroneously theorized that the salt domes were a product of volcanic forces or intrusive laccoliths under the domes (as he illustrated in Figure 50), he was correctly confident that further oil supplies were to be had at greater depth in the Gulf.

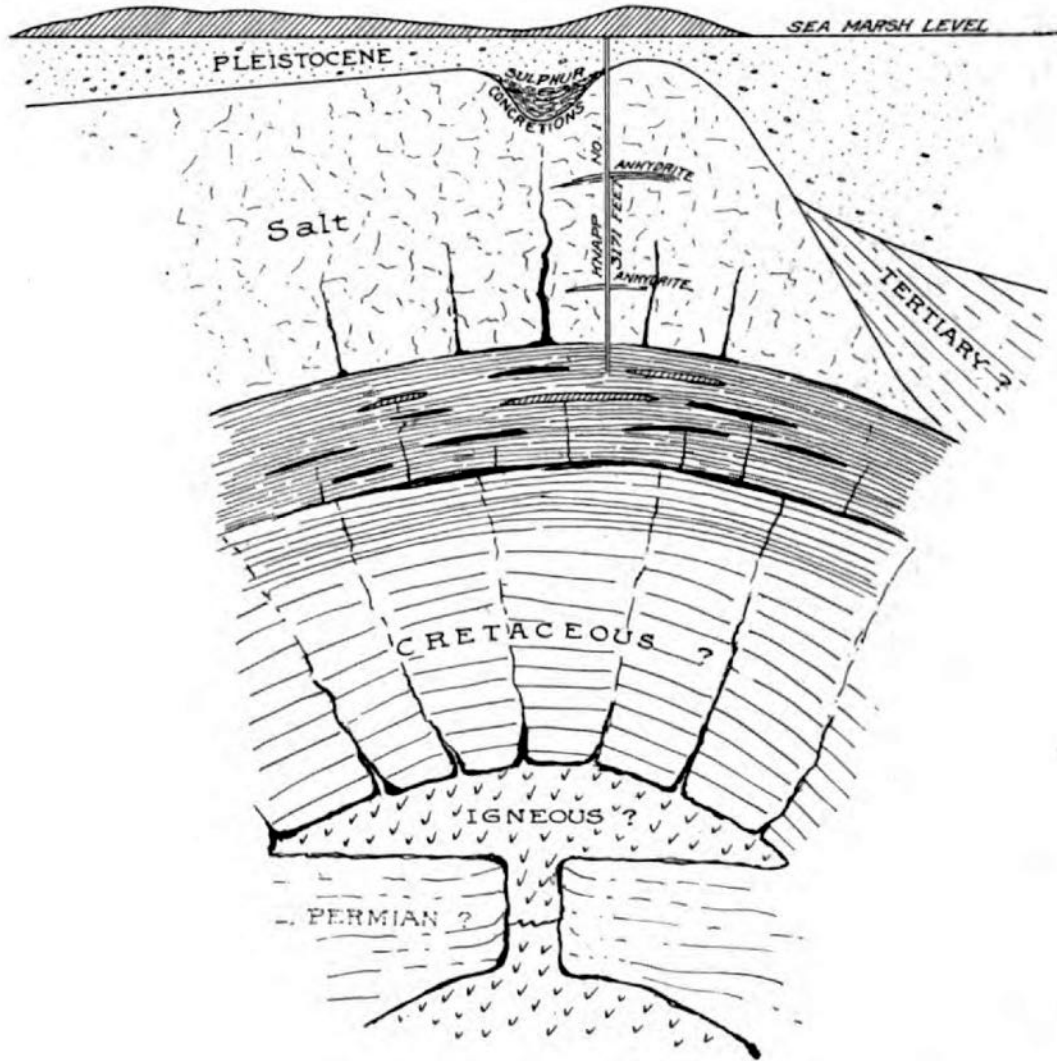
Based on observations of Knapp's 1907 drilling at Belle Isle, Lucas [1918] postulated “the presence of gas under such great pressure in the salt itself down to 2700 ft., and of oil below, proves to my mind that these hydrocarbons must have been forced up from a considerable depth. The initial source of petroleum cannot be definitely determined [but] indicate that it is partly or largely inorganic origin and that the domes themselves are certainly because of igneous forces.” He also stated that he believed “further supplies of oil are to be found in the domes at greater depth” [Lucas, 1918].

Lucas' hypotheses were just slightly ahead of the emerging technologies that were needed to better understand salt dome geometry and origin. He knew that geophysical approaches were being developed, and he published his 1918 paper to provide impetus for deeper drilling on the dome flanks and application of geophysics that, during the 1920s, brought the true geometry of the salt diapirs to light.

Anthony Lucas passed away September 22, 1921, and he was eulogized in the April 2, 1922, *Tulsa Daily World* by Reid S. McBeth, one of his closest friends. Over the 25 years that Lucas spent investigating Gulf Coast salt domes, Lucas emphasized the tremendous advantages that the southern Louisiana salt domes offered over deposits in other North American salt basins. In his 1900 paper, he stated, “The Louisiana deposits consist . . . in their nearness to the surface, their exceptional purity, and the practicality of mining them as simple underground quarries, without fear of the incidental extraction of foreign materials, to the injury of the product.” Starting at Anse La Butte and finishing with his creative hypothesis on geologic conditions at Belle Isle and plea for deeper drilling, Lucas maintained confidence in the ability of the southern Louisiana salt domes to produce oil at depth.



Lucas Geyser March Song, 1901  
Image from Jenkins Garrett Collection,  
University of Texas at Arlington.



**Figure 50.** Lucas' Hypothetical Sketch of Belle Isle and his Laccolith Hypothesis [Lucas, 1918].

Undoubtedly, Lucas will remain most famous for being the man who brought in the first salt dome oil gusher at Spindletop Dome in Beaumont, Texas, which sparked a petroleum exploration boom in Texas and launched an industry that continues prosperously to this day. This paper was written and shared to cast light on the remarkable and unprecedented contributions that Lucas made to salt exploration and production in Louisiana before and after the Spindletop gusher.

Lucas was successful at Spindletop despite the contrary opinions of oil men and geologists at the time. Despite technological advances, our understanding of subsurface geology is never perfect. Lucas left us the advice that “theories [should] be ignored and that a thoroughly practical test [should] be made” when it comes to exploration of natural resources [Lucas, 1918]. Lucas humbly explained to us that he “simply set forth [his] opinion in the hope that [his] early discoveries... on the Coastal Plain may be still further extended for the benefit of any who care to accept the hazards involved, and for the advancement of science” [Lucas, 1918]. Many listened.

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