D-1878

historic structure report
and resource study
Pensacola Harbor defense project
1890 - 1947 Florida unit
march 1982

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FOREWORD

This report has been prepared to satisfy the research needs for the Pensacola Harbor Defense Project structures as developed in discussions with former Area Manager Art Graham, Historical Architects Henry Judd and John Garner, and Team Manager John Luzader. It is designed to provide a detailed history of the structures constituting the Pensacola Harbor Defense Project from 1893 to 1947, along with data on their concept, development, and changing missions.

A number of persons have assisted with preparation of this report. Particular thanks are due former Area Manager Art Graham and former Historian George D. Berndt and the current Historian Ann Castellina-Dudley of the Florida District, Gulf Islands National Seashore, for their assistance and encouragement on-site and answering many questions as to the present condition of the structures. Pensacola Historians J. Earle Bowden (one of the fathers of the National Seashore, friend of many years, and distinguished editor of the Pensacola News-Journal) and Norman Simons cheerfully shared their vast knowledge of local lore and sources.

At the National Archives and the Suitland Records Center, we, as heretofore, would have been hamstrung without the assistance of such well informed and helpful personnel as these archivists and technicians--Dale Floyd Tim Ninninger, Mike Musick, Richard Cox, John Matias, Carol Zangara, Tom Lipscomb, Fred Prenell, and the staff of the Cartographic Division.

Dr. E. Raymond Lewis, Librarian of the House of Representatives, shared with us his encyclopedic knowledge of seacoast fortifications.

Historical Architects Henry Judd of the National Park Service's Cultural Resources Management Division and John Garner of the Southeast Regional Office spent a week reconnoitering the structures with us, pointing out changes in the fabric, and discussing preservation problems.

Our colleagues, Superintendent Frank Pridemore and Historian Ann Castellina-Dudley of Gulf Islands National Seashore, Historical Architects John Garner and Henry Judd, Chief Park Service Historian Harry Pfanz, and Manager, Historic Preservation, Denver Service Center, John Luzader, reviewed the manuscript, and made valuable suggestions. Finally, we wish to commend Mrs. Virginia Fairman and Maggie Rylee who had the unenviable task of turning our scrawl into a typed document.

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I. ADMINISTRATIVE DATA

A. Name and Number of Structures

The Harbor Defense Project, Pensacola Bay, 1893-1947, consists of a number of structures. While individually these structures are of Third Order of Significance, they constitute units of an ensemble which are of First Order of Significance.

On the List of Classified Structures for the Florida Unit, Gulf Islands National Seashore, these structures are identified:

Battery Pensacola, No. B-1
Battery Loomis L. Langdon, No. B-2
Battery Worth, No. B-3
Battery George Cooper, No. B-4
Battery No. 234, No. B-5
Battery Matthew Payne, No. B-6
Battery Trueman, No. B-7
Battery Cullum, No. B-8
Battery Sevier, No. B-9
Battery Van Swearingen, No. B-10

Battery No. 233, No. PK-1
Battery Slemmer, No. PK-2
Battery Center, No. PK-3
Fort McRee Seawall, No. PK-4
Fort McRee Windmill, No. PK-5

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Machine Gun Nest, No. P-41
Machine Gun Nest, No. P-43
Battery Fixed (Antiaircraft Emplacement), No. P-46

B. Proposed Use of Structures

Batteries George Cooper and Battery No. 234, which have been armed, will be restored to their appearance during the eras of their major significance--Battery Cooper 1906-1917 and Battery No. 234 1944-1946. The other structures will be preserved and protected, and their interiors, where feasible may be adapted to provide for a compatible usage.

C. Justification for Such Use

Public Law 91-660, enacted January 8, 1971, establishing the National Seashore, provides that "Fort Redoubt, Fort San Carlos, Fort Barrancas at Pensacola Naval Air Station, Fort Pickens on Santa Rosa Island, and Fort McRee on Perdido Key" shall be administered "so as to recognize, preserve, and interpret their national historical significance in accordance with the Act of August 21, 1935."

D. Provision for Operating Structures

The Harbor Defense Project structures will be accorded various levels of treatment. Several will be restored to reflect their appearance during a specific time frame, while the remainder will be stabilized, preserved, and protected.

E. Cooperative Agreement, if any, Executed or Proposed for Operating Structures

No cooperative agreement will be required to operate the structures.

F. Brief Description of Construction Activity

This will be covered in the Architectural Data Section of the Historic Structures Report to be prepared by an architect.

G. Estimate of Costs

Cost estimate forms will be submitted after preparation of the Architectural

II. THE BOARD OF ENGINEERS INTRODUCES THE ENDICOTT SYSTEM TO PENSACOLA BAY

A. A Technological Revolution Makes Our Nation's Coastal Defenses Obsolete

The freeze on construction funds for the Nation's seacoast defenses imposed by Congress beginning in Fiscal Year 1877 resulted in these fortifications, such as guarded the approaches to Pensacola Bay, falling into disrepair, and the defensive posture of the United States shrank "to perhaps its lowest point since 1812." Simultaneously, great advances were being made in the design and manufacture of heavy ordnance.

One important development involved the substitution of steel for iron in the casting of guns. As the technique of forging large masses of steel improved, it enabled the ordnance people to proceed with the manufacture of the compound tube. The founding of cannon tubes in accordance with this new concept -- increasing the size and strength of the gun by the successive shrinking on of reinforcing hoops -- had been practiced, it is true, in the years before 1860. Technology, however, had lagged, and it was not until the Civil War that banded and rifled guns of heavy caliber came into general use. Dr. Raymond E. Lewis, an authority on the subject, has written:

> Not until the late 1880's did the combined availability of good quality steel in large amounts, industrial facilities for producing heavy forgings, and machinery techniques able to meet the required standards of precision make it possible to produce substantial numbers of these lighter, stronger, and hence, more powerful weapons.[1]

Another important advance was in the perfection of breech-loading. The principle had been common knowledge for centuries, and it had been employed intermittently until 1855, when Lord William Armstrong of Great Britain designed a rifled breech-loading gun that "included so many improvements as to be revolutionary."[2] During the Civil War breech-loading artillery was employed on a limited scale by the belligerants. After 1865 breechloading field pieces replaced muzzle-loaders in the European armies, as well as those of the United States. Not so rapid was the replacement of the muzzle-loading heavy ordnance mounted in coastal fortifications. The problem of developing a successful breech-loading great gun was technological. To be acceptable, a breech-loading mechanism had to withstand the great heat given off by the detonation of the propellent, be capable of containing the gasses,

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1. Emanuel R. Lewis, Seacoast Fortifications of the United States: An Introductory History (Washington, 1970), p. 75.

2. Albert Manucy, Artillery Through the Ages: A Short Illustrated History of Cannon, Emphasizing Types Used in America (Washington, 1948),

and be machined to be opened and closed rapidly. It was not until the mid-1880's that ordnance technology was sufficiently advanced to produce the well-machined block mechanisms required by the big rifled guns needed for coastal defense.[3]

Three other developments helped spark the emergence of modern coastal artillery: (a) methods of rifling tubes were improved, which made possible the introduction of more efficient projectiles; (b) the development of disappearing carriages that utilize the firing recoil energy to return the gun to its position in battery behind a parapet, where it could be reloaded and serviced without unduly exposing its crew; and (c) the introduction of improved propellents, nitrocellulose- and nitroglycerin-based powders, to replace black powder.[4]

The effect on heavy ordnance of this technological revolution cannot be exaggerated, because it represented the greatest advance to be made in artillery from the time of its appearance in the fourteenth century until the development of the atomic cannon in the 1950's. As Dr. Lewis has written:

> Compared to the best of the smoothbore muzzle-loading cannon of the post-Civil War period, the new weapons which began to emerge from the developmental stage around 1890 could fire projectiles that, caliber for caliber, were four times as heavy as to effective ranges two to three times as great; and they could do so with remarkably increased armor-penetration ability and accuracy.[5]

During these years, the European naval powers had been embarking on ambitious and expensive construction programs -- the battleship had made her appearance. News of the development of what was considered to be the ultimate weapon afloat caused ranking Army and Navy officers, as well as much of the public dwelling on the Atlantic and Pacific coasts, to become alarmed over the failure of Congress to authorize appropriations for coastal defense since the mid-1870's. Pressure mounted for Congress to take action to correct a situation which had allowed the Second and Third System fortifications to deteriorate to a point where the Nation's security was jeopardized, and it would be "helpless against the attack of

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3. Lewis, Seacoast Fortifications of the United States, p. 75.

4. Ibid., p. 76; Manucy, Artillery Through the Ages,p. 28.

5. Lewis, Sea Coast Fortifications of the United States, p. 76.

any third rate power possessing modern iron-clad vessels armed with heavy rifled cannon."[6]

B. President Cleveland Constitutes the Endicott Board

President Grover Cleveland accordingly in 1885 constituted a board headed by Secretary of War William C. Endicott to review the coastal defenses of the United States and to submit recommendations for a program to update them to take advantage of the technological revolution in weaponry. The board was composed of officers of the Army and Navy, as well as civilians. Not since 1816, when the four-man board headed by Bvt. Brig. Gen. Simon Bernard had made the study leading to construction of the Third System Forts, had the subject of fortifications, types of armament, etc., been subjected to such an exhaustive study. The Endicott Board made its report in 1886.[7]

The Board called for fortifications at 27 coastal points, plus three on the Great Lakes. Batteries emplacing guns and mortars would be supplemented by floating batteries, submarine minefields, and torpedo boats. Cost of the undertaking, including the manufacture of 577 big rifled guns, 724 giant mortars, and their carriages, the Board estimated at $126,377,800.[8]

As Dr. Lewis has written:

> In terms of the cost estimate alone, the overall proposal was grossly unrealistic. Moreover, the detailed provisions concerning the types and quantities of weapons, drafted while the new ordnance was still at a fairly early stage of development, were necessarily set forth

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6. Executive Documents of the House of Representatives for the 1st Session of the 51st Congress, 1889-90 (Washington, 1889), Serial 2716, pp. 4-6.

7. Lewis, Seacoast Fortifications of the United States, pp. 77-78.

8. Executive Documents of the House of Representatives for the 1st Session of the 49th Congress, 1885-86 (Washington, 1886), Serial 2395, p. 18.

long before precise information was available regarding the actual performance of the production models.[9]

The consolidated estimates provided:

For construction of masonry and earthwork batteries	$31,863,000
For armor of batteries	20,300,000
For structural metal for batteries	3,320,000
Subtotal for emplacements	$55,483,000
For manufacture of 577 heavy steel rifled guns and 724 mortars	$28,554,000
For manufacture of 1,301 gun and mortar carriages	18,875,000
Subtotal for guns, mortars, and carriages	$47,429,000
For submarine mines	$ 1,659,000
For mining casemates	635,000
For electric lights, etc.	1,200,000
Subtotal for mining operations	$ 3,494,000
For floating batteries	$ 4,334,000
For torpedo boats	$ 9,720,000
GRAND TOTAL	$126,377,800

Nevertheless, on March 29, 1887, the Board of Engineers for Fortifications was directed by Secretary of War Endicott to prepare plans for the defense of the Nation's more important harbors, in accordance with recommendations of the Endicott Board. Operating within these guidelines, the Board "undertook a thorough revision of plans for defense of our chief ports by submarine mines and a study of the precise location of the new armaments rendered necessary by modern modes of attack."[10]

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9. Lewis, Seacoast Fortifications of the United States, p. 77.

10. Craighill to Lamont, Sept. 29, 1896, found in Report of the Secretary of War; being part of the Messages and Documents Communicated to the Two Houses of Congress at the Beginning of the Second Session of the Fifty-Fourth Congress, 3 vols. (Washington, 1896), Serial 3479, vol. 2, p. 7. Brig. Gen. W. P. Craighill was Chief Engineer and Daniel S. Lamont was Secretary of War in 1896.

During the years, 1887-1896, detailed plans for defense of 23 key harbors, including Pensacola, were prepared by the Board of Engineers and approved by the Secretary of War.[11] Besides these major undertakings, partial projects were programmed and approved for defense of the Lake Ports; Cumberland Sound, Georgia and Florida; the Kennebec and Penobscot Rivers, Maine; New Bedford, Massachusetts; and New Haven and New London, Connecticut. Under consideration in 1896 were projects for defense of Port Royal, South Carolina, and Dry Tortugas, Florida.[12]

C. Congress Acts

The 1st Session of the 50th Congress resumed making appropriations for coastal defense. On September 22, 1888, President Cleveland signed into law an act implementing several of the Endicott Board's recommendations. This legislation, besides establishing a Board of Ordnance and Fortifications to oversee the development of armament for the projected Endicott System of defense, made an appropriation for beginning the manufacture of modern seacoast guns and mortars, and made available $200,000 for inauguration of the submarine mine defense scheme.[13]

Employing these funds, the Corps of Engineers commenced construction of three mining casemates, one each at Forts Wadsworth and Schuyler, New York, and at Fort Warren, Massachusetts. A second appropriation voted by Congress on March 2, 1889, funded five more casemates, one each for the fort at Willetts Point (subsequently Fort Totten) and Fort Lafayette, New York; the fort at Sandy Hook; and at Alcatraz and Point San Jose, California.[14]

Congress, beginning in 1890, resumed making annual appropriations for seacoast fortifications. During the previous 15 years, as has been noted, great advances had been made in fabrication of great guns, and their increased power made mandatory the construction of fortifications with increased resistance to projectiles. At sea, the British and Italians

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11. In addition to Pensacola, these harbors were: Portland, Me.; Portsmouth, N.H.; Boston, Mass.; Narragansett Bay, R.I.; eastern entrance to Long Island Sound, N.Y.; New York Harbor, N.Y.; Philadelphia, Pa.; Baltimore, Md.; Washington, D.C.; Hampton Roads, Va.; Wilmington, N.C.; Charleston, S.C.; Savannah, Ga.; Key West, Fla.; Mobile, Ala.; New Orleans, La.; Galveston, Tex.; San Diego and San Francisco, Calif.; mouth of the Columbia River, Ore. & Wash.; and Puget Sound, Wash. Report of the Secretary of War, Serial 3479, p. 7.

12. Ibid.

13. Executive Documents of the House of Representatives for the 1st Session of the 51st Congress, 1889-90 (Washington, 1889), Serial 2716, pp. 507.

14. Ibid., p. 7.

had launched ships mounting rifled cannon weighing more than 100 tons. The existence of such weapons afloat necessitated "a certain corresponding resistance of works of defense, a corresponding thickness of cover." The situation was therefore propitious for the United States to program the construction of modern fortifications. General projects for defense of Portland, Maine; Boston, Massachusetts; New York City, New York; Washington, D.C; Hampton Roads, Virginia; and San Francisco, California, had been prepared and approved by the Chief of Engineers and the Secretary of War.

The Fortifications Act of August 17, 1890, which appropriated $1,221,000, required that this sum be applied as follows: Boston, $235,000; New York, $736,000; and San Francisco $260,000. On February 24, 1891, expenditures of $750,000 were authorized, with major allotments made for the defenses of San Francisco, New York, Hampton Roads, and Washington, D.C.[15]

D. The Board of Engineers' Project for Defense of Pensacola

It was June 1893 before the Board of Engineers (Cols. Henry Abbot and Cyrus B. Comstock, and Lt. Cols. Henry M. Robert and G. L. Gillespie) completed its study and made the report upon the defense of Pensacola. The Board, on surveying the area, learned that Pensacola's importance as a commercial port was constantly increasing. About 500 foreign vessels had cleared the harbor during the previous year, most of them carrying lumber. The harbor was one of the best anchorages on the Gulf Coast, although deep-draft ships could not cross the bar. As a "port of refuge" for the merchant marine and supply depot for cruisers, in time of war, it possessed "sufficient value to warrant the erection of modern works able to defy serious operations of the enemy."

Upon reconnoitering Santa Rosa Island, the Board found that Fort Pickens, which had served the Union well during the Civil War, was in fair condition. Its piers at the parade wall, they observed, exhibited vertical cracks, while the scarp "shows a tendency to incline outward." The parade was roomy, affording a good position for a lift battery, "while many good positions" were available for rapid-fire guns to protect the submarine minefield. The Board saw that its 1874 project for modernization of the fort had been partially carried out before Congress ceased its annual appropriations for modification of the Second and Third System defenses.

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15. Executive Documents of the House of Representatives for the 1st Session of the 52nd Congress, 1891-92 (Washington, 1892), Serial 2922, Vol. 3, pp. 5-7.

They identified a "well marked sand ridge extending eastward," and "composed of hard and fine white sand." It, they agreed, would afford a good site for disappearing guns, while a heavy growth of timber farther east could provide cover for a mortar battery.

Fort McRee, on Fosters Bank, was in ruins, most of the fabric "having been undermined by the sea and distributed along the shore by waves." The narrow bank was protected by two concrete groins and the rubble of the 1830's fort.

On the mainland, there were Fort Barrancas, the Redoubt, and the "old Spanish fort." The former stood on the highest ground in the area. The old Spanish fort was armed with five siege guns, while Fort Barrancas had room for eight large caliber guns--10-inch smoothbores or rifled 8-inch Rodmans. Three of its emplacements had been given new platforms, with 4-inch pintles, in 1890, and now mounted 8-inch rifled Rodmans. The Board recommended that five more platforms be given the same treatment. The fire of these rifled Rodmans could cover the minefield and the inner entrance to the harbor.

To defend Pensacola Bay and the Navy Yard against a hostile fleet, the Board called for:

> Two 12-inch guns in a lift battery on the Fort Pickens parade; four 10-inch guns on disappearing carriages on the sand ridge east of Fort Pickens; sixteen 12-inch mortars in a battery still farther eastward, provided with local flank defenses; and two 10-inch guns on disappearing carriages near the site of Fort McRee.

The Board also proposed to retain emplacements for eight 8-inch converted rifles, mounted en barbette, in Fort Barrancas, along with such of the barbette guns of Fort Pickens as bore on the submarine minefield and beaches.

The Board estimated the costs of implementing the Project for Defense of Pensacola at:

Lift Battery in Fort Pickens for two 12-inch guns	$449,000
Disappearing battery for four 10-inch guns on Santa Rosa Island	200,000
Mortar battery for sixteen 12-inch mortars, with flank defenses	176,000
Disappearing battery for two 10-inch guns, near Fort McRee	100,000
TOTAL	$925,000[16]

16. Board of Engineers to Casey, June 22, 1893, NA, RG 77, Correspondence 1893-94, Doc. 881/12.

The project was reviewed by the Chief Engineer and approved by Secretary of War Daniel S. Lamont, subject to "such changes in details by the Chief Engineer as may be found expedient during construction."[17]

E. The Coast Artillery Takes Charge

Throughout most of the years that they were armed, the Endicott Defenses were manned by the Coast Artillery. In February 1901, less than three years after the Spanish-American War, the artillery was reorganized.

Congress fixed the organization of the Army at 15 regiments of cavalry, 30 regiments of infantry, and a Corps of Artillery. Although this did not affect weaponry or the character of the fortifications, it vitally affected harbor defense activity in the United States for the next half century.

The Corps of Artillery was to consist of two branches: the Coast Artillery and Field Artillery. This division identified a situation that had existed since commencement of construction of the Endicott System and the advent of modern rifled ordnance. It recognized seacoast artillery as "a distinct branch of service," whose "officers and men must, in order to obtain the greatest proficiency, be specialists to a greater degree" in technical matters such as handling of heavy ammunition, fire control, and nighttime harbor illumination. The Coast Artillery would be responsible for the "care and use of the fixed and movable elements of land and coast fortifications, including the submarine mine and torpedo defenses." Field Artillery would accompany the Army in the field, and would include horse artillery, field and light artillery, mountain guns, and machine guns.

Officers were assigned to the Coast or Field Artillery according to their aptitude. The seven existing artillery regiments were reorganized into 126 companies of Coast Artillery, 30 batteries of Field Artillery, and 10 bands. Each Coast Artillery company possessed sufficient personnel to man either a major-caliber gun or mortar battery, two or more rapid-fire batteries, or a mine battery.

The role of the Navy in relation to coastal defenses also changed in the first decade of the twentieth century. Until formulation in the 1890's of Alfred T. Mahan's doctrine of command-of-the-seas, the Navy had undertaken a dual mission in the Nation's defense. Ships were assigned to protect American commerce and to show the flag in distant ports, and warships were designed for coastal defense -- gunboats before 1862 and monitors until general acceptance of the Mahan philosophy.

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17. Lamont to Casey, Jan. 9, 1894, NA, RG 77, Correspondence 1893-94, Doc. 881/12.

The 1890's naval construction program, the resounding naval victories of the Spanish-American War, and the Nation's emergence as a world power had far-reaching repercussions. President Theodore Roosevelt, a Mahan disciple, provided the final nudge that transformed the Navy's mission. Eliminated for all time, as Dr. Lewis has written in Seacoast Fortifications, was "the passive coast-defense doctrine as a basic element of American naval policy." In 1908, President Roosevelt emphasized this point in an address before the Naval War College. "Let the port be protected by the [Army's] fortifications," he said, leaving the fleet "foot-loose to search out and destroy the enemy's fleet; that is the function of the fleet; that is the only function that can justify the fleet's existence."[18]

In the first four decades of the twentieth century, the Army's mission was to defend key harbors and ports and protect naval bases. At Pensacola, that included the base the Navy had established and maintained for more than 75 years.

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18. Lewis, Seacoast Fortifications, p. 99.

III. THE CONSTRUCTION HISTORY OF BATTERIES CULLUM AND SEVIER

A. Planning and Funding the Project

1. The site and plans are revised and approved

On August 15, 1894, Secretary of War Daniel S. Lamont allotted $100,000 from the appropriation for "Gun and Mortar Batteries," signed into law by President Cleveland on August 1, for construction at Pensacola of emplacements for two 10-inch guns mounted on disappearing carriages. Nearly a year slipped by before District Engineer Maj. Frederick A. Mahan prepared and submitted to the Board of Engineers working drawings of the ridge battery. On reviewing the plans, the Board remarked that the "outer face of the concrete of the parapet above the level of the ceiling of the magazine should be arranged with a slope in accordance" with recent designs. Chief Engineer Craighill's office, in turn, called attention to the need to limit the concrete cover in front and on the sides of the battery to 10 feet, and that the gun pintles were to be on the median lines of the emplacement.[1]

Meanwhile, Chief Engineer Craighill had been apprised of the project to deepen and change the channel into Pensacola Bay. This caused him to call for the Board of Engineers to review the situation and report whether it was desirable to relocate the projected 10-inch battery.[2]

Major Mahan was assisted by his immediate superior, Col. Peter C. Hains, in revising the plans and recommending another construction site. On reconnoitering Santa Rosa Island, Colonel Hains and Major Mahan proposed that the four-gun battery be constructed west of Fort Pickens. Here it would better command the harbor entrance and be more easily defended against an amphibious attack.[3]

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1. Mahan to Craighill, Dec. 21, 1895, N A, RG 77, Correspondence 1894-1923, Doc. 7383/28.

2. Craighill to Robert, Dec. 20, 1895, N A, RG 77, Correspondence 1894-1923, Doc. 7383/27. Col. H. M. Robert was president of the Board of Engineers.

3. Hains to Craighill, Jan. 11, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/29. A copy of a drawing illustrating the site proposed by Hains and Mahan for the battery, titled "General Project for Defense," Drawer 78, Sheet 86-1, is found in the files of the Florida Unit, GUIS.

Hains and Mahan argued that the battery, if not positioned on the sand ridge east of Pickens, should be placed to the westward of the fort: its left gun about 250 yards west of the south bastion, the battery facing "a little to the west of south." The thickness of the sand cover, they believed, could be reduced to 20 feet.[4]

By mid-January 1896, Mahan had prepared a revised tracing "showing the plan and two sections of the proposed battery," and a blueprint of the projected wharf to be built to facilitate construction of the emplacement. The plan of the battery had not been finalized, in compliance with ColonelHains' suggestion. Because of the time factor, Hains had urged that the "project be submitted as soon as practicable," without waiting to receive the drawings of the loading platforms, "as revised by the Board of Engineers." It was believed that the modification of the loading platforms was all that was necessary to complete the drawings.[5]

The review process was completed by February 1, when Chief Engineer Craighill approved the new site and the plans as submitted.[6]

2. Funding the project

On February 6, Major Mahan suggested to the Department that it would be economical to increase the allotment sufficiently to permit construction of the four emplacements during the year. This would not constitute a physical problem, because, during the summer of 1889, workmen, under his supervision, had laid 14,587 cubic yards of concrete in reconstructing the Buffalo, New York, breakwater. This was about equal to the amount of concrete in the four emplacements. Moreover, the Santa Rosa Island "plant," on arrival of the components from Connecticut and the Coosa River, would be equivalent to that employed at Buffalo.

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4. Hains to Chief Engineer, Jan. 23, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/30.

5. Mahan to Craighill, Jan. 17, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/33. A copy of the subject drawing titled, "Plan of Proposed Battery for 10-inch Guns Disappearing Carriage on Santa Rosa Island, Fla., near Fort Pickens," Drawer 78, Sheet 81-1, is found in the Florida Unit, GUIS.

6. Craighill to Mahan, Feb. 1, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/39.

If the battery were to be built in two increments, the plant would have to be dismantled and "transported back and forth again at an additional cost, and at double risk of injury."

To guide the Chief Engineer on his monetary needs, Mahan reported that on February 1, there was available in the account $98,048.68.[7]

General Craighill agreed with Mahan's position. Should Congress make additional money available for the Endicott Defenses, another allotment would be forthcoming.[8]

The situation improved slightly on February 28, when Secretary Lamont allotted $10,000 for platforms for the battery, and on July 1, $50,000 for a third emplacement from the act of June 6, 1896, for "Construction of Gun and Mortar Batteries." As of the date of the latter allotment, there had been spent on planning and site preparation $16,816.62.[9]

Secretary of War Lamont, on December 14, 1896, six weeks after ground was broken for the battery, allotted $20,000 for construction of emplacement No. 4. The money was charged to the appropriation for Gun and Mortar Batteries enacted in June. The McKinley administration having taken office on March 4, 1897, Secretary of War Russell A. Alger made two allotments for the battery before the end of Fiscal Year 1897. On May 13, he allotted $3,500 for sodding the sand slopes, and, on June 25, he earmarked another $8,000 for this purpose.[10]

By June 30, 1897, more than $180,000 of the $191,500 allotted for construction of the four emplacements had been obligated.[11]

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7. Mahan to Craighill, Feb. 6, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/49.

8. Beach to Mahan, Feb. 10, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/49.

9. Executive Documents of the House of Representatives for the 2d Session of the 54th Congress, 1896-97 (Washington, 1896), Serial 3479, p. 519.

10. Executive Documents of the House of Representatives for the 2d Session of the 55th Congress, 1897-98 (Washington, 1897), Serial 3631, p. 714.

11. Ibid.

3. Estimates are submitted and approved.

Major Mahan assigned supervision of the project to 2d Lt. James P. Jervey, his young assistant. Jervey had graduated from the U.S. Military Academy as No. 2 in the class of 1892, and had been commissioned a 2d lieutenant in the Corps of Engineers. His first assignment had been with the Engineer Battalion at Willetts Point, New York, from where he was ordered to Montgomery, Alabama, in October 1895.

In March 1896, the Corps of Engineers, having determined to build the battery by day-labor, circulated advertisements calling for proposals from interested parties for delivery of materials--broken stone, pebbles, cement, etc. They were to be opened and abstracted on April 29.[12]

Upon reviewing the bids, Lieutenant Jervey revised his estimates for construction of the two emplacements. They now read:

EMPLACEMENTS

6440 bbls cement at $2.28-7/10	$14,728.28
3584 cu. yds. broken stone at $2.73	9,784.32
3584 cu. yds. pebbles at $4.44-4/10	15,927.29
1192 cu. yds. sand at $0.30	357.60
400 cu. yds. granolithic broken stone at $2.92	1,168.00
Labor	13,000.00
TOTAL	$54,965.49

If 3,584 cubic yards of pebbles were replaced by an equal quantity of granolithic broken stone, there would be a saving of $1.52-4/10 per cubic yard, or $5,462.02 in all. This would reduce the cost of the concrete to $49,503.47.

FORMS FOR CONCRETE

117,000 ft. P.M. (sawed) at $20.00	$ 2,340.00
3,930 " (planed) at $30.00	117.90
50 kegs of nails at $3.00	150.00
Labor at $10.00 per M	1,209.30
TOTAL	$ 3,817.20

12. Mahan to Craighill, April 27, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/72.

BEAMS AND CONNECTIONS

13,000 lbs. B and Z beams at 3-1/2 cents	$ 455.00
82 lbs. angles at 3-1/2 cents	2.87
218 lbs. bolts at 3-1/2 cents	6.54
Labor	300.00
TOTAL	$ 764.41

SAND FILLING

26,114 cubic yards at 30 cents	$ 7,834.20

TOTAL COST OF EMPLACEMENTS

Concrete	$54,965.49
Forms for concrete	3,817.20
Iron, beams, etc.	764.41
Sand Filling	7,834.20
TOTAL	$67,381.30
or reducing by saving in granolithic stone over pebbles	5,462.02
	$61,919.28

PLANT

RAILROAD

3,700 crossties at 27 cts	$ 999.00
66-2160/2240 tons 30-lb. rails at $34	2,276.78
2 steel frogs	40.00
500 pairs splice bars at 24-1/2 cts	122.50
6,000 lbs. spikes at 2-2/10 cts	132.00
3-1600/2240 tons 16-lb. rails at $34	104.41
52 pairs splice bars at 23 cts	11.96
4 turn tables at $60	240.00
200 lbs. spikes at 2-1/2	5.00
	$ 3,931.65
Labor, grading and laying track	1,025.00
TOTAL	$ 4,956.65

ROLLING STOCK

Locomotive	$ 3,300.00
20 dump cars	1,150.00
6 flat cars	16.68
TOTAL	$ 4,466.68

MISCELLANEOUS ARTICLES

1 Trolley hoist	$ 400.00
1 Travelling derrick	1,400.00
1 Fixed derrick	40.67
6 Charging carts at $33	198.00
3 Charging carts at $33	99.00
6 Unloading skips at $48	288.00
5 Concrete buckets at $80	400.00
2 Barges at $1850	3,700.00
1 Hoisting engine	800.00
1 Horizontal driving engine	600.00
Lines for barges	100.00
TOTAL	$ 8,025.67

TOOLS

2 Doz. wheelbarrows at $21.00	$ 42.00
6 Doz. shovels at $18.00	108.00
Blacksmith's, machinist & tools	250.00
TOTAL	$ 400.00

WATER SUPPLY

2 Pumps at $165	$ 330.00
Piping	700.00
Tanks	250.00
TOTAL	$ 1,280.00

TRESTLES AND INCLINED PLANE

30 M Feet timber at $20	$ 600.00
Framing at $10 per M	300.00
TOTAL	$ 900.00

The total of the plant is then:

Railroad	$ 3,931.65
Rolling stock	4,466.68
Miscellaneous articles	8,025.67
Tools	400.00
Water supply	1,280.00
Trestles and inclined plane	900.00
TOTAL	$19,004.00[13]

A depreciation allowance of five percent, or $950, would be charged against the plant. On the machinery to be shipped from Connecticut by way of Newport, Rhode Island, there was a transportation charge of $200 and on that from Wetumpka, Alabama, of $702.

A few rude frame structures to serve as an office, blacksmithy, toolhouse, etc., were to be erected at an estimated cost of $500. Doors, ventilators, drainpipes, and other small items would add another $500 to the estimates.

These items boosted the estimated cost of the two emplacements to:

Emplacements	$67,381.30
Grading and laying track	1,025.00
Plant, deterioration by wear and tear	950.20
Freight	902.90
Buildings	500.00
Doors, ventilators and drains	500.00
1/2 cost of wharf	5,505.00
	$76,764.40
Contingencies, 10 per cent	7,676.44
	$84,440.84

13. Mahan to Craighill, May 4, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/75.

PLATFORM

The cost of the platform is as follows:

330 cu. yds. concrete at $8.00	$ 2,640.00
16 2" steel bolts at $4.42	70.72
28 1-1/2" do. at $2.80	78.40
3475 lbs. steel beams at 3-1/2 cts	121.63
50 lbs. iron bolts at 3 cents	1.50
Forms and centres for concrete	400.00
Labor, transporting and placing iron-work, adjusting bolts, etc.	600.00
	$ 3,912.25
Contingencies, 10 per cent	391.23
Total for one platform	$ 4,303.48
Total for two platforms	$ 8,606.96

Adding together the cost of the emplacements and that of the platforms, we have:

Emplacements	$84,440.84
Platforms	8,606.96
TOTAL	$93,047.80[14]

The only other costs to be considered, Major Mahan informed the Department, were those for office expenses and supervision, which he placed at $5,000. No figures were given for demurrage, as it was impossible to foresee. This $5,000 increased the total to $98,047.70.

In estimating labor costs, Major Mahan had used those for workmen with whom he was familiar, i.e., "white labor of the north." Experience in the south, however, led him to conclude that "southern black labor will not do more than fourth-fifths of what northern labor" would accomplish in the same length of time. The cost of labor was listed at $23,600. One fourth of this was $5,900, which should be added to $98,047.80, thus increasing the projected cost to $104,000.

Major Mahan, however, did not believe it proper to charge the entire expense of the plant and wharf against these two emplacements.[15]

Major Mahan also addressed a confidential letter to his friend, Captain William M. Black, who was on duty in the Chief Engineer's Office. He explained to Captain Black that there was an element in the

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14. Ibid.

15. Ibid.

labor cost that could not be mentioned in his official correspondence. This was the effect of the Navy Yard, "which has demoralized utterly everything connected with permanent work in this neighborhood." The wages commanded were as high as those paid at Buffalo, but the Pensacola work force had been corrupted by the Navy Yard, where large numbers merely put in time.

The new commandant, Captain William H. Whiting, was struggling to break up the old habits, but "interia and tolerence are strong factors against improvement." [16]

Chief Engineer Craighill, on approving the estimates, warned that no further allotment could be made for the project. He accordingly suggested that Maj. Mahan pare the $5,000 estimated for office expenses and supervision and the $1,280 for water. In reference to the latter, he observed that, at most sites along the coast, water for concrete and boilers was secured from well points. [17]

Major Mahan assured the Department that every effort will be made in the interest of economy. On Santa Rosa Island, he explained, water obtained from well points was too brackish for use in boilers. It was, therefore, mandatory to draw water from the Fort Pickens cisterns. The pumps, piping, and tanks could be used again, so they could be amortized against several projects. [18]

B. The "Plant" is Assembled and Positioned

1. The building of the Engineers' Wharf

Before work could begin on the Santa Rosa Island Endicott Batteries, it would be necessary to construct a new wharf to facilitate the receiving of materials. The Fort Pickens wharf, which in the years since 1829 had been periodically rebuilt, had deteriorated to where it would be more economical to erect a new structure.

The wharf's location was dependent on the selection of the site for the ridge battery. If the four-gun battery were erected southwest of Fort Pickens, rather than to the east of the Third System masonry work, a slight modification in the configuration of the structure would be necessary, but not in its construction.

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16. Mahan to Black, May 4, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/74.

17. Black to Mahan, May 18, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/75.

18. Mahan to Craighill, May 23, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/75.

As designed by Maj. Mahan's staff, the wharf was to consist, essentially, of a series of piles to the head of which were to be attached double stringers. A heavy floor would be laid on the stringers. The stringers would brace the piles in one direction and the floor in the other. The piles, to escape the ravages of teredoes, were to be encased in terra cotta pipes, driven at least 4 feet into the sand, which formed the bottom of the bay, and a foot above high tide mark. This form of construction had been employed with success in a number of trestles across brackish inlets on the main line of the Louisville & Nashville Railroad between Pensacola and New Orleans.

Major Mahan estimated the cost of construction at:

Lumber, in stringers, floor and guard timbers	$ 1,560.00
Pile driver	1,000.00
Terra cotta pipe for casing piles	3,750.00
Railway tracks on wharf and approach	500.00
Riprap to protect foot of piles against scouring	2,000.00
Labor	1,200.00
	$10,010.00
Contingencies, 10 per cent	1,000.00
TOTAL	$11,010.00 [19]

Division Engineer Hains gave permission to begin construction immediately. The ripraping was to be deferred until such time as the need for it was demonstrated.[20]

Preparatory to beginning construction, a Corps of Engineers pile driver and pile driving equipment were brought around from the Choctawhatchee River in January 1896. They were first taken to the Pensacola Navy Yard where they were thoroughly overhauled.

The pile driver had been positioned on the north shore of Santa Rosa Island by March 6, when construction started on the wharf.

Lieutenant Jervey watched as the wooden piles were driven into the muck. Next, a terra cotta pipe was slipped around the pile and hammered into position. The space between the pipe and pile was then filled with mortar consisting of 4 parts of sand to 1 part of cement. On the heads of the piles, separated by a tenon cut therein, were positioned

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19. Mahan to Craighill, Jan. 4, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/33.

20. Hains to Craighill, Jan. 11, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/33.

two 8 by 12 stringers, firmly bolted. Floor joists, 8 by 6 inches, were placed upon the stringers. Three-inch planking was secured to the joists. When completed, the Engineers' Wharf had a 100-foot front and a depth of 170 feet. It was protected in front by five groups of fender piles, three piles to the group. The depth of the water along the face of the wharf at mean ebb tide was about 21 feet. [21]

The first pile was driven on March 31, and the pile driving continued thereafter as rapidly as possible. Because of space limitation, Lieutenant Jervey found it necessary "to put the stringers on the piles so as to get a platform from which to handle the pile driver." This slowed progress. The piles were sunk by means of a water jet, a system pioneered at Pensacola almost 30 years before by Major Frederick E. Prime, and after they were set in place the casings were lowered over them, also by means of a water jet.[22]

Major Mahan spent May 1 at Fort Pickens, and he was surprised to see that the wharf was so far along. Assistant Engineer J. E. Turtle had experienced considerable difficulty getting timber. This caused Mahan to explode, "Damn these southern methods.... A man will promise anything under the sun in order to get a job and then go back on everything he promised to do." [23]

A raft of sawn timber broke adrift during a severe storm on May 31-June 1 and was driven against the wharf, breaking a score of terra cotta casings. These were repaired by means of a driver, and work on the casings was finished on June 23. The carpenters kept pace with the pile driving, and by the close of Fiscal Year 1896, the wharf, with the exception of the turntables, was completed. [24]

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21. Executive Documents, Serial 3479, p. 518. The cost of the fender piles, protected by a patent paint, was: piles per foot in place, 23¢; painting with patent paint per foot, 46¢. The cost of ordinary fender piles in place was 30¢ per foot; piles protected with sewer pipe filled with concrete, 62¢ per foot; sharpening piles, 34¢ per pile; and framing the tenon head, $1.20 per pile. The average number of hours needed to drive one pile was 31, and to case a pile, 25.

22. Ibid., pp. 518-19.

23. Mahan to Black, May 4, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/74.

24. Ibid.; Executive Documents, Serial 3631; Mahan to Craighill, Sept. 5, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/86.

The wharf, which was finished in July 1896, cost $9,947.94. This figure broke down as follows:

LABOR

	Hours	Cost	Total
Receiving piles	146	$ 27.62	
Sharpening piles	407	76.30	
Driving piles	7,303	1,591.40	
Painting and preparing fender piles	148	27.74	
Driving fender piles	462	89.62	
Receiving terra cotta casings for piles	234	45.93	
Mixing concrete for casings	1,578	300.72	
Putting on casings	3,584	727.59	
Tenons on heads of piles	1,010	241.25	
Scarfing stringers	624	155.78	
Framing and placing stringers	1,715	383.74	
Setting deck joists	742	147.16	
Laying decks and guard rails	2,939	637.36	
Track and turntables	770	200.90	
Granite piers on shore end	110	20.42	
TOTAL LABOR			$4,673.83

MATERIALS

Lumber	$1,832.95	
Piping, staples, etc.	1,555.54	
Iron and steel	228.86	
Nails and bolts	331.54	
Cement	612.75	
Sundries	712.47	
TOTAL MATERIALS		$5,274.11
TOTAL COST OF WHARF		$9,947.94[25]

2. Major Mahan secures a "plant"

To assemble the necessary "plant," Major Mahan called for transfer to Pensacola from Mason's Island, Connecticut, of a Ledgerwood engine and boiler, a sandpump boiler and engine, a sawmill engine and boiler, and three derricks; and from the Coosa River Lock No. 31 project, near Wetumpka, Alabama, of two concrete mixers and their engine, a locomotive and associated dump and

25. Executive Documents, Serial 3631, p. 715.

measuring cars, along with necessary rammers and shovels. Several heavy duty barges would have to be purchased for bringing freight down from Pensacola to Santa Rosa Island. [26]

Mahan planned to salvage and use as aggregate the large quantity of "good stone" lying about the island in "the shape of old traverse stones, pintle stones, etc." [27]

Colonel Hains approved the transfer of the equipment and the use of the stone as suggested, and urged that the project, in view of the delays, be pushed "with more vigor." [28]

Project Engineer Jervey, in March, secured authority to demolish two old dilapidated flea-infested engineer buildings near the landing. The site was needed as a storage area, and the materials were salvaged and used in construction of sand bins. [29]

3. A narrow gauge railroad comes to Santa Rosa Island

To expedite construction of the fortifications, 7,500 feet of narrow gauge railroad tracks were laid on Santa Rosa Island. Lt. Jervey laid out two spurs leading south from the Engineers' Wharf: one to the site of the emplacement for the four 10-inch guns, and the other toward the south beach, where there was plenty of clean white sand for mixing concrete. The line for grading was laid with a transit, with curves established either by deflection and chords or by tapeline and ordinates. The grade line was selected to equalize cutting and filling.

Wherever possible, the fill was put in with dump cars. The track, being laid on the ground surface, was leveled as fill was hauled in from the cuts. No pegs were set in laying and spiking the rails, the tangents and curves being eyeballed. In positioning guiding stakes for grading, a stake was set at the correct elevation wherever there was a change in slope. The foreman was then handed three wooden tees of equal height. Then, having a tee held on each peg at the extremities of a slope, he brought any intermediate point to a correct grade by excavating or filling until the top of the third tee, when held

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26. Mahan to Craighill, Jan 4, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/33.

27. Ibid.

28. Hains to Craighill, Jan. 11, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/33.

29. Jervey to Craighill, March 20, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/68. The Fort Pickens ordnance-sergeant had been allowed to keep hogs, and they were blamed for the palgue of fleas.

at that point, was in line with the tops of the other two. The 30-pound rail was spiked to sawn yellow pine ties, 6 by 8 inches by 6 feet, spaced 2 feet center to center.

All frogs and switches for the railroad were fabricated by the project blacksmith.[30]

Major Mahan broke down the cost of the railroad:

LABOR

	HOURS	COST	TOTAL
Unloading iron	988	$ 214.30	
Grading	13,155	2,811.53	
Laying cross-ties	394	72.74	
Laying rails, etc.	2,202	448.46	
Railroad in front of battery	536	100.50	
TOTAL LABOR			$3,647.53

MATERIALS

Iron and steel	$2,761.40	
Spikes and bolts	289.26	
Ties	389.93	
Towage	54.75	
TOTAL OF MATERIALS		$3,495.34
TOTAL COST OF RAILROAD		$7,142.87[31]

4. Erecting an incline and storage bins

In Fiscal Year 1896, an area convenient to the construction site was cleared and leveled. Here would be erected the storage bins for sand, pebbles, and cement. Timbers for the incline approach to the bins were framed and stored, ready for positioning as soon as the rolling stock was received.[32]

A locomotive and cars reached Santa Rosa Island from Wetumpka by way of Pensacola in August 1896. A large force was then turned to building

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30. Executive Documents, Serial 3631, p. 715; Executive Documents Serial 3479, p. 519.

31. Executive Documents, Serial 3631, p. 715.

32. Executive Documents, Serial 3479, p. 519.

the storage bins and erecting the incline. The trestle bents were 10 by 10's, each having two posts and two braces. The bents were spaced 12 feet center to center. Each line of stringers consisted of two 3 by 12 inch timbers. Two-inch boards were employed as cross-ties. No mortising was used in the construction, all members being drift-bolted together. The extremities of the incline were connected with the horizontal portion and with the horizontal track at the foot by vertical curves.

In positioning the curves, the distances from the tops of the various bents to the tangents to the curves were first calculated from the drawing. A small wooden tee was then nailed to each bent, so the distance from the top of the bent to the top of the tee was equal to the tangent distance for that bent. Next, the bents were adjusted until the tops of the tees were in alignment. This brought the tops of the bents onto the curve.[33]

When completed, the 5-degree incline permitted dump cars to be spotted above the storage bins. The locomotive was able to handle ten cars, each loaded with 3 cubic yards of materials on this grade.[34]

Lieutenant Jervey placed the cost of the incline and storage bins at $2,270.21. This figure broke down:

Cost and Labor		
Labor		$849.09
Material		
Iron and steel work	$ 27.06	
Nails, etc.	128.42	
Lumber	1,265.64	
Total materials		$1,421.12
TOTAL COST		$2,270.21[35]

33. Executive Documents, Serial 3631, p. 716.

34. Ibid.

35. Ibid.

5. The mixer and its mode of operation

An "ordinary" 4-foot cubical mixer was used. The charges were measured in light handcarts. They were carried up and dumped into a large wooden iron-bound bucket resting in the charging hold. Next, the charge was hoisted vertically, and then run up to a 25 percent incline above the hopper. This operation was performed by one line, the car on the incline being held in position by a counterweight until the charge was hoisted. As soon as the sheave block on the bucket came in contact with the buffer on the car, the counterweight was raised and car and bucket ascended the incline. The maximum charges handled in an eight-hour day was 175. [36]

The cost of positioning the mixer, hoisting gear, and incline was:

Labor		
Framing		$749.19
Materials		
Hoisting buckets	$187.65	
Ropes	88.90	
Iron and steel	68.90	
Lumber	468.66	
Belting	32.15	
Piping	64.87	
Nails, etc.	7.05	
Sundries	11.55	
Total materials		$923.56
Total Cost		$1,672.75[37]

6. Providing water for the boilers

As Chief Engineer Craighill had feared and as Major Mahan had forecast, water was an expensive item. To avoid drawing brackish water from surface wells, a wooden tank was built and connected with one of the Fort Pickens cisterns. This supply was soon exhausted, and a second tank was constructed on the wharf. This tank was filled by pumping from tugboats.

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36. Ibid.

37. Ibid., p. 717.

A severe freeze in February 1897 burst nearly all the water pipes, necessitating extensive repairs.[38]

C. Lieutenant Jervey Builds a Battery

1. Additional delays cause the Chief Engineer to explode

As the months slipped by and no earth was moved at the battery site, the Chief Engineer's Office began to badger Major Mahan. Responding to these complaints about his failure to push the project, Major Mahan explained that, although Pensacola was "a great timber market," it had been difficult to find a mill to saw timber for the wharf because of the great backlog of orders for foreign buyers. It had taken Assistant Engineer Turtle six weeks to locate a sawmill willing to take such a small order. There had been similar problems in securing piles. The storm of July 6-7, besides damaging the wharf and barges, had swept away "a great deal of timber" intended for completing the structure.

It was mid-July before the wharf was ready for the receipt of materials. Lieutenant Jervey had called on the contractors for broken stones to commence making delivery. These contractors, in turn, dragged their feet, citing that the hurricane season was at hand. Another difficulty had arisen when the cement contractor seemed unable to understand that, according to law, only American manufactured cement was acceptable. When he persisted, his contract was annulled.

On a recent visit to Santa Rosa Island, Major Mahan found that Lieutenant Jervey and his people were now making progress. A large quantity of sand had to be moved to "raise the bottom of the concrete parapet" to the required reference. The movement of the sand was slow because there was only one locomotive, and it was usually employed in transporting materials from the wharf to the construction site. By September 5, one-half the required pebbles for the aggregate had been received and stored.[39]

Capt. Joseph E. Kuhn of the Chief Engineer's Office spent September 24 on-site with Major Mahan. He saw that the excavations for the foundations of three magazines were completed and boxed. Sand fill for the foundations of the parapets, which were at a higher level, was being positioned. No concrete had been poured, and no work done by the

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38. Executive Documents, Serial 3479, p. 519; Executive Documents, Serial 3631, p. 717.

39. Mahan to Craighill, Sept. 5, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/86.

90 employees on the gun platforms. The "plant" for receiving and handling materials and for mixing and laying concrete was nearly ready to place in operation.

Lumber for concrete forms and about 2,000 cubic yards of gravel were on hand and stored. Neither cement nor broken stone had been received. Major Mahan, however, assured Captain Kuhn that shipments of both were expected to arrive at any time from the north.

So much time had already been lost, Captain Kuhn informed General Craighill, that it was useless to anticipate more than completion of the three platforms before December 1. Even then, it would require extraordinary efforts on the part of Major Mahan and Lieutenant Jervey. To accomplish this modest goal, he recommended that Major Mahan be directed

> to push work on the gun platforms, and, if necessary, to purchase limited quantities of cement in open market for immediate delivery and to make concrete with gravel alone, as is being done at Mobile and at New Orleans.

The Ordnance Department was to be called on to forward to Major Mahan, without delay, the templates required for setting out the platform bolts.

Captain Kuhn was unable to find any extenuating reasons for the lack of progress, beyond "faulty management in the beginning in arranging the time of delivery of materials." Although the wharf had been finished on July 20, 1896, more than eight weeks had passed and no concrete had been layed. The situation had seemingly improved, and Major Mahan was now making "an earnest effort to push matters." In this, he was being loyally assisted by Lieutenant Jervey.[40]

In mid-October, Major Mahan left Montgomery for New York and Washington. No gravel had yet been received, although the schooner John K. Souther had sailed from Washington on September 26. Recent storms off Cape Hatteras led to fears that the vessel had foundered with all hands. The first shipment of cement had finally cleared New York Harbor, as the Lawrenceville Cement Company had experienced difficulty in chartering shipping space because of the "great demand for wheat transportation." It would be the first of November before the Lawrenceville cement reached Pensacola.[41]

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40. Kuhn to Craighill, Oct. 8, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/92. For guidance in construction of the platform for emplacements Nos. 1-3, Lieutenant Jervey had this drawing: "Details of Platform for 10 in. Gun Battery on Santa Rosa Island, Fla.," Drawer 78, Sheet 81-4. A copy of this plan is on file at the Florida Unit, GUIS.

41. Mahan to Craighill, Oct. 21, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/94.

The letter in which Mahan conveyed this information to the Department should never have been written. After reading it, Chief Engineer Craighill fired off a communication chiding Major Mahan that the first allotment for the battery had been made two years ago. He pronounced the present situation as "inexcusable and discreditable" to the Corps. "Serious consequences" were promised for Mahan's career unless there was a prompt change for the better.[42]

2. Ground is broken and the first concrete layed

Major Mahan returned to the Gulf Coast in the last week of October. On his arrival in Montgomery from New York, he had written Lieutenant Jervey, urging him to expedite construction of the platforms. Though the weather had turned bad with frequent rains, Jervey and his men made good progress in the week ending on the 31st.

When Mahan visited the site on November 3, he was delighted to find the greater part of the forms for one of the gun platforms completed, "and the whole of the form for the foundation of the front and rear walls of the shell room, under the loading platform...done." Concrete was being laid on the foundations for the shellroom walls.

The schooner John K. Souther had finally tied up at Fort Pickens on October 29. She had been becalmed in the Straits of Florida. During one 72-hour period, she logged only 37 miles. Three days later, on November 2, a second schooner loaded with stone docked. She had made the passage around from Washington in 18 days.

Lieutenant Jervey was now working three shifts. To provide round-the-clock supervision, Major Mahan ordered Mr. Singleton, the overseer for Lock No. 4; Mr. Johnson, the overseer for Lock No. 31; and Fort Pickens master carpenter Kauser to report to Lieutenant Jervey. Assistant Engineer Turtle would hold himself ready to take charge of the project whenever called upon.[43]

Lieutenant Jervey, in response to the Department's telegram of October 23, had purchased foreign cement locally. Because of wind and rain, it was impossible for A. M. Avery to send a lighter loaded with 900 barrels of Louisville cement down Pensacola Bay until the 31st. On its arrival, the cement was unloaded and stored in two hours.[44]

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42. Craighill to Mahan, Oct. 24, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/93.

43. Singleton had had experience in concrete work on the New York batteries, Johnson had supervised construction of Lock No. 31, while Kauser has worked on the Pensacola jetties.

44. Mahan to Craighill, Nov. 4, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/95.

3. A change order involving air spaces

On November 9, 1896, Major Mahan requested authority to eliminate all air spaces around the magazines and in the walls of the shellrooms and loading platforms as shown in the drawings. His reasoning for recommending these changes was: (a) in the interest of economy; and (b) the extreme porosity of Santa Rosa Island. On a recent visit, he had water poured into a small hole in the sand at a rate of 165 gallons per minute. Although the hole was not more than 4 feet in diameter and only a few inches deep, the water leached out as rapidly as the pump poured it in.

Consequently, no moisture would remain for any length of time in any part of the concrete work, nor could dampness "penetrate toward the magazine from the outside." Any dampness collecting on the inside of the magazines, resulting from excessive moisture in the air, he argued, could not be "prevented from so forming by the air spaces" called for in the plans.[45]

Chief Engineer Craighill approved the change order as recommended.[46]

4. The Department approves revetting the slopes with turf

Early in May, 1897, Major Mahan called attention to the need to provide some revetment for the battery. The nearby Fort Pickens glacis would be a good source of turf for the revetment. The sod, with its crop of Bermuda, could be selectively skimmed off in 6-inch thick sections.

The 1830's glacis, Mahan assured the Department, was of no use, except as a defense against an attacking force advancing westward along the island. As it was proposed to leave "a sufficient thickness of turf to support" the Bermuda, which would rejuvenate itself, he did not foresee any permanent damage to the glacis. But without this revetment, he warned, the sand parapet of the new 10-inch battery would quickly be blown away by the winds.[47]

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45. Mahan to Craighill, Nov. 9, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/103; "10 in. Gun Battery on Santa Rosa Island, Fla., Outline of Concrete Showing Proposed Change," Drawer 78, Sheet 81-5. A copy of the subject drawing is on file at the Florida Unit, GUIS.

46. Craighill to Mahan, Nov. 17, 1896, N A, RG 77, Correspondence 1894-1923, Doc. 7383/103.

47. Mahan to Wilson, May 3, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/125.

The Department, after reviewing the proposal, allotted $3,500 for its accomplishment.[48]

5. Work accomplished in Fiscal Year 1897

Once construction was started, Lieutenant Jervey kept his three shifts laying concrete until January 31, 1897, when the project was shut down because of lack of cement. A shipment was received in late February, and, on March 1, the furloughed workmen were recalled.

By March 29, all the masonry, except a few steps and the magazine paving, was completed. The plant was then dismantled and stored, the concrete for the steps and paving being mixed by hand.[49]

Lieutenant Jervey found on reviewing his books that the forms for the masonry had cost:

Labor	
Placing and removing boxes around anchor bolts	$ 66.84
Framing forms for platforms	1,765.30
Removing forms from platforms	76.11
Forms for paving	83.63
Framing forms for remainder of battery	4,237.29
Removing	500.79
Total Labor	$6,729.96
Materials	
Lumber	$3,035.98
Nails, etc.	205.90
Iron and steel	2.19
Total Materials	$3,244.07
Total Cost	$9,974.03

In removing the forms, the posts were forced off with jack-screws.[50]

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48. Kuhn to Mahan, May 13, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/125.

49. Executive Documents, Serial 3631, p. 714.

50. Ibid., p. 717.

The cost of positioning a cubic yard of concrete was:

Rosendale Concrete

Forms	$ .71
15 cubic feet broken stone	1.88
15 cubic feet pebbles	1.71
5 cubic feet sand	.10
1-1/2 barrels cement	1.41
Supplying broken stone to mixer	.08
Supplying pebbles to mixer	.06
Supplying sand to mixer	.03
Supplying cement to mixer	.08
Supplying water to mixer	.01
Mixing	.17
Placing	.62
Total	$6.86

Where Portland concrete was employed, all items were the same as in the Rosendale concrete, except the Portland cement, which was $2.39, making the total cost $7.84 per cubic yard.

Where Louisville concrete was used the cost was $7.04 per cubic yard.

Labor costs for paving and steps, involving about 1,200 square yards of paving, was $409.87, or 34 cents per square yard.[51]

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51. Ibid., p. 719.

Costs of materials for concrete stored in the bins at the mixer were:

		Quantity	Cost per Yard	Total Cost
Pebbles	cubic yards	6,082	$3.09	$18,794.81
Broken stone	cubic yards	6,486	3.39	21,908.92
Rubblestone	cubic yards	2,000	5.58	11,168.60
Sand	cubic yards	2,500	.549	1,373.77
				$53,246.10
Portland cement	barrels	2,558	$2.393*	
Louisville cement	barrels	997	1.593*)	$22,001.92
Rosendale cement	barrels	12,580	1.143*)	
Total Cost				$75,248.02[52]

*Cost per barrel

Steel beams employed in construction of the four emplacements had cost $2,099.47, and the labor of placing them, $195.79.[53]

As the platforms were built concurrently with the other masonry, Lieutenant Jervey provided an approximate break down:

1,000 cubic yards of Portland concrete	$7,840.00
600 cubic yards of Louisville concrete	4,224.00
400 square yards of paving	616.00
Anchor bolts	540.00
Steel beams	500.00
Removing forms	76.11
Total cost of four platforms	$13,976.11

To this figure, which gave an average cost of $3,449.03 per platform, would have to be added charges for cranes, ammunition hoists and conveyors, and placing the base rings.[54]

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52. Ibid., p. 718.

53. Ibid.

54. Ibid., p. 720.

Preparations for positioning the sand fill had been completed by mid-April 1897. Two months were required to complete the fill and trim the slopes to grade. By June 30, the slopes had been partially covered with muck and turf.[55]

The sand fill was put in partly by hired labor and partly by contract. The incline over the storage bins was used to position the sand, with a maximum day's work 1,000 cubic yards. Forty thousand cubic yards had been placed at a cost of $12,323.12.[56]

During the final 90 days of Fiscal Year 1897, all the battery's 21 doors were made and hung; a permanent water system installed; steps completed; plans prepared and approved and contracts awarded for construction of the ammunition service, lighting plant, and sewer system; and two disappearing gun carriages, Model 1894, received.[57]

Lieutenant Jervey listed the cost of these miscellaneous items and operating expenses:

Road in rear of battery	$ 199.16
Ladders (five)	143.50
Drainage	441.47
Speaking tubes	45.10
Doors (21)	595.94
Plastering, painting, and whitewashing magazines	262.81
Placing base rings	164.25
Retaining walls	213.14
Taking down and storing plant	223.05
Holidays	1,599.15
Fuels	994.95
Office expenses, including blue printing, telegrams, express charges, etc.	1,018.64
Mileage	723.71
Advertising	39.60
Subsistence	762.40
Testing cement	87.00
Surveys	28.50
TOTAL	$7,542.37[58]

55. Ibid., p. 714.

56. Ibid., p. 718.

57. Ibid., p. 714.

58. Ibid., pp. 718-19.

During the four months of round-the-clock operations (November-January and March), the four boilers and five plant engines had used 160 gallons of cylinder oil, 246 gallons of black oil, and 860 pounds of waste.

In operating the lighting plant, 11 gallons of lard oil, 324 gallons of kerosene, and 842 gallons of gasoline were burned. Fuel consumed measured 340 cords of wood and 57 barrels of coal.

Charged to maintenance and repairs by Lieutenant Jervey were:

Sundry materials	$ 390.65
General damage from storms	203.57
Wharf	558.96
Hoisting engine	16.80
Traveling derrick	61.50
Water supply	281.66
Rolling stock	274.90
Railroad	108.27
Locomotive	970.26
Lighters and boats	1,419.48
Mixer	202.48
General plant	409.48
TOTAL	$4,397.01[59]

59, Ibid.

Total expenditures on the battery as of June 30, 1897 were:

Wharf	$ 9,947.94	
Railroad	7,142.87	
Incline and storage bins	2,270.21	
Concrete mixer	1,672.75	
Water supply	1,714.08	
Miscellaneous "plant"	13,568.40	
Total "plant"		$36,316.25
Materials for concrete	$75,248.02	
Supplying materials to mixer	3,544.54	
Mixing concrete	2,229.33	
Depositing concrete	8,042.66	
Forms	9,974.03	
Total cost of concrete		$99,038.58
Steel beams	$ 2,099.47	
Sand filling	12,323.12	
Miscellaneous operating expenses	5,477.00	
Maintenance and repairs	4,397.01	
		$24,296.60
Clerical, superintendence, etc.		4,805.25
Miscellaneous items for battery		2,065.37
Expenses from Montgomery office before April 1896		2,142.21
TOTAL		$168,664.26 [60]

60. Ibid., p. 720.

6. Work accomplished in Fiscal Year 1898

During the summer and autumn of 1897, the electric light plant, ammunition conveyors, shot cranes and hoists were installed; the sewerage system positioned; and the covering of the sand slopes with muck and turf completed.[61]

Expenditures charged to construction of the battery in Fiscal Year 1898 were:

Classification	Labor	Material	Total
Conveyors (750 feet)	$ 436.04	$2,326.00	$2,762.04
Shot cranes (14)	164.68	660.00	824.68
Hoists (2)	170.05	940.00	1,110.05
Sewerage system		627.50	627.50
Muck on slopes	827.28	27.75	834.03
Mounting guns (4)	3,091.98	215.41	3,307.39
Setting traverse circles and base rings (4)	1,088.35	2.25	1,090.60
Concrete aprons	368.85	450.00	818.85
Manholes	176.12	4.95	181.07
Superintendence	318.31		318.31
Holidays	320.35		320.35
Road in rear of battery	446.41		446.41
Water supply		5.40	5.40
Railroad		11.92	11.92
Fuel		35.50	35.50
Tools and non-expendable items		13.50	13.50
Boats and lighters	224.43	415.87	640.30
Mileage		159.16	159.16
Advertising and printing		54.83	54.83
General purposes		23.60	23.60
Sundries	72.65	135.61	208.26
Operating mail boat	151.50		151.50
Waterproofing		700.00	700.00
Lighting plant	154.33	3,933.35	4,087.68
Subsistence		60.63	60.63
Platforms		263.52	263.52
Doors		25.22	25.22
TOTAL	$8,011.33	$11,094.97	$19,106.30[62]

61. Executive Documents, Serial 3746, p. 726.

62. Ibid.

7. Plans of the completed battery are drawn and forwarded

Plans of the battery as completed were prepared by R. A. Chapman of the district office and transmitted to the Department in the autumn of 1898.[63]

8. Arming the battery

War Department policy called for the artillery to mount the big guns and mortars in the fortifications. When the guns were to be emplaced in works in "whole or in part" in charge of the Corps of Engineers, the project engineer, after discussions with the artillery commander, would decide whether the mounting would be done under his supervision or that of the artillery.[64]

It was accordingly decided by Army headquarters to have the Fort Barrancas garrison mount the carriages and 10-inch guns. The first disappearing carriage was received by rail in Pensacola in late May, 1897. A contractor moved it by barge from the railroad wharf to Fort Pickens. When a base ring was taken to the emplacement, it was found "not adapted to the position." This information was relayed to the Chief Engineer by Lieutenant Jervey.

While awaiting receipt of a new base ring, Post Commander John Murray took steps to have his troops relieved of the responsibility for mounting the armament. It would be a mistake to do so, he pointed out, because about 15 percent of his men were on sick call, and the work would be arduous even during the winter. But, in the summer, his men would find the heat "overpowering" as they labored behind a parapet where there were no cooling sea breezes, no shade, and the "sun's rays are reflected on the three sides from the white concrete walls." To endure these conditions would severely tax acclimated blacks, but it could not be accomplished by his "unacclimated" artillerists without serious consequences to their health.[65]

Commenting on Captain Murray's request, Major Mahan felt certain that if the guns and carriages were to be mounted now, it should be the Engineers' responsibility. By the last week of June, two carriages were on hand, and a third, along with three guns, had been shipped. Until

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63. "Emplacement for Four 10 inch B. L. Rifles, Disappearing Carriages, Fort Pickens, Santa Rosa Island, Florida," Drawer 78, Sheet 81-16. Copies of the subject plan are on file at the Florida Unit, GUIS.

64. Circular No. 5, AGO, April 4, 1896.

65. Murray to Adj. Gen., May 28, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/140.

such time as the two carriages were off the wharf and out of the way, the landing was too encumbered to receive the en route ordnance.

If the Corps moved promptly, Mahan informed Chief Engineer John M. Wilson, the hoisting machinery still at the battery could be employed, at a great savings in labor. If General Wilson opted to wait until autumn and permit the garrison to mount the armament, it would be necessary to remove the carriages and guns to make space for the landing of materials to be used in construction of the mortar battery. To mount the armament would require a $2,500 allotment.[66]

Secretary of War Alger, at the request of the Chief Engineer, revoked the orders for the artillery to mount the armament. Funds were allotted, and Major Mahan was directed to see that the ordnance was immediately mounted.[67]

In October, the Philadelphia Quartermaster Depot was alerted to make arrangements for shipment to Pensacola, in mid-November, from South Bethlehem, Pennsylvania, of one 10-inch disappearing carriage. When Maj. Charles A. H. McCauley of the depot sought to arrange details for delivery of the carriage, he learned that Major Mahan had left Montgomery for New Jersey on the advice of his physician because of the outbreak of yellow fever in central Alabama. Mahan's clerk informed McCauley that, due to quarantine restrictions, it was impossible to communicate with Lieutenant Jervey in Pensacola. But, he noted, the Corps of Engineers would look after the carriage upon its arrival at the railroad freight yard, provided the Quartermaster Department funded the operation.[68]

On the 29th, the Department contacted Major Mahan at Elizabeth, New Jersey. He recommended that the shipment be deferred to avoid payment of demurrage on the flat cars should yellow fever spread to Pensacola. It was now at Flomaton, on the Alabama-Florida boundary, through which most of the railroad traffic from the north and west passed.[69]

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66. Mahan to Wilson, June 26, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/142. Brig. Gen. John M. Wilson had replaced General Craighill as Chief of Engineers on February 1, 1897.

67. Adj. Gen. to Commanding General, Dept. of the East, July 21, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/145.

68. McCauley to Quartermaster General, Oct. 20, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 6273.

69. Mahan to Wilson, Oct. 29, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/160.

Early in November, Assistant Engineer Turtle called for another $300 to finish mounting guns Nos. 1-3. Unseasonably hot, humid weather in August and September had sapped the men's endurance. Day after day, he had watched them "perspire until their trousers were ringing wet." More men had been added to the payroll to keep the project moving.

If the Engineers were to mount the fourth gun and its carriage, another $900 in addition to the $300 were required.[70]

Chief Engineer Wilson allotted $1,200 from the appropriation for "Guns and Mortar Batteries" to finish mounting guns Nos. 1-3, and for positioning the carriage and gun in emplacement No. 4.[71]

By late January, 1898, emplacements Nos. 1-3 were completed, excepting the handrail around the loading platforms and marking the meridian lines. This railing could not be put up until the carriage and gun for emplacement No. 4 were received and mounted. In addition, the ammunition hoist for that emplacement was missing several parts.[72]

On February 15, Chief Engineer Wilson notified Secretary of War Alger that emplacements Nos. 1-3 had been completed and armed and were ready for transfer. Then, on the 24th, nine days after destruction of the battleship Maine in La Habana harbor, emplacements Nos. 1, 2, and 3 were inspected and transferred to the artillery.[73]

It was April 9 before the gun and carriage were mounted and ready for service in emplacement No. 4. This was only 11 days before the United States declared war on Spain.

The battery's electrical system was given a thorough test, as there was so "much receiving of material going on it is necessary to work all night long as well as all day." Ten electric lights had been purchased for use with the plant. Three of these had been positioned on the wharf, and the others would be put up when received.[74]

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70. Mahan to Wilson, Nov. 8, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/164.

71. Kuhn to Mahan, Nov. 12, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 7383/164.

72. Mahan to Wilson, Feb. 10, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 7383/178.

73. Wilson to Alger, Feb. 15, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 7383/179; Executive Documents, Serial 3746, p. 726.

74. Mahan to Wilson, April 9, 1898, N.A, RG 77, Correspondence 1894-1923, Doc. 24949/1.

More than another two months passed before emplacement No. 4 was inspected and transferred to the artillery.[75]

Capt. William Crozier of the Ordnance Department had been at Santa Rosa Island in the second week of May to inspect the armament. He saw that three of the four carriages were Model 1894 and the other a Model 1896. One round was fired from each gun. Captain Crozier observed that all were in serviceable condition, although the Model 1894's did not work to his satisfaction. Without their counterweights, they did not "rise clear into battery and had to be punched in by the tripping bars." The recoil of Nos. 7 and 8 was from 8 to 12 inches short. Crozier, on checking, found this was caused by the binding of the top carriage upon the chassis rails.

He remained on the island an extra day. Assisted by a mechanic detailed by Major Mahan, he filed off a small amount of metal from the rail of carriage No. 7. This materially improved its operation. Crozier, before starting for Mobile, showed the post commander the method to be followed in filing down the other carriages.[76]

The guns and carriages mounted in the battery were:

GUNS

	Caliber	Length	Model	Serial No.	Manufacturer
No. 1	10-inch	367.25"	1888	25	Watervliet
No. 2	10-inch	367.25"	1888	42	Watervliet
No. 3	10-inch	367.25"	1888	44	Watervliet
No. 4	10-inch	367.25"	1888	30	Watervliet

CARRIAGES

	Type	Model	Serial No.	Manufacturer	Motor
No. 1	Disappearing	1894	6	Bethlehem Ironworks	8 h.p. 110V DC
No. 2	Disappearing	1894	7	Bethlehem Ironworks	8 h.p. 110V DC
No. 3	Disappearing	1894	8	Kilby Mfg. Co.	8 h.p. 110V DC
No. 4	Disappearing	1896	38	Bethlehem Ironworks	8 h.p. 110V DC[77]

75. Executive Documents, Serial 3746, p. 726.

76. Crozier to Flagler, May 14, 1898, N A, RG 156, Doc. 20056.

77. Pitman to Chief of Ordnance, Dec. 2, 1899, N A, RG 156, Doc. 20056.

9. Naming the battery

On March 24, 1900, the War Department issued General Order No. 43, designating the emplacements Battery Cullum in honor of the late Brig. Gen. George W. Cullum. The officer honored was born in New York City, February 25, 1809. His parents moved to Meadville, Pennsylvania, while he was a child. Young Cullum was appointed to the U.S. Military Academy in 1829. He was graduated No. 3 in the class of 1833, and was commissioned a 2d lieutenant in the Corps of Engineers. As an officer of the Corps, Cullum served as superintending engineer at a number of Third System coastal fortifications, and was detailed as an instructor at West Point during the next 27 years.

He was a captain when South Carolina withdrew from the Union in December 1860. During the first months of the Civil War, Cullum served as an aide to Lt. Gen. Winfield Scott. His principal war service was as chief of staff to Maj. Gen. Henry W. Halleck, with rank of brigadier general of volunteers from November 1, 1861. In January and February 1862, while at Cairo, Illinois, he served as liasion between Brig. Gen. Ulysses S. Grant and General Halleck during the Forts Henry and Donelson Campaign. After leaving Halleck's staff in September 1864, General Cullum returned to West Point as superintendent.

In 1868, Cullum resumed and continued his engineering duties until his retirement from the Army in 1874, with rank of colonel. The following year, he married General Halleck's widow, a granddaughter of Alexander Hamilton. He inherited a substantial fortune from his wife, much of which he bequeathed to the Military Academy and the American Geographical Society.

Cullum is best known for his monumental compilation, Biographical Register of the Officers and Graduates of the United States Military Academy, published in three volumes in 1890, and supplemented at ten-year intervals by a provision of his will. General Cullum died in New York City, February 29, 1892.[78]

D. Improvements To and Maintenance and Repair of the Battery 1899-1915

1. A roadway improves communication

To facilitate communications and movement of supplies between the battery and Engineers' Wharf, a working party in the autumn of 1898 built a chert roadway in rear of the four emplacements.[79]

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78. Ezra J. Warner, Generals in Blue: Lives of Union Commanders (Baton Rouge, 1964), pp. 105-06; GO 43, March 24, 1900, War Dept.

79. Executive Documents, Serial 3904, p. 914.

HISTORIC STRUCTURE REPORT

AND

RESOURCE STUDY

PENSACOLA HARBOR DEFENSE PROJECT

1890-1947

Florida Unit

Gulf Islands National Seashore

Escambia & Santa Rosa Counties

Florida

by

Edwin C. Bearss

2. The Fiscal Year 1899 effort at waterproofing and improving drainage

Several October 1898 downpours caused water to back up into the magazines to a depth of several inches. To prevent reoccurance, gratings and drains were placed across each doorway. This was not enough, and it became necessary to drain the chert road in rear of the battery into the main sewer by gratings and connecting drains. To insure better results in the battery, District Engineer A. F. Flagler recommended construction of a cesspool to drain the counterweight well of emplacement No. 4. This well, he observed, was too low to drain directly into the sewer.

To combat overhead leakage, he urged that the superior slope above the magazines be covered with a "continuous sheet of asphalt." This was being done at emplacements Nos. 3 and 4, but additional funds were desired for extending the asphalting to emplacements Nos. 1 and 2.[80]

On December 1, Chief Engineer Wilson allotted $635 for asphalting emplacements Nos. 1 and 2, $55 for 4 gratings on roadway, and $45 for a cesspool at emplacement No. 4.[81]

These projects were implemented during the winter of 1898-1899.[82]

3. The Fiscal Year 1900 attempt to stop magazine seepage

This did not stop the seepage, however. In Fiscal Year 1900, Captain Flagler submitted to the Chief Engineer plans and estimates for prevention of dampness in the magazines by coating the exterior surfaces of concrete in front of the magazines with asphalt. Because of the high cost, General Wilson directed that only the magazines in which the situation was most acute be waterproofed. Two thousand one hundred and seventy-six dollars were allotted for the project.

The sandfill was accordingly removed from the front of emplacement No. 4; the concrete face coated with hot asphalt to below floor level; and a trench drain of broken brick laid against the asphalt, covered with a thin layer of gravel, and filled. The entrance was regraded with a fill to the rear, and two wing walls built to keep rain water from entering from the sides.

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80. Flagler to Wilson, Nov. 25, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 7383/207.

81. Kuhn to Flagler, Dec. 1, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 7383/207.

82. Executive Documents, Serial 3905, p. 922.

Although this checked dripping from the ceiling, the magazines were still damp.[83]

4. Two rooms are added to the battery

Because of cramped conditions in the electric light plant and the prevalence of water in the battery's dynamo room, Captain Flagler proposed to: (a) construct two additional rooms; (b) remove some of the sand covering; and (c) to improve the ventilation. Chief Engineer Wilson approved the proposal on May 25, 1900, and allotted $2,300 from the appropriation for "Gun and Mortar Batteries Act" of July 7, 1898, to implement it.

By June 30, most of the materials had been ordered and the cement stockpiled. The railroad track from the wharf to the battery had been overhauled and the locomotive repaired. A crew was then turned to, and the west entrance wing wall partially removed.[84]

The project was completed in Fiscal Year 1901. Two new chambers were built: one for the generator and one for the storage battery. The room formerly used for the plant was converted into a boiler room.[85]

5. General repairs and improvement for Fiscal Year 1900

In Fiscal Year 1900, District Engineer Flagler and his men made a number of maintenance-oriented repairs to Battery Cullum. These included:

(a) The scarred and eroded earthen shopes were repaired, and new sod and Bermuda sprouts placed where needed.

(b) Battery doors were repaired as needed, and several speaking tubes repaired, altered, and labeled.

(c) A broken ammunition lift was repaired.

(d) Steel hoods were positioned over exposed doors to prevent ingress of water.

(e) The plumbing was repaired, several pipes having burst during the subfreezing weather.

(f) Drainage holes were drilled in several places in the magazines and platforms to carry off surface water.

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83. Executive Documents, Serial 4089, pp. 941-42.

84. Ibid., p. 939.

85. Executive Documents, Serial 4279, pp. 27-28, 332.

(g) Several electrical instruments were repaired on the switchboards.

(h) Breaks in the concrete surface of the superior slopes were patched.[86]

6. The battery's platforms are extended

In Fiscal Year 1901, Chief Engineer George L. Gillespie allotted $1,600 for construction of a communication gallery (platform extension). Materials were stockpiled, and work commenced on a concrete-steel gallery connecting the four loading platforms.[87] The project was completed in Fiscal Year 1902.[88]

7. Magazines Nos. 3 and 4 are lined with brick and ceiled with lead

In Fiscal Year 1901, Capt. William V. Judson, who had relieved Captain Flagler as District Engineer in September 1900, reported Battery Cullum was in good condition except that magazines Nos. 3 and 4 and the storerooms of emplacement No. 4 were very damp; shellroom No. 4 was damp;

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86. Executive Documents, Serial 4089, p. 941; Kuhn to Flagler, May 31, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 30969. One hundred and fifty dollars had been allotted for repair of the slopes.

87. Executive Documents, Serial 4279, pp. 28, 833; "Type Extension of Platform Extension for Batteries Cullum and Pensacola, Santa Rosa Island, Fla," Drawer 78, Sheets 94-1 and 94-2; "Sketch showing details of platform connection between emplacements of 10" Battery, at Ft. Pickens, Florida," Drawer 78, Sheet 94-3. Copies of these drawings are on file at the Florida Unit, GUIS.

88. Executive Documents, Serial 4444, p. 735.

and the dynamo room was rather damp. An allotment was made by Chief Engineer Gillespie to correct these faults through use of detached lead ceilings and brick walls, raised floors, double doors, etc.[89]

These magazines were relined with brick and ceiled with lead in Fiscal Year 1902. Moisture, which had formerly accumulated in the magazines, was led from the spaces between the old and new walls by drains.[90]

This treatment failed to solve the problem. Capt. J. B. Cavanaugh, who had replaced Capt. Robert R. Raymond as district engineer in June 1903, soon found that the linings in the magazines of emplacements No. 3 and 4 were failing. There was a small break in the brick wall of No. 3 powder magazine, the lead ceiling of No. 4 shotroom, and the small

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89. Executive Documents, Serial 4279, p. 28. An Indianan, Judson had graduated from the U.S. Military Academy as No. 3 in the class of 1888. He was commissioned a 2d lieutenant in the Corps of Engineers and assigned to the Engineer School at Willett's Point. In March 1891, he was ordered to duty on Lake Erie, where he remained until February 1893. From February 1893 to March 1894, Judson was an assistant to Lt. Col. A. Mackenzie and oversaw improvements to navigation on the Upper Mississippi. While there, he was promoted to 1st lieutenant.

Lt. Judson was assistant engineer for improvement of Galveston Harbor from November 1894 to February 1897, when he was ordered to duty with the Engineer Battalion at Willett's Point. Promoted to captain on July 5, 1898, Judson was named Recorder for the Board of Engineers, a position he held for 12 months. His next assignment was Chief Engineer, Department of Puerto Rico. In August 1900, he returned to the United States and relieved Capt. Flagler as district engineer. Cullum, Biographical Register, Vol. IV, p. 460; Vol. V, p. 416.

90. Executive Documents, Serial 4444, p. 739.

room in emplacement No. 3. It was apparent to him that the "ultimate failure of all these ceilings can be expected."[91]

8. The ironwork is repainted and the emplacements rewired

In Fiscal Year 1902, the battery's ironwork was repainted. About the same time, Chief Engineer Gillespie allotted $1,000 for replacement of the old wiring with new enclosed in a steam-tight nickel conduit system. District Engineer Raymond contacted a number of manufacturers of nickel pipe to secure data for preparation of specifications.[92]

By the spring of 1902, the battery had been rewired, although Signal Corps personnel had not yet connected the wiring and the switchboards.[93]

9. The floors of the magazines, shellrooms, etc., are raised

As built, the floors in the magazines, shellrooms, etc., of Batteries Cullum, Slemmer, Worth, Pensacola, etc., had no drains, and this contributed to their dampness. In 1900, District Engineer Flagler complained that the flooring in the magazines, shellrooms, etc., of Battery Cullum should be renewed to "give a fall to the rear," thus preventing

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91. Cavanaugh to Gillespie, June 24, 1903, N A, RG 77, Doc. 18957/9. James B. Cavanaugh was a classmate of Lt. Jervey's at West Point. Graduating No. 1 in the class of 1892, he had been commissioned a 2d lieutenant in the Corps of Engineers, and assigned to the Engineer School at Willett's Point. In August 1895, he was ordered to Detroit as assistant engineer for river and harbor improvements. Then, in 1898, he was sent to the Mobile District. He remained at Mobile until June 1900, when he was ordered to Philadelphia for a brief tour of duty. Cavanaugh was transferred to the Philappine Islands in September, as commander of a company of engineers in Luzon. He returned to the United States in December 1901, and was assigned to Jefferson Barrack. While in the Far East, Cavanaugh had been promoted to captain, and on June 1, 1903, relieved Raymond as district engineer. Cullum, Biographical Register, Vol. IV, p. 530.

92. Executive Documents, Serial 444, pp. 738-39.

93. Kinzie to Adj. Gen., Oct. 1, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/19.

water from entering from "whatever cause" and standing. Settlement had caused the floors in several of the magazines to be lower than the entrance doorway sills.[94]

During the next several years, the floors were raised and gutters installed. By July 1902, District Engineer Raymond could report that at the major batteries this program, along with lining magazine walls with brick and ceiling them with lead, had been carried out, and the magazines and rooms were, with few exceptions "remarkably dry at all times." Many floors, however, were still not drained. But as these were dry, he concluded that there was no urgency for installation of drains therein.

The remaining damp rooms, excepting the Battery Center magazines, could be made dry with available funds, while $75 was needed to eliminate the dampness in the centre magazines.[95]

In approving this expenditure, the Department authorized Lieutenant Raymond to consolidate the balances within several accounts and apply them to general repairs.[96]

10. The aprons are repaired

Col. David H. Kinzie, when he inspected the battery in the autumn of 1902, saw that the concrete aprons fronting the emplacements had been fractured in several places.[97]

The Department promptly allotted funds for repair of the aprons.

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94. Executive Documents, Serial 4089, p. 942. Robert R. Raymond, a son of Lt. Col. C. W. Raymond, had graduated from the U.S. Military Academy as No. 5 in the class of 1893. Commissioned a 2d lieutenant in the Corps of Engineers, he was ordered to Willett's Point for service with the Engineer Battalion. In July 1896, he reported to Maj. Milton B. Adams as assistant engineer at Forts Schuyler and Wadsworth and for the mine defense of the Narrows. Raymond was promoted 1st lieutenant in July 1898. Soon thereafter, he was sent to Boston Harbor for duty as assistant engineer on the fortifications and mine defenses. He remained there until October 31, 1901, when he was ordered to Montgomery to relieve Capt. Judson as district engineer. Cullum, Biographical Register, Vol. IV, p. 550; Vol. V, p. 500.

95. Raymond to Gillespie, July 5, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 18957/5.

96. Abbot to Raymond, July 17, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 18957/5.

97. Kinzie to Adj. Gen., Oct. 1, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/79.

11. The Fiscal Years 1904-05 improvements

In May 1903, District Engineer Raymond informed the Department that the loading platforms were too narrow for proper service of the guns. An extension similar to the connecting galleries between emplacements was required. When providing this, provision should be made for rooms for tools and armament chests, which now obstructed the shot galleries.

The latrines could not be maintained as presently sited, where they were wrecked by blasts from the guns.

All magazines and shellrooms should be lined and the upper concrete surfaces repaired. If necessary to stop seepages, the exterior slope of the concrete parapet must be uncovered down to the ceiling level, repaired, and the sand replaced.

Emplacements Nos. 1, 2, and 3 were equipped with old style hoists, by which the ammunition service was by means of trolleys and cranes. Emplacement No. 4 was more modern in that ammunition service was by means of trolleys, two balanced platform lifts, and ammunition cranes. Consequently, up-to-date chain hoists were required at the four emplacements.

The blast aprons were fragmented.

To underwrite several of these improvements and repairs, Captain Raymond called for:

Closing cracks in concrete	$ 60.
Handrail on one stairway	10.
Removal of old chimney from abandoned dynamo room, and closing aperture	16.
Gratings for drains	4.
Construction of new latrine	2,800.
New iron doors (15) at all openings	1,500.
Racks for rammers at all emplacements	25.
Extensions to loading platforms with iron stairs	4,432.
Toolroom chests	160.
Water supply and hydrants	350.
TOTAL	$9,357

In allotting funds for these projects, the Chief Engineer slashed the sum for a brick latrine from $2,800 to $40 for one built of wood.[98]

98. Raymond to Gillespie, May 4, 1903 & Abbot to Cavanaugh, June 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

By June 1904, workmen had completed all the projects for which the Department had allotted funds 12 months before, except the extension to the loading platforms. Plans for enlarging the platforms and "addition of shell and relocator rooms" had been prepared and submitted by District Engineer Cavanaugh.[99]

On preparing his program for Fiscal Year 1905, Captain Cavanaugh called for:

(a) 5 double and 2 single steel doors to close the shellrooms and outside openings to the battery, presently without doors or entered through wooden doors.

(b) The fragmented concrete blast aprons should be removed and the parapet and slopes refilled and sodded. Extensive filling and sodding was required at other places on the slopes.

(c) In emplacement No. 4, the oil room floor must be raised to provide proper drainage.

(d) A stairway should be cut between the gallery leading to the magazine and the shot gallery under the platforms.

(e) Finally, to prevent people walking across the sodded slopes, a concrete walk must be built from the chert roadway in rear of the battery to the steps giving access to the platform.

The Department, after reviewing the projects and estimates, allotted $1,610 for implementing them.[100]

12. Installation of the Taylor-Raymond hoists-

In 1903, plans were finalized for improvements to the ammunition ervice by replacement of the obsolete trolleys and cranes at emplacements Nos. 1-3 and the balanced platform lifts and crane at emplacement No. 4 by TaylorRaymond hoists. Consequently, on April 8, 1904, District Engineer Cavanaugh submitted plans and estimates for modifying substantially emplacement No. 4 by adding a layer of 16-ounce copper over the hoist shaft and truck recesses for waterproofing. The enlargement of and additions proposed to emplacements Nos. 1-3, he explained, were similar in detail to those depicted on the drawing of the supplement to mimeograph 78.

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99. "Proposed Enlargement of Loading Platforms and Addition of Shell and Relocator Rooms to Battery Cullum, Pensacola Harbor, Fla.," Drawer 78, Sheet 81-5. A copy of the subject drawing is on file at the Florida Unit, GUIS.

100. Cavanaugh to Mackenzie, June 3, 1904, & Abbot to Cavanaugh, July 7, 1904, N A,RG 77, Correspondence 1894-1923, Doc. 18957/11.

The platform enlargements and connecting galleries were to be of reinforced concrete, to conform to that of existing connecting galleries and the platform extensions currently under construction. He had reduced the thickness of the concrete to about 6 inches. The stairs were to be built of armored concrete. Thacker bars would be employed to provide necessary tensil strength.

The waterproofing layer over the shellrooms, hoist rooms, shafts, and truck recesses was to be copper. Air spaces were to drain directly into the sand. The porous brick lining of the shellroom side walls was to constitute part of these walls, and be thoroughly bonded into them. The porous lining of the ceiling was to be of flat arch tile, projecting below the ceiling beams and covering them to prevent condensation.

To fund the project, as outlined, Captain Cavanaugh needed a $29,300 allotment.

If this sum could not be made available, elimination of these elements would save the money indicated:

(a) The stairways and that part of the platform extensions and connecting galleries on the left of each platform from the axis of the platform to the prolongation of the right edge of the roof of the adjacent hoist room	$5,125
(b) The relocator room	1,110
(c) The shellrooms by employing hoist rooms for storage of a small number of projectiles	7,100
(d) The permanent galleries in rear of hoists and remainder of platform extensions, including those in angle of parapet on each side of guns, by constructing temporary wooden galleries in rear of hoists, including connection to loading platforms	3,750

This would reduce the $29,300 to $12,225, which Cavanaugh argued was the minimum figure for installation of four Taylor-Raymond hoists.[101]

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101. Cavanaugh to Chief Engineer, April 8, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 47627/66; "Proposed Enlargement of Loading Platforms and Addition of Shell and Relocator Rooms to Battery Cullum, Pensacola Harbor, Fla.," Drawer 78, Sheet 81-15. A copy of this plan is on file at the Florida Unit, GUIS.

The Department, after reviewing Cavanaugh's plans and estimates and its nation-wide commitments, allotted $15,975 for the project. This would cover the minimum needs and those items listed under (d).[102]

Orders for the Taylor-Raymond hoists were placed, and on June 28, 1904, hoists Nos. 38-41 were turned over by the factory for shipment. It was now decided to defer shipment until workmen could make necessary alterations to the fabric of the emplacements. This was not done until the winter of 1905-06.

On March 6, 1906, Captain Cavanaugh notified the Department that he was ready to install the rheostats for the hoists' motors.[103]

Nine weeks later, Capt. Cavanaugh notified the Chief Engineer that the probable date for shipment of the hoists was needed, because this information was necessary in arranging for their installation so there would be minimal interference with service practice by the Coast Artillery.[104]

By early September, the hoists were in position and the controllers had been final tested and pronounced satisfactory.[105]

13. Installation of powder hoists at emplacements Nos. 1-3

On August 25, 1908, Capt. Harley B. Ferguson, who had replaced Captain Cavanaugh as district engineer on October 7, 1907, submitted to the Department drawings exhibiting the condition of the Battery Cullum and Battery Pensacola emplacements. To install one type "A" powder hoist for gun No. 4, the cost would be $160, and for a type "C" hoist at each of the other three Battery Cullum guns, $1,560.[106]

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102. Abbot to Cavanaugh, April 18, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 47627/66.

103. Cavanaugh to Mackenzie, March 7, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 47627/98.

104. Cavanaugh to Mackenzie, May 11, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 47627.

105. Cavanaugh to Mackenzie, Sept. 6, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 47627.

106. Ferguson to Chief Engineer, Aug. 25, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 68422; "Proposed location of Powder Hoists Battery Cullum, Pensacola Harbor, Fla.," Drawer 78, Sheet 81-18. A copy of the subject drawing is on file at the Florida Unit, GUIS. Ferguson had graduated from West Point as No. 7 in the class of 1897. Commissioned a 2d lieutenant in the Corps of Engineers, he was ordered to Charleston, South Carolina, (continued)

After reviewing the plans and estimates and considering priorities, Chief Engineer Alexander Mackenzie allotted funds for purchase of and installation of type "C" hoists for emplacements Nos. 1-3. On February 4, 1909, Captain Ferguson transmitted to the Department a drawing of the type "C" hoists his workmen were positioning at Battery Cullum.[107]

14. The construction of a B.C. station and plotting room for emplacements Nos. 3 and 4

On January 22, 1914, Chief of Coast Artillery Erasmus M. Weaver called for division of Battery Cullum into two batteries, each to have its own fire control equipment. Because of the bleak funding situation, provision should be made for construction of one Battery Commander's Station and plotting room at this time. General Weaver suggested that priority be given to construction of these fire control facilities for guns Nos. 1 and 2.[108]

District Engineer Earl I. Brown accordingly submitted to the Chief Engineer drawings of the "Battery Commander's Station and Plotting Room," which were to be erected in rear of emplacements Nos. 1 and 2. After being reviewed by the Chief Engineer, orders were issued directing that "the B.C. station, plotting room, etc., shown" on these plans will be "built in rear of the traverse between loading platforms 3 and 4."[109]

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106. (continued) as assistant to the district engineer. After a brief tour of duty at Willett's Point, Lt. Ferguson was next sent to Cuba, in late April 1898, with Company E, Battalion of Engineers. In July 1899, he sailed for the Philippines. He was chief engineer with the China Relief Expedition from June 1900 to May 1901.

Lieutenant Ferguson returned to the United States in December 1901. Upon reaching Washington, he was assigned to the War Department's Information Bureau, a position he held until August 1903, when he reported for duty at the U.S. Military Academy, as instructor in Engineering. Promoted to captain, Ferguson was a student at the Fort Leavenworth Staff College from August 1904 to July 1905. Following two years as an instructor at the Infantry and Cavalry School, Ferguson was ordered to Montgomery, where on October 7, 1907, he relieved Capt. Cavanaugh. Cullum, Biographical Register, Vol. IV, p. 623; Vol. V, p. 574.

107. Ferguson to Chief Engineer, Feb. 4, 1909, N.A, RG 77, Correspondence 1894-1923, Doc. 68422/171. The subject drawing is not on file at National Archives.

108. Weaver to Chief Engineer, Jan. 22, 1914, N A, RG 77, Correspondence 1894-1923, Doc. 35518/267.

109. "Fort Pickens, Fla., Proposed B.C. Station and Plotting Room for Battery Cullum," Drawer 78, Sheet 81-29. A copy of this drawing is found (continued)

Major Brown, upon resubmitting the drawings, provided the Department with two alternatives for the "proposed B.C. Sta. & Plotting Room" between emplacements Nos. 3 and 4. Upon reviewing the drawings, Secretary of War Lindley Garrison opted for alternative A. This would locate the plotting room as a first story under the Battery Commander's Station.[110]

The Department, in Fiscal Year 1915, allotted $2,310 for implementing the project. Construction proceeded smoothly, and on August 20, 1915, the Corps of Engineers transferred the recently completed and equipped concrete Battery Commander's Station and Plotting Room to the Coast Artillery.[111]

E. Emplacements Nos. 1 and 2 Become Battery Sevier

On April 25, 1916, the War Department, although no steps had been taken to fund construction of a B.C. Station and plotting room for emplacements Nos. 1 and 2, implemented General Weaver's proposal to divide the battery into separate fire units. General Order No. 15 was issued that day designating emplacements Nos. 1 and 2 Battery Sevier. Emplacements Nos. 3 and 4 would continue to be known as Battery Cullum.

The man honored by this action was John Sevier. A pioneer, soldier, and the first governor of Tennessee, Sevier was born near present-day New Market, Virginia, in September 1745. He emigrated from the Shenandoah Valley in 1773 to the remote frontier that is now East Tennessee.. There, he settled on the Holston River. He became a member of the local Committee of Safety in 1776. Four years later, in October 1780, he led 240 overmountain men against the British in the battle of Kings Mountain. During the ensuing months, he commanded a number of raids deep into Cherokee country.

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109. (continued) in files of the Florida Unit, GUIS. A Georgian, Brown had graduated from the U. S. Military Academy as No. 6 in the class of 1898. Commissioned a 2d lieutenant in the Corps of Engineers, he was ordered to Willett's Point for duty with the Engineer Battalion. In October, he reported to Fort Caswell, North Carolina, where he served until September 1899. After another assignment to Willett's Point, he was ordered to the Philippines in June 1901. Lt. Brown returned from the Far East in November 1903. After a tour of duty at the Washington Barracks, Brown, now a captain, was sent to Cuba in October 1906. He returned to the United States in May 1907, and was assigned to the Wilmington Engineer District. Captain Brown remained at Wilmington until July 1911, when he was named District Engineer at Galveston. Promoted major in October, Brown became district engineer for the Montgomery District on July 12, 1912. Cullum, Biographical Register, Vol. IV, p. 643; Vol. V, pp. 595-96; Vol. VI, p. 826.

110. "Proposed B.C. Sta. & Plotting Room, Between Emplacements 3 & 4, Battery Cullum, Fort Pickens, Fla.," Drawer 78, Sheet 81-32. A copy of this drawing is on file at the Florida Unit, GUIS. Vertical posts were to be substituted for the "leaning ones in Section A-B for Position A."

111. Emplacement Book, Battery Cullum, N A, RG 392.

During the "critical" years following the Revolutionary War, Sevier was elected governor of the short-lived State of Franklin. When Tennessee was admitted to the Union, he became its first governor, serving three successive terms from 1796 until 1801, and three more terms from 1803 to 1809. His choice was a natural for "he was a military hero, still a dashing figure, unaffectedly cordial in his manner, neither cultured nor illiterate, an experienced public officer, and bound by ties of blood and intimate friendship to many families throughout the state." In 1815, Sevier was appointed a commissioner to participate in a survey of the Creek cession. He died in Alabama while on this service.[112]

F. The Batteries from World War I Through World War II

1. The construction of the reinforced concrete power station

In 1922-23, a new power station was constructed, to service Batteries Cullum and Sevier. The 23'8" by 15' (interior dimensions) reinforced concrete structure was built adjacent to the exterior slope of Battery Cullum, near the division point between the two batteries. A wooden partition divided the structure into two rooms--a radiator and engine room. Positioned in the structure were two 25-kilowatt gasoline-powered 115-volt, 2-way generators, GM-13, complete with all standard accessories (2 oil pressure gauges, 2 radiators, 2 boxes with tools, 2 boxes of spare parts, 2 thermometers, and 2 cylinders); 2 buried gasoline tanks; 1 switchboard, 3-panel, Type N, complete (with 1 voltmeter, 1 ammeter, 2 wattourmeters, 2 circuit breakers, and other standard accessories); 2 switches (DPST); 1 transformer (SRW); and interior lighting system.[113]

2. The batteries are removed from the project and the armament salvaged

Fatigue parties from the 13th Coast Artillery, during the period September 1November 30, 1930, repaired the aprons and earthen parapets of Batteries Cullum and Sevier.[114]

Some 30 months later, the War Department, recognizing that a number of its coastal defenses had become obsolete and in the interest of economy, listed Batteries Cullum and Sevier as no longer required.

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112. GO 15, April 25, 1916.

113. Fort Pickens Historical Record Book, N A, RG 392; "Defenses of Pensacola, Fla., Power Station for Batteries Cullum-Sevier," Drawer 78, Sheet 81-39; "Defenses of Pensacola, Fla., Switchboard, Power Station--Batteries Cullum-Sevier," Drawer 78, Sheet 81-40. Copies of these plans are on file at the Florida Unit, GUIS.

114. Coast Artillery Journal, Vol. 74, p. 66.

Upon receipt of this order, dated June 16, 1933, the four 10-inch guns had their breech mechanisms removed and were given a heavy coat of cosmoline.[115]

The post's correspondent for the Coast Artillery Journal, taking note of this, wrote:

> Old friends of Barrancas will shed a tear--or cheer, as the case may be, to learn that old Batteries Cullum, Sevier, and Pensacola have succumbed to the modern age and are now resting in heavy dope--out of service. All of a sudden, somebody went modern and signed the death warrant, or should we say they decided to save money, and lay the old hands off. But no one knows the future. General [Hugh S.] Johnson may force the War Department to join the NRA and put these old employees back on the payroll again![116]

Although the batteries had been withdrawn from the Harbor Defense Project, the guns and carriages were not removed and salvaged until November 1942, 11 months after Pearl Harbor.[117]

G. World War II Modifications

In 1943, the Coast Artillery, "to provide better coverage of the beach and water areas within its range, relocated Battery Trueman to Battery Cullum. The two 3-inch rapid-fire guns were emplaced on concrete platforms between emplacements Nos. 1 and 2. A Battery Commander's and Coincidence Range-Finder Station was erected at the easternmost point of the battery. At the same time, the signal and meteorological stations were relocated to Battery Sevier.[118]

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115. Emplacement Book, Battery Cullum, N A, RG 392. In May 1918, Battery Cullum's two 10-inch rifles were dismounted and shipped on June 15 to the Watervliet Army Gun Factory, the battery having been declared surplus to the Army's needs. On March 18, 1919, the battery was listed by the War Department to be retained. In December 1919, the Gun Factory shipped two Model 1895 guns to Fort Pickens -- Nos. 48 and 49 -- as replacements for Nos. 30 and 44. They were mounted by the garrison in May 1921, No. 48 in emplacement No. 1 and No. 49 in emplacement No. 2.

116. Coast Artillery Journal, Vol. 76, p. 380. Johnson, a retired general, headed the NRA.

117. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, Jan. 22, 1943, N A, RG 407.

118. Ibid.; Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, July 1, 1945, N A, RG 407.

IV. THE CONSTRUCTION HISTORY OF BATTERY WORTH

A. The Planning Process Frustrates Major Mahan

1. Major Mahan submits plans and estimates

By the spring of 1897, construction of the four-gun 10-inch battery had proceeded to the point where the Department was ready to allot funds for another major element in the Endicott System at Pensacola. On April 6, Chief Engineer Wilson called on Major Mahan to submit detailed plans and estimates for construction of eight emplacements for 12-inch mortars. In considering the site for these emplacements to be funded from the act of March 3, 1897, "for construction of Gun and Mortar Batteries", Mahan was to make provision for eight more emplacements, either on the same line or directly in rear, as circumstance dictated.[1]

Nine weeks later, on June 12, Major Mahan transmitted to the Chief Engineer's office, estimates for construction of an eight-gun mortar battery. Also, enclosed was a tracing, showing the proposed site. The rectangle, marked "A", was the location proposed by the Board of Engineers, and approved by Chief Engineer Craighill. Neither the site for the mortar battery nor the one for the 10-inch battery had been staked. The positions had been determined by scaling on a map.

Mahan had added a rectangle, delinated "B", on the tracing as his recommended battery site. His reason for this change was that the terrain was better adapted, having "large ridges of sand on the front and on each flank of the battery," while site "A" had these dunes and valleys in the wrong places. This would result in considerably more filling and excavating than at site "B". The only objection which might be made to the change was that site "B" was 534 feet nearer the channel than site "A".

Major Mahan also recommended that granolithic mortar or Portland cement be substituted for cut stone in the mortar pits. This would result in a saving of $30 per cubic yard.[2]

Division Engineer Hains, on reviewing the plans and estimates, concurred with Mahan's recommendations. He suggested that Portland cement be used in the mortar platforms in lieu of cut stone, and that the project be accomplished by day-labor and purchase of materials by contract.

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1. Kuhn to Mahan, April 6, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/1.

2. Mahan to Wilson, June 12, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/7.

He objected to certain features in the plans. These included: (a) observation stations to be provided on each flank of the battery instead of a single station in the center; (b) the placing of a cistern in the traverse; (c) the firing room being too far removed from the mortar groupment; (d) the danger that doors of the guardroom would be blown from their hinges when a group of mortars were fired; (e) the entrance to the magazines was likewise too near the mortars' muzzles. This could be alleviated by a central passage in the middle of the traverse, with side passages to right and left, opening in rear of the groupments. (f) No ventilation had been provided for the magazines, guardrooms, etc.; (g) no method to handle ammunition was provided; (h) no explanation had been given for the mass of concrete, 20 feet thick, to the right of the firing room; and (i) the side walls on the flanks of the battery were 8 feet thick from bottom to top, while the end walls of the magazine, at reference 15, were only 5 feet. At reference 20, there was the equivalent of 114 feet of sand horizontal rotection to the mortar pits from flank fire, while at the same reference, the magazines had the equivalent of 106 feet of protection from frontal fire. It seemed to Colonel Hains that the danger from flanking fire would be much less than from frontal.[3]

2. Chief Engineer Wilson challenges the estimates

Chief Engineer Wilson questioned the estimated cost of the battery, as it was in excess of the $108,000 figure submitted for the 16-gun mortar battery at San Francisco. He trusted that Major Mahan could build the Pensacola emplacements for about $100,000.[4]

The estimates and plans were forthwith returned to Major Mahan for revision in accordance with the attached comments.[5]

3. The plans and estimates are revised and defended

Major Mahan made the requested changes to the plans and had Lieutenant Jervey revise the estimates. The new figures placed the cost of the project at $109,970.25, to which must be added 10 percent for contingencies, giving a grand total of $120,967.27.

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3. Hains to Wilson, June 13, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/7. The drawing referred to is "Battery for 8-12" Mortars, Pensacola Harbor, Fla.," Drawer 78, Sheet 86-2. A copy of this plan is on file at the Florida Unit, GUIS.

4. Wilson to Mahan, June 25, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/7.

5. Executive Documents, Serial 3631, p. 720.

The breakdown of the revised mortar battery estimates listed:

PRELIMINARY WORK

RAILROAD

36 tons of rails at $25.00	$ 900.00
Rail joints	60.00
Spikes	100.00
2,000 ties at $.25	500.00
Receiving railroad iron	100.00
Grading	1,200.00
Laying ties	50.00
Laying rails	300.00
Turntable	50.00
TOTAL	$3,260.00

GENERAL PLANT

Erecting mixer, moving and placing engines, etc. and making all necessary steam and water connections	$ 600.00
Cableway	2,500.00
Water Supply	500.00
Tearing down, moving and setting up storage bins	500.00
TOTAL	$4,100.00

MASONRY

The total amount of masonry is as follows, viz:

CLASS	CUBIC YDS
Portland Mortar (1 to 1-1/2)	610
Portland concrete	1,240
Rosendale concrete	6,270
Rubble stone	1,250
TOTAL	$ 9,370

QUANTITIES AND COST OF MATERIALS FOR CONCRETE DELIVERED AT MIXER

9,500 bbls. Natural cement at $1.13	$10,735.00
3,200 bbls. Portland cement at $2.25	7,200.00
1,250 cubic yards Rubble stone at $4.00	5,000.00
4,300 cubic yards broken stone at $3.40	14,620.00
4,300 cubic yards pebbles at $3.00	12,900.00
1,700 cubic yards sand at $.30	510.00
TOTAL	$50,965.00

1-1/2 barrels of natural cement have been allowed per yard of concrete as it has been found that 1 barrel does not give sufficient mortar.

LABOR PLACING CONCRETE

7,510 cubic yards at $.75	$5,632.50
560 square yards revetment at $.60	336.00
750 square yards pavement at $.40	300.00
TOTAL	$6,268.50

SAND FILLING

50,000 cubic yards at $.25	$12,500.00

METAL WORK

83,300 lbs. steel beams at $.03	$2,499.00
34,000 lbs. anchorage bolts at $.04	1,360.00
13,000 lbs. trolley beams at $.04	520.00
Labor	400.00
TOTAL	$4,779.00

VENTILATION, DRAINAGE, AND PERMANENT WATER SUPPLY

1 iron tank	$ 175.00
200 feet 12" vitrified sewer pipe at $.25	50.00
200 feet cast iron water pipe at $.25	50.00
300 feet 8" vitrified sewer pipe at $.10	30.00
200 feet 4" cast iron soil pipe at $.16	20.00
Wells and piping, etc.	100.00
3 cast iron manholes at $30.00	90.00
Closets and fittings	240.00
10 catch basin covers	30.00
TOTAL	$ 785.00

ELECTRIC LIGHTING PLANT

Complete plant, including installation	$5,246.00

This plant will furnish power for two searchlights, in addition to lighting the battery. Duplicate machinery is allowed for to avoid stoppages from break-downs.

LUMBER

70,000 ft. B.M. dressed at $20.00	$1,400.00
200,000 ft. B.M. rough at $15.00	3,000.00
2,000 shingles at $5.00	10.00
Labor receiving	350.00
Framing at $12.00 per M	3,240.00
TOTAL	$8,000.00

NAILS, BOLTS, etc.

80 kegs nails at $3.00	$ 240.00
1,000 lbs. spikes at $.03	30.00
Bolts and nuts for repairs	50.00
TOTAL	$ 320.00

TURFING

3,000 cubic yards fertile earth at $1.00	$3,000.00
Labor planting Bermuda grass	1,000.00
TOTAL	$4,000.00

MAINTENANCE AND REPAIR

5,000 lbs. iron at $.025	$ 125.00
Repair of barges	250.00
Tires for locomotive	210.00
Brakes for locomotive	16.50
Fuel	500.00
Oil and waste	400.00
Tools	150.00
Ropes (manilla)	125.00
Ropes (steel)	110.00
Water piping	75.00
Repairs to mixer	108.00
Repairs to derricks	75.00
Sundry repairs	475.00
TOTAL	$3,619.50

SUNDRY ITEMS

Clearing site	$ 150.00
Chimney for engine room	7.25
Speaking tubes	200.00
Doors and fittings	250.00
3 Turntables	180.00
Removing forms	500.00
Ammunition conveyors	2,000.00
TOTAL	$3,287.25

SUNDRY OPERATING EXPENSES

Advertising	$ 40.00
Mileage	500.00
Sundry office expenses	300.00
Superintendence	2,000.00
Operating boat	1,000.00
TOTAL	$3,840.00

SUMMARY

Railway	$ 3,260.00
General Plant	4,100.00
Material for concrete	50,965.00
Labor concreting	6,268.50
Sand filling	12,500.00
Metal work	4,779.00
Ventilation, drainage, etc.	785.00
Electric Plant	5,246.00
Lumber and framing	8,000.00
Turfing	4,000.00
Nails, etc.	320.00
Maintenance and repairs	2,619.50
Sundries	3,287.25
Operating expenses	3,840.00
TOTAL	$109,970.25
10% for contingencies	10,997.02
GRAND TOTAL	$120,967.27

In preparing these figures, Lieutenant Jervey had based his estimates, in part, on the "actual cost of work on the 10" gun battery."

Ventilators, as called for by Colonel Hains, were located at each end of the magazines, at the end of the center gallery, in the engine room, in the guardrooms, and in the relocator rooms.

It was proposed to cover the sand embankment with one foot of "fertile earth, and put in a shoot of Bermuda...about every square foot."

The traveling derrick employed in construction of the 10-inch gun battery was deemed impractical for the long narrow walls of the mortar battery. It was proposed to replace the derrick with an overhead cableway.[6]

To justify the estimates, Major Mahan took a critical look at the San Francisco figures cited by the Chief Engineer. He found that they did not include these items Lieutenant Jervey had estimated for:

(a)	A railway to facilitate construction	$3,260.00
(b)	Office and operating expenses	3,840.00
(c)	Electric light plant	5,246.00
(d)	Water supply and drainage	785.00

Moreover, construction conditions at San Francisco were superior to those on Santa Rosa Island. For example, the Golden Gate was within two miles of foundries and machine shops to which there was prompt and ready access by rail. Fort Pickens was seven miles by water from the Pensacola shops. The only means of communication was by sailboat or a chance tug. It was a mile and one-half across Pensacola Bay to the Barrancas, but the hiatus between trains to town averaged about two hours. In addition, the Fort Barrancas wharf was unsafe for landing heavy equipment.

Stone, or other materials, coming from the interior could be brought to the Golden Gate without breaking bulk or changing cars. But at Santa Rosa Island, these items had to be transferred from cars to barges at Pensacola, and from barges to cars at the Fort Pickens wharf.[7]

4. Chief Engineer Wilson approves the plans and estimates

On August 6, Chief Engineer Wilson approved the revised plans and estimates. The latter, however, would be subject to several slight modifications caused by the Ordnance Department's revision of their plans for the 12-inch mortar carriage, Model 1896. These alterations involved: (a) the elimination of the inner circle of anchor bolts; and (b) a reduction in the diameter of the mortar pit from 10 feet to 9 feet 9 inches.[8]

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6. Mahan to Wilson, July 23, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/13.

7. Mahan to Wilson, July 23, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/12.

8. Kuhn to Hains, Aug. 6, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/7; Executive Documents of the House of Representatives for the 3d Session of the 55th Congress, 1898-99, (Washington, 1898), Serial 3746, p. 726. The subject plan is not on file at National Archives.

5. Secretary of War Alger makes the necessary allotments

On June 25, 1897, Secretary of War Alger, in response to a request from the Department, had allotted $8,000 from the Act of March 3 for construction of "Gun and Mortar Batteries" for preliminary work at the site.[9]

Upon being notified that the Chief Engineer had approved the plans and estimates, Secretary Alger, on August 6, allotted another $113,000 for the project from the same appropriation.[10]

B. The Engineers Get Ready to Break Ground

1. Mahan obtains clearance for improvements to the plant and support facilities

Meanwhile, Major Mahan had called for a $2,500 allotment for an overhead conveyor (cableway), which would save the taxpayers more than $4,500 in laying concrete.

He also requested authority to erect a cement house, a small storehouse, a shed to shelter the engines and boilers, and to relocate the carpenter shop from the 10-inch battery to the mortar battery site. These improvements would cost about $800. Another $400 was required to build an office. While superintending construction of the 10-inch battery, Lieutenant Jervey had utilized several Fort Pickens casemates for office space, but the fort was at an inconvenient distance from the new construction site. In addition, the casemates were so damp that Jervey's books and instruments had suffered damage.[11]

Chief Engineer Wilson approved these requests, which would be funded from the $121,000 allotments.[12]

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9. Wilson to Mahan, June 25, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/8.

10. Executive Documents, Serial 3746, p. 726.

11. Mahan to Wilson, Aug. 5, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/17. The mortar battery site was nearly one mile east of the masonry fort.

12. Kuhn to Mahan, Aug. 9, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 20302/17.

2. Building the railroad and positioning the plant

During the spring of 1897, a right-of-way for a narrow gauge railroad was surveyed from the Engineers' Wharf to the site selected for the mortar battery, 1,263 yards east of the salient angle of Fort Pickens' south bastion.

At the end of June, on receipt of the $8,000 allotment, a crew of gandy dancers was turned to putting down ties and laying track. The spur was completed early in Fiscal Year 1898.[13]

Upon completion of the mortar battery spur, laborers were put to work by Lieutenant Jervey clearing the site, sand filling for foundations, and getting the plant out of storage and positioning it. The layout was similar to that employed in construction of the emplacements for the four 10-inch guns. Sand, gravel, and cement were stored in frame bins under which there was a double track. Charges were dropped into iron concrete cars, which were then hauled up an incline by a "wire rope haulage plant."

On arrival above one of the two cubical mixers, the charge was dropped through a hopper. After being mixed, the concrete was dumped from the mixers into tubs resting on flat cars and hauled by mules under a traveling Lidgerwood cableway. A maximum day's work was 258 charges.[14]

The cost of the railroad and plant elements were:

Water supply	$ 786.41
Railroad (9,000 feet of track)	7,271.39
Locomotive and engines	487.64
Boats and lighters	417.71
Storage bins	3,021.85
Mixers	1,496.82
Lidgerwood cableway	5,643.93
Derricks	175.08
Cars, etc.	216.31
General maintenance and repair	825.83
TOTAL	$20,344.97 [15]

13. Executive Documents, Serial 3631, p. 720; Executive Documents, Serial 3746, p. 726.

14. Executive Documents, Serial 3746, pp. 726-27.

15. Ibid., p. 727.

brought over from the navy yard were being placed in the concrete, and were estimated to constitute 20 percent of the mass. These stones were not "so advantageous for use" as they "might be otherwise, on account of our being at work mainly in the small walls between the magazines and passages."[19]

The masonry was practically completed by May 31, by which time 9,700 cubic yards of concrete were laid. This was accomplished in 70 working days, for a daily average of 138.5 cubic yards.[20]

Wooden forms for the concrete had cost:

Labor for framing	$3,491.34
Removing	421.17
Lumber	1,579.48
Nails	70.52
TOTAL	$5,561.51

The cost of concrete materials stored in the bins at the mixers was:

		Quantity	Unit Cost	Total Cost
Pebbles	cubic yards	7,000	$2.53	$17,708.76
Random stone	short tons	1,828	1.21	2,224.64
Rosendale cement	barrels	8,477	1.04	8,816.13
Portland cement	barrels	4,684	2.15	10,098.00
Sand	cubic yards	2,000	.49	999.73
TOTAL				$39,847.26[21]

19. Ibid., p. 726; Mahan to Wilson, April 9, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/1.

20. Executive Documents, Serial 3746, p. 726.

21. Ibid., p. 727.

3. Contracting for materials and machinery

In August 1897, Major Mahan advertised for proposals for furnishing and delivering materials for the mortar battery. On September 22, he opened and abstracted the bids. Eight firms had submitted proposals for cement (Portland and natural), broken stone, and pebbles. The low bid for natural cement, 95 cents a barrel, was submitted by Lawrenceville Cement Company of New York City. The proposal was accepted and a contract signed on November 22 for delivery of 9,500 barrels of American natural cement.[16]

The proposals for Portland cement, broken stone, and pebbles were rejected by the Chief Engineer as excessive.

The only bid received for providing and installing the electric plant was from General Electric Co., of Atlanta, Georgia. Chief Engineer Wilson approved the price quoted, $6,474, and a contract was signed on January 13, 1898.[17]

Thompson C. Gill & Co. of Philadelphia submitted the only proposals for steel beams, steel anchor bolts, and pumping supplies. These proposals were rejected as too high.[18]

C. Construction Accomplished in Fiscal Year 1898

1. Placing the concrete

A yellow fever scare in October 1897 compelled Major Mahan to shut down construction. There was a further delay caused by the failure to receive Portland cement, which was required for the foundations. It was mid-February 1898 before the first shipment was unloaded.

Lieutenant Jervey had the men begin pouring concrete on February 18. By the second week of April, the battery was "rising rapidly." On Wednesday, the 6th, 177 cubic yards of concrete were laid in nine hours, and on Thursday, 180 cubic yards in the same length of time. Large stones

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16. Ibid. The other bidders were: Bond, Harrison & Co., Savannah, Ga.; New York and Rosendale Cement Co., New York, NY; Western Cement Co., Louisville, Ky.; M. P. Palms, Pensacola, Fla.; Fred F. Visscher, Montgomery, Ala.; Charles G. Smith & Son, Washington, D.C.; and Simmons & Mayrant, Charleston, S.C.

17. Ibid., pp. 731-32. The bid broke down: dynamos and engines, $1,140 each; boilers, $415 each; storage battery, $1,055 each; pump, $108 each; blower, $145 each; lamps, $8.36 each; and switchboard, testing, and wiring, $1,067.64.

18. Ibid., pp. 730-32.

Lieutenant Jervey, on checking his books, found that the cost of mixing the concrete was:

	Cost per yard	Total Cost
Mixing	.098¢	$ 881.83
Supplying cement	.031	282.28
Supplying sand	.043	389.08
Supplying pebbles	.066	595.30
Supplying water	.020	185.93
TOTAL	.258¢	$2,333.92[22]

The cost of depositing the concrete for the battery was:

Concrete proper	$4,000.11
Random stone	353.39
TOTAL	$4,353.50[23]

Lieutenant Jervey listed a cost of 44 cents per cubic yard for concrete and 19 cents per ton for stone. Labor costs for mixing and positioning the concrete for the mortar battery had been 69.8 cents per cubic yard, compared to the $1.04 per cubic yard for the 10-inch battery. In placing concrete, the Lidgerwood cableway had resulted in a savings of 18 cents per yard, or a total sum of $1,620.

The cost of mixing at the mortar battery had been 25.8 cents per cubic yard, compared with 43 cents at the 10-inch battery, for a savings of 17.2 cents per cubic yard. This represented a savings on 9,000 cubic yards of masonry of $1,548. The concrete mixing plant at the mortar battery, principally because of the cableway, had cost $477.71 more than the plant at the 10-inch battery, netting a savings for the improved plant of $1,070.39.[24]

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22. Ibid., 728.

23. Ibid., pp. 727-28.

24. Ibid., p. 728.

The cost of the cement per cubic yard, in place, was:

ROSENDALE CONCRETE

24 cubic feet pebbles	$2.25
10 cubic feet sand	.148
1-1/2 barrels cement	1.566
Supplying pebbles to mixer	.066
Supplying sand to mixer	.043
Supplying cement to mixer	.031
Supplying water to mixer	.020
Mixing	.098
Placing	.440
Forms	.573
TOTAL	$5.235

PORTLAND CONCRETE

All items identical to Rosendale concrete, except cement, which was $3.234, making the cost per cubic yard $6.903.[25]

The cost of the battery's steel reinforcing beams was $1,800.96, with the cost of placing them $54.32, or one-half cent per pound.[26]

2. Change orders

a. Lighting the pits, magazines, and emplacements

On January 15, 1898, Major Mahan sought authority to spend $300 for providing lighting apparatus for night firing at the mortar pits and the emplacements of the 10-inch battery.[27]

The Board of Engineers sanctioned the proposal because plans already provided for construction of an electric plant for interior lighting. Mahan would make preparations for exterior illumination by stockpiling insulated wire and incandescent lamps with hoods and guards. Until such time as the electric plant was installed, lanterns were to be employed for lighting the pits and emplacements.[28]

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25. Ibid., p. 729.

26. Ibid., p. 728.

27. Mahan to Wilson, Jan. 15, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/28.

28. Robert to Wilson, Jan. 27, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/28.

b. Providing fireplaces for the guardrooms

Meanwhile, Mahan had inquired whether fireplaces would be provided for the guardrooms, as they would be "scarcely habitable without them" because of the damp winter climate. Even if no fires were built, the chimneys would be useful for ventilation.[29]

Fireplaces had not heretofore been provided for guardrooms of Endicott gun and mortar batteries because they were not intended as permanent quarters, the Chief Engineer replied. But, he continued, they could be added, provided Mahan believed they were useful.[30]

c. Waterproofing the magazine roofs

On February 8, Major Mahan questioned the necessity of asphalting the magazine roofs. He believed they could save $900 to $1,000 by eliminating the asphalt waterproofing and smoothing them off with Portland cement. There was, he pointed out, a "slight slope in the roof made for the purpose of carrying the water off." This and 10 feet of concrete would prevent any seepage.[31]

Chief Engineer Wilson, however, deemed it good economy to employ some form of waterproofing over "rooms and passages" of the Endicott batteries. It would afford added protection to the magazines, engine rooms, dynamo rooms, etc. Good results, he continued, had been secured by "simply painting the exterior of the masonry with paraffine paint or hot asphaltum applied with a brush or broom."[32]

To waterproof the magazines, Lieutenant Jervey, with Major Mahan's approval, adopted a novel method. Beginning at the ceiling, a layer of "rich Portland concrete" was placed, mixed very dry, and tamped with great care. Over this was laid a coat of mastic. The interior waterproof layer, thus formed, drained off the moisture into the air spaces around the magazines. From these, it percolated into the sand.[33]

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29. Mahan to Wilson, Jan. 15, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/27.

30. Kuhn to Mahan, Jan. 21, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/27.

31. Mahan to Wilson, Feb. 8, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/33.

32. Kuhn to Mahan, Feb. 12, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/33.

33. Executive Documents, Serial 3746, p. 727. The cost of waterproofing the magazines for labor was $276.40 and for materials $730.

d. The thickness and slope of the sand embankment is reviewed and adjusted

In mid-May, Major Mahan suggested a change order to extend the 45 degree superior slope and thereby increase the thickness of the covering of the magazines. Such a change would: (a) prevent a direct hit from hurling large masses of concrete into the pits and causing heavy casualties among the artillerists; and (b) reduce the amount of sand cover required.

As designed, the top of the concrete cover of the magazines had a slope of 6 degrees. Assuming an angle of fall of 7 degrees, the angle between the axis of a projectile and the top of the concrete cover would be 13 degrees, sufficient "to divert greatly the direction of a projectile from outside." Moreover, no sand cover had been provided in any of the gun batteries for the tops of the magazines, and the protection afforded by the parapets was much less than what would be given by the proposed construction. This change, Mahan argued, could be adopted at a considerable saving in money and time. For example, it cost about 30 cents a cubic yard to handle sand on Santa Rosa Island, yielding a projected saving in money of $3,000 to $4,500 and in time of four to six weeks. The latter, with the Nation at war with Spain, could be important.[34]

Division Engineer Hains, on reviewing the proposal, suggested that, because of the urgency of the situation, Major Mahan be authorized to defer laying of the concrete revetment above reference 32.[35] The Chief Engineer concurred, as the Board of Engineers was known to be preparing "new type plans for a mortar battery."[36]

After waiting two months, Major Mahan again broached the subject. The sand embankment had been raised to a height where it was necessary to make a decision. He was still of the opinion that it would be wise to reduce the thickness of the sand covering above the magazines.

The roofs of the magazines, he explained, had been completed as detailed by the plans. Consequently, if the sand fill was placed at reference 35, it would permit the sand to repose on its natural slope on the side next to the mortar pits, thus allowing the top of the slope to

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34. Mahan to Wilson, May 11, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/37.

35. Hains to Wilson, May 13, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/37.

36. Kuhn to Mahan, May 16, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/37.

"come where it may with the foot of the slope about one foot in front of the upper part of the mortar pit." This would provide greater protection to the pits and magazines than that possessed by the emplacement magazines of the 10-inch battery.[37]

Chief Engineer Wilson approved this change order.[38]

3. Major Mahan describes certain details

The platforms were founded on wet sand at reference (4.0). This sand was seemingly unstable with no bearing power. To compensate for this, a retaining wall was built around the pits to prevent the sand spreading laterally. This gave promise of success.

The concrete revetment enclosing the pits was easily and smoothly laid by moulding it in place in sections about 4 feet long and 2 feet high. The sections in each layer were arranged to break joints. This revetment was arched in rear and supported by slight piers to insure no cracking from the sand's settlement.[39]

Until June 1, 1898, all sand-filling had been for the battery foundations and totalled 3,000 cubic yards. The cost, including wetting, spreading, and ramming, was $1,897.38 or 62.6 cents per cubic yard. From June 1 to the 23d, 7,000 cubic yards of sand had been placed in the parapet, at a cost of about 20 cents per cubic yard. This figure represented a saving of 10 cents per cubic yard as compared to the 10-inch battery, or a total of $6,000. This sum more than paid for the cableway conveyor, which had cost $5,643.[40]

Comfortable, well-ventilated guardrooms, with fireplaces, electric lights for the mortar pits and magazines, latrines, and communications by speaking tubes or telephone had been provided for all rooms of the battery as well as the pits.[41]

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37. Mahan to Wilson, July 16, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/44.

38. Kuhn to Mahan, July 20, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/44.

39. Executive Documents, Serial 3746, pp. 726-27.

40. Ibid., pp. 727-28.

41. Ibid., p. 727.

By the end of Fiscal Year 1898, base rings for the eight carriages had been set, and the racers positioned. Three carriages were mounted, and work on the other five underway. Mechanics from General Electric were installing the 30-kilowatt electric plant, while other men were positioning the ammunition conveyors, and carpenters were building doors.[42]

The cost of these, along with other miscellaneous items, was:

Brick for guardrooms	$ 50.00
Sewerage system	607.75
Doors for magazines	153.95
Ammunition conveyors (700 feet of track, 8 trolleys, and blocks)	862.22
Mounting mortar carriages	970.62
Bolts and traverse circles	748.94
Speaking tubes	3.00
TOTAL	$3,386.48[43]

4. Balancing the books

At the close of Fiscal Year 1898, Major Mahan balanced the project's books. Charged against the plant for maintenance and repair were:

MATERIAL	
Locomotive	$123.20
Cars	172.64
Derricks	8.60
Sundries	17.70
Lidgerwood cableway	22.13
TOTAL	
LABOR	$2,447.57
TOTAL COST	$2,791.84[44]

42. Ibid.

43. Ibid., p. 729. Mounting the mortar carriages included loading them onto flat cars at the Engineers' Wharf, transportation to the battery, and unloading eight carriages. The labor cost was $912.62 and materials $58.

44. Ibid.

Debited to miscellaneous operating expenses were:

Holidays	$ 666.75
Fuel	1,184.47
Tools and non-expendable articles	934.42
Office and buildings	1,082.93
Mileage	258.14
Advertising	95.40
Lighting expenses	178.29
Sundries	815.88
Testing cement	107.56
Subsistence	924.01
Telegrams	12.00
Draft animals	457.00
Materials	532.00
Superintendence, clerical, etc.	6,546.00
Fender piles on wharf	136.00
Temporary wharf	149.00
Operating mail boat	625.00
Sundry transportation expenses	80.00
TOTAL	$14,788.00[45]

To demonstrate the efficiency of the Lidgerwood cableway for positioning concrete, Major Mahan provided figures on the comparative construction costs of the two batteries:

	10-inch Battery	Mortar Battery
Plant	$36,316.25	$20,344.97
Material for 1-yard Rosendale concrete	5.10	3.96
Material for 1-yard Portland concrete	6.08	5.62
Supplying cement, per cubic yard	.08	.031
Supplying pebbles, per cubic yard	.06	.066
Supplying broken stone, per cubic yard	.08	X
Supplying sand, per cubic yard	.03	.043
Supplying water, per cubic yard	.01	.020
Mixing concrete, per cubic yard	.17	.098
Placing concrete, per cubic yard	.62	.440
Forms for concrete, per cubic yard	.71	.573

Each cubic yard of concrete for the mortar battery had contained 24 cubic feet of pebbles, 10 cubic yards of sand, and 1-1/2 barrels of cement. The 10-inch battery's concrete had consisted of 15 cubic feet of pebbles, 5 cubic feet of sand, and 1-1/4 barrels of cement.

45. Ibid., p. 728.

Much of the plant for the mortar battery had been charged to the 10-inch battery.[46]

D. The Fiscal Year 1899 Program

1. The emplacements are completed

During the period, July 1-December 20, work was pushed by Lieutenant Jervey, and the battery completed, except for mounting the mortars. Thirty-four thousand cubic yards of sand were placed to complete the parapets, at a cost of 15 cents per cubic yard. The exterior and superior slopes were covered with "clayey soil taken from the glacis" of Fort Pickens. This proved a mistake, as the "clayey soil" soaked up the heavy rains and eroded badly. In the summer of 1899, to alleviate this situation, the "clayey soil" was stripped off and replaced by swamp sod.[47]

Two observations stations with stairways of concrete and steel were built.[48]

The system adopted by Major Mahan and Lieutenant Jervey for waterproofing the magazines gave promise of success. As of June 30, 1899, they had shown no moisture.[49]

To supplement his Annual Report for Fiscal Year 1899, District Engineer Flagler enclosed a drawing of the mortar battery, as completed, with sections and elevations.[50]

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46. Ibid., p. 729.

47. Executive Documents of the House of Representatives for the 1st Session of the 56th Congress, 1899-1900 (Washington, 1899), Serial 3905, pp. 914, 922.

48. Ibid., p. 914.

49. Ibid.

50. "Battery for 8-12 inch Mortars, Fort Pickens, Santa Rosa Island, Florida," Drawer 78, Sheet 86-3. A copy of the subject plan is on file at the Florida Unit, GUIS.

Construction materials purchased and utilized during the period included:

MATERIAL	QUANTITY	UNIT PRICE	COST	SUPPLIER
Cement, Beach's barrels	1,225.3	$ .95	$1,164.03	Lawrenceville Cement Co.
Gravel, cubic yards	232.51	1.70	394.93	F. F. Visscher
Cast iron blocks for trolleys	160.0	.07	11.20	C. M. Sweeney
Electric Light Plant			6,386.59	General Electric Co.
Tank			145.00	Henry Vogt Machine Co.
Iron sills & gratings			139.58	C. M. Sweeney
6-inch terra cotta pipe	400 ft.	.125	50.00	A. M. Avery[51]

2. The electric plant is placed in operation

Personnel from General Electric had installed the electric lighting plant, consisting of two boilers and two direct connected engines and generators of a combined capacity of 30 kilowatts, together with all lights, wiring, and storage battery. The plant, which tested satisfactorily, was designed to power two searchlights, in addition to furnishing light to the mortar battery. The Engineer Depot, however, had shipped separate dynamos with the searchlights. Consequently, this made available at the battery 25 kilowatts of energy for other purposes.

A land line connected all generators at Santa Rosa Island, so that the plant at any battery could be utilized in event of emergency to light one or several of the others.[52]

E. Arming the Battery

1. The Engineers are given the task

By May 17, 1898, six weeks before Admiral Pascual Cervera Topete's squadron was destroyed off Santiago de Cuba, Major Mahan notified Chief Engineer Wilson that nearly all the concrete had been poured. The mortar carriages had been received, and Capt. H. M. Andrews, the post commander, had been notified that 40 projectiles were being shipped to him by the Ordnance Department.

Although no mortars were on hand, Major Mahan wished to know, who is to mount the mortars on their arrival--the garrison or the Engineers? Captain Andrews was willing to have his men do it, but Major Mahan did

51. Executive Documents, Serial 3905, p. 915.

52. Ibid., p. 914.

not see how he could spare the men, as the artillerists were "constantly" at work or drilling "to fit them for the use of the guns already in position." Mahan believed it would be to the government's advantage to have the carriages and mortars mounted by the Engineers' work force, as the men were accustomed to this class of work while the majority of Captain Andrews' men were recruits. He estimated the cost of mounting the mortars at $500 per piece.[53]

To add an air of urgency to the situation, Chief of Ordnance Daniel W. Flagler now alerted Captain Andrews that the 12-inch mortars could be momentarily expected. Should this be the case, the question would arise whether during a war, it was better for the troops to be instructed in handling the big guns or mounting carriages and mortars.[54]

Chief Engineer Wilson, after evaluating the circumstances, directed Major Mahan to have the mortars mounted.[55]

2. The carriages and mortars are mounted

Almost a year, however, passed before the eight mortars were received from the Army's Sandy Hook Proving Ground. As the carriages were on hand, Lieutenant Jervey and his men had positioned the base rings and mounted the carriages during the summer of 1898.

The mortars were landed at the Engineers' Wharf on April 24, 1899, and moved by rail to the battery. There they were placed on skids preparatory to being mounted.[56]

By June 30, they had been mounted and the battery was inspected by Captain Flagler and turned over to the artillery.[57]

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53. Mahan to Wilson, May 17, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/41. Captain Andrews' men were being drilled to handle the 10-inch disappearing guns, the rapid-fire battery, and the 8-inch converted rifles on the barbette tier of Fort Pickens.

54. Mahan to Wilson, May 24, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/39.

55. Wilson to Mahan, May 31, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 20302/39.

56. Executive Documents, Serial 3905, p. 915.

57. Ibid.

The mortars and carriages were positioned:

MORTARS

EMPLACEMENT	CALIBER	LENGTH	MODEL	SERIAL NO.	MANUFACTURER
Pit A, No. 1	12-inch	11.76'	1890	23	Watervliet
Pit A, No. 2	12-inch	11.76'	1890	38	Watervliet
Pit A, No. 3	12-inch	11.76'	1890	3	Watervliet
Pit A, No. 4	12-inch	11.76'	1890	45	Watervliet

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
Pit A, No. 1	Mortar	1896	109	Providence Steam Engine
Pit A, No. 2	Mortar	1896	97	Robert Poole & Son
Pit A, No. 3	Mortar	1896	99	Robert Poole & Son
Pit A, No. 4	Mortar	1896	98	Robert Poole & Son

MORTARS

EMPLACEMENT	CALIBER	LENGTH	MODEL	SERIAL NO.	MANUFACTURER
Pit B, No. 1	12-inch	11.76'	1890	5	Niles Tool
Pit B, No. 2	12-inch	11.76'	1890	4	Niles Tool
Pit B, No. 3	12-inch	11.76'	1890	21	Builders' Iron
Pit B, No. 4	12-inch	11.76'	1890	18	Builders' Iron

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
Pit B, No. 1	Mortar	1896	129	Robert Poole & Son
Pit B, No. 2	Mortar	1896	111	Robert Poole & Son
Pit B, No. 3	Mortar	1896	128	Robert Poole & Son
Pit B, No. 4	Mortar	1896	110	Robert Poole & Son[58]

3. Naming the battery

On March 24, 1900, the War Department issued General Order No. 43, designating the mortar pits Battery Worth to honor Bvt. Maj. Gen. William J. Worth.[59]

58. Pitman to Chief of Ordnance, June 4, 1901, N A, RG 156, Doc. 20056.

59. General Order No. 43, March 24, 1900, War Dept.

Born in March 1794 in Hudson, New York, Worth was educated in the local common schools. About 1810, he moved to Albany and went to work in a store. Soon after the outbreak of the War of 1812, Worth applied for a commission in the Army. On March 19, 1813, he was commissioned a 1st lieutenant in the 23d U.S. Infantry. Soon thereafter, Brig. Gen. Winfield Scott selected him as aide-de-camp. He was cited for gallantry by General Scott at the battles of Chippewa and Lundy's Lane. In the latter fight, Worth was severely wounded, being confined to his bed for a year and lamed for life. He, however, decided to remain in the Army, having been brevetted a captain and then a major.

Worth was commandant of cadets at the U.S. Military Academy from 1820 to 1828. He became colonel of the 8th U.S. Infantry in July 1838, leading his regiment to victory over the Seminoles at Palaklaklaha. He was ordered to report to Brig. Gen. Zachary Taylor's Army of Observation in Texas in 1845. He fought gallantly at Palo Alto and Resaca de la Palma, and planted the first United States flag on the Rio Grande. At Monterrey, his column stormed Cerro Independencia, captured the Obispado, and fought its way into the city. He was rewarded by a brevet of major general and by a congressional resolution.

He then joined General Scott's army, participating in the campaign from Vera cruz to Mexico City. At Cerro Gordo, he played a conspicuous role, and vigorously pursued the defeated Mexicans after the battle. At Churubuso, Chapultepec, and Mexico City, General Worth showed himself to be an indomitable force upon the field.

Off the battlefield, he could be narrow-minded and self-centered. His ambition caused him to turn on General Scott, and he joined the cabal with Brig. Gen. Gideon J. Pillow and Col. James Duncan against Scott. After the war, General Worth was placed in command of the Department of Texas where he died of cholera in May 1849.

F. Improvements to and Repair of the Battery--1899-1905

1. The Lidgerwood cableway is transferred and the plant dismantled and stored

Upon completion of construction, the Lidgerwood cableway was transferred to Lt. Col. W. H. H. Benyaurd for use on Cumberland Sound, and $1,500 credited to the allotments for the mortar battery.[60]

60. Executive Documents, Serial 3905, p. 914.

Chief Engineer Gillespie allotted $500 for dismantling and storing the plant (track, gravel, and storage bins) used in construction of the mortar battery.[61] After this was accomplished, the unexpended balance was used to defray construction of a boathouse for the naphtha-powered launch.[62]

2. A supplementary drainage system is introduced

Heavy rains during the winter of 1898-99 revealed to Lt. Lewis H. Rand that the open sumps in the mortar pits were unable to handle the run-off. It was decided to construct a supplementary drainage system. An open brick cesspool, 10 feet in diameter and 6 feet deep, was built behind the battery. It was centered and connected with "one rear mortar pit of each four by sewer-pipe drains."

This project was completed in May 1899, at a cost of $376.67.[63]

3. Improvements and maintenance for Fiscal Years 1900-02

In Fiscal Year 1900, the earthen slopes having been eroded by rains were repaired and new sod and Bermuda placed where needed. Doors were rehung; speaking tubes repaired, altered, and labeled; steel hoods placed over exposed doors to prevent entry of rain; drainage holes drilled in several places in the magazines and platforms to carry off surface water; switchboard electrical instruments repaired; and broken concrete patched.[64]

On June 30, 1901, District Engineer Judson reported the battery "in fair condition except as to the main gallery, the dynamo room, and the floors of guardrooms and firing chamber," which were damp. Chief Engineer Gillespie had allotted funds for raising the floors of the guard and firing rooms.[65]

Leaks had recently been discovered in the two magazines.[66]

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61. Executive Documents of the House of Representatives for the 1st Session of the 57th Congress, 1901-02 (Washington, 1901), Serial 4279, p. 833.

62. Executive Documents of the House of Representatives for the 2d Session of the 57th Congress, 1902-03 (Washington, 1902), Serial 4444, p. 736.

63. Executive Documents, Serial 3905, p. 915.

64. Executive Documents of the House of Representatives for the 2d Session of the 57th Congress, 1900-01 (Washington, 1900), Serial 4089, p. 941; Kuhn to Flagler May 31, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 30969. The Chief Engineer had allotted $1,125 for landscaping and sodding the slopes.

65. Executive Documents, Serial 4279, p. 28.

66. Ibid.

During Fiscal Year 1902, the floors of the four guardrooms were raised 2 inches to provide better drainage and the mortar pits repaved. At the same time, a flight of concrete steps was built to prevent damage to the slopes by the detachments at drill, and the foundation of the water supply pump rebuilt.[67]

4. The power house is relocated outside the traverse and other minor improvements are made

In May 1903, District Engineer Raymond prepared a detailed report on the condition of Battery Worth and the estimated cost of necessary improvements. Workmen, he noted, were still busy repaving the pits, while about one-half the floors within the rooms and galleries needed renewal to improve drainage. The guardrooms and passageways were so wet they required lining with copper and wood.

The electric plant could not be maintained on-site and should be removed. The battery would then be supplied with power from a central powerhouse. The latrines were out of order, improperly situated, and a source of danger. A small brick building was called for, having plumbing of sanitary and durable material and design, and a sewer to tidewater.

To fund these improvements, Captain Raymond called for and was allotted these sums:

Patching walls of pits, where cracked	$ 66.00
Painting temporary storage battery house	30.00
Cleaning up debris of old construction plant	60.00
Three gratings for drains under mortars	4.50
Removing electric plant, erecting temporary power-house, installing plant, etc.	3,293.00
Rewiring in conduits for electric lights	45.00
Water supply and hydrants	250.00
TOTAL	$3,748.00

Instead of a brick latrine, the old ones were removed, and cheap frame structures built at a proper distance from the battery.[68]

By June 1903, the pits had been repaved, and Captain Cavanaugh (who had replaced Raymond as district engineer) asked authority to have the

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67. Executive Documents, Serial 4444, p. 739.

68. Raymond to Gillespie, May 4, 1903, & Abbot to Cavanaugh, June 23, 1903, N.A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

small balance remaining in that account reprogrammed to repair the power room floor. He planned to employ a covered trench to carry the now exposed pipes and cables, and to replace the interior ceiling which had failed.[69]

Upon receiving the Department's approval, Cavanaugh proceeded with his plans.[70]

5. The 1905 improvements

District Engineer Cavanaugh, on formulating his maintenance and improvement program for Fiscal Year 1905, called for: (a) the conversion of the former power room into a guardroom by flooring and lining it with wood, and adding a fireplace--$150; (b) the extension of the paving of the mortar pits to the rear at both entrances to the battery as far as the rear of the retaining wall--$950; (c) repairing and resodding the slopes as needed, and for future protection thereof, construction of steps for access to one of the observation stations and a raised platform from one flank of the battery to the other for use of the sentry in walking his post--$153; (d) whitewashing the guardrooms and repair of chimneys--$15; and (e) $15 for making a connection between the pump and water mains to afford a means of sprinkling the Bermuda.

Chief Engineer Mackenzie approved the less expensive projects. The conversion of the power room and extension of the paving were to be deferred.[71]

G. The Armament is Salvaged and the Battery is Given a New Mission

1. The construction of a B.C. station and plotting room

In Fiscal Year 1915, the battery was rewired.[72] Then, in Fiscal Year 1915-16, a Battery Commander's Station and plotting room were built at the battery. The B.C. station and B.C. walk were atop the traverse and above the former boiler and engine room. The boiler and engine room became

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69. Cavanaugh to Gillespie, June 24, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/10.

70. Abbot to Cavanaugh, July 2, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/10.

71. Cavanaugh to Mackenzie, June 3, 1904, & Abbot to Cavanaugh, July 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 18957/11.

72. "Battery Worth, Fort Pickens, Fla., 8-12 Inch Mortars, Proposed Wiring Plan for Illuminating & Firing Circuits," Drawer 78, Sheet 86-9. A copy of this plan is on file at the Florida Unit, GUIS.

the plotting room, after the upper part of the old chimney was plugged with concrete. The B.C. station and plotting room were inspected and transferred to the Coast Artillery by the Corps on August 20, 1915.[73]

2. The battery looses one-half of its punch

In May 1918, the battery lost one-half its armament. Dismounted and removed from Pit A were mortars Nos. 23 and 3 and carriages Nos. 109 and 99; and from Pit B, mortars Nos. 4 and 18 and carriages Nos. 111 and 110. The emplacements vacated in Pit A were Nos. 1 and 3 and in Pit B, Nos. 2 and 4.[74]

In June, obsolete mortars were shipped to the Watervliet Arsenal. The carriages were salvaged and cannibalized.

The removal of one-half the mortar battery's armament was in accordance with War Department policy to reduce the weaponry mounted in the Nation's older emplacements of this category.

3. The construction of a new power station

In the early 1920's, the Corps of Engineers built a new power station. The 23-by 15-foot reinforced concrete structure, incorporating part of the old steam power house, was positioned in rear of the battery. A frame partition divided the station into two rooms. Housed in the station were one 25-kilowatt generator, a radiator, and a DPDT switchboard.

On February 9, 1923, the station was given its final inspection and turned over to the garrison by the Corps of Engineers.[75]

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73. "Proposed B.C. Station and Plotting Room, Battery Worth, Fort Pickens, Fla.," Drawer 78, Sheet 86-10; Emplacement Book, Battery Worth, N A, RG 392. A copy of this drawing is on file at the Florida Unit, GUIS.

74. Emplacement Book, Battery Worth, N A, RG 392. Mortar No. 4 and its carriage were dismounted on April 13, mortars Nos. 3 and 18 and their carriages on April 18, and mortar No. 23 and its carriage on the 28th.

75. Fort Pickens Historical Record Book, N A, RG 392; "Defense of Pensacola, Fla. Power Station for Battery Worth," Drawer 86, Sheet 18. A copy of this drawing is on file at the Florida Unit, GUIS.

4. The battery becomes a combined HECP-HDCP

During the 1930's, the four 12-inch mortars of Battery Worth, along with the 12-inch rifles of Battery Langdon, constituted Tactical Fire Group No. 2. The war reserve allowance for the battery was 259 rounds. In 1936, the battery's lighting and power systems required rewiring.[76]

The mortars, although they remained a unit of Fire Group No. 2 until after Pearl Harbor plunged the United States into World War II, were obsolete. On May 21, 1942, Secretary of War Henry L. Stinson officially recognized this, when he signed an order listing Battery Worth as no longer required for the defense of Pensacola Bay.

In mid-November, one week after American and British forces assigned to TORCH landed in French North Africa, the Southern Defense Command reported that the mortars and their carriages had been salvaged.[77]

The battery, however, continued to play an important role in the Pensacola Harbor Defenses until Fort Pickens was deactivated in 1947. Even before the mortars were salvaged, the Fire Control Switchboard Room had been established there. In the weeks after November 1942, the magazines and bombproofs were converted into a combination Harbor Entrance Control Post (HECP)-Harbor Defense Command Post (HDCP). Battery Worth thus became the nerve center for joint Army-Navy defense of the vital Pensacola area.[78]

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76. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, June 11, 1936, N A, RG 407.

77. Salvaged at this time were mortars Nos. 5, 21, 38, and 45, and carriages Nos. 97, 98, 128, and 129.

78. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, Jan. 22, 1943, and July 1, 1945, N A, RG 407. For information on the role of a combined HECP-HDCP, the reader should consult E.C. Bearss, Special History Study, Fort Moultrie HECP-HDCP, Fort Sumter National Monument (Denver, 1974).

V. THE CONSTRUCTION HISTORY OF BATTERY VAN SWEARINGEN

A. Building and Arming the Battery

1. A battery is constructed in near record time

The threat of war with Spain and the passage of the "National Defense Act" of March 9, 1898, found no rapid-fire batteries at Pensacola. This could be critical should enemy torpedo boats and destroyers, under the cover of darkness, seek to penetrate the controlled minefield and enter Pensacola Bay.

On March 19, to meet this emergency, Chief Engineer Wilson notified Major Mahan that $6,000 had been allotted from the appropriation for "National Defense" for construction of a battery for two 4.7-inch Nordenfeldt rapidfire guns. It would be sited on the right flank of and "in contact with the 10-inch battery."[1]

A large force of laborers was turned out by Lieutenant Jervey on April 7. Such good progress was made during the next 48 hours that Major Mahan forecast that the battery "promised" to be completed in about two weeks.[2]

As the amount of masonry was limited, Lieutenant Jervey had the concrete mixed by hand and placed by wheelbarrows. No problems were encountered, and by June 30, 1898, the battery was nearly completed and the two guns and their carriages mounted.[3]

In Fiscal Year 1899, the battery was completed when workmen placed a small amount of sand fill on the right flank of the parapet, turfed the slopes, and hung the doors. The chert road, servicing the 10-inch battery, was extended in rear of the emplacements.[4]

2. Mounting the carriages and guns

The Ordnance Department, fearful of an early outbreak of war with Spain, decided not to await delivery of the Nordenfeldt guns. Instead, it purchased from Great Britain's Armstrong Works fourteen 4.7-inch rapid-fire guns, twelve of 40 calibers and two of 50 calibers. On being apprised of this, Chief Engineer Wilson announced that the two 50

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1. Executive Documents, Serial 3746, pp. 27, 732-33. The Board of Engineers, on March 1, had recommended that a two-gun rapid-fire battery be constructed on the right flank of the 10-inch battery.

2. Mahan to Wilson, April 9, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/1.

3. Executive Documents, Serial 3746, pp. 27, 732-33.

4. Executive Documents, Serial 3905, p. 918.

caliber guns and their carriages were to be shipped to Fort Monroe and a pair each of the 40 caliber pieces to these defenses: Fort Pickens; Fort Wadsworth; Fort Delaware; Fort Morgan; Long Island Head, Massachusetts; and Tybee Island, Georgia.

Different size platforms, he cautioned, were required for the 40 and 50 caliber mounts.[5]

The two rapid-fire guns and their carriages reached Santa Rosa Island in early May. When he checked the invoice, Lieutenant Jervey found neither base rings nor ammunition.[6]

Several weeks slipped by before the base rings and ammunition were landed on Santa Rosa Island. By June 29, the pedestal carriages and the two 4.7-inch guns were mounted, and the battery was inspected and turned over to the artillery.

3. Relating the guns and carriages to the emplacements

The Armstrong guns and carriages were mounted:

EMPLACEMENT	GUN NO.	CARRIAGE NO.
No. 1	9718	10836
No. 2	9719	10841

4. Submitting a plan and elevations

On September 5, 1901, the District Engineer mailed to the Department a plan titled "Emplacement for two 4.7-inch Rapid-Fire Guns, Fort Pickens Santa Rosa Island, Florida." This plan detailed the battery as constructed.[7]

5. Naming the battery

On May 25, 1903, the War Department issued General Order No. 78 naming the work Battery Van Swearingen.[8] The officer commemorated

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5. Wilson to Flagler, April 6, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 25436.

6. Crozier to Flagler, May 14, 1898, N A, RG 156, Doc. 20056.

7. Judson to Chief Engineer, Sept. 5, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 24949/30. A copy of the subject plan, labeled Drawer 78, Sheet 96, is on file at the Florida Unit, GUIS.

8. G. O. 78, May 25, 1903, War Department.

was Joseph Van Swearingen of Maryland, who had graduated from the U.S. Military Academy as No. 30 in the class of 1824. Commissioned a 2d lieutenant, he was assigned to the 6th U.S. Infantry. He was on frontier duty at Fort Atkinson, Iowa, in 1826-27; in garrison at Jefferson Barracks 1828-29; and back on frontier duty at Fort Leavenworth in 1829. He was promoted 1st lieutenant on May 12, 1829.

In 1829, Van Swearingen participated in the expedition to the Upper Arkansas, from where he returned to Jefferson Barracks. He served in the Black Hawk War in 1832. From 1833 to 36, he was posted at Jefferson Barracks. In the latter year, he was ordered to Fort Jesup, Louisiana.

Van Swearingen was promoted captain on July 31, 1837, and sent to Florida. He was killed in action against the Seminoles at the battle of Okee-cho-bee on Christmas, 1837.[9]

B. Improvements to and Maintenance of the Battery

1. Correcting erosions

In Fiscal Year 1900, the Corps of Engineers spent $50 filling erosions and resodding the battery's slopes where they had been washed by heavy rains.[10]

2. Providing a more stable platform for the guns

During the winter of 1901-02, the two Armstrong rapid-fire guns and their carriages were dismounted and the bases taken out. The anchorage bolts were found to be fastened to a 5-by-5-foot iron plate, the bolts and plate being secured in a column of neat concrete. This did not provide sufficient stability, and the Engineers positioned and set the bolts in an annular iron ring of the same size as the top base. The guns were then remounted, and the ironwork painted.[11]

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9. George W. Cullum, Biographical Register of the Officers and Graduates of the U.S. Military Academy, 3 vols. (New York, 1879), Vol. III, p. 268.

10. Kuhn to Flagler, May 31, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 30969.

11. Kinzie to Adj. Gen., Dept. of the East, Jan. 14, 1902, N A, RG 156, Doc. 25241/71; Executive Documents, Serial 4444, p. 729.

3. Combatting seepage into the magazines

In Fiscal Year 1904, Corps of Engineers workmen lined the magazines to prevent seepage and patched the superior slopes, where the concrete had been fractured by muzzle blasts.[12]

4. Paving the platforms in rear of the guns

The Corps of Engineers, in Fiscal Year 1905, spent a $340 allotment paving the platforms in rear of the gun circles and landscaping the exterior slopes where they had washed. The first project had been undertaken because the ammunition service had been "impeded" by the artillerists being compelled to cross a space "covered with sand and gravel between the head of the steps from the magazines" and the 4.7-inch Armstrong rapid-fire guns.[13]

C. The Battery is Disarmed and Becomes a Coincidence Ranger Finder Station

The 4.7-inch Armstrong rapid-fire guns and their carriages had been purchased from Great Britain and mounted as an emergency measure during the Spanish-American War. But by 1917, the Fort Pickens Armstrongs, along with those emplaced at other coastal defenses such as Forts Hancock and Moultrie, were obsolete. In addition, their ammunition was a different caliber from that fired by the standard Coast Artillery rapid-fire guns. As such, it had to be purchased in Great Britain or manufactured under license in the United States. Because of the limited number of 4.7-inch Armstrongs, the latter option was impractical for economic reasons.

Declared surplus to the needs of the Pensacola Harbor Defense Project, the Battery Van Swearingen Armstrongs were dismounted in the winter of 1917-18, and in February 1918 shipped to the Watervliet Gun Factory. In mid-March 1919, the War Department determined to retain Battery Van Swearingen as an element in the Harbor Defense Project. The Armstrongs and their carriages were accordingly returned to Fort Pickens and placed in storage.

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12. Raymond to Gillespie, May 4, 1903 & Abbot to Cavanaugh, June 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

13. Cavanaugh to Mackenzie, June 3, 1904, & Abbot to Cavanaugh July 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 18957/11.

Then, in May 1921, the War Department reversed itself and ordered the guns and carriages disposed of. Gun No. 9718 and carriage No. 10841 were donated to Danielsville, Georgia, and gun No. 9719 and carriage No. 10836 to Orlando, Florida.[14]

The next year, 1922, the battery was given a new mission. Emplacement No. 1 was converted into a coincidence ranger finder station for Battery Payne. This involved construction of a 10-by-10-foot (interior measurement) square structure on the former gun platform. The 18-inch thick reinforced concrete walls of the station had a viewing slit centered 4 feet above the instrument pedestal. When not in use, the instruments were stored in the former magazine. On February 9, 1923, the station, having been completed and equipped, was transferred by the Engineers to the Coast Artillery.[15]

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14. Turtle to Chief Engineer, March 16, 1918, & Chief Engineer to District Engineer, March 18, 1919, N A, RG 77, Harbor Defense File; telephone call, Lewis to Bearss, July 18, 1977. Emanuel R. Lewis, author of Seacoast Fortifications in the United States, is an expert on this subject.

15. "Defense of Pensacola, Fla., Coincidence Ranger Finder Station for Battery Payne on Van Swearingen," Drawer 78, Sheet 102-9; Fort Pickens Historical Record, N A, RG 392.

VI. THE CONSTRUCTION HISTORY OF BATTERY PENSACOLA

A. The 12-inch Battery Takes Shape

1. Funding the project

The Board of Engineers in the early 1890's had approved these projects for defense of Pensacola Bay: two 12-inch guns on lift carriages at Fort Pickens; four 10-inch guns on disappearing carriages east of Fort Pickens; sixteen 12-inch mortars also east of Pickens; and two 8-inch guns on disappearing carriages at Fort McRee.[1]

By late winter of 1898, when the destruction of Maine edged the United States to the brink of war with Spain, the four-gun 10-inch battery on Santa Rosa Island, although relocated west of Fort Pickens, was partially armed, while two pits, each designed for four mortars, were under construction. Congress, to accelerate building and arming of coastal defenses, responded to the emergency by enacting a National Defense Act appropriating $3,827,842.80 for construction of "Gun and Mortar Batteries." President William McKinley signed the act into law on March 9.

A week later, on March 18, Chief Engineer Wilson telegraphed Major Mahan that an emplacement for two 12-inch guns mounted on disappearing carriages would be built at Fort Pickens. Work was to commence immediately, and it would be funded from a $50,000 allotment made by Secretary of War Alger from the appropriation for "National Defense."

The gun platforms were to be built first so the armament could be mounted without delay upon its arrival.

Mahan was to push the work to early completion. The operations of the Corps, Chief Engineer Wilson exhorted, in accomplishing this mission with the funds allotted would be "viewed by the entire country, and your own reputation and that of the Corps...is involved in this matter."[2]

On receipt of this communication at his Montgomery office, Major Mahan wrote Lieutenant Jervey at Santa Rosa Island. He would immediately prepare drawings and estimates for the 12-inch battery.

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1. Craighill to Hains, Dec. 21, 1895, N A, RG 77, Correspondence 1894-1923, Doc. 7383/1.

2. Wilson to Mahan, March 18, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/1; Executive Documents, Serial 3746, pp. 723-33. In the years since the early 1890's, the disappearing carriage had been perfected and found to be superior to the lift carriages.

Orders were placed for the anchor bolts for the gun carriage base rings, 7,300 barrels of Portland cement, 12,000 barrels of natural cement, and a large quantity of gravel.

By the 23d, he hoped to have the dimensions of the iron beams needed for the 8-inch Fosters Bank battery and, by the 24th, those required for the 12-inch emplacements. Because of an injury to his ankle, Major Mahan planned to rush his chief clerk to Atlanta to perfect arrangements with the agent of the Carnegie Steel Company for purchase of the beams and attachments.[3]

2. The plans and site are approved

On March 28, Major Mahan mailed to the Department plans of the 12-inch battery as up-dated and revised by Lieutenant Jervey. The final design was being delayed, he noted in a covering letter, because of the necessity to incorporate changes dictated by receipt of the latest drawings of the 1897-type emplacement for a 12-inch gun. These had been received from Washington on Saturday, the 21st.

The battery was designed so its projectiles would strike the water just beyond the 18-foot curve on the south side of Santa Rosa Island. Lieutenant Jervey had adjusted the inclination of the superior slope on this basis. The right gun would be positioned to command the entrance of the harbor beyond the lighthouse.

In determining the battery's position, Jervey had taken the line of fire of the gun in the left emplacement to clear the mortar battery 1,300 yards east of Fort Pickens. The line of fire of the right emplacement had been determined by laying off an angle of 220 degrees to the southward and westward from the line of fire of emplacement No. 2.

No change in the thickness of concrete had been made for the battery because the old Third System masonry fort provided only slight resistance against the fire of modern naval guns. Moreover, these "ruins" would "make a comparatively small heap for the protection of the 12-inch gun battery." To obtain "proper command" of the area fronting Fort Pickens, it had been necessary to raise the interior crest of the proposed battery above the breast-height wall of the 1829-35 masonry work.[4]

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3. Mahan to Wilson, March 22, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/8.

4. Mahan to Wilson, March 28, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/13.

The Chief Engineer's office approved the battery site, but questioned certain aspects of the plan. Captain Kuhn noted that various surfaces of the gun and loading platforms were not at their correct grades in respect to each other, and to the interior crest for the model 1896 12-inch disappearing carriage. Consequently, it was difficult to ascertain whether the battery was arranged for depressing fire.

It was understood that the reference of the magazine floors was related to the grade of the Fort Pickens parade. The Department was not "disposed" to raising the magazine floors much above that grade, either by filling in under the battery or by increasing the depth of the foundations.

Major Mahan was to study the feasibility of "razing the breast-height wall of the barbette tier" of Fort Pickens to improve the field of fire coincident with economy of effort and securing better foundations.

To avoid loss of time, Major Mahan was to begin construction as soon as the platform references had been corrected and the elevation of the magazine floors determined.[5]

Major Mahan, after discussing the situation with Lieutenant Jervey, reported that it would be economical "to raze the breast-height wall throughout the field of fire." In addition, it would save construction time because it would enable them to materially reduce the height of the battery's exterior slope. The floors of the magazines, as a result of this change, need not be elevated more than two feet above the fort's parade.[6]

Major Mahan was at Pensacola on April 5-8 and found that Lieutenant Jervey had staked out the battery. Ground was scheduled to be broken on Monday, the 9th. The gun platforms, as ordered, were to be built first. As the concrete plant was not yet on the scene, the work would be done by hand, pending its arrival.[7]

3. The plant is organized

Major Mahan had hoped to employ the plant centered on the Lidgerwood cableway for construction of the 12-inch battery, but it was still engaged on the mortar battery. A new plant had to be assembled.

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5. Kuhn to Mahan, March 31, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/13.

6. Mahan to Wilson, April 5, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/13.

7. Mahan to Wilson, April 9, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/1.

While awaiting arrival of the machinery, Lieutenant Jervey employed his laborers to clear the site designated for the massive battery inside Fort Pickens. The right flank of the Endicott emplacement would be positioned within a short distance of the area where the northwest channel front of the masonry fort tied into the Tower Bastion and its left flank near the gorge of the southeast bastion.

The plant, when organized, consisted of a one cubic yard capacity cubical mixer. The dry mixture (sand, pebbles, and cement) was measured in small handcarts, dumped into a tub, raised over the mixer by a derrick, mixed, and dumped into a tub resting on a flat car. It was then run out under the derricks at the construction site, and placed in position without handling. The placing was accomplished cheaply and quickly by a system of running lines on the derricks. Involved were two hoisting lines on each derrick, so situated that the bucket of concrete could be dumped anywhere in the area covered by the derrick. Material was stored near the mixer by two derricks.[8]

4. Major Mahan reports good progress in Fiscal Year 1898

Although plagued by a labor shortage, complicated by the April 25 declaration of war against Spain, good progress was reported. By June 30, 1898, both gun platforms were finished. In emplacement No. 1, the loading platform was completed, as was the emplacement's concrete work. The derricks had been removed from this emplacement to where they could better handle the concrete for emplacement No. 2. The foundations and paving in emplacement No. 2 were finished. Six thousand two hundred cubic yards of concrete had been laid up and 1,000 yards of sand fill placed.[9]

5. Allocating the costs

Since they were both funded from the appropriation for "National Defense," Major Mahan and Lieutenant Jervey kept one set of books for the 12-inch battery and the emplacements for the two 4.7-inch rapid-fire guns (Battery Van Swearingen) being erected on the right flank of the 10-inch battery.

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8. Executive Documents, Serial 3746, pp. 732-33.

9. Ibid.

As of May 31, 1898, there had been spent on the 12-inch and 4.7 inch emplacements:

CLASS OF LABOR

Maintenance & repairs & condensing plant	$ 182.00 931.00	Policing	$ 50.00
Placing hoisting engines	75.00	Water tanks	128.25
Blacksmith work	268.75	Moving rapid-fire guns	129.00
Receiving wood	150.00	Handling boiler for Fort McRee	15.00
Receiving sand	814.75	Mixing concrete	160.00
Receiving gravel	963.00	Leveling & clearing site	250.00
Receiving lumber	264.50	Building & removing forms	1,237.62
Receiving cement	1,425.50	Erecting derricks	204.50
Sand filling	731.50	Buildings & tents	306.05
Concreting	4,018.00	Overseers, clerks, time-keepers, electricians, enginemen, master laborers, watchmen, cook, and waiters	2,500.00
Placing beams	32.50		
Storing sundries	10.50		
Supplying cement to mixer	105.00		
Supplying pebbles to mixer	200.00		
Supplying sand to mixer	55.00		
		TOTAL	$15,207.42

TOTAL LABOR ON EACH WORK

Rapid-fire battery	$ 2,557.50
12-inch battery	12,649.92
TOTAL	$15,207.42

EXPENDITURES FOR MATERIALS, ETC.

Office outfit	$ 73.27	Plant	$ 4,879.09
Montgomery office	240.00	Pipe and fittings	460.99
Telegrams	17.59	Iron, steel, and nuts	135.18
Traveling expenses	57.35	Nails (55 kegs)	117.80
Electrical supplies	720.14	Provisions	907.45
Yards of gravel	3,400.00	Oil, waste, pomade	60.18
Barrels of Portland cement	10,315.00	Towing	817.72
Sundries	813.49		
Lumber (155,861 feet)	1,910.66		
		TOTAL	$24,936.21

TOTAL EXPENDITURES ON EACH BATTERY

4.7-inch battery	$ 4,218.19
12-inch battery	20,718.02
TOTAL	$24,936.21

LIABILITIES

Lumber	$ 3,378.72	Delivery of tubs	$ 1,157.70
Miscellaneous supplies	1,587.83	Condenser	48.99
Provisions	867.97	Electrical supplies	889.00
Castings	48.70	Wood	192.00
Maintenance & repairs	159.70	Telegrams	24.00
Meat	164.62	Steel beams	2,122.00
Car wheels	260.02	Cement (7,809 barrels)	9,842.00
Hoisting tubs	60.00	Gravel (2,000 yards)	3,400.00
Coal	30.20		
		TOTAL	$24,242.64[10]

COST OF ITEMS

PLANT

Lumber	$ 728.80
Material	5,390.08
Liabilities	817.71
Towing	817.72
TOTAL	$7,704.31

LUMBER

First cost	$1,910.66
Labor unloading	264.50
Liabilities	3,378.72
TOTAL	$5,553.88

Total received, 400,000 board feet; average cost delivered $13.88 per thousand

PEBBLES

First cost	$3,400.00
Labor unloading	963.00
Liabilities	4,557.70
TOTAL	$8,920.70

Total received, 4,000 yards; average cost per yard--$2.25

SAND

Labor	$ 814.75

Total stored, 2,000 cubic yards; average cost per year--$.407

SAND FILLING

Labor	$ 731.50

Amount placed, 3,000 cubic yards; average cost per yard--$.244

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10. Ibid., pp. 733-34.

CEMENT

First cost	$10,315.00
Labor unloading	1,425.50
Liabilities	9,849.45
TOTAL	$21,589.95

Total received, 11,809 barrels; average cost delivered--$1.83 per barrel

MIXING CONCRETE BY MACHINERY

Labor	$ 160.00

Total mixed, 2,000 yards; average cost per yard--$.08

PLACING ROOF BEAMS

Labor	$ 30.00
Liabilities	2,122.00
TOTAL	$2,154.00

MAINTENANCE AND REPAIR

Repairs to locomotive	$ 76.50
Blacksmithing	268.75
Repairs to tracks	75.00
Repairs to cars, etc.	30.50
Liabilities	159.70
Material	948.76
TOTAL	$1,559.12

LIGHTS & CONDENSING APPARATUS

Labor	$ 931.00
Materials	720.14
Liabilities	889.18
TOTAL	$2,540.32

SUPPLYING MATERIAL TO MIXER

Labor	$ 360.00

Total number of yards mixed, 2,000; average cost per yard--$.18

PLACING CONCRETE

2,000 yards at 12-inch battery	$2,321.00
1,000 yards at 4.7-inch battery	1,697.00
TOTAL	$4,018.00

Average cost per yard, 12-inch battery--$1.16; average cost per yard, rapid-fire battery--$7.69

RECEIVING FUEL

Labor	$ 150.00
Liabilities (wood)	192.90
Liabilities (coal)	30.20
TOTAL	$ 373.10

SUBSISTENCE

Provisions	$ 907.45
Liabilities	1,322.59
TOTAL	$1,940.04

SUNDRY LABOR ITEMS

Storing sundries	$ 10.50
Policing	50.00
Moving 4.7-inch guns	129.00
Leveling sites	250.00
Superintendence	2,500.00
TOTAL	$2,939.50

SUNDRY LIABILITIES

Miscellaneous supplies	$1,187.83
Telegrams	24.52
TOTAL	$1,212.35

SUNDRY EXPENDITURES

Office expenses	$ 323.27
Telegrams	17.59
Traveling expenses	57.35
Nails	117.90
Oil, waste, etc.	60.48
TOTAL	$ 576.49

Average estimates of cost of 1 yard of concrete in place, 12-inch battery:

24 feet of gravel	$ 2.00
1-1/2 barrel of cement	2.75
10 feet sand	.15
Forms, labor	.309
Material (lumber)	.350
Nails	.015
Supplying material to mixer	.18
Mixing concrete	.08
Placing concrete	1.16
TOTAL	$ 6.994

Average estimates of cost of 1 yard of concrete in 4.7-inch battery:

24 feet of gravel	$ 2.00
Cement	3.00
Sand	.15
Lumber	.35
Nails	.105
Labor	1.69
TOTAL	$ 6.205

SUMMARY

Plant	$7,704.31	Forms, buildings	$1,237.62
Lumber	5,553.88	Ceiling beams	2,154.64
Cement	21,589.95	Maintenance & repair	1,559.12
Pebbles	8,920.70	Fuel	373.10
Sand for concrete	814.75	Lights and water	2,540.32
Sand filling	731.50	Subsistence	1,940.04
Supplying mixer	360.00	Sundry labor	2,939.50
Mixing	160.00	Sundry materials	576.49
Placing	4,018.00	Sundry liabilities	1,212.35

GRAND TOTAL - $64,386.27

The total expenditures and liabilities for each work were:

12-inch Battery

Labor	$12,649.92
Material	20,718.19
Liabilities	23,886.38
TOTAL	$57,254.38

4.7-inch Battery

Labor	$ 2,557.50
Materials	4,218.02
Liabilities	356.37
TOTAL	$ 7,131.38

GRAND TOTAL -- $64,386.27[11]

6. A proposal to substitute Model 1896 for Model 1897 carriages causes a furor

Early in June 1898, the Chief Engineer notified Lieutenant Jervey that two Model 1896 disappearing carriages for 12-inch guns were being shipped by the Ordnance Department to Santa Rosa Island. This was bad news. As Jervey advised his superiors, to adapt the emplacements for the Model 1896 carriages would necessitate removal of a large quantity of concrete from emplacement No. 1 and a small amount from No. 2.[12]

To avoid this costly operation, the Chief Engineer arranged with the Ordnance Department to send the Model 1896 carriages elsewhere. Jervey would complete the emplacements for Model 1897 carriages.[13]

7. Chief Engineer Wilson resolves differences in the plans

On June 17, Major Mahan advised the Department that the loading platform of emplacement No. 1 had been completed in accordance with the design approved by the Board of Engineers on June 10, 1896. On studying the revised prints, Major Mahan found that they depicted the gun in loading position overhanging the platform 2-1/2 feet more than in the Ordnance Department's June 6, 1898, revision. This additional overhang, however, did not seem to interfere with the loading of the gun. The Ordnance people's revised plan called for about 30 cubic yards less concrete than the Board of Engineers'.

To correct the loading platform, as built, would necessitate cutting away 30 cubic yards of concrete and rebuilding the steps in conformity with the larger radius. This would cost about $500.[14]

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11. Ibid., pp. 734-35.

12. Jervery to Wilson, June 8, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/28.

13. Wilson to Jervey, June 9, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/28.

14. Mahan to Wilson, June 17, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/31.

Major Mahan, to illustrate his point, mailed to the Department a plan of the "12" Gun Battery, Pensacola, Fla., Disappearing Carriages Model 1897."[15]

Chief Engineer Wilson had good news for Major Mahan and Lieutenant Jervey. The changes depicted on the revised Ordnance Department drawings were not "material to the successful operation of the gun carriage." This alteration would not be introduced into any platform where progress of the work necessitated cutting out concrete.

The increased radii of the steps connecting the loading and gun platform levels had been introduced to secure more headroom for the artillerists under the elevating arms of the carriage.[16]

8. A tunnel is added to the project

On August 20, Major Mahan reminded the Department that the battery divided Fort Pickens into two unequal parts, cutting off all direct communication between the two sections except via a "foot-way passing around the right flank of the battery." This "foot-way" entered into a casemate under the arch connecting it to the adjacent casemate and through the second, and could only be used by pedestrians.

To open for access the casemates in the south and southwest fronts which were valuable as quarters, storerooms, etc., Mahan recommended construction of a tunnel around the left flank of the battery. Without the tunnel, there would be no way to sustain the rampart slope of the left flank. It had been necessary to cut deeply into this slope to obtain necessary protection on the left flank of the battery. He estimated the cost of the tunnel at $4,025.

After the current construction program was completed at Santa Rosa Island and Fosters Bank, Major Mahan noted, there would be need for space for storage of the plant, and the Fort Pickens casemates were the answer.[17]

The Chief Engineer's Office questioned the wisdom of this expense. They wished to know: (a) Cannot the same sum be expended for construction of a commodious storehouse with better facilities than the

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15. A copy of this plan labeled Drawer 78, Sheet 90-4, is on file at the Florida Unit, GUIS.

16. Kuhn to Mahan, June 21, 1898, N A,RG 77, Correspondence 1894-1923, Doc. 24909/31.

17. Mahan to Wilson, Aug. 20, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/36.

casements? (b) Cannot the subject casemates be reached by a less expensive means? (c) Will an additional allotment be required to complete the battery if the tunnel is authorized?[18]

Replying, Major Mahan assured the Department that a storehouse would provide neither as good nor as secure facilities as the casemates, particularly those of the south front. These casemates formed a double row, of which the outer or gun casemates would, during a bombardment, have to be first demolished.

The only means of access to these casemates, other than the route previously cited, was up the steps at the flanks of the north front along the terreplein of the gorge, or the barbette tier of the channel fronts to the steps at the flanks of the south front.

The casemates in rear of the battery in the north front, he explained, were required for troops, as there were no quarters on the island for the garrison. Finally, an additional allotment would be needed for the tunnel, because the estimates for the battery had been pared to the bone.[19]

After reviewing the arguments presented by Mahan, the Chief Engineer approved and allotted $4,000 for the undertaking.[20]

To detail what was planned, Major Mahan and his staff prepared and transmitted to Washington a "Cross Section of Proposed Tunnel, 12" Battery, Pensacola, Fla."[21]

The tunnel was constructed in September and October through the sand fill at the left of the battery. An arched structure, the tunnel was 8 feet wide and 9 feet in height.[22]

9. Captain Flagler replaces Major Mahan as District Engineer

Major Mahan, who had been District Engineer since March 1894, had been in poor health for some time. On October 1, 1898, he went

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18. Kuhn to Mahan, Aug. 23, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/36.

19. Mahan to Wilson, Aug. 26, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/37.

20. Kuhn to Mahan, Aug. 31, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/36.

21. A copy of the subject plan, labeled Drawer 78, Sheet 90-5, is on file at the Florida Unit, GUIS.

22. Executive Documents, Serial 3905, p. 916.

on sick leave, preparatory to reassignment as military attache to Denmark. His replacement was Capt. Clement A. F. Flagler. A son of Brig. Gen. Daniel W. Flagler, he was graduated from the U.S. Military Academy as No. 3 in the class of 1889. Commissioned a 2d lieutenant in the Corps of Engineers, Flagler was assigned to the Engineer Battalion at Willett's Point. He remained with the battalion until June 1, 1892, when he was ordered to San Francisco as assistant engineer to Col. G. H. Mendell. At the end of 26 months, he returned to West Point as an instructor. While there, he was promoted 1st lieutenant.

On August 20, 1895, Flagler left West Point for Fort Monroe, Virginia, for duty as assistant engineer. After a tour as assistant engineer at Portland, Oregon, he reported, in December 1897, at Willett's Point, and was assigned to Companies B and C, Engineer Battalion.

On May 15, 1898, Flagler entered the U.S. Volunteers as a major, and was assigned to Maj. Gen. James H. Wilson's staff. After service with the 1st Division in the southeast and Puerto Rico, Flagler was discharged from the Volunteers on December 31, 1898. Having been promoted to captain in the Regulars, he was ordered to Montgomery as District Engineer.[23]

Three months later, on December 20, Lt. Jervey was reassigned to West Point. His replacement as assistant engineer at Pensacola, Lt. Lewis H. Rand, reported to Captain Flagler on March 14, 1899. A native of New Jersey, Rand had graduated from the U.S. Military Academy as No. 4 in the class of 1899. Commissioned a 2d lieutenant in the Corps of Engineers, he was ordered to report to Captain Flagler.[24]

10. The battery is completed and turned over to the Artillery

During the summer of 1898, Lieutenant Jervey had pushed his workmen. By September 30 "practically" all the concrete, totaling 9,400 cubic yards, 5,000 of which had been handled since July 1, had been placed. Its average cost was $6.99 per cubic yard.

Sand filling was began in August and completed in December. It totaled 13,770 cubic yards, and cost 24 cents per cubic yard.[25]

A 15-kilowatt electric light and power plant with two hoists had been installed and tested. Overhead ammunition conveyors had been installed, doors hung, and ladders positioned.

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23. Cullum, Biographical Register, Vol. IV, p. 474.

24. Ibid., pp. 530-31, 658.

25. Executive Documents, Serial 3905, p. 916.

The magazines of emplacement No. 2 had been covered with asphalt and were dry. Those for emplacement No. 1, which had not been given the asphaltic covering because of the time factor, showed traces of dampness.[26]

On December 20, Captain Flagler reported that, except for a few details, the battery was finished. It should, therefore, be turned over to the artillery.[27]

Before approving the transfer, the Department desired to know who was going to mount the armament.[28]

Captain Flagler proposed that the artillery mount the carriages and guns, while the Engineers were to be responsible for the base rings.[29]

Before the battery was transferred, Division Engineer Hains spent several days in early January on Santa Rosa Island. He saw that the breast-height wall of Fort Pickens, fronting the battery, had not been taken down. Before the battery was transferred, this must be done.[30]

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26. Ibid.

27. Flagler to Wilson, Dec. 20, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/44.

28. Kuhn to Flagler, Dec. 29, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/44.

29. Flagler to Wilson, Jan. 12, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 24909/44.

30. Hains to Wilson, Jan. 16, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 24909/44.

On January 30, Captain Flagler accordingly called for an allotment to complete the battery. He needed to:

Remove the breast-height wall and parapet	$ 550.00
Sod the slope at approach to tunnel	75.00
Provide wooden cover for ventilator shaft of engine room	20.00
Store plant	100.00
Clean up around battery	200.00
Care for and clean carriages and guns when received, setting base rings, and assistance to artillery in mounting	500.00
TOTAL	$1,445.00[31]

The Department allotted the requested sum to be charged against the Act of January 5, 1899.[32]

By June 30, 1899, these details had been attended to, and Captain Flagler inspected the battery and turned it over to the post commander. Along with his annual report, Flagler transmitted to the Department a drawing titled "Emplacement for two 12-inch B. L. Rifles on Disappearing Carriages, Fort Pickens, Santa Rosa Island, Florida."[33]

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31. Flagler to Wilson, Jan. 30, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 24909/49.

32. Kuhn to Flagler, Feb. 4, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 24909/49.

33. Executive Documents, Serial 3905, p. 916. A copy of this print, labeled Drawer 78, Sheet 90-6, is found in the files, Florida Unit, GUIS.

11. Materials expended and positioned in Fiscal Year 1899

Among the construction materials purchased for use in the battery during Fiscal Year 1899 were:

MATERIAL	QUANTITY	UNIT PRICE	TOTAL COST	SUPPLIED BY
Cement:				
Natural--barrels	234	$ 1.05	$ 245.70	Lawrenceville Cement
Natural--barrels	5,736	1.55	8,890.80	Lawrenceville Cement
Natural--barrels	2,350	.95	2,232.50	Western Cement
Natural--barrels	13	1.50	19.50	A. V. Clubbs
Portland--barrels	442	2.605	1,151.51	Sinclair & Babson
Portland--barrels	131	2.65	347.15	Pensacola Supply
Portland--barrels	16	3.00	48.00	A. V. Clubbs
Portland--barrels	10	2.75	27.50	W. F. Vandiver
Portland--barrels	2	2.50	5.00	A. M. Avery
Gravel--cubic yards	1,146.70	1.70	2,854.07	F. F. Visscher
Electric plant			1,283.00	C & C Electric
Storage battery			850.00	Electric Storage Battery Co.
Electric supplies			756.53	General Electric Co.
Fixtures			87.31	Post Glover Electrical Co.
Ammunition hoists with motors	2		2,375.00	New Jersey Foundry
Trolley--sets	2		600.00	Thomas Carlin & Sons
Shot cranes	4	91.00	364.00	Thomas Carlin & Sons
Triple blocks	2	82.28	164.56	Yale & Towne
Steel doors	15	7.75) 33.00)	330.00	Snead-Van Alstine
Bronze hinges--pounds	980	.24	235.20	William Gisriel
Steel beams--pounds	93,195		1,602.56	Carnegie Steel
Railings			66.00	Snead-Van Alstine
Tank			40.00	Henry Vogt
Padlocks	12	.50	6.00	D. M. Snow
Lumber--feet	22,376	11.29) 14.96)	493.33	R. B. Pitt Mill[34]

As of the close of Fiscal Year 1899, there had been expended from the allotments for construction of the battery $71,205.60. Unobligated funds remaining in the account totaled $57.10.[35]

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34. Ibid., p. 917.

35. Ibid.

B. Arming the Battery

1. The 1st Artillery mounts the guns and carriages

Two 12-inch breech-loading rifles, Model 1895, arrived on April 24, 1899, while two 12-inch disappearing carriages, LF Model 1897, were received from Robert Poole & Son Co. The first of the carriages arrived on March 25 and the second on April 29. The ordnance, after being landed, was transported to and stored in rear of the battery.

Then, on June 10, the decision having been made for the troops to mount the armament, Lt. R. H. C. Kelton and 60 men of the 1st U.S. Artillery reached Fort Pickens from Barrancas Barracks. Of the detachment, only 15 soldiers constituted the "maneuvering detail," while the remainder pulled guard and cared for the ordnance previously mounted. The fire and explosion on the 20th destroyed much of the equipment stored in the Fort Pickens ordnance store--the maneuvering blocks, skids, etc. Lieutenant Kelton now found his detachment without material "so far as timbers and blocking were concerned." Requisitions were submitted to the Chief of Ordnance for authority to purchase on the open market pine timber necessary for the project.

Mounting the armament was hard, time consuming work, and it was "continued without intermission, except Sundays and holidays," until November 27. On that date, the ordnance which had been positioned was tested.[36]

The guns and carriages mounted by the artillerists were:

GUNS

Emplacement	Caliber	Length	Model	Serial No.	Manufacturer
No. 1	12-inch	40 cal.	1895	7	Watervliet
No. 2	12-inch	40 cal.	1895	6	Watervliet

CARRIAGES

Emplacement	Type	Model	Serial No.	Manufacturer	Motor
No. 1	Disappearing	1897	3	Poole & Son	8 h.p. 110V DC
No. 2	Disappearing	1897	4	Poole & Son	8 h.p. 110V DC[37]

36. Kelton to Chief of Ordnance, March 6, 1900, N A, RG 156, Doc. 20056.

37. Pitman to Chief of Ordnance, Dec. 2, 1899, N A, RG 156, Doc. 20056.

2. Naming the battery

On July 22, 1899, the War Department issued General Order No. 134 designating the emplacements Fort Pensacola. This was found to violate the Army's nomenclature, and on May 29, 1900, the War Department issued another general order redesignating the work Battery Pensacola.[38]

C. The 1900-05 Improvements and Maintenance Programs

1. Maintenance and improvements in Fiscal Year 1900

In Fiscal Year 1900, a number of minor repairs and improvements were made to the battery. The washed and eroded earthen slopes were repaired and new sod and Bermuda sprouts placed where needed; several doors were rehung; speaking tubes repaired, altered, and labeled; steel hoods placed over exposed doors to prevent entry of rain water; drainage holes drilled in several places in magazines and platforms to carry off surface water; several switchboard electrical instruments repaired; and breaks in the concrete of the superior slope patched.[39]

2. The Corps spends considerable time and money in an effort to make the battery waterproof

Water seepage into the magazines and interior rooms plagued nearly all Endicott emplacements. At Battery Pensacola in Fiscal Year 1900, Assistant Engineer Rand, to combat dampness in the dynamo and storage battery rooms of the electric plant, applied an oil coating to the overhead gun platforms of gun No. 1. An asphalt covering, he had concluded, would soon be cut to pieces by the wheels of the ammunition trucks. Before applying the mixture of resin and boiled linseed oil, in proportion of 1 to 3, the platforms were carefully swept and cleaned. The next day, forms one-half inch in height were constructed by laying 1-1/2-inch planks and building up against their edge dampened clay to a thickness of about 3 inches. After the clay had dried and hardened, the planks were removed.

Diagonal rectangles, in checkerboard fashion, about 36 inches square, were then treated. Twenty gallons of the mixture in a 55-gallon caldron were heated to near the boiling point, and poured into the rectangle and spread with brooms to cover the surface.

After standing 24 hours, the forms were removed and replaced for the uncoated rectangles, with an overlap of about 12 inches. After

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38. G. O. 134, July 22, 1899, & G. O. 73, May 29, 1900, War Department.

39. Executive Documents, Serial 4089, p. 941; Kuhn to Flagler, May 31, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 30969. Four hundred and seventy-five dollars were spent for landscaping the slopes.

these were taken up, the laps were given another thin coating, poured on. This was likewise done to the steps and other irregular spaces where forms could not be employed. The thick unabsorbed resin, after being allowed to stand for two weeks, was scraped off.

Since then, there had been a marked improvement in the dynamo room, although there was still some dripping water. The space between two I-beams, for a distance of about 6 feet, was still damp, but the larger part of the ceiling was now dry, and the dripping from directly above the dynamo had stopped.

Lieutenant Rand speculated that this dripping came through the interstices from another source.[40]

The magazine, shellroom, etc., of emplacement No. 1 were also very damp. To correct this situation, Chief Engineer Gillespie allotted $600 in Fiscal Year 1901. This money was employed to raise the flooring and to build an interior detached ceiling of lead and walls of brick. The floor was raised 2 inches and double doors hung at magazine No. 1. These doors were designed to be screwed against stops faced with rubber to make the openings "practically air-tight whenever desired."[41] In Fiscal Year 1902, arrangements were made for manufacture of the remaining doors.

District Engineer Judson, as an experiment, sought to artificially dry the magazine with calcium chloride.[42]

In Fiscal Year 1902, a recess was cut in the wall of the boiler room to give access to the end of the boiler. Several boiler tubes were replaced and others repaired. The dynamo and storage battery rooms were lined with brick and their ceilings leaded. Moisture from these rooms, as well as that from the magazines of emplacement No. 1, was led off from the dead space between the walls by drains. This system seemingly worked, and these rooms, formerly very damp, were now dry.[43]

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40. Executive Documents, Serial 4089, p. 942. About 170 square yards had been coated at a cost of $70.00. In the mixture, 75 gallons of linseed oil and 25 gallons of resin had been used.

41. Executive Documents, Serial 4279, pp. 28, 834, 835.

42. Executive Documents, Serial 4444, p. 727.

43. Ibid., p. 739.

3. The Fiscal Year 1902 improvements

During Fiscal Year 1902, the Engineers made several improvements to Battery Pensacola. The floor of emplacement No. 1 was raised 2 inches; all the battery ironwork was painted; and $30 spent on necessary alterations to the ammunition lift delivery tables. These involved positioning guide rails upon the loading platforms to facilitate rapid and accurate placing of ammunition trucks to receive their loads from the lifts.[44]

Two hundred and fifty dollars were spent to connect the boiler rooms of Batteries Pensacola and Cullum with the post water system.[45]

4. Colonel Kinzie's report

The commander of Fort Barrancas in 1902 was Col. David H. Kinzie. On making his January semi-annual inspection, he pronounced Battery Pensacola in good condition. The retraction chains had been replaced by wire ropes by the Ordnance Department and the counter-recoil buffers altered. The huge 12-inch guns had been test fired for the first time by Maj. John Pitman on December 23, 1901. When this was done, "old Fort Pickens, which completely surrounds the battery, was badly shaken. The wooden parts of the casemates were roughly used, but the masonry" of the fort seemingly had "sustained no damage." The shingled piazzas fronting the casemate quarters south of the battery had been torn down.

The magazines, which had been relined, were now dry. The floors had been raised and guttered in such a manner as to prevent moisture standing in the magazines or shot galleries where formerly two inches of water was not infrequent.

The dynamo in the boiler room, the flue doors of which were formerly embedded in the wall, had been detached preparatory for cleaning. District Engineer Judson had made certain minor changes, i.e., installation of one 10-kilowatt 4-pole dynamo. This dynamo had formerly been part of the submarine mine project, and would be used as a supplemental machine.

Colonel Kinzie observed "great condensation and possibly some leakage" on the lead ceiling of the storage battery room.[46]

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44. Ibid., pp. 738-39.

45. Executive Documents, Serial 4444, p. 740.

46. Kinzie to Adj. Gen., Jan. 14, 1902, N A, RG 156, Doc. 25241/71.

Commenting on the condensation and possible leakage reported by Colonel Kinzie, District Engineer Raymond noted that the Battery Pensacola magazines and certain other rooms had been lined with brick, one-half brick thick, made impervious by the Sylvester process. A carefully drained airspace had been left between the old walls and the brickwork. The ceilings were lined with sheet lead supported by angle irons bolted to the ceiling beams, the lead being allowed to sag slightly to improve drainage. These linings were waterproof, but condensed moisture when the magazines or rooms were left open. The lead had corroded through, as a result of water percolating through the concrete.

The ceiling of one room in Battery Worth, as an experiment, had been lined with asbestos roofing paper, well covered with roofing composition, supported by angle bars, with an intermediate lacing of wire. This lining, however, softened when acted upon by percolating water.[47]

When he made his next semi-annual inspection in September 1902, Colonel Kinzie found the storage battery room out of commission, certain elements having been turned over to the Engineer Department for replacement or repair.[48]

5. The battery is rewired and other repairs made

The reason the battery room was out of operation was because the Chief Engineer had recently allotted $1,000 to remove the electrical wiring and to install new wiring encased in a steamtight conduit system of nickel. Letters had been written to manufacturers of nickel pipe to secure data for compiling bills of material. Simultaneously, the electric power plant was removed from the battery and installed in the casemates of Fort Pickens' northeast bastion.[49]

In May 1903, District Engineer Raymond informed the Department that electricians were busy renewing the wiring.

An inspection of the battery revealed that there were no latrines, while the loading platform handrails had been removed and not replaced when the guns and carriages were mounted three years before. There were no steps from gun platform No. 1 to the rooms below. The recent removal of the electric plant made these projects desirable.

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47. Raymond to Gillespie, May 4, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

48. Kinzie to Adj. Gen., Oct. 1, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/79.

49. Executive Documents, Serial 4444, p. 738.

Captain Raymond estimated the cost of these and other needed improvements at:

Construction of latrine and sewer	$2,400
Replacing handrail around loading platforms	25
Gratings, etc., for drains in counterweight wells	8
Two wooden ladders, one at each gun	12
Construction of steps to No. 1 gun platform	50
Water supply and hydrants	175
TOTAL	$2,670

The Department made the necessary allotments to fund these projects, with the exception of the latrine. A frame privy costing $30 was built instead of a brick structure and sewer to tidewater.[50]

6. The Fiscal Year 1905 program

These projects completed, District Engineer Cavanaugh submitted his program for Fiscal Year 1905. It consisted of one major and a number of minor undertakings. The former involved an 8-foot 8-inch steel and concrete extension to the loading platforms. Included in the latter were:

(a) The darkening of concrete surfaces with lampblack to prevent glare.

(b) Raising of the floor of the dynamo room to secure proper drainage and the hanging of a steel door in the opening leading to the platform to bar "free access" to the interior of the battery.

(c) Landscaping the slopes.

(d) Providing the relocator room under platform No. 2 with a steel door having two window frames with reinforced glass so it could serve as an office and plotting room.

(e) Construction of two small retaining walls to prevent the slopes from encroaching on the walks in front of the Fort Pickens casemates.

The Department allotted $537 to underwrite the minor projects, but deferred action on the request for $3,500 to finance extending the loading platforms.[51]

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50. Raymond to Gillespie, May 4, 1903, & Abbot to Cavanaugh, June 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

51. Cavanaugh to Mackenzie, June 3, 1904, & Abbot to Cavanaugh, July 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 18957/11.

D. The Efficient Operation of the Battery Dictates Partial Demolition of the Pickens Breast-Height Wall

1. The problem surfaces

In 1899, before Battery Pensacola was transferred by the Engineers to the Artillery, a $550 allotment was made for removal of the Fort Pickens breast-height wall and parapet fronting the two emplacements. Workmen were turned to by District Engineer Flagler and a section of the breastheight wall taken down.

The Coast Artillery was able to live with this situation until 1907, when the Battery Commander's station was built. This caused problems, and Capt. Lynn S. Edwards, whose company was assigned to the battery, asked that measures be taken to have the breast-height wall of the south curtain, southwest bastion, and part of the southwest channel front of Fort Pickens removed. Its demolition, he wrote, was dictated by these considerations:

(a) It concealed part of the field of fire from the gun pointers.

(b) It screened all the field of fire from the Battery Commander's station.

(c) The muzzle blasts from the huge propellent charges stirred up huge dust clouds on the terrepleins which helped obscure the view from the battery and interferred with the task of the deflection observer and battery commander.

(d) The smoke from the propellents was deflected upward by the breastheight walls and, mixing with the dust, restricted observation to a degree where the battery commander was unable to determine the effectiveness of his fire.

(e) It slowed the rate of fire, as the second gun could not be fired until the smoke and dust had dissipated.

(f) In case of an engagement with a bombarding squadron, a shell striking the old fort would hurl a mass of casualty inflicting brickbats into Battery Pensacola.[52]

2. The 1908-09 correspondence results in no action

District Engineer Ferguson, on reviewing the situation, concluded that about 8,000 cubic yards of brickwork would have to be removed

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52. Cabbott to C.O., Pensacola, Dec. 5, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 67935. Capt. John W. Cabbott commanded the 77th Company Coast Artillery.

to correct this situation. This could be done for $3,500, provided no attempt was made to preserve the casemate arches. The rubble could be salvaged and used as riprap to front the seawall and as aggregate.[53]

To illustrate the problem, Ferguson prepared a drawing of a "Portion of Old Fort Pickens and Battery Pensacola Showing Battery Commander's Sta."[54]

When called on by the Department for data on the structural condition of the parts of Fort Pickens that would be involved in removal of the breastheight wall, Ferguson noted that the exterior scarp of the parapet was in "a bad state of preservation." In places, the parade wall was "leaning away from the main portion of the wall, leaving a crack which is now about 6 inches wide, being partially filled with sand."[55]

Chief of Coast Artillery Arthur Murray, after reviewing the situation, recommended that action be deferred until the question involving installation of a standard fire control system had been resolved.[56]

Captain Edwards, however, was dissatisfied with the status quo. On June 18, 1909, he again called for removal of "at least the upper portion of the old fort." This would have to be done before the new Battery Commander's station would be of any value.[57]

As an alternative to lowering the Fort Pickens parapet, the Chief Engineer suggested altering the Battle Commander's station to raise the axis of its instruments.[58]

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53. Ferguson to Chief Engineer, June 11, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 67935. At this time, a number of casemates in the south curtain were occupied as kitchen, dining room, and sleeping quarters for Army employees.

54. A copy of the subject drawing, file number Drawer 78, Sheet 108-2, is found at the Florida Unit, GUIS.

55. Ferguson to Div. Eng., Aug. 31, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

56. Murray to Chief Engineer, Sept. 10, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

57. Edwards to Post Adj., June 18, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

58. Abbot to Ferguson, Aug. 11, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

The Coast Artillery, however, argued that raising the station would "increase its visibility and danger in war, and that the lowering of the old fort" was the answer.[59]

3. Colonel Ridgeway pushes the issue

A lack of funds to underwrite the project dictated no action. The subject was again raised by Capt. John W. Cabbott in December 1912. Col. Thomas Ridgeway, who was in charge of the Pensacola Artillery District, agreed with Cabbott that the breast-height wall constituted a "serious obstruction." At the most recent target practice, dust raised after the discharge of either gun interferred with the vision of the gun pointer at the other, and concealed the target from gun No. 1 when gun No. 2 was fired.

Colonel Ridgeway estimated the cost of lowering the wall at $1,800.

As the standard fire control system was still under study, Colonel Ridgeway urged that the breast-height wall be lowered immediately so the project would be completed before the next target practice scheduled for April 1913.[60]

Captain Cabbott was of the opinion that if the walls of Fort Pickens are "cut down to such height that they do not interfere with the view of fire from the gun pointers' platforms and the B.C. station" and the terreplein cemented, it would also eliminate the dust problem. To get rid of the "eddying effect of walls on smoke," it would be necessary to reduce the Fort Pickens exterior scarp and parade wall to a height not exceeding 10 feet.[61]

District Engineer Brown, on being provided with this information, prepared his estimates. To clear the field of fire and to pave the superior slope to control the dust involved removal of 2,000 cubic yards of material and the paving of the superior slope with brick salvaged from the breast-height wall. Such a project would cost $5,000.

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59. Ferguson to Div. Engineer, Aug. 27, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

60. Ridgeway to Commanding General, Eastern Div., Dec. 10, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

61. Cabbott to Ridgeway, Dec. 23, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

To accomplish these goals, along with positioning debris to prevent the "eddying effect of old walls on smoke," involved taking up and transporting 16,000 cubic yards of material and paving the area uncovered at a cost of $9,500.[62]

4. Ridgeway's alternatives

Colonel Ridgeway and his people recommended adoption of the second alternative, because anything that did "not do away with the eddying effect of the old walls on dust and smoke" would be unsatisfactory and the efficiency of the battery would continue to be compromised. It was urged that priority in spending be given to cementing the brick paving to be placed on the superior slope rather than the southwest bastion.[63]

Maj. Gen. Thomas H. Barry, commander of the Eastern Division, poured cold water on the plan. He did not believe the object sought warranted such an expenditure.[64]

Chief of Coast Artillery Erasmus M. Weaver, on reviewing the subject, agreed with Colonel Ridgeway and his people that the walls of Fort Pickens limited the efficiency of Battery Pensacola. He, however, agreed with General Barry that the expense of their removal could not be justified, unless the rubble therefrom was salvaged and used for construction or repair work.[65]

Secretary of War Lindley M. Garrison was agreeable to use of the rubble for the purposes suggested, provided no additional expense was incurred.[66]

Colonel Ridgeway accordingly submitted two estimates:

a. To open up the field of fire, as requested, and to pave with salvaged brick the superior slope of the parapet would involve removal of 2,600 cubic yards of material at a cost of $5,000.

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62. Brown to Ridgeway, Feb. 9, 1913, N A, RG77, Correspondence 1894-1923, Doc. 67935.

63. Barry to Ridgeway, Feb. 10, 1913, & Ridgeway to Hq., Dept. of the Gulf, Feb. 11, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

64. Barry to Chief of Staff, Feb. 14, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

65. Weaver to Chief Engineer, Feb. 25, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

66. Weaver to Adj. Gen., April 17, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

b. To open the field of fire, to pave the superior slope with salvaged brick, and to place the debris "to prevent the eddying effect of old walls and smoke from the guns" would involve taking up and transporting 16,000 cubic yards of material at a cost of $9,500.

He urged that the work be done as detailed in the estimate but without the paving. This would pare the cost to $6,000.[67]

On August 14, 1913, the Chief Engineer inquired of District Engineer Brown, can the project be accomplished for $6,000 or less? It had been suggested that the scarp be thrown down and the debris allowed to remain where it fell. But there were those who questioned this solution. Although it was desirable to improve the situation, higher priority projects made it mandatory to eliminate this one from consideration, unless means could be devised to accomplish it at a "greatly reduced expense."[68]

Major Brown recommended that, because of the uncertain nature of the work involved, an initial allotment of $2,500 be made. After this sum had been expended, it would be possible to estimate the additional funds required.[69]

With the $2,500 sufficient work could be accomplished to provide an unobstructed view to the seaward from the guns and the Battery Commander's Station. There would not be enough money, however, to "correct the defect of eddying smoke in front of the guns."[70]

5. Colonel Beach delays the project

Division Engineer Lansing H. Beach, on reviewing the subject, learned that in 1899 the breast-height wall on Ferguson's plan, between A and B, had been removed to the left of A, "leaving the mortar surface exposed." An inquiry had divulged that the worst sand clouds were stirred up by muzzle blasts at the points where the breast-height wall had been

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67. Ridgeway to Commanding General, Eastern Dept., May 3, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

68. Chief Engineer to Brown, Aug. 14, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

69. Brown to Chief Engineer, Aug. 16, 1913, N A , RG 77, Correspondence 1894-1923, Doc. 67935.

70. Brown to Chief Engineer, Sept. 2, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

removed. Colonel Beach was satisfied that Brown's proposal would, if anything, increase the eddying effect of the sand clouds. Consequently, he recommended that the expenditure of the $2,500 be held in abeyance, until such time as there were sufficient funds "to do the entire work properly."[71]

6. The project is finally implemented

In May 1915, the commander of the South Atlantic Coast Artillery District called attention to the urgent need to remove the wall of Fort Pickens "to provide clear field of fire and view from Battery Pensacola, including pavement of superior slope."[72]

Chief Engineer Dan D. Kingman, after studying the proposal and estimates, concluded to adopt the project to demolish that "portion of the wall...in front of the guns and extending to either flank as far as the field of fire covered by the guns, all brick and other debris being removed so as to prevent scattering the same by the bursting of shells."[73]

Secretary of War Garrison approved expenditure of $6,000 for this undertaking.[74]

When work was commenced, it became apparent that "complete demolition" of the subject section of the scarp would cost nearly $20,000. Consequently, the project engineer had his men begin removing the sand from the parapet and depositing it into the area between the parados and Battery Pensacola. There it would be available to reinforce the exterior slope of the Endicott Battery, whenever more funds were allotted. They then lowered by blasting the old masonry.[75]

On December 10, District Engineer Charles Keller visited the site. He saw that to open the "field of view and to obviate blast effects," it would necessary to remove the sand cover, and the "coping

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71. Beach to Chief Engineer, Oct. 11, 1913, N A ,RG 77, Correspondence 1894-1923, Doc. 67935.

72. Chief Engineer to District Engineer, June 5, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 67936.

73. Kingman to Chief of Staff, May 28, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 67936.

74. Adj. General to Chief Engineer, Sept. 2, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 67935.

75. Keller to Chief Engineer, Nov. 20, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 67936.

walls," retaining this sand and a little of the brickwork of the arches near the two flanks of the field of view.

If it proved necessary, which it did not, to remove the brick arches, it should be done by contract.[76]

By late April 1916, the lowering of the breast-height wall had been accomplished and policing the area was underway. Funds had been limited so work had been restricted to removal of the sand parapet of the old fort and to lowering the brickwork 3 to 4 feet. Even so, the field of fire for the guns of Battery Pensacola had finally been cleared.[77]

E. Battery Pensacola from World War I to World War II

1. The 1917 modification

In Fiscal Year 1917, the Ordnance Department modified the two disappearing carriages to improve their performance. Also involved in this project was the cutting away of concrete from around the base rings within the traverse for "rack of elevating arms at maximum elevation" of the guns. The crest of the parapet was modified to secure a 2-inch clearance when the guns were retracted, while set at zero elevation.[78]

2. The post-World War I power station

In the early 1920's, a new power station was built to service the battery. The 23'8" by 15' interior dimensions, reinforced concrete structure's south elevation abutted on the concrete retaining wall at the battery's left flank. Consequently, this sealed the parade entrance to the tunnel. To protect the station's north elevation, containing its doorway, a concrete retaining wall was built.

The power station was divided into a power room and a radiator room by a frame partition. Housed in the station were: two 25-kilowatt gasoline powered generators, 2-way, Type GM-13, with the standard accessories (2 oil pressure gauges, 2 radiators, 2 tool boxes, 2 boxes of spare parts, 2 thermometers, and 2 cylinders); 2 gasoline tanks buried in the ground near the station's west elevation; one 3-panel switchboard, Type N (with 1 voltmeter, 2 ammeters, 2 wattmeters, 2 circuit breakers, and other standard accessories); 2 DPST switches; and one SRW transformer.

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76. Keller to Chief Engineer, Nov. 29, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 67936. Colonel Keller was in charge of the Mobile Engineer District from October 1913 to March 1916.

77. Black to Chief of Staff, April 28, 1916, N A, RG 77, Correspondence 1894-1923, Doc. 94520.

78. Sturdivant to Chief Engineer, Oct. 24, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148.

On February 9, 1923, the Battery Pensacola power and lighting stations were inspected and transferred to the Coast Artillery by the Engineers.[79]

3. The battery is disarmed

On June 16, 1933, the War Department, as an economy measure, listed Battery Pensacola as surplus to the needs of the Harbor Defense Project. The power was disconnected, the breech-blocks removed, and the guns and carriages coated with cosmoline.

On October 24, 1934, the guns (Nos. 6 and 7), having been dismounted, were shipped to the Army Gun Factory at Watervliet. The carriages were not disposed of until October 1942, when they were salvaged and sold as scrap.

During the years of the pre-Pearl Harbor build-up by the United States military, Battery Pensacola, its teeth pulled, served the Coast Artillery as a storage facility.[80]

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79. Fort Pickens Historical Record Book, N A, RG 392; "Defense of Pensacola, Fla., Power House for Battery Pensacola in 2 Sheets," Drawer 78, Sheets 90-26 & 90-27. Copies of the subject plans are on file at the Florida Unit, GUIS.

80. Emplacement Books, Battery Pensacola, N A, RG 392; Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, June 11, 1936; Annexes to Harbor Defense Project, Harbor Defense of Pensacola, Jan. 22, 1943; Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, July 1, 1945, N A, RG 407; Coast Artillery Journal, Vol. 76, p. 380.

VII. THE CONSTRUCTION HISTORY OF BATTERY SLEMMER

A. The Battery is Built

1. Plans are submitted, revised, and approved

In the early 1890's, the Board of Engineers had approved several projects for defense of Pensacola Harbor. Among these were two emplacements for 8-inch guns on disappearing carriages at Fort McRee, on Fosters Bank.[1]

On March 17, 1898, Chief Engineer Wilson telegraphed Major Mahan at Montgomery that Secretary of War Alger had allotted funds from the recently enacted appropriation for "National Defense" for immediate construction of three batteries for defense of Pensacola Bay. One of these, to emplace two 8-inch guns mounted on disappearing carriages, Model 1896, was to be positioned on Fosters Bank, west of the ruins of Fort McRee.[2]

On receipt of this message, Major Mahan had his draftsman pull the plans previously prepared for the battery. Orders were placed for anchor bolts for the gun carriage base rings, 7,300 barrels of Portland cement, 12,000 barrels of natural cement, and a large quantity of gravel. By the 23d, he hoped to have the dimensions of the iron beams required for the battery. These, as well as their attachments, were to be ordered from the Carnegie Steel Co.

A contract had been signed for piles to be used in construction of a wharf to facilitate landing of materials on Fosters Bank.[3]

On March 21, Major Mahan mailed to the Department plans for the 8-inch battery to be erected on Fosters Bank. In locating the emplacements, he had plotted two lines of fire--one to the westward to be directed "to cross the 4-mile circle from Fort McRee where the circle crosses the 18-foot depth" curve. The right emplacement was sited to have this line as its extreme range, without being exposed to an enfilade fire and being taken in reverse. The eastern limit of fire commanded the navy yard and a long reach of Pensacola Bay by firing over the western extremity of Santa Rosa Island.

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1. Craighill to Hains, Dec. 21, 1895, N A, RG 77, Correspondence 1894-1923, Doc. 7383/1

2. Executive Documents, Serial 3746, p. 732. The other two batteries, on being built, would become Battery Pensacola and Battery Van Swearingen.

3. Mahan to Wilson, March 22, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/8.

As shallow-draft monitors might be able to take the battery under a reverse fire, Mahan had carried to the rear of the right emplacement a concrete wall to act as a traverse. The traverse between emplacements had been made heavier than usual to protect emplacement No. 2 from being enfiladed.[4]

Chief Engineer Wilson pronounced the field of fire and location excellent. A material savings in concrete and cost, he believed, could be effected by:

(a) Reducing the vertical cover over the magazines and rooms to 12 feet.

(b) Eliminating the extension of the central traverse to accommodate the engine room and cistern. The engine room could be located in one of the bombproofs and the cistern built outside the battery of brick or concrete.

(c) The interval between emplacements was to be reduced by shrinking the width of the central traverse to 10 feet which would leave sufficient cover for the magazine and shotroom of the left emplacement.

The Department also noted that Mahan had lowered the crest of the battery 11 inches "to receive 5 degrees depression of fire." He was cautioned that lowering the crest reduced the protection afforded to the armament and the cannoneers.[5]

Before he received the Department's comments, Mahan was disturbed to learn that the site proposed was unstable as it was swept by waves during "severe southerly storms." He accordingly selected a new site not having this disadvantage. It would, however, be farther from the channel.

In recommending the change, he reminded the Chief Engineer that Fort McRee, "a strong and important work, was wrecked entirely by the action of the sea on the beach."[6]

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4. Mahan to Wilson, March 21, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/5. A copy of the subject plan, "8-in. Gun Battery, Fort McRee, Fla., General Plan," Drawer 80, Sheet 59-2, is on file at the Florida Unit, GUIS.

5. Kuhn to Mahan, March 23, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/5.

6. Mahan to Wilson, March 25, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/11.

The Department approved change in location, and Major Mahan revised the plans, keeping in mind the Chief Engineer's comments. The central traverse, he explained, had been extended to the rear in the "original design for the purpose of giving additional protection to emplacement No. 2 from reverse fire coming from down the coast to the westward of the battery." Advantage had been taken of this to locate the engine room and cistern inside the traverse.

The authority to relocate the battery would make it necessary to lower the crest only 2-1/5 inches, not the 4 inches as directed.

The position of the lifts had also been changed because a vessel "running up the bay" could place a "shot square into the gallery on which the lifts open when the charge of the gun was sent up." The gallery of the left emplacement had, therefore, been placed at the rear of the traverse to correspond with the gallery in the right emplacement, thus providing it with better protection.

The engine and boiler had been positioned in the emplacement No. 1 bombproofs. But on doing so, Major Mahan called attention to his experiences with the recently completed Santa Rosa Island 10-inch battery, which had demonstrated that an area of this size was too small and the room would be unbearably hot. If "complete protection" from reverse fire were to be given the left emplacement, it would be necessary to extend the centre traverse to the rear. If this were done, the engine room could be located within. There, it would have better ventilation and more headroom.

Drainage would not constitute much of a problem because the site was of sand into which water was absorbed almost instantaneously. By leaving the air spaces around the magazines and passages leading to the ground, "any water which may penetrate so far will be carried off at once by the sand."

Plans were being prepared for circulating air through the magazines by an electric fan to keep them dry.[7]

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7. Mahan to Wilson, March 29, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/18. A copy of the revised plan, "8 in. Gun Battery, Fort McRee," Drawer 80, Sheet 59-4, is found on file at the Florida Unit, GUIS.

On April 2, 1898, Chief Engineer Wilson, while approving the plans as revised, vetoed the extension of the central traverse. He had no objection to increasing slightly the size of the boiler and engine rooms or the overhead space to 10 feet. A door in the rear wall and a window in the side wall of the boiler room and a door between the engine and boiler rooms would solve the ventilation problem.[8]

2. Clearing the site, building the wharf, and assembling the plant

Appropriations for improvements to Pensacola Harbor having been slashed, Assistant Engineer Turtle was assigned by Major Mahan to assume charge of the battery's construction. Because of Fosters Bank's isolation, there would be construction problems. In the first place, there was no sheltered landing area, and second, the wharf formerly located at Fort McRee had been pounded to pieces by the sea, years before.

To build a wharf, all material had to be barged into the lagoon north of the battery site. This could only be accomplished at flood tide and when the sea was smooth. Consequently, there were frequent delays in sending materials and equipment to the site.[9]

On April 7, the first barge of timber was landed at Fort McRee, and carpenters commenced the forms for the gun platforms on Monday, the 9th.

Not having a hoisting engine, Mr. Turtle was unable to put his pile driver into action for erecting the wharf until mid-April. To complicate the situation, three carloads of plant machinery had been received.[10]

The wharf was finally commenced on April 18 and finished on May 14, ready to receive the rails. Major Mahan had ordered the rails from American Rail Trust Co. of Atlanta. Despite repeated pleas, the company "dilly dallied" about making delivery. His patience exhausted and time of an essence, Major Mahan cancelled the order and placed it elsewhere. This caused additional delay, besides increasing costs.

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8. Kuhn to Mahan, April 2, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/5.

9. Executive Documents, Serial 3746, pp. 735-36.

10. Mahan to Wilson, April 9, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/1.

It was June 30 before the rail was positioned and a pile trestle across the small lagoon to the site completed.[11]

3. The battery takes shape

As soon as the plans had been approved, Assistant Engineer Turtle sent a labor force to Fosters Bank to stake and prepare the site. Much of the area was covered with muck, grass, weeds, etc., which had to be removed. After discussions with Major Mahan, Mr. Turtle started the foundations at reference 2.70 instead of 4.00, as planned. Since the foundations of the parapet wall were to be at reference 6.00, it was necessary for Turtle and his people to position 6,700 cubic yards of sandfill to raise all parts of the site to this elevation. By June 30, 1898, nine-tenths of the fill was in place.

All concrete work for the foundations of the magazines and passages had been poured by the end of the fiscal year, while the carpenters had built forms for the rest of the masonry.

The "plant" had been positioned, excepting the derricks for depositing concrete, necessary storehouses erected, and a water system installed.[12]

By mid-July two stiff-leg derricks had been erected to speed the placing of concrete and sand. Each derrick was propelled by three cars running on tracks parallel with the battery's crest line. A framework, "forming the car proper," raised each derrick to provide free working space for the boom over the highest line of concrete nearest the derrick. On each car and atop the derrick still were erected boxes securely framed and large enough for the ballast stone needed for a counterpoise. The tracks for the cars were 42 feet between centers, and the center of the track nearest the work was 15 feet from the concrete wall. One car carried the outer end of each sill and one the intersection of the sills and mast. Crossing the sills diagonally and at a distance from the mast to give proper working distance for the hoisting line were positioned two 12 by 12's. The water tank held 330 gallons.[13]

The derrick masts were 44 feet, the booms 60 feet. When the derricks were opposite, the booms lapped about 10 feet. By means of two snatchblock, secured to samson posts placed beyond the ends of the

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11. Executive Documents, Serial 3746, pp. 735-36; Executive Documents, Serial 3905, p. 918.

12. Executive Documents, Serial 3746, p. 736.

13. Executive Documents, Serial 3905, pp. 920-21.

tracks and one lashed to the foot of the mast, the derricks were moved without difficulty by a line carried to the spool of the hoisting engine.[14]

The mixing plant was on an extension of the battery's center line, and at a distance to give an easy curve for the car carrying the mix. A switch allowed the car from either side of the work to pass under the mixer. Two cars were employed, and usually each derrick deposited half the concrete, which, when there was need for haste, was a tremendous advantage because it allowed Assistant Engineer Turtle to turn out an extra gang of rammers. In addition, it insured "a careful and proper disposition of the material, and as the derricks were movable," the construction was in horizontal layers.

The daily cost of running each derrick was:

Motorman	$1.90
Fireman	1.50
Two tugmen	3.00
Wood	2.00
TOTAL	$8.40

With the two derricks, the amount of concrete placed per day varied from 130 to 200 cubic yards, depending upon the locality of the work, and the cost per cubic yard from 8.4 to 13 cents.[15]

When Assistant Engineer Turtle devised this system, he also intended to employ it in placing the sandfill. The spread of the tracks, 42 feet between centers, brought the outer track outside the proposed fill to enable it to be employed for sand cars. Outside of this was placed another track. The two were within reach of the derrick, which permitted running three sand trains of six cars each, thus one gang would not have to wait on the other. The filling commenced at the end of the battery, which the derricks faced, and as it progressed, the derrick, by utilizing its hoisting engine and snatchblock, moved away from the work, the inner track being removed as the filling proceeded. The entire fill was thus placed. No shoveling was required, except for levelling the superior slope.

The sand was conveyed in skips, each holding 42 cubic feet. Each skip was equipped with a trip, enabling it to be dumped without being lowered.

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14. Ibid., p. 921. A copy of a plan, "Derrick System used in the construction of two emplacements for 8 in. battery," Drawer 80, Sheet 64, is on file at the Florida Unit, GUIS.

15. Executive Documents, Serial 3905, p. 921.

Because of the distance to the borrow pit, the derrick handled the sand twice as fast as it was supplied.[16]

Sod for covering the sand slopes was taken from the edge of a marsh, and was termed "semimarsh" by Assistant Engineer Turtle. It had been formed by "especially high tides," depositing in low places "quantities of vegetable matter, bark, chips, etc.," which lodged on the outer edges of low places. This had decayed and formed a fertile area covered with a coarse grass.

The sod was first cut with axes and shovels into squares averaging 5 inches in thickness and about the size of a shovel head. It was then wheeled to the track and thrown into the skips, the sods being "tough enough" to be handled in this manner.

At the battery, the sodding was commenced at the bottom of the slopes and carried upward in sections about 30 feet in width and placed directly on the sand. After being positioned, it was rammed. As an experiment, on one 40-foot section, the sods were turned upside down, as Mr. Turtle believed that the Bermuda which was to follow would "more readily take hold." By the end of Fiscal Year 1899, much of the "semimarsh grass" was still growing, but Assistant Engineer Turtle questioned how long it would survive. Accordingly, a team was sent to cut regular Bermuda sod in rear of Fort Barrancas. It was then transported to Fosters Bank and positioned in rows 2-1/2 feet apart, on the semimarsh sod. It was then rammed.

The Bermuda took hold, and, where the first sod was inverted, spread rapidly.[17]

4. A change order eliminates the platform roofs

On September 12, 1898, Major Mahan asked authority to eliminate the concrete roof from the lift platforms. It seemed to him that the concrete being broken up into sections by beams in this area was likely to crack. Moreover, they could be dangerous if struck by a shell and sundered into hundreds of deadly fragments.

The width of the lift platform was 8 feet, and if the overhead covering were omitted, protection would be afforded by a wall 8-1/2 feet in height. The wall protecting the loading platform was 39 feet wide and

16. Ibid.

17. Ibid., pp. 921-22.

8-1/2 feet in height. Consequently, the lift platform was already well protected. It seemed that this vertical wall would give ample protection against shell fragments, unless a part of the projectile was hurled backward by the force of the explosion.[18]

The roof over the lift platform, Chief Engineer Wilson replied, was not designed to afford protection against hostile shellfire but against the muzzle blasts of the 8-inch guns when firing at the extreme angle of the traverse. As the limits of fire of the battery did not extend so far to the flanks as at most emplacements, the roofs over the platforms could be eliminated.[19]

5. The emplacements are completed

By June 30, 1899, the battery had been completed, and two 8-inch disappearing carriages, L. F. Model 1896, received and mounted. The amount of concrete laid was 8,031 cubic yards. The guns, however, had not yet arrived from the Sandy Hook Proving Ground.

An electric plant, consisting of two direct-connected generators and a storage battery, with lights, instruments, etc., had been installed. One of the generators was intended to power a searchlight.

Hand ammunition hoists, ammunition trolleys, and shot cranes had been positioned, and the battery fitted with steel doors, ladders, steps, and railings.[20]

6. Assigning and evaluating construction costs

Before work was commenced, Major Mahan had ordered lumber locally, and had urged prompt delivery. A delay in receiving railroad supplies and equipment prevented landing the lumber on Fosters Bank. Nearly all the lumber, both for structures and forms, had to be ferried into the lagoon, and transferred to the site by hand. This added to the cost.

In the platforms and foundations, 2,513 barrels of cement were used. These were barged over from Santa Rosa Island and into the lagoon, and then to the construction site, adding to the cost of receiving and storing cement.

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18. Mahan to Wilson, Sept. 12, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/40.

19. Kuhn to Mahan, Sept. 15, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/40.

20. Executive Documents, Serial 3905, p. 918.

The locomotive brought from the Upper Coosa River project was unsatisfactory, and the cause of much delay and expense. In August 1898, it had caused Assistant Engineer Turtle to close down the project for two weeks.[21]

A breakdown of the cost of the project revealed:

DISTRIBUTION OF EXPENDITURES

Railroad			
Labor		$2,472.73	
Material		2,398.89	
	TOTAL		$4,871.53
Wharf			
Labor		$ 909.21	
Material		1,045.39	
	TOTAL		$1,954.50
Buildings			
Labor		$1,648.38	
Material		403.00	
	TOTAL		$2,051.38
Plant			
First cost		$7,392.80	
Placing and erecting		2,548.14	
Repairs, including labor at the site and in Pensacola, and necessary material		1,678.62	
	TOTAL		$11,619.56

21. Ibid., pp. 919-20.

Water Supply

Labor	$ 472.03	
Materials	530.06	
TOTAL		$1,002.09

Forms

Labor	$5,132.43	
Material	1,108.00	
TOTAL		$6,240.43

Total cubic yards of concrete placed--8,031

Average cost per cubic yard	$6,631
Cost of forms for each cubic yard of concrete	.777
Cost of sandfilling per cubic yard	.250

Concrete

Mixing	$6,292.91	
Depositing	7,001.39	
TOTAL		$13,294.30

Cement

Portland	$8,340.26	
Natural	14,529.10	
Labor and storing	1,672.70	
TOTAL		$24,542.06

ITEMIZED COST OF CONCRETE PER CUBIC YARD

Portland

Forms	$ .077
Average cost per barrel	2.607
Cost per barrel for transportation	.045
Cost per barrel, receiving and storing	.128
Cost of gravel	1.511
Transportation--gravel	.377
Receiving and storing gravel	.336
Sand for 1 cubic yard	.120
Mixing	.783
Depositing	.877
TOTAL	$7.556

Natural

Forms	$ .777
Storing cement	.192
Transportation	.067
Sand	.120
Receiving and storing gravel	.336
Cost of gravel	1.511
Transporting gravel	.377
Storing	.336
Mixing	.783
Depositing	.872
TOTAL	$5.371[22]

22. Ibid., pp. 918-19

Included in the materials purchased for construction of the battery in Fiscal Year 1899 were:

MATERIAL	QUANTITY	UNIT COST	TOTAL COST	SUPPLIER
Cement				
Natural, barrels	8,842	$1.56	$13,674.10	Lawrenceville Cement Co.
Natural, barrels	900	.95	855.00	Western Cement
Portland, barrels	2,120	(2.12		
		(2.77	5,438.53	Sinclair & Babson
Gravel, cubic yards	4,880	1.70	8,296.00	F. F. Visscher
Stone, tons	85	1.50	127.50	W. H. Northup
Asphaltic cement and felt			103.23	Warren Chemical
Steel beams, pounds	48,447	(.01		
		(.03	843.88	Carnegie Steel
Electric plant			1,283.00	C & C Electric
Storage battery			850.00	Electric Storage Battery
Electrical fixtures			139.63	Post Glover Electric
Ammunition hoists			1,175.00	New Jersey Foundry
Trolleys and blocks			265.25	New Jersey Foundry
Trolley bolts	50	.06	3.00	Creary & McClintock
Cranes and blocks	4	79.50	318.00	Thomas Carlin & Sons
Boiler and tank			363.25	Henry Vogt
Steel doors	11		422.40	Snead-Van Alstine
Handrails			9.56	A. M. Avery
Hoods for doors			8.96	McKenzie & Derting
Steam pipe			26.69	A. M. Avery
Lumber, feet	137,960	26.00	1,733.29	(Bagdad Sash (Bryan Dunwoody (B. R. Pitt[23]

23. Ibid., p. 920.

B. The Battery is Armed

1. An accident mars mounting the guns

During the summer of 1899, the handrailings and necessary pipe connections were made. By mid-October, the two 8-inch breech-loading rifles were landed on the Fosters Bank wharf. It was agreed that they would be mounted by an Engineer labor force. On the 26th, while one of the guns was being transported by rail across the trestle spanning the lagoon, the structure gave way. Gun, locomotive, and three cars were thrown into the water. The gun and plant were quickly salvaged. Although the locomotive and cars were slightly damaged, the gun was uninjured, and both guns were soon in position.[24]

On March 21, 1900, Captain Flagler inspected the battery and turned it over to the artillery.[25]

2. The positions of the armament as mounted

The guns and carriages were positioned:

GUNS

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.	MANUFACTURER
No. 1	8-inch	1888 M2	41	Watervliet
No. 2	8-inch	1888 M2	10	Bethlehem Iron Co.

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
No. 1	Disappearing	1896	14	Pond Machine Tool
No. 2	Disappearing	1896	15	Pond Machine Tool[26]

24. Flagler to Wilson, Nov. 6, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24909/59.

25. Executive Documents, Serial 4089, pp. 941, 942.

26. Pitman to Chief of Ordnance, Dec. 2, 1899, N A, RG 156, Doc. 20056.

3. Naming the battery

On January 27, 1902, Chief of Artillery Wallace F. Randolph reminded the War Department that the battery had not been assigned a name. He suggested that it be designated "Battery Slemmer" in honor of Lt. Col. Adam J. Slemmer, late of the 4th U.S. Infantry.[27]

The War Department was agreeable, and, on February 14, issued General Order No. 16, naming the 8-inch emplacements Battery Slemmer. Intimately associated with the history of Fort Pickens, Adam J. Slemmer was born in January 1829 in Montgomery County, Pennsylvania. He received his early education in local public schools, and at 17 he entered the U.S. Military Academy. Graduating in the class of 1850, Slemmer was commissioned a 2d lieutenant and assigned to the 1st U.S. Artillery. His first field service was against the Seminoles; he was then stationed in California for 4 years; and from 1855 to 1859 was a professor at West Point.

January 1861 found him a 1st lieutenant and, as senior officer, in command of Barrancas Barracks. On January 10, in defiance of Florida and Alabama secessionists, he transferred his troops to Fort Pickens. He held the fort until reinforced. On May 14, Slemmer was promoted to major of the newly constituted 16th U.S. Infantry, which he helped recruit and organize. He soon found himself assigned as acting inspector general of the Department of the Ohio. He served with Maj. Gen. Don C. Buell's Army of the Ohio during the campaigns from Nashville through Perryville. At the battle of Stones River, Slemmer led a reinforced battalion of the 16th U.S. Infantry. In the terrible fighting on December 31, 1862, in the cedars south of the Nashville Pike, he was severely wounded. This ended his wartime field service.

He was promoted brigadier general of volunteers to rank from November 29, 1862. From July 1863 until the end of the war, General Slemmer served as president of a board for examination of sick and wounded officers at Columbus and Cincinnati, Ohio. He was promoted lieutenant colonel in the regular establishment in 1864.

While in command of Fort Laramie, Dakota Territory, Slemmer suffered a heart attack and died on October 7, 1867.[28]

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27. Randolph to Army Headquarters, Jan. 27, 1902, N A, RG 156, Doc. 25241/71.

28. Warner, Generals in Blue, pp. 450-51; G.O. 16, Feb. 14, 1902, War Department.

C. Improvements, Repairs, and Maintenance, 1901-05

1. A gallery facilitates communication between loading platforms

In Fiscal Year 1901, Chief Engineer Gillespie allotted $700 for construction of a concrete-steel gallery to connect the loading platforms. By June 30, materials had been stockpiled and work commenced.[29] The project was finished in Fiscal Year 1902.[30]

2. New doors are fabricated and hung

Chief Engineer Gillespie, in Fiscal Year 1901, made available $276 for installation of double doors for the magazines and shellrooms. The doors were designed "to be screwed up against stops faced with rubber so as to make the openings practically air-tight whenever desired."[31]

3. Maintenance and repairs in Fiscal Year 1902

In Fiscal Year 1902, one of the electric plant boilers was retubed; the earthen slopes repaired where injured by grazing cattle; and the ironwork repainted.[32]

4. The 1904-05 improvements

In May 1903, District Engineer Raymond reported that the two obsolete Battery Slemmer platform lifts for ammunition delivery should be replaced by chain hoists. The boiler and dynamo rooms were too small, and it was impossible to get at the boiler flues for maintenance. During the summer, these rooms were so hot and stuffy that men manning them had been prostrated. A temporary powerhouse should be built to afford relief.

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29. Executive Documents, Serial 4279, pp. 28, 833; "8 in. Gun Battery, Fort McRee, Florida, Design for Gallery connecting Gun Platforms," Drawer 78, Sheet 94-5. A copy of the subject drawing is on file at the Florida Unit, GUIS.

30. Executive Documents, Serial 4444, pp. 735-36.

31. Executive Documents, Serial 4279, pp. 28, 834-35.

32. Executive Documents, Serial 4444, p. 738.

Captain Raymond estimated the cost of necessary battery projects at:

Painting new accumulator house	$ 30
Cleaning up debris and storing plant	90
Repair of wing wall caping	180
Handrails for two stairways	32
New latrine and sewer	2,400
New powerhouse	3,000
General repair of machinery	100
Hydrant	90
TOTAL	$5,912

Chief Engineer Gillespie, in approving the program, allotted the requested sums, except for the latrine. Forty dollars were made available for construction of a frame privy.[33]

These projects either completed or well underway, District Engineer Cavanaugh proposed a program for Fiscal Year 1905. He called for:

(a) Installation of 3 double and 2 single steel doors to close shellrooms and outside openings to the battery.

(b) Darkening the concrete surfaces with lampblack to reduce glare.

(c) Repair of concrete pavement of the superior slope.

(d) Reflooring of power room and positioning hoods over smokestack openings.

(e) Building a wire fence around battery at foot of exterior slope to keep cattle off the battery.

(f) Repair and resodding of slopes.

(g) Connecting pumps to water mains for sprinkling parapets.

To fund this work, the Department allotted $770.[34]

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33. Raymond to Gillespie, May 4, 1903, & Abbot to Cavanaugh, June 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

34. Cavanaugh to Mackenzie, June 3, 1904, & Abbot to Cavanaugh July 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 18957/11.

D. The Battery Becomes Obsolete and Receives a New Mission

1. Disarming the battery

The increased firepower of naval armament, underscored by bitter lessons learned by the belligerents in the opening months of the Great War, convinced the War Department that its 8-inch seacoast batteries were obsolete. In August 1917, a directive was issued by Washington, calling for disarmament of Battery Slemmer, and the transfer of its two 8-inch rifles for use as railway guns on the Western Front.[35]

By mid-February 1918, the guns (Nos. 10 and 41) had been dismounted and shipped to the Watervliet Army Gun Factory. The carriages (Nos. 14 and 15) were declared surplus and scrapped in the summer of 1920.[36]

2. Emplacement No. 2 becomes the site of a coincidence range-finder station

In 1922, the Army decided to utilize Battery Slemmer's No. 2 emplacement for a site of the structure designed to house the Battery Center coincidence range-finder station. The 16-by-16-foot interior dimensions, reinforced concrete structure was positioned in the right angle formed by the platform and traverse. Its observation slit was only a few inches above the parapet's superior slope. Access to the shelter was by a stairway and doorway in its rear elevation.

In addition to the azimuth instrument, the station was equipped with 3 wall telephones, 3 telephone headsets, 3 telephone terminal blocks, and 1 terminal box.

On February 9, 1923, the coincidence range-finder station was inspected and transferred to the Coast Artillery by the Engineers.[37]

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35. Bishop to Chief Engineer, Aug. 24, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 95991.

36. Emplacement Books, Battery Slemmer, N A, RG 392.

37. Ibid.; "Defense of Pensacola, Fla., Coincidence Range Finder Station for Battery Center on Bat. Slemmer," Drawer 80, Sheet 62-7. A copy of the subject drawing is on file at the Florida Unit, GUIS.

VIII. THE CONSTRUCTION HISTORY OF BATTERY CENTER

A. The Battery is Built and Armed

1. Plans are prepared and a site selected

On December 18, 1898, District Engineer Flagler submitted plans and estimates for construction of two 15-pounder batteries, each for two guns, at Foster's Bank and Fort Pickens. The approved site for the former had been selected before the position of 8-inch Battery Slemmer was changed and, being to its front, was now untenable. The site now proposed by Captain Flagler was on the left flank of the 8-inch battery, its crest parallel to the northern limit of fire from emplacement No. 2. Emplacement No. 1 of the 15-pounder battery was planned to have a field of fire of 140 degrees, as it was limited on the right by Battery Slemmer. Emplacement No. 2 was to have a field of fire of 220 degrees, covering the bight formed by the north shore of Pensacola Bay. Both 15-pounders would command the minefield. The site was on solid ground and would require no fill for the foundation of the magazine walls.

At Fort Pickens, the approved site for the two 15-pounders was on the left flank of the 10-inch battery (Battery Cullum), its crest being slightly in advance. Captain Flagler objected to this location because:

(a) It was swampy.

(b) Its field of fire toward the minefield would be partially obstructed by the 10-inch battery.

(c) It was in the field of fire of gun No. 4 of the 10-inch battery.

Flagler proposed to relocate the battery 100 yards to the south, its crest remaining parallel to the crest of the 10-inch battery. Objection "c" also applied to this site but to a lesser degree. The other two (a and b) did not.

Advantages accruing to this site were a natural parapet and command of the minefield.

A site to the right of the 10-inch battery would be better yet, but construction problems were such that Captain Flagler hesitated to make the recommendation. There, it would have to be constructed almost entirely on fill. As part of this site was occupied by a pond and this portion of Santa Rosa Island unstable, it would have to be shielded by a seawall.[1]

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1. Flagler to Wilson, Dec. 18, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 28661/17.

The estimates submitted by Captain Flagler brokedown the costs:

ESTIMATE FOR FORT McREE EMPLACEMENTS

Preliminary

Survey	$ 15.00
Draughtsman	75.00
Railroad	200.00
Erecting plant	400.00
Clearing site	4.50
Water supply	15.00
Storage platforms	18.00
TOTAL	$727.50

Material for concrete

125 bbls. Portland cement at $2.50	$312.50
870 bbls. Natural cement at $1.65	1,435.50
515 cubic yards gravel at $2.50	1,282.50
250 cubic yards sand at $.30	75.00
TOTAL	$3,105.50

The masonry is as follows

Natural concrete	540 cubic yards
Portland concrete	35 cubic yards
Portland mortar	25 cubic yards
TOTAL	600 cubic yards

Lumber

20,700 ft. B.M.	$269.90

Sundry Material

Subsistence for three months	$450.00
700 lbs. nails	35.00
Oil and waste	44.00
Fuel	190.00
3,200 lbs. steel beams	160.00
Railing	45.00
760 square feet asphalt in place	206.00
Doors (3)	90.00
Ramps in place (2)	75.00
Drains	110.00
1,000 square yards turf	375.00
20 tons chert	30.00
TOTAL	$1,810.00

Labor

2,500 cubic yards sand filling at $.30	$750.00
Labor on forms	460.00
Mixing and placing concrete	750.00
Placing beams	12.00
890 square yards plastering	133.50
Removing forms	56.00
Building road	30.00
TOTAL	$2,191.50

Miscellaneous Items

Same as for Fort Pickens	$2,415.00

Summary

Preliminary	$727.50
Material for concrete	3,105.50
Lumber	269.90
Sundry material	1,810.00
Labor	2,191.50
Miscellaneous items	2,415.00
Contingencies	1,000.00
TOTAL	$11,519.40

ESTIMATE FOR FORT PICKENS EMPLACEMENTS

Preliminary

Survey	$ 15.00
Draughtsman	75.00
Railroad	250.00
Setting up derrick	175.00
Clearing site	4.50
Water supply	15.00
Mixing platforms	18.00
TOTAL	$552.50

Material for concrete

125 bbls. Portland cement at $2.50	$312.50
850 bbls. Natural cement at $1.65	1,402.50
510 cubic yards gravel at $2.50	1,275.00
235 cubic yards sand at $.30	70.50
TOTAL	$3,060.50

The masonry is as follows

Natural concrete	530 cubic yards
Portland concrete	35 cubic yards
Portland mortar	25 cubic yards
TOTAL	590 cubic yards

Lumber

20,700 feet B.M.	$269.90

Sundry Material

Subsistence for three months	$450.00
700 lbs. nails	35.00
Oil and waste	44.00
Fuel	190.00
3,200 lbs. steel beams	160.00
Railing	30.00
760 sq. ft. asphalt in place	206.00
Doors (3)	90.00
Ramps (2)	75.00
Drains	110.00
750 sq. yds. turf	280.00
20 tons chert	30.00
TOTAL	$1,700.00

Labor

1,100 cu. yds. of excavation and fill at $.30	$330.00
Labor on forms	460.00
Mixing and placing concrete	900.00
Placing beams	12.00
890 square yards of plastering at $.15	133.50
Removing forms	56.00
Building road	30.00
TOTAL	$1,921.50

Miscellaneous Items

Holidays	$240.00
Tools	55.00
Mileage	110.00
Operating launch	300.00
Local office expenses	900.00
Montgomery office	500.00
Maintenance and repair	275.00
Stationery and telegrams	35.00
TOTAL	$2,415.00

Summary

Preliminary	$552.50
Material for concrete	3,060.50
Lumber	269.90
Sundry material	1,700.00
Labor	1,921.50
Miscellaneous items	2,415.00
Contingencies	1,000.00
TOTAL	$10,919.40

The concrete for the Fosters Bank emplacements would be mixed by machinery, while for those at Fort Pickens it would be mixed by hand because of the expense of moving the plant.[2]

The Chief Engineer's Office approved the plans and estimates for construction of the 15-pounder emplacements on Fosters Bank. Eleven thousand five hundred dollars were allotted from the appropriation for "Gun and Mortar Batteries" of July 7, 1898, for funding the project.

General Wilson and his staff agreed with Captain Flagler's comments regarding the proposed location of the two emplacements near the 10-inch battery. If, as seemed probable, no suitable site could be pinpointed on the Santa Rosa Island side of the channel, consideration should be given to constructing these emplacements on Fosters Bank.[3]

Captain Flagler did not believe it feasible to relocate the two 15-pounder emplacements to Fosters Bank. The 8-inch battery, he explained, had been unfortunately located, being placed so far to the rear that the "development" of batteries on its alignment was limited.

The problem of locating additional emplacements on Santa Rosa Island had been complicated by the refused position of the 12-inch battery (Battery Pensacola) in respect to the 10-inch battery. A rapid-fire battery could not be positioned without exposing it to the muzzle blasts of the 12-inch guns or masking its fire by the 10-inch battery.[4]

Division Engineer Hains could not understand why four 15-pounders could not be positioned on Fosters Bank. There would be crowding, but it would be less objectionable than the disadvantages incurred on Santa Rosa Island.

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2. Ibid.

3. Kuhn to Flagler, Dec. 28, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 28661/17.

4. Flagler to Wilson, Jan. 17, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 28661/16.

As he recalled the site, there would be no difficulty in locating four 15-pounders in the area selected by Captain Flagler for the two. The battery could be moved nearer the 8-inch battery. His recommendation was that the four 15-pounders be placed in a single battery in the position designated by Flagler for the two-gun battery.[5]

Chief Engineer Wilson agreed with Colonel Hains. This could be accomplished by a slight reduction in the interval between guns "below that shown on the typical plans." A single magazine for each pair of guns would help reduce the battery frontage.[6]

Captain Flagler accordingly revised his plans as directed, and on February 14, 1899, the Chief Engineer allotted another $7,730 to be applied to construction of a battery of four 15-pounder rapid-fire guns on Fosters Bank.[7]

2. The emplacements take shape

On March 16, 1899, 2d Lt. Lewis H. Rand, Lieutenant Jervey's replacement, staked the battery site, some 50 feet northeast of the two 8-inch emplacements. A crew was turned to under Assistant Engineer Turtle's supervision clearing and raising the site. Construction was continued until June 30, except for a shutdown from April 29 to May 24 occasioned by a delay in receipt of steel beams.[8]

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5. Hains to Wilson, Jan. 21, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 28661/17.

6. Kuhn to Hains, Jan. 25, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 28661/17.

7. Kuhn to Flagler, Feb. 14, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 28661/16; Executive Documents, Serial 3905, pp. 915-16. On February 6, 1899, Captain Flagler forwarded to the Department a plan titled, "Survey of Site for Proposed Batteries for Fort McRee, Fla., Scale 1 in. = 50 feet. Made under the direction of Captain C.A.F. Flagler, Corps of Engineers, U.S.A. by J.E. Turtle, Assistant Engineer." Three days later, on February 9, he mailed to the Chief Engineer for approval a plan titled "Proposed Location of 4-15 pdr. R.F. Guns at Fort McRee, Fla." Copies of these plans, the first labeled Drawer 80, Sheet 62-1, and the second Drawer 80, Sheet 62-2, are on file at the Florida Unit, GUIS.

8. Executive Documents, Serial 3905, pp. 915-16. Rand, a native of New Jersey, had been graduated from the U.S. Military Academy on February 15, as No. 4 in the class of 1899. His first assignment was as Captain Flagler's assistant. Cullum, Biographical Register, Vol. IV, p. 658.

By June 30, all concrete was in place, except a portion of platforms Nos. 1 and 2 and all of platforms Nos. 3 and 4. As of that date, 777 cubic yards of masonry had been laid. The sandfill had been carried to reference (10.5). Involved were 3,197 cubic yards.

Concrete had been mixed in a cubical box mixer that had been employed in construction of the adjacent 8-inch battery. It was deposited by a large movable derrick, which ran back and forth in front of the emplacements. Sand for filling was secured about one-fourth mile to the southeast, hauled on cars to the site, and deposited by the movable derrick.[9]

Construction materials had been purchased from:

MATERIALS	QUANTITY	UNIT PRICE	TOTAL COST	SUPPLIED BY:
Cement				
Natural, barrels	1,338	$1.55	$694.40	Lawrenceville Cement Co.
Portland, barrels	317	(2.25 (2.55	743.35	A. M. Avery
Gravel, cubic yards	1,063.18	2.20	2,339.00	F. F. Visscher
Steel beams, pounds	8,763	(.018 (.02	161.86	Carnegie Steel Co.
Lumber, feet	3,100	*20.00	62.00	Bagdad Sash

*per thousand feet[10]

The cements used were Beach's natural and Olsen brand Portland. The fine, clean gravel employed in the mix was from Flomaton, Alabama, and had been delivered by F. F. Visscher alongside the Engineers' Wharf. No broken stone was used in the concrete. The mix was 1 part cement, ____parts sand, and 5 parts gravel. [11]

Of the $20,230 allotted for construction of the battery, $13,995.10 had been expended by the end of Fiscal Year 1899.[12]

By August 24, the battery, with exception of the doors, hand railings, electric lights, latrine fixtures, and armament, had been completed.

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9. Executive Documents, Serial 3905, pp. 915-16.

10. Ibid., p. 916.

11. Ibid.

12. Ibid.

The sandfill of the parapets was covered with swamp sod and planted in Bermuda. By June 30, 1900, there had been no erosion, except on the left flank, where it was being cut by the surf.

The magazine roofs had been asphalted. When it rained, the floors were wet, owing to the absence of doors. The magazine floors had been built with a considerable fall to the rear, and this served to get rid of standing water which plagued several of the batteries.[13]

One thousand two hundred and forty-three cubic yards of concrete had gone into construction of the battery at a cost per cubic yard of $8.61, including materials, forms, labor, rations, and superintendence. Five thousand six hundred and ninety-six yards of sandfill had been deposited at a cost of 28 cents per cubic yard.[14]

The wells in the four platforms were made large enough to permit "easy and accurate insertion and fixing of the well-linings for the balanced-pillar mounts." A circular segmented cylinder 8 inches deep would have to be cut from the parapet fronting the guns in emplacements Nos. 1, 2, and 3, before the armament was mounted.[15]

By the end of Fiscal Year 1900, the doors, hand railings, and electric light and latrine fixtures had been landed on Fosters Bank. They were stored pending receipt of the armament.[16]

District Engineer Flagler, when he submitted his annual report for Fiscal Year 1900, enclosed a plan with elevations and sections of the "Emplacement for Four 15-pdr. R. F. Guns, Fort McRee, Florida."[17]

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13. Executive Documents, Serial 4089, p. 940.

14. Ibid.

15. Ibid.

16. Ibid. In Fiscal Year 1902, there being no further use for the construction plant at Pensacola, it was returned to the Coosa River.

17. A copy of the subject plan labeled Drawer 80, Sheet 62-3, is on file at the Florida Unit, GUIS.

3. The battery is armed

On November 2, 1900, Chief of Ordnance Adelbert R. Buffington notified the Engineers that four 15-pounder Driggs-Seabury rapid-fire guns and their mounts would be shipped from the Sandy Hook Proving Ground to Fosters Bank.[18]

The guns and their balanced-pillar mounts were received by the Engineers during the winter and transported to the site. The armament was then turned over to the artillery and mounted. The 15-pounder Driggs-Seabury guns and their mounts were positioned:

Emplacement	Gun	Carriage
No. 1	20	20
No. 2	11	11
No. 3	10	10
No. 4	25	25

4. The battery is completed and turned over to the troops

Meanwhile, the Engineers had installed the doors, hand rails, and latrine fixtures. On April 30, 1901, the battery was given a final inspection by District Engineer Judson and transferred to the artillery.[20]

In accordance with policy, Captain Judson had submitted to the War Department a plan, "Fort McRee, Fla., Battery for Four 15-pound R.F. Guns on BalancedPillar Mounts, Showing Drainage and Electric Systems." According to the plan's notes, which were to guide maintenance procedures, the current for the emplacement lights was provided by the Battery Slemmer electric plant. The only switch for the system was in the dynamo room of the 8-inch battery, and was connected to both the generator and storage battery. All wires were exposed and were either No. 6 or No. 8 American Wire Gauge, weatherproof braided. The lamps were 16-candlepower, 110 volts.

All drains were covered, and attention must be given to "prevent foreign substances from getting into drains through latrines." The drains should be flushed through the latrines at least once a month. The drain openings in the gun platforms were so nearly covered by the gun mounts that it was not believed any foreign matter could enter them while the mounts were in the wells.

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18. Buffington to Chief Engineer, Nov. 2, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 31147.

19. Executive Documents, Serial 4279, pp. 28, 833.

20. Ibid. The battery had cost $20,603.84. Captain Judson had replaced Captain Flagler as District Engineer on September 26, 1900.

Earthen slopes were to be inspected after heavy rains, and all erosions promptly repaired.[21]

5. The battery is named

On January 27, 1902, Chief of Artillery Randolph called the War Department's attention to its failure to provide the Fosters Bank 15-pounder battery with a name. He suggested that it be designated "Battery Center" to honor Lt. J. P. Center, Adjutant, 6th U.S. Infantry, killed in the battle of Okeechobee, December 25, 1837.[22]

The War Department was agreeable. On February 14, it issued General Order 16, assigning names to a number of recently completed Endicott Emplacements. Hereinafter, the Fosters Bank 15-pounder emplacements would be known as Battery Center.[23]

John P. Center, the officer commemorated, was from Massachusetts. He was graduated from the U.S. Military Academy as No. 30 in the class of 1833. Commissioned a brevet 2d lieutenant, he was assigned to the 6th U.S. Infantry. Lieutenant Center was stationed at Jefferson Barracks until 1836, when he was ordered to Fort Jesup, Louisiana. He was promoted 2d lieutenant in August of that year. In the autumn of 1837, Center, now a 1st lieutenant, accompanied his regiment to Florida to participate in the Second Seminole War. He was killed on Christmas 1837 in the battle of Okeechobee.[24]

B. Improvements, Repairs, and Maintenance, 1900-1905

1. Early efforts to protect the site

A change in the lagoon shore line at the turn of the century permitted storm waves to attack the recently completed emplacements. To shield the left flank of the battery from being undercut by the surf, sheet piling was positioned at the point of danger.[25]

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21. "Fort McRee, Fla., Battery for Four 15-pound R.F. Guns on Balanced Pillar Mounts," N A, RG 77. A copy of this plan is on file at the Florida Unit, GUIS.

22. Randolph to Army Headquarters, Jan. 27, 1902, N A, RG 156, Doc. 25241/71.

23. G. O. 16, Feb. 14, 1902, War Department.

24. Cullum, Biographical Register, Vol. I, p. 438.

25. Executive Documents, Serial 4089, p. 942.

Then, a September 1900 storm washed away a portion of the shore shielding the battery's left flank, and "cut out a small portion of the sand cover." Reporting this to the Chief Engineer, Captain Flagler noted that he was satisfied that a temporary structure (sheet piling with bricks from old Fort McRee) would afford sufficient protection to the works until a decision on construction of the proposed retaining wall and causeway had been resolved. Meanwhile, he needed a $725 allotment for riprapping, etc., to protect the site.[26]

Division Engineer Hains questioned Flagler's statement respecting the proposed retaining wall and causeway.[27]

Flagler responded that there was a proposal to construct a seawall, estimated to cost $22,500, to protect the batteries and quarters the Quartermaster General planned to erect on Fosters Bank. The temporary structure referred to was merely a row of sheet piling with a string piece at the top, extending a short distance into the channel opposite the left flank of the battery. Both ends of the piling were tied into the shore, and the interior filled with sand and brickbats.[28]

Flagler's explanation was deemed satisfactory, and the Department allotted the requested sum.[29]

Eleven months later, the August 1901 hurricane damaged and caused minor changes to the shore in front and in rear of the battery's left flank. It underscored the need for an extension of the riprap to protect this beach beyond the limits of the wall constructed in the autumn of 1900. That wall was 313.9 feet in length, with an elevation of from 3.38 feet to 4.5 feet.

To provide additional site protection, Captain Judson recommended construction of 98 lineal feet of wall toward the front of the battery, and 135 lineal feet toward the rear, in prolongation of the wall already built, and the raising of low portions of the existing wall to 4.5 feet. Captain Judson estimated the project's cost at $1,600.[30]

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26. Flagler to Wilson, Sept. 17, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 28661/26.

27. Hains to Flagler, Sept. 19, 1900, N A, RG 77, Correspondence 1894-1923 Doc. 28661/26.

28. Flagler to Hains, Sept. 21, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 28661/26.

29. Abbot to Flagler, Sept. 27, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 28661/26.

30. Judson to Gillespie, Oct. 4, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 28661/51; Executive Documents, Serial 4279, p. 835.

Chief Engineer Gillespie made available the sum requested from the appropriation for "Preservation and Repair of Fortifications."[31]

In addition to the money expended on site protection in Fiscal Year 1902, Captain Judson had the workmen resod and plant in Bermuda "620 squares of the earthen parapet to control drifting sand." This gave promise of success, besides improving the appearance of Battery Center. The parapet was also repaired where it had been injured by cattle.[32]

2. Repairs and maintenance in Fiscal Years 1904-05

In Fiscal Year 1904, the Chief Engineer allotted $40 for repair of breaks in the concrete superior slope.[33]

The Chief Engineer allotted for maintenance and improvements of Battery Center in Fiscal Year 1905, $405. This sum was budgeted:

Darkening concrete surfaces to curb glare	$ 20
Five single steel doors with frames to control access to battery and magazines	300
A wire fence to keep livestock off slopes	60
Repair of earthen slopes	25[34]

C. The Battery is Disarmed and the Armament Salvaged

The battery suffered heavy damage in the September 1906 hurricane, and, in 1910, it was repaired and modified. For details regarding the damage wrought by the hurricane and the resulting improvements to the emplacements, the reader is referred to the chapter titled "PROTECTING THE HARBOR DEFENSES AGAINST THE SEA."

The four Driggs-Seabury 15-pounders and their balanced-pillar carriages were declared obsolete and dismounted in 1920. Coated with cosmoline, they were placed in storage. Four years later, they were declared surplus and salvaged.[35]

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31. Abbot to Judson, Oct. 12, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 28661/51.

32. Executive Documents, Serial 4444, pp. 738-39.

33. Raymond to Gillespie, May 4, 1903, & Abbot to Cavanaugh, June 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 18957/7.

34. Cavanaugh to Mackenzie, June 3, 1904, & Abbot to Cavanaugh, July 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 18957/11.

35. Telephone interview, Lewis with Bearss, July 27, 1977.

IX. THE CONSTRUCTION HISTORY OF BATTERY GEORGE COOPER

A. A 6-inch Rapid-Fire Battery Is Added to the Project

1. The project is revised to include more rapid-fire guns

Captain Judson, soon after replacing Captain Flagler as District Engineer, broached the advisability of revising the Harbor Defense Project. To justify his proposal, he noted that the project, which had not been revised since 1893, enbraced these works:

Two 12-inch breech-loading rifles at Fort Pickens--completed
Four 10-inch breech-loading rifles at Fort Pickens--completed
Two 8-inch breech-loading rifles at Fort McRee--completed
Two 4.7-inch rapid-fire guns at Fort Pickens--completed
Eight 12-inch breech-loading mortars at Fort Pickens--completed
Four 15-pounder rapid-fire guns at Fort McRee--guns being mounted
Two 6-inch rapid-fire guns--not yet under construction

Now was the time to re-examine the project because construction problems relating to operations on Santa Rosa Island and Fosters Bank, the building of seawalls and revetments, installation of searchlights and position finders, and the disposition of the plant, etc., could be more "intelligently dealt with if the complete proposed defense could be determined."

Judson was of the opinion that the defense, as proposed, was seriously lacking in rapid-fire guns. The number of heavy guns and mortars was deemed sufficient, but with the increase in strength of the secondary armament of battleships and a boost in the number of guns mounted on cruisers, it was likely that the few rapid-fire batteries would be quickly knocked out. The character of the coast was such that enemy warships could form line of battle and hold a course parallel to Santa Rosa Island and Fosters Bank and within two to three miles of existing batteries. If an enemy battleship succeeded in penetrating the channel, she would be exposed to "but little fire, while taking in reverse the Fort Pickens batteries." Consequently, Captain Judson argued, several rapid-fire batteries should be constructed on the Barrancas, near the lighthouse.

He recommended that these guns be added to the proposed defenses:

At Fort Pickens: Four 6-inch rapid-fire guns and eight 6-pounder rapid-fire guns on mobile carriages.

At Fort McRee: Two 6-inch rapid-fire guns, four 15-pounder rapid-fire guns, and four 6-pounder rapid-fire guns on mobile carriages.

Near Barrancas Light: Four 6-inch rapid-fire guns and six 6-pounder rapid-fire guns on mobile carriages.

This additional expense was justified, Captain Judson noted, because:

(a) Pensacola Bay was the best fleet anchorage between Hampton Roads, Virginia, and the mouth of the Rio Grande.

(b) The vital mission of the navy yard.

(c) Its position in proximity to the Alabama coal-and-iron fields.

(d) The anticipated development of important ship building facilities on the bay.[1]

Division Engineer Hains agreed with Captain Judson. As he recalled, the depth of the channel at the time the project had been adopted did not exceed 22 feet, and Pensacola had been of much less military and commercial significance. Since then, the channel had been dredged to 30 feet and the United States Navy had greatly bolstered its strength. This had been accompanied, especially since the Spanish-American War, by a greatly increased national interest in the Caribbean.[2]

The Department referred the subject to its Board of Engineers. At its May 29, 1901, meeting, attended by Colonel Hains, the Board recommended that the total armament for defense of Pensacola Bay be:

<u>At Fort Pickens</u>

*Two 12-inch breech-loading rifles
*Four 10-inch breech-loading rifles
*Eight 12-inch breech-loading mortars
Two 6-inch rapid-fire guns
*Two 4.7-inch rapid-fire guns
Four 15-pounder rapid-fire guns

<u>For the entire line</u>

Twelve 6-pounders on mobile carriages[3]

<u>At Fort McRee</u>

*Two 8-inch breech-loading rifles
Four 6-inch rapid-fire guns
*Four 15-pounder rapid-fire guns

<u>Near Barrancas Light</u>

Two 6-inch rapid-fire guns

*already built

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1. Judson to Wilson, Jan. 30, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 38148.

2. Hains to Wilson, Feb. 1, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 38148.

3. Suter to Gillespie, June 3, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 38148. Col. Charles R. Suter was president of the Board of Engineers in June 1901.

2. The plans and site are approved

On November 18, 1902, Chief Engineer Gillespie notified Lieutenant Raymond that with funds appropriated by Congress on June 6, 1902, for construction of "Gun and Mortar Batteries," it was proposed to build emplacements for two 6-inch rifles on disappearing carriages at Fort Pickens. As necessary information regarding the mounts had not yet been received from the Ordnance Department, work on the emplacements would have to be deferred.

For construction of the emplacements, a provisional allotment of $36,000 had been made.[4]

Lieutenant Raymond was notified on February 19 that plans for emplacements for 6-inch rifles on disappearing carriages, Model 1903, had been completed and published. He would, therefore, prepare and submit detailed plans and estimates for the project.[5]

To accomplish this, Raymond asked for and was given $500 by the Department.[6]

On April 11, Captain Raymond called for authority to purchase, before finalization and approval of plans, necessary steel work and electrical fittings. By ordering these items, in conjunction with similar hardware for the 15 pounder batteries, certain economies could be effected.[7]

The Department sanctioned this request, provided no funds were spent for excavation or site preparation.[8]

By the end of the third week in May, Raymond and his staff had completed the plans and estimates. These were submitted on the 21st to the Chief Engineer through Division Engineer Henry M. Adams. The

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4. Abbot to Raymond, Nov. 15, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 45095.

5. Abbot to Raymond, Feb. 19, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095.

6. Abbot to Raymond, March 26, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/2.

7. Raymond to Adams, April 11, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/1. Raymond was promoted captain to rank from February 20, 1903.

8. Abbot to Adams, April 17, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/1.

three-month delay, Raymond explained, had been mandated by the need to secure "the advice of the Board of Engineers with regard to the selection" of the site.[9]

The two enclosed tracings depicted the site selected for the battery and its outline. The latter did not contain many details because it was "practically identical with the mimeograph drawings" for this type emplacement issued by the Board.

Among the proposed changes were the substitution of open drains for pipes leading into the ground in rear of the battery for drainage of the magazines. On Santa Rosa Island, drifting sand had a tendency to obstruct drains. Another change projected was "the carrying down of the concrete of the gun platforms and more important walls of the magazines to a good foundation." This would add about 550 yards of concrete to the emplacements.[10]

The site selected, Captain Raymond reminded Washington, was practically identical to the one designated by the Board on its recent visit to Pensacola. It was in a hollow excavated by wind blowing through the dunes. The gun platforms, as well as all important walls, would be "carried down to the natural surface, and the fill made of good silicious sand."

The axis of the guns had been placed at reference 24 feet above mean low water, as this height was necessary to enable them to fire over the surrounding dunes. The crest of the battery would be similar to that of the adjacent dunes so it would be difficult to pinpoint from the sea. Its field of fire had been calculated to include the outer beach to the eastward, as well as all navigable waters to the west within range of its right flank gun. A depression of three degrees had been allowed for a sweep of the waters immediately in front of the battery.

The project, as approved by the Board, had called for 360-degree fire from barbette guns. This, however, would be impossible with

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9. Raymond to Gillespie, May 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/5.

10. Raymond to Gillespie, May 21, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/5. The two sheets of drawings were the "Defense of Pensacola Harbor, Fla., Plan and Section of Emplacement for Two 6-in. R.F. Guns on Disappearing Carriages," and "Proposed Location for Two 6-in. Rapid-Fire Guns on Santa Rosa Island, Fla." Copies of the subject plans, the former labeled Drawer 78, Sheet 105-1, and the latter Drawer 78, Sheet 105-2, are on file at the Florida Unit, GUIS.

disappearing carriages unless the cover was reduced to a "very considerable extent." If it were desirable to cover the land approaches, Captain Raymond suggested the deployment of guns on moveable mounts.

No protection from the rear had been provided because of the "concealment" of the battery and the partial protection afforded by the sand dunes.

No provision had been made for supplying electric power at the battery because the problem of power distribution for the entire post had not been solved.

Calling attention to the estimates, Captain Raymond noted that the high cost resulted from the isolation and the necessity "for expensive and thorough fixation of sand," along with the increase in the amount of concrete.[11]

The cost estimate read:

Fill--5,000 cubic yards at 25¢	$ 1,250.00
Concrete--3,350 cubic yards at $10.00	33,500.00
Forms for concrete at $1.80 per cubic yard	6,030.00
Doors--12 at $75.00	900.00
Electric lighting system--65 outlets at $8.00	520.00
Drainage	75.00
Fixation of sand--about 4,000 yards at $.50	2,000.00
Brick lining of magazines--7,550 sq. ft. at $.17	1,283.50
Waterproofing	425.00
Steel for ceilings	155.00
Superintendence	800.00
	$46,938.50
Installing plant	1,200.00
Railroad to site--1,100 yards at $2.10	2,310.00
	$50,448.50
Contingencies--10%	5,044.85
TOTAL	$55,493.35
Allotted Nov. 15, 1902	36,000.00
Additional funds required	$19,493.35[12]

Chief Engineer Gillespie approved the plans and estimates on May 26 and allotted the additional $19,493.35 requested.[13]

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11. Ibid.

12. Ibid.

13. Abbot to Raymond, May 26, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/2.

The Army now had second thoughts. Captain Raymond had indicated on May 23 that there was a more advantageous site for the battery. Chief Engineer Gillespie thereupon telegraphed him to forward a sketch of the preferred locality. On doing so, Raymond noted that the "new site" was designed to cover all waters to its front with the fire of both guns. One of them could also shoot across Santa Rosa Island as far as old Fort Pickens, while the left flank gun could register on the land approaches to the eastward. Guns at this position could effectively command all points of the Caucus Channel.

The 12-inch guns of Battery Pensacola, while to the rear of the site, were at such a distance as to present no difficulty from their muzzle blasts.

Captain Raymond was of the opinion that both this position and the one cited in his May 21 letter should be occupied by 6-inch rapid-fire guns. As yet, no detailed surveys had been made of the second site, so no reference for its crest had been established.[14]

Chief Engineer Gillespie, on studying Raymond's letter and the accompanying sketch, saw that the mortar battery had been sited to cover the deepwater area an enemy squadron could be expected to occupy preparatory to bombarding the navy yard. The approved site for the 6-inch battery, being some distance east of the mortar emplacements, would extend the defense line some two miles farther east along the shore. It would not, however, significantly boost the firepower directed at a squadron attempting to fight its way into Pensacola Bay.[15]

Division Engineer Adams agreed with General Gillespie on the superiority of the site discussed in Captain Raymond's May 26 letter. The Board of Engineers concurred, and, on June 23, the Chief Engineer withdrew his action of May 26 and directed that the 6-inch battery be built at the site south of the mortar battery.[16]

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14. Raymond to Gillespie, May 26, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/6.

15. Gillespie to Adams, June 6, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/6.

16. Abbot to Adams, June 23, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 45095/6.

3. Providing facilities for support of the construction force

Meanwhile, on April 16, 1903, Captain Raymond had advised the Department that proposed construction of the new emplacements (two 6-inch and four 15-pounder), along with the military railroad and riprap to guard against beach erosion, would mandate the presence of a large working force on isolated Santa Rosa Island.

The messrooms and kitchens were in the casemates of the south curtain of Fort Pickens, where they were under the muzzles of the guns of Battery Pensacola. Consequently, sashes, doors, cupboards, and mess furniture were damaged or destroyed whenever the guns were fired.

The only structure available into which to relocate these facilities was the small frame office building with attached shed bedroom near the Engineers' Wharf. This, however, was not the answer. What was required were a subsistence storeroom, kitchen, officers' mess, laborers' messhall, cook's quarters, and housing for foremen and others who were on call roundthe-clock. To fund this construction, Captain Raymond called for $2,500.[17]

The Chief Engineer approved this expenditure.

4. Constructing the battery

Captain Cavanaugh, who had replaced Captain Raymond as District Engineer, soon had a number of laborers at work clearing the site and excavating sand for the foundations. The construction of the battery, unlike the debate over its location, caused no problems. By the autumn of 1905, it had been completed.

In accordance with procedures, preparatory to turning the emplacements over to the Coast Artillery, Captain Cavanaugh submitted a drawing of the battery, showing its electric wiring, water supply, and drainage. The current for the lighting, it was noted, was obtained from Battery Worth over a pole line ending at a manhole in rear of the traverse. All electric wires were carried in conduit embedded in masonry. The 16-candlepower, 110-volt lights were controlled by switches on the switchboard and snap switches.

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17. Raymond to Gillespie, April 16, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 36261/75.

All drains were to be inspected once a week and all obstruc- ... removed. Perforations in covers of vertical drains in magazine and shellroom, powder passage, and bottom of counterweight wells were to be kept open and the sand at bottoms of drains kept soft and at least one foot below tops of drains. When not in use, portable lights were to be detached from boxes, openings in boxes closed with screw caps, and cables neatly coiled and stored in recesses provided for them.

After hard rains, the earthen slopes were to be inspected for washes and minor damages repaired. Any serious erosion was to be reported in writing to the district engineer.[18]

5. Arming the battery

In October 1905, two 6-inch disappearing carriages, Model 1903, Nos. 31 and 32, were inspected and shipped to Pensacola by Wellman-Seaver-Morgan of Akron, Ohio.[19]

District Engineer Cavanaugh notified the Department in January 1906 that the guns for Battery Cooper were on hand, the carriages on-site, and the base rings placed on bolts ready for leveling and grouting. He presumed that the guns and carriages would be mounted by the artillery.[20]

He learned that he was mistaken, however, as the Engineers were to arm the battery. To accomplish this, Captain Cavanaugh requested and received an allotment of $375.[21] This sum proved insufficent, and he was compelled to requisition another $400 to complete the task.[22] The guns and carriages had been mounted by late June, but it was mid-September before the battery was given its final inspection and turned over to the Coast Artillery.[23]

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18. "Battery George Cooper, Two 6 inch Rapid Fire Guns, Santa Rosa Island, Pensacola Harbor, Fla., Showing Electric Wiring, Water Supply and Drainage," Drawer 78, Sheet 105-4. A copy of this plan is on file at the Florida Unit, GUIS.

19. Russell to District Artillery Officer, Pensacola, Dec. 24, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 45095/10. A. H. Russell was a major in the Ordnance Department.

20. Cavanaugh to Mackenzie, Jan. 4, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 45095/13.

21. Cavanaugh to Mackenzie, Jan. 27, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 45095/14.

22. Cavanaugh to Mackenzie, March 27, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 46095/15.

23. Pearce to Cavanaugh, Sept. 15, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 45095/20.

The armament was positioned:

GUNS

EMPLACEMENT	MODEL	SERIAL NO.	MANUFACTURER
No. 1	1903	42	Watervliet
No. 2	1903	53	Watervliet

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
No. 1	Disappearing	1903	32	Wellman-Seaver-Morgan Co.
No. 2	Disappearing	1903	31	Wellman-Seaver-Morgan Co.

6. Naming the battery

On December 27, 1904, the War Department issued General Order No. 194, designating the emplacements Battery George Cooper to commemorate 2d Lt. George A. Cooper, killed in action at Mavitac, Philippine Islands, on September 17, 1900. A Louisianian, Cooper had been called into service as a captain in the 2d Louisiana Volunteer Infantry on May 2, 1898. He was mustered out 11-1/2 months later. On September 1, 1899, Cooper re-entered the service as 2d lieutenant in the 15th U.S. Infantry.[24]

B. The Emplacements Become a Support Facility for Battery GPF

1. Disarming the battery

The United States entered the Great War on April 6, 1917, when Congress declared war on Imperial Germany. Artillery was the king of battles, and to support the American Expeditionary Force (AEF) and their allies on the Western Front, there was need for long-range railway guns. In August, the War Department listed a number of 8-, 6-, and 5-inch guns from coastal batteries as available for use on railway mounts in Europe. Among the batteries included were:

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24. G.O. No. 194, Dec. 27, 1904.

COAST DEFENSE	FORT	BATTERY	GUNS
Pensacola	Pickens	Cooper	Two 6-inch
Pensacola	McRee	Slemmer	Two 8-inch
Charleston	Moultrie	Gadsden	Two 6-inch
Sandy Hook	Hancock	Eagle	One 5-inch[25]

Complying with this decision, fatigue parties, in November 1917, dismounted the Battery Cooper guns. On the 17th, guns Nos. 42 and 53 left Fort Pickens for the Watervliet Gun Factory. The disappearing carriages, Nos. 31 and 32, were kept on hand until June 7, 1920, when they were declared obsolete and salvaged.[26]

2. The 1934 proposal

A Board of Officers convened at Fort Barrancas on February 5, 1934, proposed to establish a battery consisting of four 155 MM GPF guns at Battery George Cooper. Involved would be modification of the firing platforms of the battery and construction of two new platforms on sandfills on the left (east) flank of the battery. Detailed plans for this modification and construction were prepared in the office of the Mobile Engineer District.[27]

This modification of the Battery Cooper platforms and construction of two new ones would permit the 155's to have a 360-degree field of fire. They would thus cover the water area within their range and support the defense against amphibious landings on the Santa Rosa Island and the Fosters Bank beaches.

In conjunction with this construction activity, the storage areas in the Battery Cooper traverse would be rehabilitated and deteriorated ironwork replaced as needed. Rehabilitation of the 1903-06 battery involved:

(a) Renewal of steel doors, shutters, and stairs, as required, and the cleaning and painting of ironwork.

(b) Construction of a latrine, with 6 commodes, 2 basins, urinal, and septic tank, to be connected by a 2-inch water main from Battery Worth.

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25. Bishop to Chief Engineer, Aug. 24, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 95991.

26. Emplacement Book, Battery George Cooper, N A, RG 392.

27. "155 MM Gun Emplacement 360 degrees Traverse, Defenses of Pensacola, Fla.," Drawer 78, Sheet 105-6; "2-155 MM Emplacements in Battery Cooper, Defenses of Pensacola, Fla.," Drawer 78, Sheet 105-6a. Copies of these drawings are on file at the Florida Unit, GUIS.

(c) Rewiring of battery and installation of a 5-kilowatt generator.

(d) Remodeling of the B.C. station.[28]

3. The construction and arming of Battery GPF

This project was only partially implemented. In the spring of 1937, two emplacements for 155 MM GPF's were constructed in front of Battery Cooper, not on the platforms as proposed. These guns, Model 1918, were numbered 806 and 932, and their carriages were Nos. 182 and 433. A third emplacement was constructed to the right of Battery Cooper and a fourth to its left. Emplaced in the former was gun No. 831 and carriage No. 70 and in the latter gun No. 789 and carriage No. 515.

The Battery Cooper traverse was then rehabilitated as proposed and a frame latrine with concrete flooring and foundations built to its ear.[29]

The four 155's constituted a unit in the Harbor Defense Project designated Battery GPF. Assigned to Fire Group I, Battery GPF remained a part of the project through the pre-Pearl Harbor build-up and to within four weeks of V-E Day. On April 5, 1945, the battery was disarmed and discontinued.[30]

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28. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, July 15, 1936, N A, RG 407.

29. "Harbor Defense of Pensacola, Fort Pickens, Fla., New Latrine at Battery Cooper," Drawer 78, Sheet 106-42a; Fort Pickens Historical Record Book, N A, RG 392.

30. Supplement to Harbor Defense Project, Harbor Defenses of Pensacola, July 1, 1945, N A, RG 407.

X. THE CONSTRUCTION HISTORY OF BATTERIES MATTHEW PAYNE & ALEXANDER TRUEMAN

A. The Batteries are Built and Turned Over to the Troops

1. Plans are prepared, rejected, revised, and approved

On June 27, 1902, the Department called on District Engineer Raymond to prepare plans and estimates for construction of emplacements for four 15pounder rapid-fire guns on pedestal mounts. More than three months slipped by before Lieutenant Raymond submitted the requested documents.

Calling attention to the site plan, in an accompanying letter, Raymond noted that the proposed location gave a good field of fire and permitted the magazine floors to be placed above "the reach of the highest tides without placing them on made ground." The area consisted of sand, he cautioned, and, unless protected from the surf, would be subject to erosion.

The design of the battery was "nearly identical with that of similar emplacements constructed by Col. Charles Suter and Captain Harry Taylor...at Fort Standish, Boston Harbor, where it was found to be very satisfactory." It would provide 360-degree fire, but was protected on the flanks and in front. Low traverses separated the guns, although the rear would be subject to fire from any ship or ships that ran the gantlet and found their way into Pensacola Bay. It would, if desired, be protected by parados. The details for ventilation, drainage, and lighting were not shown on the enclosed plan.[1]

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1. Raymond to Gillespie, Oct. 9, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 43494/2.

Lieutenant Raymond's estimate called for:

Excavation--100 cubic yards at 25¢	$ 25.00
Fill--2,557 cubic yards at 25¢	589.25
Concrete--1,114 cubic yards at $10.00	11,140.00
Forms--1,114 cubic yards at $1.80 per cu. yd	2,005.20
Doors--11 at $50.00	550.00
Ammunition doors--4 at $40.00	160.00
Electric lighting system--40 outlets at $7.50	300.00
Drainage	175.00
Fixation of sand slopes--3,000 yards at 50¢	1,500.00
Brick lining of magazine, etc.--4,200 sq. ft. @ 17¢	714.00
Steel beams	200.00
Superintendence	600.00
Installing plant	1,500.00
Railroad track to site	1,100.00
	$20,558.45
Contingencies, etc.--10 percent	2,055.84
TOTAL	$22,614.29[2]

The Chief Engineer rejected and returned the plans and estimates as submitted. His reasons for this were:

(a) The plans were for balanced-pillar mounts, not the pedestal mounts called for.

(b) The magazines were protected by only 3 feet of concrete in front and flanks, and were exposed to fire from warships whose projectiles were passing in front of Batteries Cullum and Van Swearingen.

(c) The cover of the magazines against frontal fire consisted of only 6 feet of sand and 3 feet of concrete, while the type plan prescribed a minimum of 8 feet of concrete.

(d) The ramps in rear of the gun platforms occupied space which could better afford cover for the gun detachment.

(e) It was deemed unwise to group more than two rapid-fire guns in one battery because of the dust, smoke, and noise.[3]

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2. Ibid.

3. Abbot to Raymond, Oct. 27, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 43494/2.

Lieutenant Raymond took less than a month to revise the plans. On November 22, he mailed to the Department a drawing for a battery of two rapid-fire guns on pedestal mounts. It was based upon the Fourth Supplement to Mimeograph No. 30. As a 360-degree fire was necessary, the parapets had been drawn to permit servicing the guns when pointed to the rear. About 2 degrees depression was provided for, the site being 6 feet above mean low water.

Personal experience had satisfied Raymond that the interval between guns must be increased beyond that shown in the type plan, and that a screen was a prerequisite between guns to lessen the blast whenever a gun was fired in the direction of the other. "To extend the interval, provide the screen and make the battery compact, both magazines" had been placed in a central traverse, together with a storeroom. This would prevent the artillerists from employing a magazine as a storeroom as was frequently done where there was no storage facility.

The sides of the traverse were inclined to deflect projectiles. The top of the traverse was placed at a reference that would give better protection than that provided in the mimeograph sheet. Being a rounded mass, it would deflect shot better than a square edge. The form of the traverse enabled the ceilings of the magazines to be inclined, thus increasing head room, improving ventilation, and preventing the drip of condensation. Moisture would run along an inclined ceiling and be dripped near the wall, not down its face, by a small groove in the ceiling so as to fall into a gutter at the foot of the wall. The magazines could be ventilated through the storeroom.

The rear of the battery was protected by parados low enough to permit fire to the rear and "high enough to give good cover to the magazines." The top of the retaining wall would be low to avoid exploding shells coming from the channel.

The steps had been placed in rear of the emplacements instead of near the magazines to avoid filling the terreplein.[4]

The Chief Engineer's Office reviewed and approved the plan. On doing so, they called on Raymond to submit a site plan and estimates.[5]

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4. Raymond to Gillespie, Nov. 22, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 43494/5. A copy of the "Preliminary Design for Battery of 2-15 pdr. Rapid Fire Guns on Pedestal Mounts," Drawer 78, Sheet 102-1, is found in the files of the Florida Unit, GUIS.

5. Abbot to Adams, Dec. 2, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 43494/5.

In preparing the former, Lieutenant Raymond took into consideration the emplacements' location in relation to Battery Van Swearingen. As the central traverse of the planned batteries resulted in a dead angle at each side on which only one gun could bear, Battery No. 2 had been positioned so that the dead angle at the left would "fall upon and to the rear" of Battery Van Swearingen. The dead angle on its right unavoidably fell upon a reach of the channel, but in rear of the minefield. The battery proposed for site No. 3 was situated so both its guns could sweep the bay's interior waters while covering the minefield and channel, except for one dead angle. This angle slightly overlapped the corresponding angle of Battery No. 2.[6]

Raymond, before entering the estimates, explained that the reference for the crests, determined by the elevation of the magazine floors, had been placed at 6 feet above mean low water. The two batteries had been placed well apart to reduce the effect of their blast upon each other, and on "elevated portions of the beach" to facilitate construction of foundations.

The addition of cover from reverse fire and the separation of the guns into pairs would boost construction costs considerably above that for a single battery of four guns. Lieutenant Raymond's revised estimate for one two-gun battery called for:

Excavation--150 cubic yards at 25¢	$ 37.50
Fill--3,600 cubic yards at 25¢	900.00
Concrete--820 cubic yards at $10	8,200.00
Forms for concrete at $1.80 per cubic yard	1,476.00
Doors--3 at $50	150.00
Electric lighting system--15 outlets at $8	120.00
Drainage	75.00
Fixation of sand slopes--2,000 yds. at 50¢	1,000.00
Brick lining of magazines, etc.--1,850 sq ft @ 17¢	314.50
Waterproofing	318.00
Steel work for ceilings	200.00
Superintendence	600.00
	$13,391.00
Installing plant	1,500.00
Railroad to site	1,400.00
	$16,291.00
Contingencies--10 percent	1,629.10
TOTAL COST OF BATTERY	$17,920.10

To build both batteries would mandate an allotment of $32,000.

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6. Raymond to Gillespie, Jan. 2, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 43494/5. A copy of the site plan, "Proposed Location for Two Batteries of 2-15 pdr. Rapid Fire Guns on Santa Rosa Island, Fla.," Drawer 78, Sheet 102-2, is found in the files of the Florida Unit, GUIS.

Moreover, to prevent the sites from being "washed away or damaged" by hurricanes, they must be shielded by groins made of riprap from the debris of the Fort Pickens bastion wrecked by the June 20, 1899, explosion.[7]

Chief Engineer Gillespie approved the sites selected and allotted the requested funds to underwrite the project.

2. Work is delayed to combat beach erosion

Before ground was broken, a late winter storm seriously eroded the beach fronting the site designated for Battery No. 3. Reporting this to Chief Engineer Gillespie, Captain Raymond noted that the surf had so encroached on the site that it would be unwise to begin construction until the shore was protected by riprap. To accomplish this, he asked for and was given a $10,000 allotment.[8]

The riprapping (bricks from the blasted bastion) was too little and too late. Storms during the winter of 1903-04 hammered the area, and the beach fronting site No. 3 was badly washed. If constructed on the approved site, the battery would extend into the surf at flood tide. Moreover, Captain Cavanaugh (who had replaced Captain Raymond as District Engineer) reported, the high ground between sites Nos. 2 and 3 has been swallowed by the sea. The surf, driven by howling gales, had swept across the strand and into the pond beyond. Sections of the railroad track on the elevated terrain used in conjunction with positioning the riprap had been washed out.

Because of this, Cavanaugh asked authority to relocate the site for Battery No. 3, 120 feet to the northeast of the area pinpointed on the approved tracing. In addition, with Battery No. 2 nearly completed, he desired permission to begin construction of Battery No. 3, as it could be conveniently and cheaply built while the plant was in its present location.[9]

Chief Engineer Mackenzie approved Captain Cavanaugh's proposal on February 15.[10]

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7. Ibid.

8. Raymond to Chief Engineer, March 12, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 43494/9.

9. Cavanaugh to Mackenzie, Feb. 6, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/11. The ponds would be filled at the same time.

10. Abbot to Cavanaugh, Feb. 15, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/11.

3. Captain Cavanaugh modifies the plans for Battery No. 3

Before turning a force to clearing the site for Battery No. 3, Captain Cavanaugh requested authority to modify the approved plan to conform to a drawing of the "type published as Supplement 6 to Mimeograph No. 30." His reasons for this request were:

(a) The type plan had several advantages--the magazines and storeroom were larger and the distance between guns had been increased by 13 feet.

(b) Construction had been simplified and the brick lining of rooms and waterproofing layer could be more "readily applied."

(c) Platform details for this type plan included the "latest ideas on ammunition service for 3-inch batteries as determined from experience of the artillery."

(d) Finally, it was presumed that certain economies introduced into the latest type plan would compensate for the "increase in quantities of sandfill and concrete" and the cost of the emplacements would not be correspondingly increased.[11]

This change order, Cavanaugh reminded the Department, would not delay the project because work could not be started until the riprap was in position and the beach secure.[12]

The Department promptly reviewed and approved the change order.[13]

4. The project accrues a $7,000 arrearage

On June 4, 1904, Captain Cavanaugh notified Chief Engineer Mackenzie that he needed a $7,000 allotment to complete Battery No. 3. It had cost $21,000 to build Battery No. 2 which had been estimated by Captain Raymond at $17,920.

This arrearage was attributed to:

(a) The high cost of moving the plant from Fort McRee to Santa Rosa Island and of repairs to machinery, railroad tracks, and wharf.

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11. Cavanaugh to Mackenzie, March 5, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/12.

12. Ibid.

13. Abbot to Cavanaugh, March 12. 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/12.

(b) The charge for support of the engineering force.

(c) Certain modifications to the structure. Among these were the addition of an interior layer of copper in the traverse over the three rooms for waterproofing and an increase in width and depth of the rear retaining wall.

In addition, it was believed that in some respects Captain Raymond's estimates had been below the actual cost of construction at Fort Pickens. For example, forms for concrete, with the large number of thin walls and many curved surfaces, could not be erected for less than $1.80 per cubic yard of concrete. Of the 1,800 barrels of Portland cement purchased for the two batteries, 1,386 barrels had been employed in Battery No. 2. This was due to the large amount of pavements, steps, and finished surfaces.[14]

The Chief Engineer's Office was understandably dismayed by this information. The national average cost of a 3-inch emplacement was a little under $7,500, General Mackenzie chided. Heretofore, the Chief Engineer had not sought to induce his officers to reduce their estimates of the cost of new batteries, although they exceeded this norm. But, after an allotment had been made, it was assumed that the district engineer could complete the project for the estimate. When there was an arrearage, it could make "it impossible to emplace a gun already ordered from the Ordnance Department." But, in view of the urgency at Pensacola, General Mackenzie was allotting $7,000 from the March 2, 1903, appropriation for "Gun and Mortar Batteries."[15]

5. The emplacements are completed

Battery No. 3 was completed by the winter of 1904. Some 26 months later, Captain Cavanaugh, in accordance with procedures, transmitted to the Department plans showing the batteries' electric wiring, water supply, and drainage. Coast Artillerists assigned to Battery No. 2 (Matthew Payne) were to inspect the drains weekly and see that they were free of obstructions and, after each hard rain, were to examine the earthen slopes for washes. Minor damages were to be repaired by the troops, while serious erosions were to be reported to the district engineer.

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14. Cavanaugh to Mackenzie, June 4, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/14. Copies of the "Sketch of Waterproofing on 3 inch Battery" and "Sketch of Brick Lining," Drawer 78, Sheet 102-3, are on file at the Florida Unit, GUIS.

15. Abbot to Cavanaugh, June 11, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/14.

The current for lighting the battery was obtained from the post's central plant through a lead cable which extended from a manhole in rear of Battery Van Swearingen to the storeroom in center of the traverse. All electric wiring was carried in conduit embedded in masonry. The lights (16-candlepower, 110-volt) were controlled by snap switches.

All hydrants were non-freezing and were connected to the post water supply system.[16]

Maintenance instructions for the artillerists assigned to Battery No. 3 (Alexander Trueman) were more complex. In addition to those accruing to Battery No. 2, they were to see that all switches on the switchboard were kept open except when the lights were burning. The main switch was to be closed before the feeder switches were shut.

Current for lighting the battery was drawn from the central plant over the post lighting system's mains. There was a temporary pole line and a lead cable from the east pole of this line to the switchboard in the battery storeroom. The remainder of the electrical and water systems were identical to those found at Battery No. 2.[17]

At the time the batteries were transferred to the garrison in January 1908, District Engineer Ferguson (Captain Cavanaugh's replacement) reported that 6-inch terra cotta pipes carried the electrical wiring and water pipes. They were of sufficient size to also handle telephone lines, if required. These conduits had their outlet in the storeroom of each of the batteries. At No. 3, there was a conduit leading from the switchboard niche to a point in the side wall where a telephone, if desired, could be installed.

The only remedy to correct the concrete traverse of Battery No. 2 would be its removal and its replacement by a sand traverse. This would be expensive and of questionable value.

At Battery No. 3, the sand around its entrance had been removed. If it continued to accummulate, Captain Ferguson proposed to remedy it by building a small concrete ramp at this entrance.[18]

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16. Plan "Battery Matthew Payne, Two 3-inch Rapid-Fire Guns, Santa Rosa Island, Pensacola Harbor, Fla., Showing Electric Wiring, Water Supply and Drainage," Drawer 78, Sheet 102-4. A copy of this plan is on file at the Florida Unit, GUIS.

17. Plan "Battery Alexander Trueman, Two 3-inch Rapid-Fire Guns, Santa Rosa Island, Pensacola Harbor, Fla.," Drawer 78, Sheet 102-5. A copy of the subject plan is found in files of the Florida Unit, GUIS.

18. Ferguson to Mackenzie, Feb. 25, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 43494/25.

6. The batteries are armed

On May 11, 1904, Captain Cavanaugh reported that Battery No. 2 was ready for its armament.[19]

Chief of Ordnance Crozier, upon being alerted, assured General Mackenzie that two pedestal carriages and their guns, Model 1902, would be shipped to Pensacola from South Bethlehem, Pennsylvania, as soon as a satisfactory design for a telescopic sight had been perfected.[20]

One 3-inch gun and its pedestal carriage, Model 1902, No. 17, left South Bethlehem for Santa Rosa Island in late April 1905.[21] By the end of May, the gun and carriage had been received and hauled to Battery No. 2 preparatory to being mounted by the artillery.[22]

Soon, thereafter, two 3-inch rifles and their carriages were transferred to Fort Pickens from Galveston, Texas. The three pieces were mounted in July, two in Battery No. 2 and one in Battery No. 3. The work was accomplished by the Engineer force under the supervision of an Ordnance mechanic. Relaying this information to the Chief Engineer, Captain Cavanaugh explained that it had been done because the derrick employed for the sandfilling was about to be removed. Any delay would have resulted in increased costs and difficulty in getting the guns and mounts into position.[23]

Eighteen months later, on February 5, 1907, Captain Cavanaugh notified the Department that Batteries Nos. 2 and 3 were ready for transfer to the Coast Artillery, although emplacement No. 2 of Battery No. 3 was still missing a gun and carriage.

The sand slopes of both batteries had been injured by the hurricane of September 26-27, 1906. These slopes, however, could not be repaired until additional funds were appropriated by Congress.[24]

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19. Cavanaugh to Mackenzie, May 11, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 43494/13.

20. Crozier to Chief Engineer, May 20, 1904, N A, RG 156, Ltrs. Sent.

21. Carpenter to Abbot, May 3, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 43494/15.

22. Cavanaugh to Mackenzie, May 31, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 43494/16.

23. Cavanaugh to Mackenzie, Aug. 1, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 43494/18.

24. Cavanaugh to Mackenzie, Feb. 5, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 93494/19.

The Chief Engineer vetoed the transfer, pending repair of the parapets.[25]

It was December 1907 before the repairs were effected and the fourth gun and carriage received and mounted. On January 7, 1908, the two batteries were inspected and transferred by Captain Ferguson to the Coast Artillery.[26]

The guns and carriages were mounted:

BATTERY MATTHEW PAYNE (BATTERY NO. 2)

GUNS

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.	MANUFACTURER
No. 1	3-inch	1902	16	Bethlehem Steel
No. 2	3-inch	1902	17	Bethlehem Steel

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
No. 1	Pedestal	1902	16	Bethlehem Steel
No. 2	Pedestal	1902	17	Bethlehem Steel

BATTERY ALEXANDER TRUEMAN (BATTERY NO. 3)

GUNS

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.	MANUFACTURER
No. 1	3-inch	1902	25	Bethlehem Steel
No. 2	3-inch	1902	24	Bethlehem Steel

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
No. 1	Pedestal	1902	25	Bethlehem Steel
No. 2	Pedestal	1902	24	Bethlehem Steel

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25. Abbot to Cavanaugh, March 7, 1907, N A, RG 77, Correspondence 1894-1923.

26. Ferguson to Chief Engineer, Jan. 25, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 93494/26.

7. The batteries are named

Although the batteries had not been armed nor turned over to the artillery, the War Department decided to give them names. On December 27, 1904, General Order No. 194 was issued designating Battery No. 2 Battery Matthew Payne, and Battery No. 3 Battery Alexander Trueman.[27]

The first of the soldiers commemorated, Matthew M. Payne of Virgina, had entered the U.S. Army as a 1st lieutenant in the 20th Infantry on March 12, 1812. He was promoted captain in March 1814 and was mustered out on June 15, 1815. He re-entered the Army as a captain in the Artillery Corps 11 months later. On June 1, 1821, Captain Payne was transferred to the 4th U.S. Artillery. He was promoted major of the 2d U.S. Artillery to rank from December 17, 1836, and to lieutenant colonel June 27, 1843. Payne was breveted colonel for gallantry and meritorious service at Palo Alto and Resaca de la Palma and was promoted colonel of the 2d Artillery on November 11, 1851.

Colonel Payne resigned his commission in 1861 and died August 1, 1862.[28]

Alexander Trueman of Maryland, the other officer, was commissioned a captain of the U.S. Infantry Regiment on June 3, 1790, and was transferred to the 1st Regiment on the Army's reorganization in March 1791. He was promoted major on April 11, 1792, and died of wounds received in action with the Indians near Fort Recovery on June 2, 1792.[29]

8. The batteries are identified

To identify the batteries, white wooden sign boards, the names spelled in block six-inch letters painted in black, were erected. The locations were left to the local commander.[30]

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27. G. O. No. 194, Dec. 27, 1904, War Department

28. Francis B. Heitman, Historical Register of the United States Army, From Its Organization September 29, 1789, to September 29, 1889 (Washington, 1890), p. 512.

29. Ibid., p. 651.

30. Chief Engineer to Adams, Aug. 1, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 42146.

B. The Mission and Emplacements are Modified

1. The saga of gun No. 16

In the spring of 1913, there was a relocation of the armament. Gun No. 16 and its carriage were dismounted from Battery Payne and shipped to the Sandy Hook Proving Ground for experimental purposes. The transfer of the 163d Company (Mine) Coast Artillery from Battery Van Swearingen to Battery Payne complicated the situation. To enable the artillerists to be responsible for a two-gun battery, Colonel Ridgeway requested authority to shift a 3-inch gun and its carriage from Battery Trueman to Battery Payne.[31]

Chief Engineer William H. Bixby approved the transfer and, in August, the artillerists removed gun No. 29 and its carriage from Battery Trueman and mounted them in Battery Payne's emplacement No. 1.[32]

In the summer of 1916, the Ordnance Department returned the gun and carriage. While at the Proving Ground, the piece had been fired 241 times. On their arrival, the gun and carriage were mounted in Battery Trueman's emplacement No. 2.[33]

2. The Battery Trueman coincidence range-finder station

In the early 1920's, the three extant rapid-fire batteries (Payne, Trueman, and Center) were programmed to receive coincidence range-finder stations. The subject station for Payne was built on the abandoned platform of Battery Van Swearingen's No. 1 emplacement, while Center's was erected on the abandoned platform of Battery Slemmer's No. 2 emplacement. Trueman's range-finder station was sited about 100 feet northeast of the battery.

The 10-by-10-foot interior dimensions, reinforced concrete shelter was supported by foundation walls and a platform which raised its floor 6 feet above ground surface. To provide the structure with a low silhouette, sand and earth were embanked against three of its elevations to within 6 inches of the observation slit. Access to the southeast elevation and doorway was provided by a concrete stairway.

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31. Ridgeway to Adj. Gen., May 27, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 93494/30.

32. Bixby to Crozier, July 3, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 93494/30.

33. Ruggles to Ordnance Officer, Pensacola, July 14, 1916, N A,RG 77, Correspondence 1894-1923, Doc. 93494/31.

The range-finder station was equipped with an azimuth instrument, 3 wall telephones, 3 telephone headsets, 3 telephone terminal blocks, and a terminal box.

On February 9, 1923, the coincidence range-finder station was inspected and transferred by the Corps of Engineers to the Coast Artillery.[34]

3. The July 18, 1922 accident at Battery Payne

On July 18, 1922, a detail from the Coast Artillery Officers' Reserve Corps attending the summer camp was at Battery Payne. On the seventh shot from gun No. 24, the recoil tore the piece loose from its cradle and hurled it down the emplacement steps, bowling over Pvt. Hugo W. Paap of the 163d Company who was acting as the gun detachment's No. 1. Paap was rushed to the Fort Barrancas hospital where he died.

An investigation divulged that "the excessive air space in the recoil cylinder during the functioning of the first few shots caused excessive oil hammering which caused the throttling ring to become displaced from its position."[35]

4. The rapid-fire batteries in the 30's and 40's

The Harbor Defense Project during the 1930's found Batteries Payne and Trueman, along with Battery GPF, assigned to Fire Group I. Battery Payne was sited to cover the outer channel and entrance to Pensacola Bay, and Battery Trueman to command the entrance to the bay. The war reserve of ammunition for each battery was 432 rounds.[36]

One month after Pearl Harbor and simultaneously with the arrival of the first German U-boats off the Atlantic coast, the War Department approved a proposal to relocate Battery Trueman. When built more than 30 years before, the battery had been sited to provide maximum protection to the inner submarine minefield. But in the 1920's, the minefield had

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34. Fort Pickens Historical Record Book, N A, RG 392: "Defenses of Pensacola, Fla., Coincidence Range-Finder Station at Battery Trueman," Drawer 78, Sheet 102-8. A copy of the subject drawing is on file at the Florida Unit, GUIS.

35. Fort Barrancas Historical Record, N A, RG 392, Coast Artillery Districts and Commanders.

36. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, June 11, 1936, N A, RG 407.

been eliminated from the project. It was proposed to move the battery to the southeast, on the eastern end of Battery Cullum, to provide better coverage by its 3-inch guns of the beach and water areas.[37] The battery was shifted in 1943.

For details regarding its relocation, the reader is referred to Chapter III of this study focusing on the "Construction History of Batteries Cullum and Sevier."

In 1943, a combined splinter-proof Battle Commander's and CRF Station was built for Battery Payne. It replaced the coincidence range-finder station that had been constructed for the battery in the early 1920's at Battery Van Swearingen. The new station was between Batteries Cullum and Sevier.

On June 27, 1946, 10 months after V-J Day, the two 3-inch rapid-fire guns and carriages (Nos. 16 and 25) in Battery Trueman and the two 3-inch rapid-fire guns and carriages (Nos. 17 and 25) in Battery Payne were dismounted. They were turned over to the post salvage officer for disposal.[38]

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37. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, Jan. 22, 1943, N A, RG 407.

38. Fort Pickens Historical Record Book, N A, RG 392.

XI. A STRUCTURAL HISTORY OF THE SUBMARINE MINE DEFENSES

A. The System is Activated to Guard Against the Spanish Fleet

A vital component in the Endicott Defense System was the submarine mine project. Unlike gun and mortar batteries, the controlled minefields were not a permanent installation. The mines and their miles of control cable were stored ashore so they could be planted rapidly in event of war. Elements of this system included, besides the mines and cables, a fire control station or mining casemate as it was called, mine and cable storage facilities, loading rooms, wharves, primary and secondary stations, and mine-laying vessels.

In the years between 1893 and 95, the Corps of Engineers had converted casemates Nos. 86 and 87 in the northeast bastion of Fort Pickens into a mining casemate, and constructed a cable gallery connecting it with the bay. The construction history of this project is detailed in Chapter XV of the Structural History and Resource Study of Fort Pickens.

Drenching rains during the winter of 1894-95 eroded the superior slope of the bastion above the mining casemate. It was repaired in the spring of 1895 at a cost of $50.[1]

The February 15, 1898, destruction of the United States battleship Maine in La Habana Harbor, with heavy loss of life, edged the Nation and Spain to the brink of armed conflict. As the yellow press called for war and the diplomats vainly sought to find a solution to the crisis, District Engineer Mahan submitted requisitions for materials necessary to activate the Pensacola Bay submarine mine defense system.[2]

On March 25, Assistant Engineer Jervey proposed to position the mines of "the grand group" across the channel in two lines, employing both buoyant and ground torpedoes. There would be three groups of mines in the outer row and four in the inner. Extending out from the 6-foot curve fronting Santa Rosa Island and Fosters Bank would be two heavy booms, securely anchored, a 1,000-foot opening between them. The booms were to be strong enough to stop a torpedo boat moving at flank speed. In rear of the booms would be planted 36 mines "extemporized" from gasoline tanks.[3]

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1. Mahan to Craighill, July 10, 1895, N A, RG 77, Correspondence 1894-1923, Doc. 6919.

2. Executive Documents, Serial 3905, pp. 922-23.

3. Mahan to Wilson, March 25, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 21637; "Plan of Pensacola Bay Minefield," Drawer 77, Sheet 28. A copy of the subject plan is on file at the Florida Unit, GUIS.

The plan was promptly approved and measures taken to speed its implementation. Two tons of dynamite for arming the mines were shipped from Pensacola to Fort Pickens by schooner on Sunday afternoon, April 8. It had been anticipated that the Engineer detachment ordered to the area from Willetts Point, New York, would arrive at the same time.

Arrangements had been made by Major Mahan for boats and tugs for positioning the mines; shelving in the Fort Pickens casemates was being installed; and the mines and plugs had been stockpiled.[4]

The next day, the 9th, 16 days before Congress declared war, Sgt. George W. Hurtt and six privates of Company B, U.S. Engineer Battalion, reached Pensacola from Willetts Point. Assisted by Lieutenant Jervey and several of his men, the Engineers planted the mines. Recourse, by necessity, was made to various expedients to supplement deficiences. The mining casemate in Fort Pickens' northeast bastion was activated and a searchlight positioned to sweep the channel minefield.[5]

After the torpedoes and booms had been secured, two tugs were chartered at $70 per day to patrol the minefield.[6]

Two Fort Pickens casemates were "fitted up" -- one as a storeroom and the other as an engine room for the searchlight and the oil engine. The latter casemate was paved.[7]

America's "splendid little war" lasted less than four months. Upon return of peace in August, Lieutenant Jervey assumed responsibility for taking up and storing the mines and cables. Jervey and his people encountered considerable difficulty in getting up the mutiple cable. Sand and waterlogged timbers had drifted over it in many places, and it was impossible to pull it up with available means. On September 7, they pulled the towing bits out of the tug Menefee. To continue the project, Jervey was given authority to hire a more powerful tug at $75 per day.[8]

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4. Mahan to Wilson, April 9, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/1.

5. Executive Documents, Serial 3905, pp. 922-23.

6. Mahan to Wilson, Aug. 4, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/13.

7. Mahan to Wilson, July 4, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/12.

8. Jervey to Mahan, Sept. 8, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/21; Executive Documents, Serial 3905, pp. 922-23.

By early December, 35 of the 45 mines had been recovered and destroyed. Great difficulty was encountered in this work because of the defective material employed. Of the 10 infernal machines not located, four were buoyant and had certainly gone adrift, as the area they had occupied had been swept by drags and reconnoitered by divers. The other six were gasoline tanks used as ground mines. Half of these were in deep water off the channel and had been lost when the cables parted. The others, likewise in the channel, had been presumably fouled by a dredge and dragged out of position.[9]

B. The Fiscal Year 1899 Construction Program

1. Plans and estimates are prepared, revised, and approved

The crisis and ensuing war found the local submarine mine defense system without several key structures. Among these were the torpedo storehouse, cable tank, and loading room. Until these could be built, emergency housing for these activities were found in Fort Pickens near the mining casemate.

In June 1898, Chief Engineer Wilson allotted $6,000 from the appropriation for "Torpedoes for Harbor Defense," enacted May 7, for construction of a torpedo storehouse and $3,000 for building a cable tank.[10] During the first three weeks of July, Major Mahan and his staff prepared plans and formulated estimates for these structures. On the 19th, they were forwarded to Washington. In his covering letter, District Engineer Mahan noted that a frame torpedo storehouse with a corrugated iron roof and concrete foundations and floor could be erected for $3,000. A brick storehouse of similar dimensions would cost double that figure.

A $4,000 cable tank could be built of navy yard granite.[11]

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9. Flagler to Wilson, Dec. 2, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/25.

10. Executive Documents, Serial 3905, p. 923, As early as Fiscal Year 1897, Major Mahan had prepared and submitted plans and estimates for additional facilities for the submarine mine defense system. Executive Documents, Serial 3631, p. 720.

11. Mahan to Wilson, July 19, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/10. Copies of the subject plans--"Cable Tank, Fort Pickens, Pensacola, Fla.," Drawer 78, Sheet 92-1, and "Torpedo Shed, Pensacola, Florida," Drawer 78, Sheet 92-2, are found in the files of the Florida Unit, GUIS.

Chief Engineer Wilson, after studying the plans and estimates, called for a fireproof torpedo storehouse. The subject structure was to be partitioned off in one corner for storage of "minor articles of torpedo material."

Commenting on the cable tank plan, the Chief Engineer directed that filling and overflow pipes and an "overhead traveler for handling cable drums" be added. He also pronounced the price excessive. If this cost arose from the proposed use of granite blocks, they were to be abandoned and concrete substituted.[12]

His people were rapidly using up the granite blocks in construction of the 8- and 12-inch batteries (subsequently designated Slemmer and Pensacola), so Major Mahan determined to build the tank of concrete, although cost was not the determining factor. The site being too low to admit a regular drain, a windmill would be provided for "emptying the tank" and keeping it full.[13]

Major Mahan's revised estimates, which the Department approved, called for:

CABLE TANK

137 yards of concrete	$1,233.00
7,000 feet, B.M., lumber	168.00
10,000 shingles	40.00
Framing	250.00
Shingling	45.00
Traveler	550.00
Windmill, pump, etc.	295.00
Filling, grading and excavating	102.00
Railroad (100 feet)	75.00
	$2,758.00
Contingencies--15 percent	413.70
TOTAL	$3,171.70

12. Kuhn to Mahan, July 22, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/10.

13. Mahan to Wilson, Aug. 6, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/10.

TORPEDO STOREHOUSE

109 yards of concrete	$ 981.00
51,000 brick	1,020.00
Mortar	120.00
Labor on brickwork	525.00
12,000 lbs. structural iron	1,090.00
Windows and frames	72.00
Doors and shutters	300.00
Slate roof	456.00
Upper rafters and sheeting, and storeroom	326.00
Traveler	550.00
Gutters	50.00
Railroad (160 feet)	120.00
	$5,610.00
Contingencies--15 percent	841.50
TOTAL	$6,451.50[14]

2. The construction of a torpedo storehouse and cable tank

A site for the torpedo storehouse was designated by Major Mahan on the axis of a line between the Engineers' Wharf and the Fort Pickens sally port. Its north elevation was several hundred feet south of the wharf and its west wall adjacent to the narrow gauge railroad. The foundations and floor were concrete, the walls red brick, the roof slate with steel trusses, shutters, and doors. There was a traveling crane to handle mine cases.[15]

The concrete cable tank was constructed south of and adjacent to the torpedo storehouse. It was sheltered by a wooden shed, open to the west. The shed supported a traveling crane for moving cable drums. A windmill and pump were erected for filling the tank with brackish water.[16]

3. A boarding house is converted into a loading room

In November 1898, Captain Flagler, Major Mahan's replacement as district engineer, asked authority to spend $750 for construction of a torpedo loading room. To accomplish this with the sum named, he proposed to purchase the frame boarding house (30 feet by 60 feet by 10 feet height to the eaves) erected by Aniello de Lustro. De Lustro had built this structure with an understanding that it was to be removed or vacated when

14. Mahan to Wilson, undated, N A, RG 77, Correspondence 1894-1923, Doc. 31566/3.

15. Executive Documents, Serial 3905, p. 923.

16. Ibid.

no longer required. The boarding house was so situated that the railroad track from the cable tank and torpedo storehouse passed to its front. It was in good condition, and could be acquired and converted into a torpedo loading facility for:

Purchase of building	$200.00
Shutters for 18 windows	45.00
Travelers	205.00
Mine stands	15.00
Doors	50.00
Painting and whitewashing	25.00
Benches, desks, etc.	100.00
Contingencies	70.00
	$710.00[17]

The Department approved the proposal and allotted the requested funds. During the winter of 1898-99, the boarding house was purchased by the United States and outfitted as a loading room for the submarine mine defense.[18]

4. The northwest bastion cistern gets a novel use

Meanwhile, Captain Flagler had discovered that the cable tank was not large enough to store all the cables on hand and in transit to Fort Pickens. The approved mine defense project involved 27 miles of single conductor and 8 miles of multiple cables, or 30 drums. The tank would accommodate this number, provided the cable was wound on 4-foot diameter drums per the "Torpedo Manual." But a large number of the drums were 6-foot, and the tank, when full, would hold only 20 miles of single conductor and 5-1/2 miles of multiple cable. Now, Captain Flagler learned that another 6-1/2 miles of multiple cable were en route to Fort Pickens from the Engineer Depot.

Only two methods of taking care of this excess suggested themselves to Flagler--either return the 9 drums or build another tank.[19]

On studying the problem, the Chief Engineer's Office directed that the nine drums be stored in the fort's cisterns. They were accordingly placed in the cistern of the northwest bastion.[20]

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17. Flagler to Wilson, Nov. 4, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/22.

18. Executive Documents, Serial 3905, p. 923.

19. Flagler to Wilson, Nov. 28, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/24.

20. Mackenzie to Flagler, Dec. 1, 1898, & Flagler to Wilson, Dec. 8, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 24949/24.

Excessive humidity in the Fort Pickens mining casemate plagued the wiring and storage battery. In a futile effort to combat this situation, a doorway, in Fiscal Year 1899, was cut through the masonry into the adjoining casemate, and a blower installed to improve ventilation. The casemate was "ceiled throughout with flooring to prevent dampness."[21]

C. Several of the Submarine Mine Defense Structures are Rebuilt

1. The June 20, 1899, explosion wreaks havoc

The explosion of June 20, 1899, which shattered the northwest bastion of Fort Pickens, did extensive damage to the mine defense facilities. The torpedo storehouse, excepting its foundations, was demolished; the loading room flattened; the cable tank shed, windmill, and traveling crane wrecked; leaving the concrete tank and cable tank uninjured; and both doors to the mining casemate wrenched off their hinges and one shattered.[22]

2. Estimates are prepared and funds allotted for rebuilding the torpedo shed and cable tank

Captain Flagler and his staff spent several days poking through the wreckage. At the torpedo storehouse, they found little that could be salvaged--the bricks being so broken as not to pay for culling. Roof trusses, shutters, etc., were twisted and broken. Several parts of the hand cranes from both the storehouse and cable tank could be salvaged and utilized, provided the firm supplying them would sell new traveling cranes incomplete. When rebuilt, the storehouse would be a replica of the first, except for substitution of corrugated iron for slate roofing.

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21. Executive Documents, Serial 3905, p. 923.

22. Ibid.

Flagler placed the cost of its construction at:

Labor	$2,250.00
Cement and lime	150.00
Lumber	175.00
Towage, loading and unloading	210.00
Brick	880.00
Steel doors and shutters	210.00
Roof trusses	265.00
Hand crane	220.00
Beams	60.00
Trolley I beams	25.00
Window frames and sashes	30.00
Paint, nails and tools	75.00
Subsistence and ice	200.00
Superintendence and office expenses	390.00
Corrugated iron roofing	125.00
	$5,245.00
Contingencies--10 percent	524.50
	$5,769.50[23]

As for the cable tank, there was on hand, besides the cable, the 9 drums stored in the cracked northwest bastion cistern. When the superstructure of the tank was rebuilt, Captain Flagler urged that the tank be enlarged. In the space between the addition and the old tank, he would position a track. This would provide wet storage for all the cable on hand, and permit shifting drums, with the traveling crane, directly from the cars, instead "of the clumsy side method necessary with the old tank." His projected cost of this project was:

Labor	$1,700.00
Cement	525.00
Lumber	375.00
Shingles	80.00
Windmill, pump, etc.	150.00
Hand crane	360.00
Towage and unloading	165.00
Subsistence	200.00
Superintendence, office expenses, etc.	225.00
Clearing site and excavation	150.00
	$3,930.00
Contingencies--10 percent	393.00
	$4,323.00

23. Flagler to Wilson, July 18, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/4.

If only the superstructure were rebuilt, the cost would be $2,046, to which should be added at least $500 for a "temporary expedient" for storing the 9 drums from the fractured cistern.[24]

On July 22, the Chief Engineer allotted $5,720 for reconstruction of the torpedo storehouse. He did not, however, understand the request for $4,323 for rebuilding the cable tank, with an additional $2,046 for restoration of the old tank, making $6,369. On reviewing the documents on file, General Wilson found that the original structure had been built for $3,000. Captain Flagler was also asked for an explanation of the "temporary expedients" referred to for storage of surplus cable.[25]

Replying, Captain Flagler noted that the $4,323 was for reconstructing the old tank and for building an extension. If no addition were made, $2,046 would suffice. To this latter figure must then be added $216.70 for constructing a tank for the extra 9 drums. This could be accomplished by repairing the cistern heretofore used by erecting a brick wall around the three sides fractured by the explosion.[26]

The Department then approved this proposal for which it allotted $2,270.[27]

3. The torpedo storehouse and cable tank are rebuilt

Work was started immediately on the new torpedo storehouse and cable tank, and they were completed well before June 30, 1900. The former, a 34-by-58-foot brick structure, costing $5,066.62, was reconstructed on the foundations of the old. Except for substitution of a corrugated iron roof for slate, it was identical to the 1898-99 building. Portions of the crane, shutters, and doors, which had been salvaged, were utilized in the reconstruction.[28]

A new windmill, built to the same plan as the first, was erected, and the tank shed rebuilt. The new 25-by-80-foot structure was

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24. Ibid.

25. Kuhn to Flagler, July 22, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/4.

26. Flagler to Kuhn, Aug. 9, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/4.

27. Kuhn to Flagler, Aug. 15, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/4.

28. Executive Documents, Serial 4089, p. 943.

like the first, except its north elevation extended beyond the tank over the railroad track in the form of a porte-cochere. The rails for the traveling crane were extended the length of the structure, which simplified handling the drums. The cost of these reconstructions and additions was $2,227.56.[29]

Meanwhile, Assistant Engineer Rand had his carpenters build and hang two doors to replace the ones in the mining casemate wrecked by the explosion.

Shelves and tables, as described in the "Torpedo Manual," were also positioned in the casemate, and the storage battery set up ready to receive the electrolyte.[30]

4. The Engineers transfer responsibility for the system

In Fiscal Year 1901, the Corps of Engineers transferred responsibility for care and maintenance of the submarine mine defense system to the Coast Artillery.[31]

D. The Construction of a New Mining Casemate, Loading Room, Etc.

1. The need for a new casemate is demonstrated

The positioning of the mining casemates in the bastions of the Third System masonry forts, because of the high humidity, had been a costly blunder. In August 1903, Chief of Artillery Randolph asked for $10,000 for a new mining casemate at Fort Pickens. A loading room, to replace the one destroyed by the explosion, was also desirable.[32]

It, however, might be years before an appropriation was made, so the post commander took steps to ameliorate this situation. District Engineer Cavanaugh, on a late November 1903 visit to Santa Rosa Island, found the torpedo officer making arrangements to install in the torpedo storehouse the machinery and instruments currently in the mining casemate. The casemate, deep in the bowels of Fort Pickens, was too damp for his sensitive electrical instruments. This shift involved storage of mine cases, etc., in the Fort Pickens casemates where there were no overhead tramways for moving them.

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29. Ibid.

30. Ibid.

31. Executive Documents, Serial 4279, p. 835.

32. Randolph to Secretary of War, Aug. 15, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 46294.

To provide better facilities for the mining casemate and permit return of the cases to the torpedo shed, Cavanaugh asked for a $100 allotment to prepare plans and estimates for the desired new casemate.[33]

No money was available for the project, and Cavanaugh's request was pigeonholed. Then, in mid-March 1904, Capt. L. S. Lyon, the Fort Barrancas torpedo defense officer, in reporting the transfer of the electrical paraphenalia to the torpedo storehouse, called for construction of a temporary 3-room frame shelter for installation of the mining casemate apparatus, consisting of storage battery, oil engine, transformer, switchboard, and testing table.[34]

Then, in June, the Torpedo Board recommended that $3,000 be budgeted for a new casemate. It was to be of frame or brick with no overhead protection "other than that given by the natural features of the ground or the artificial protection of fortifications now in place."[35]

2. Plans and estimates for the casemate are prepared and approved

The Department now called on Captain Cavanaugh to prepare and submit plans and estimates for construction of a mining casemate. These documents had been prepared by the end of the first week of September. The site selected was in the moat of Fort Pickens in lee of the northeast bastion. Here, Captain Cavanaugh explained, it would be afforded concealment from all directions, except to the westward inside the harbor.

At present, the moat (ditch) was filled with mud and water to reference (3) above mean low water. To secure firm foundations, it would be necessary to excavate to "clean white sand...found at reference '0." The moat, in the vicinity of the casemate and between the casemate and causeway upon which the railway was located, would be filled "to cover the muck and rank vegetation and give access to the casemate."[36]

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33. Cavanaugh to Gillespie, Nov. 30, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 24949/36.

34. Lyon to Post Adj., March 16, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 24949/37.

35. Proceedings of Torpedo Board, Fort Totten, N.Y., June 30, 1904.

36. Cavanaugh to Mackenzie, Sept. 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 24949/40. Copies of "Plan Showing Location of Mining Casemate at Fort Pickens, Pensacola Harbor, Fla.," Drawer 78, Sheet 92-4, and "Plan and Details for Mining Casemate at Fort Pickens, Pensacola Harbor, Fla.," Drawer 78, Sheet 92-2, are found in files of the Florida Unit, GUIS.

The estimates were transmitted in two parts--the first covering the aforementioned work required to make the mining casemate available for drill and the second details necessary to "fully protect" it against shell fire. The breakdown read:

ESTIMATE FOR CASEMATE PROPER

500 cubic yards excavation in water, including sheet piling	$ 500.00
2,500 cubic yards sandfilling	1,250.00
125 cubic yards concrete in foundations	1,750.00
30,000 pressed brick, in place, at $30.00	900.00
12-1/2 M. feet lumber, in place, at $27.50	343.75
23 windows, doors and frames, in place	345.00
1,275 lbs. steel beams, in place	128.00
14 squares copper roofing, in place, including copper gutters and downspouts	760.00
Ventilators, registers and wall vents	48.00
7 steel shutters	175.00
Plumbing and fixtures, including 6" sewer to beach	335.00
Manhole and 6" and 24" conduits for cables	495.00
Painting and oil finishing	60.00
Electric lights, tables, shelving, and other accessories, including installation of machinery	400.00
	$7,489.75
Superintendence and incidentals--approximately 10%	760.25
TOTAL	$8,250.00

ESTIMATE FOR PROTECTING CASEMATE

1,760 cubic yards concrete at $11.00	$19,360.00
11,500 cubic yards sand at 40¢	4,600.00
12,500 lbs. structural steel, in place, at 8¢	1,000.00
Steel doors and shutters, 6 double and 8 single	700.00
Drainage and waterproofing	250.00
	$25,910.00
Superintendence and incidentals, approximately 10%	2,590.00
	$28,500.00
Less reduction for omitted protection on west side if central plant is constructed, approximately	6,750.00
TOTAL	$21,750.00[37]

37. Cavanaugh to Mackenzie, Sept. 7, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 24949/40.

Chief Engineer Mackenzie allotted $8,250 for construction of the mining casemate to be charged against the appropriation for "Casemates, Galleries, etc., for Submarine Mines" of April 21, 1904.[38]

3. A Board calls for additional facilities

While construction of the casemate foundation was being pushed in the spring of 1905, the Board constituted to prepare a program for completing the Pensacola Bay mine defense system convened on-site on April 10, and reviewed the minutes of previous meetings.[39]

After reconnoitering the area, the members agreed on certain needed additions to the system and repairs to existing facilities. The cost of these improvements were estimated at:

(a)	Repair of roof of torpedo storehouse and repainting of same	$ 95.00
(b)	Enlarging cable tank and constructing new cable tank house for entire tank; and raising track of traveling crane 1'3"	2,660.00
(c)	Constructing new loading room in accordance with Corps of Engineers standard plan, including service room and grading site	2,750.00
(d)	Changing connections of tramway to storeroom and cable tank, putting in new tramway to loading room, and constructing six flat cars	330.00
(e)	Repair of Engineers' Wharf which will be used for a mine planting facility	1,850.00
(f)	Constructing double primary station for mine command on northeast bastion of Fort Pickens, including concrete retaining wall 12 feet high on three sides of site	4,700.00
(g)	Building double secondary station for mine command near Battery George Cooper	950.00
(h)	Laying cable from mining casemate to Gulf beach south of Fort Pickens	280.00
TOTAL		$13,615.00[40]

38. Abbot to Cavanaugh, Sept. 19, 1904, N A , RG 77, Correspondence 1894-1923, Doc. 24949/40.

39. Members of the Board were Maj. Arthur Murrary and Capt. L. S. Lyon of the Artillery Corps, and Capt. J. R. Cavanaugh of the Corps of Engineers.

40. Cavanaugh to Mackenzie, May 24, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 24949/52.

4. The additions and improvements are funded

Chief Engineer Mackenzie, on studying the estimates, allotted the requested sums for the double primary and secondary stations, and $2,180 for repair of the wharf and improvements to and additions to the tramway system. Three thousand dollars were programmed for the loading room, which was to include a 33- by 7-foot tank. The money for this work, $10,830, was to be charged against the appropriation for "Casemates, Galleries, etc., for Submarine Mines," signed into law by President Roosevelt on March 3, 1905.[41]

5. The construction of the mining casemate, loading room, fire control stations, etc.

Yellow fever broke out in Pensacola in the late summer of 1905, causing a suspension of work and disrupting the labor force. This resulted in a ten percent increase in costs above estimates. Relaying this information to the Chief Engineer, Captain Cavanaugh, in May 1906, called for and received additional funds to permit him to complete the mining casemate, loading room, and repairs to the tramway and wharf.[42]

In June 1907, the mining casemate and the 22- by 45-foot torpedo loading room were completed, inspected, and turned over for maintenance and operation to the Coast Artillery.[43]

It was May 1909 before the double primary station on Fort Pickens' northeast bastion and the double secondary station 800 feet east of Battery George Cooper were completed, inspected, and turned over to the artillery by the Corps of Engineers.[44]

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41. Abbot to Cavanaugh, June 5, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 24949/52.

42. Cavanaugh to Abbot, May 24, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 24949/55.

43. Cavanaugh to Mackenzie, June 23, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 24949/60. The loading room, which is extant, was west of and on the opposite side of the railway from the torpedo storehouse.

44. Marshall to Adj . Gen., Feb. 13, 1909, & Ferguson to Marshall, June 4, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 35518/193. Copies of a plan of "M' Station, Santa Rosa Island, Pensacola Harbor, Fla., Showing Electric Wiring," Drawer 78, Sheet 92-12. A copy of the subject plan is on file at the Florida Unit, GUIS. A search of the pertinent files of the National Archives' Cartographic Branch failed to turn up a plan of the secondary station.

E. The Submarine Mine Defense System is Phased Out

In 1926, as an aftermath of the year's killer hurricane, the submarine mine defense system was eliminated from the Army's Harbor Defense Project for Pensacola Bay. Responsibility for underwater defense of the area was assumed by the Navy.

The badly damaged double primary and double secondary stations were salvaged in the early 1930's, and the frame cable tank house on August 11, 1941. The remains of the concrete cable tanks are distinguishable after more than 35 years. The corrugated iron roof of the torpedo storehouse, ripped off by the hurricane, was replaced by one of cypress shingles.

In the 1930's, responsibility for maintenance and repair of the torpedo storehouse and loading room was transferred from the Corps of Engineers to the Quartermaster Department. The structures were assigned new numbers, the former becoming No. 24 and the latter No. 25, and given new missions. Building No. 24 henceforth served as an automotive maintenance area and No. 25 as a carpenter's shop. The mining casement was retained by the Harbor Defense Project, becoming the Fire Control Switchboard Room.[45]

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45. Completion Reports, Fort Pickens, Nov. 27, 1943, N A, RG 77; Fort Pickens Historical Record Book, N A, RG 392; telephone call Castellina-Dudley ith Bearss, July 18, 1977.

XII. THE JUNE 20, 1899, FORT PICKENS EXPLOSION

A. A Blast Rips the Northwest Bastion

Shortly after midnight on June 20, 1899, a fire was discovered in the second or third casemate west of the Fort Pickens sally port. The former housed blocking for moving guns and the latter ordnance stores in charge of Ord. Sgt. John O'Riely. Second Lieutenant R. H. C. Kelton, the officer in charge of the detachment sent to Fort Pickens to arm Battery Pensacola, at 12:45 a.m., turned out his troops to fight the fire. The intense heat of the burning blocking and shed in rear of the curtain made it difficult for the firefighters. Equipment was also lacking.

Kelton and his men sought to keep the flames from spreading westward. A bucket brigade brought water from the cistern in which the cable drums were stored. The heat drove the soldiers from the cistern, and the fire advanced slowly but surely toward the northwest bastion magazine containing 8,000 pounds of powder. Anticipating an explosion, Lieutenant Kelton withdrew his men. At 5:20 a.m., the flames reached the powder, and the magazine exploded with a roar heard for miles.

Across the bay at the navy yard, Commandant William W. Reisinger felt the shock of the explosion, and sought to call the commander of Barrancas Barracks by telephone. He was at first unsuccessful. At 8:30, the Army called and asked the Navy to rush assistance, including a tug and hose, to Fort Pickens. Commandant Reisinger turned out 1st Lt. Bertram S. Neumann, U.S.M.C., and a detail of Marines. Taking with them two hose carts, axes, etc., the Marines boarded the tug Tacoma. She departed the wharf promptly, and, within a few minutes, was alongside the Fort Pickens wharf.

The Marines and sailors ran a hose ashore from Tacoma, and rushed to the assistance of Lieutenant Kelton and his 60 artillerists. After several more hours of exhausting work, the fire was extinguished. Although they arrived well after the explosion, this service was not without danger, as the Marines, in their efforts to prevent further destruction of public property, toiled in and about the casemates from which bricks were continually falling, and in proximity to the northeast bastion magazine.[1]

Upon mustering his command, Lieutenant Kelton discovered that Pvt. Earle F. Welles of Battery H, 1st Artillery, had been killed while Pvt. Henry Hopgood of the same unit had received a contused wound of the right shoulder and a lacerated left leg from several of the thousands of bricks hurled toward the wharf where they were standing guard. On hearing

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1. Reisinger to Secretary of the Navy, June 20, 1899; Flagler to Wilson, Aug. 31, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 20056 and 31566/17; Executive Documents, Serial 3905, p. 922.

the explosion, they had raced for the shelter afforded by a wood pile. Welles' skull had been crushed by a brickbat.[2]

B. District Engineer Flagler Surveys the Destruction

Inspecting the damage, District Engineer Flagler saw that the fire had swept through the wooden linings of two casemates east of the sally port, the first occupied by Lieutenant Kelton as quarters and the second employed as a storeroom for electrical material belonging to the Engineers. All the material was destroyed, except for a few telephones and voltmeters, a blacksmith's forge, and a cement testing machine, which were saved by the artillerists. The next casemate east housed a searchlight dynamo and the casemate dynamo and oil engine. This casemate not being ceiled, the fire had done little or no damage to the machinery. The searchlight, hich stood near the sally port, had been wrecked.

Most of the damage had been caused by the explosion, which acted on two planes at right angles to the face of the northwest bastion. Along one of these, to the northwest, no damage had been done, as there were no structures in that direction. On the other, to the northeast, along the line of structures belonging to the submarine mine defense, there was nothing left standing. The loading room, the superstructure of the cable tank, the torpedo storehouse, Engineer storehouse, and windmill were "blown to pieces and are heaps of ruins." The cable tank and mine cases could be salvaged. The Engineers' Wharf, though uninjured, was littered with debris.

The northwest bastion had been destroyed. All that remained was a pile of broken brickbats and dust. The cistern containing nine cable drums was cracked, and the water had leaked out. Its entrance was nearly blocked by debris.

No. 2 magazine and its 4,000 pounds of powder had been wet down before and after the explosion. No. 3 magazine was empty. The dynamite-filled magazine in the counterscarp had been in no danger.

Both doors of the mining casemate had been blown off their hinges. Twelve inch Battery Pensacola had lost three door staples, while its concrete had been chipped in several places. The guns and carriages, although near the blast, were uninjured.

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2. Horn to Adj. Gen., June 23, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 20056. Pvt. Welles was buried with military honors in the Barrancas National Cemetery at 4:30 p.m. on June 20, 1899.

To begin salvage operations, Captain Flagler called for $1,000.[3]

C. The Department Allots $1,000 for Salvage

The Department promptly allotted $1,000 from the appropriation for "Preservation and Repair of Fortifications" to be applied to the recovery and preservation of Engineer property.

Captain Flagler was to submit plans and estimates for reconstruction of the cable tank shed and torpedo storehouse. Salvaged property was to be stored in uninjured casemates and buildings.[4]

D. Captain Flagler Seeks to Ascertain the Cause

Captain Flagler, on investigating the cause of the explosion, offered three suggestions:

(a) Spontaneous combustion in the cotton waste left in Ordnance-Sergeant O'Riely's storeroom.

(b) The casemate containing the blocking had been opened to get blocking for mounting the 12-inch carriages. In passing to and fro, one of the men may have dropped a match or emptied his pipe.

(c) The soldiers had been in the habit of congregating in one of the nearby passages to play cards and talk, with pieces of paper scattered about the floor.[5]

Funds were soon forthcoming to finance reconstruction of the torpedo storehouse and the cable tank superstructure. Details of this operation are found in the chapter covering the Submarine Mine Defense System. The rubble (brickbats, etc.) from the shattered bastion and adjoining north curtain casemates was used for riprap to stabilize the shoreline fronting battery No. 3 (Alexander Trueman) in 1904-05.

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3. Flagler to Wilson, June 21 & 22, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/4; "Plan showing planes of explosion, August 30, 1899," Drawer 78, Sheet 93-1. A copy of this plan is on file at the Florida Unit,

4. Kuhn to Flagler, June 24, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/2.

5. Flagler to Wilson, Aug. 31, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31566/17.

XIII. SEARCHLIGHTS AS PART OF THE PROJECT

A. At the Turn of the Century

At the time of the June 20, 1899, explosion, there were two 36-inch searchlights assigned to the harbor defenses--one at Fort Pickens and the other at Fort McRee. The projector for the Santa Rosa Island light, along with other parts stored in a Fort Pickens casemate, was wrecked by the blast. By June 30, 1900, the dynamo and switchboard had been repaired. Meanwhile, the Fort McRee searchlight plant was transferred to the artillery by District Engineer Flagler.[1]

On January 8, 1901, District Engineer Judson submitted a project for a 36-inch searchlight at Fort Pickens. It would replace the one destroyed 18 months before. Judson, to fund the undertaking, asked for a $10,000 allotment. This broke down:

36-inch projector with proper dynamo, engine, and boiler	$7,500.00
Powerhouse (30-by-20-foot interior measurements) concrete with slate roof	1,300.00
Tracks, car, and shelter for searchlight	275.00
Installation and contingencies	925.00
TOTAL $10,000.00	$10,000.00

Accompanied by Capt. Henry L. Harris, Judson selected a site. The shelter would be located in the Fort Pickens chemin de ronde, to the left of the 12-inch guns' line of fire, and the powerhouse in rear of the right flank of the 12-inch battery, close under the retaining wall.[2]

Meanwhile, Post Commander Kinzie was writing headquarters, Department of the East, calling for four 36-inch searchlights--one for each major battery.[3]

When called on for its comments, the Board of Engineers suggested that a decision on the number of searchlights be deferred until it had made a further study. But, in view of the importance of having searchlights

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1. Executive Documents, Serial 4089, p. 943.

2. Judson to Wilson, Jan. 8, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 35499/2.

3. Kinzie to Adj. Gen., Dept. of the East, Jan. 8, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 35499/3.

installed at the harbor defenses and encouraging practice with them, the Board recommended that priority be given to installation of a 30-inch unit.[4]

Captain Judson, when called on for an estimate, placed the cost of installing a 30-inch projector at Fort Pickens at:

Shelter, incline, service platform, car, etc.	$ 400.00
4,000 feet No. 000 weatherproof cable	855.00
Installation of generator	200.00
Erecting poles	130.00
30-inch projector	2,500.00
Contingencies	215.00
TOTAL	$4,300.00

The cost of positioning the 36-inch searchlight currently on hand at Fort McRee would be $1,500.

Colonel Kinzie, while desirous of having both searchlights placed in operation, urged that priority be given to the one at Fort McRee.[5] Consequently, $1,500 was allotted for this purpose.

Captain Judson used the $1,500 to erect a small house about 1,500 feet from the Battery Slemmer dynamo room with which it was connected by cable. An inclined track was positioned up which, mounted on a car, the 36-inch searchlight could be hauled to a service platform. A drum was employed for hauling the searchlight. The incline was 168 feet in length, and for the incline and house, 56 piers were positioned.[6]

B. The System is Modernized and Expanded

In the early 1920's, funds were allotted by the War Department to modernize the Harbor Defense Project's searchlight system. More than 5 years earlier, the Board of Review, on studying the situation, had called for these additions and expenditures to the system: one 36-inch searchlight, $9,572; two 36-inch searchlights, $23,000; one 60-inch searchlight, $13,017; one 60-inch searchlight, $12,782; one 60-inch searchlight, $17,000; and one 60-inch searchlight, $8,000. This figure ($83,371) was to cover installation costs of seven searchlights. Subsequently, in 1917, the project

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4. Roberts to Wilson, Jan. 19, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 35499/3.

5. Judson to Wilson, Feb. 11, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 35499/3.

6. Executive Documents, Serial 4279, p. 632; Executive Documents, Serial 4444, p. 735.

was redefined by the Davis Board. Its primary mission would be to provide illumination for the fire of the coast defense guns, whereas the earlier lights' principal role had been to sweep the submarine minefield to prevent its penetration by minesweepers and torpedo boats.

The 1917 project, as implemented, involved construction and installation of these searchlights:

(a) Searchlights Nos. 1 and 2 were sited on the mainland about 1,300 yards northwest of Fort McRee. No. 1, a 60-inch light, was on a steel tower 46'4" in height, while No. 2, likewise a 60-inch light, was on a 36'4" tower. The towers' legs were supported by concrete piers. Power units for these lights were housed in a reinforced concrete shelter (15' by 23'8") and consisted of two 25-kilowatt generators. These lights and their towers were salvaged in 1945.[7]

(b) Searchlight No. 3 was positioned on Battery Slemmer's No. 1 emplacement. The 60-inch light was housed in a frame shelter, supported on a squat wooden tower. The power plant, a 25-kilowatt generator, was housed in Battery Slemmer. Searchlight No. 3 was removed in 1943 to facilitate construction of Battery 233, and stored at Fort Barrancas until salvaged in 1946.[8]

(c) Searchlights Nos. 4 and 5 (originally Nos. 7 and 8), both 60-inch, were positioned on 60-foot steel bascule towers, the legs of which rested on concrete foundations. These towers were, respectively, positioned 600 and 760 feet east of Battery Worth. Energy for the lights was provided by two 25-kilowatt generators housed in a 23'8" by 15' reinforced concrete structure. Searchlights Nos. 4 and 5 were salvaged in 1946.[9]

(d) Searchlights Nos. 6 and 7 (originally Nos. 9 and 10) were positioned on 60-foot steel bascule towers, their legs anchored to concrete support piers, 2,900 and 3,149 feet east of Battery Langdon. The 60-inch lights

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7. Fort Pickens Historical Record Book, N A, RG 392; "Defense of Pensacola, Fla., Searchlight No. 1," Drawer 80, Sheet 59-18; "Defense of Pensacola, Fla., Searchlight No. 2," Drawer 80, Sheet 59-19. Copies of these drawings are on file at the Florida Unit, GUIS.

8. Fort Pickens Historical Record Book, N A, RG 392; "Defense of Pensacola, Fla., Searchlight No. 3," Drawer 80, Sheet 59-20. A copy of this plan is on file at the Florida Unit, GUIS.

9. Fort Pickens Historical Record Book, N A, RG 392; "Defense of Pensacola, Fla., Proposed Foundations of Towers for Searchlights 7, 8, 9, & 10," Drawer 78, Sheet 106-17. A copy of this drawing is on file at the Florida Unit, GUIS.

were powered by two 25-kilowatt generators housed in a 23'8" by 15' reinforced concrete power station. These searchlights, their towers, and electrical equipment were salvaged in 1946.[10]

These seven searchlights and their power stations were given a final inspection and turned over to the Coast Artillery by the Corps of Engineers on February 9, 1923.[11]

(e) Searchlight 3A was added to the project during World War II. A 60-inch light positioned on a ramp at Fort Pickens, it was assigned to the AMTB Battery.[12]

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10. Ibid. In the 1920's, there was assigned to Fort Barrancas a mobile 36-inch searchlight mounted on a Cadillac truck.

11. Fort Pickens Historical Record Book, N A, RG 392.

12. Supplement to Harbor Defense Project, Harbor Defenses of Pensacola, July 1, 1945, N A, RG 407. On July 1, 1945, there were in storage at Fort Barrancas, four 60-inch portable searchlights. Plans, which were never implemented, called for siting one of these lights (to be designated No. 1) at Gulf Beach; old lights Nos. 1 and 2 (redesignated Nos. 2 and 3) were to be moved to Red Bluff; No. 3A to Fort McRee; Nos. 8 and 9, in storage, to Camp Saufley; and No. 10, also in storage, to Pensacola Beach.

XIV. THE CENTRAL POWER STATION: 1903-25

A. The Post Gets a Central Lighting System

In 1901, there were three electric generators on Santa Rosa Island. Battery Pensacola was lighted by 10 arc lamps (80V, 5 amp each) and 150--100V, 16 c.p. incandescents, powered by a 15-kilowatt 110-volt generator. At Battery Cullum, there was a 8-kilowatt, 110-volt generator, capable of handling 15 arcs. There were two 15-kilowatt generators at Battery Worth.[1]

The Department accordingly decided to utilize some of this power, which was excess to the needs of the batteries, to provide an exterior and interior lighting system for the post. To defer its cost, a $2,300 allotment was made. The Engineers were to position the poles and outside leads to and about the post from Battery Pensacola's electrical plant while the Quartermaster Department furnished the lamps and interior wiring.[2]

But there was a change in plans. In 1903, a central power station was established to supplement the battery powerhouses and to provide electricity to post facilities in the casemates of the southeast face of the Fort Pickens northeast bastion. Positioned in casemates Nos. 75 and 76 were one 50-kilowatt Skinner-Willey generator, one 10-kilowatt and one 8-kilowatt General Electric generators, three engines, a switchboard, and three storage batteries. Housed in a frame structure in the re-entrant formed by the bastion and the east curtain were a 103-horsepower Babcock & Wilcox boiler, a feed pump, and heater. Protruding through the roof of the boilerhouse was a tall iron chimney.[3]

B. Storing Coal for the System

Three frame sheds were erected in 1902-03 for storage of coal for the power stations at Batteries Pensacola, Cullum, and Worth. Heretofore, the fuel had been dumped on the ground.[4]

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1. Judson to Wilson, April 1, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 35499/10.

2. Executive Documents, Serial 4279, p. 834.

3. "Plan of Central Power Plant (in old casemate), Fort Pickens, Fla., showing General Arrangement," Drawer 78, Sheet 106-7. A copy of this drawing is on file at the Florida Unit, GUIS.

4. Executive Documents, Serial 4444, p. 740; Post Engineer to Post Adj., June 4, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 36261.

In the summer of 1903, $180 was allotted to convert into a coal shed for the central power station the casemate on the left of the sally port, next to the tracks. To accomplish this, the casemate was ceiled and floored.[5]

C. The 1905 Expansion and Improvement of the System

On August 12, 1904, Captain Cavanaugh submitted estimates for repairs and additions required to place the electric plants in good condition:

1. Battery Pensacola--The platform lighting was in conduit and was complete. Necessary conduit had been installed for all interior wiring except in magazines and shellrooms. There, the work had been delayed, pending a decision regarding these rooms' lining. To complete the installation, there would be required "erection of conduits and boxes in the magazines and shellrooms, purchase of the necessary wire and other materials, "and wiring all the conduit in these rooms." Cost of this work was placed at $698.50.

2. Battery Cullum--The platform lighting was conduit throughout, with exception of connections to mains. All interior lighting was open work and in such bad condition it would have to be replaced. The current for the battery was supplied from the central plant through a single feeder consisting of a twin conductor lead-covered cable, having a length of 1,600 feet from the switchboard to the distribution center in rear of the battery.

To supply the ammunition hoist motors from the central plant with "a drop not exceeding 10 percent will require feeders having a cross section not less than 400,000 c.m." To provide this current would require installation of an additional generating unit. This unit should be designed for future use in a permanent central plant. A boiler of sufficient power to operate a 50-kilowatt generator had been recently installed in a temporary plant, and there were plans to relocate it in a permanent unit.

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5. Post Engineer to Post Adj., June 22, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 36261.

Captain Cavanaugh estimated the cost of necessary work on the battery's electrical system at:

Material	$ 245.00
Labor	420.00
Lead-covered cable for distributing mains for motors and lights, installed in ducts, including necessary man-holes	1,600.00
Lead-covered cable for feeder for motor circuits installed in trench	2,400.00
One 50 k.w., 125 volt, D.C. generator, installed	1,250.00
One 75 H.P. automatic high-speed engine	2,000.00
One switchboard	200.00
	$8,115.00
Incidentals and superintendence--10%	811.50
TOTAL	$8,926.50

Turning to Battery Slemmer, Cavanaugh reminded the Department that its platforms were unlighted while the lighting system in the magazines and rooms was carried in "open wiring." To light the platforms and place the open wiring in conduit would cost $1,457.50.

Neither Battery Van Swearingen nor Battery Center had an electrical system. To light the platforms and rooms of the former was estimated at $654.50, and the latter at $1,457.50.[6]

On March 12, 1905, the Chief Engineer allotted $12,925 from the appropriation for "Modernizing Older Emplacements," March 3, 1905, to fund these projects.[7]

D. The Central Power Station is Phased Out

By 1916, the central powerhouse was leaking badly. Its boiler room was in a "very delapidated structure," which should be replaced. The commander of the defenses had recommended that commercial power be supplied to the post and that each battery be provided with a gasoline-driven electric generator. If this were done, the central power plant, with its smoke-belching chimney, could be removed and the boiler room and chimney razed.[8]

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6. Cavanaugh to Mackenzie, Aug. 12, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 18957/12.

7. Abbot to Cavanaugh, March 22, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 18957/12.

8. Boggs to Chief Engineer, April 21, 1916, N A, RG 77, Correspondence 1894-1923, Doc. 95520/17-20.

The 1903 powerhouse became superflous in the early 1920's, following completion of the Batteries Pensacola and Cullum powerhouses. In 1925, the equipment was surveyed and sold and the boiler house demolished.[9]

9. Fort Barrancas Historical Record, N A, RG 392, Coast Artillery Districts and Commands.

XV. THE PENSACOLA BAY FIRE CONTROL AND POSITION FINDING SYSTEM

A. Plans are Made, Reviewed, and Revised

In the summer of 1900, Army Headquarters called for construction at Fort Pickens of one fire commander's station and three battery commander's stations. These were to be positioned in high towers and were to be built as rapidly as funds would permit. So far as Chief Engineer Wilson was concerned, it was immaterial which station was erected first.

Available funds would allow construction of only one station in Fiscal Year 1901, and the battery commander's station for the 10-inch battery, with Type A Depression Range Finder, was designated. The artillery then indicated that they wished priority given to a different site, and Army Headquarters was agreeable.

Capt. Henry L. Harris accordingly asked that the battery commander's station for the mortar battery be first constructed, whereas the artillery inspector, Department of the East, preferred the fire commander's station. As these two stations would be in proximity to each other and were both screened by trees, and as the fire commander's station could be employed as a battery commander's station for the mortar battery until such time as the latter could be constructed, the Chief Engineer ordered plans and estimates prepared for the fire commander's station, instead of the battery commander's station for the 10-inch battery.[1]

On learning of this, Captain Harris went on record that if only one station is to be provided with a tower and Type A Depression Range Finder (DPF), it should be the mortar battery's battery commander's station. To counter arguments that the fire commander's station could be employed for the mortar battery in case of need, Harris pointed out that it was not as conveniently situated. It was about double the distance from the battery as the site selected for the battery commander's station, "thus rendering conversion of range and azimuth less accurate." Moreover, he continued, "the site is lower, making the cost of construction greater; and last, tho not least, the trees in the vicinity do not give as much cover or screen as at the site of the battery commander's station for the mortar battery."[2]

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1. Greene to CG, Dept. of the East, Aug. 11, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/4. Captain Harris was stationed at Fort Barrancas from May 1900 to May 1903. From 1894 to 1900, he had been a member of the Board for Regulation of Sea Coast Artillery Fire.

2. Harris to Story, Aug. 13, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/7. Maj. J. P. Story was stationed at Governors Island.

Harris agreed that if but one tower were to be erected for the Type A DPF at posts where all sites were low, it should be for the fire commander. But at Santa Rosa Island, he would change the location of the fire commander's station from that selected by the Board on the supposition that all the towers were to be erected at the site designated for the mortar battery commander's station for the reasons enumerated.

In peacetime, they could employ this station for a fire commander's station during maneuvers. Whenever the Army perfected its fire control system, he believed the artillery officers would find the single station position finder so advantageous that they would "clamor for towers on low sites."

Mortar batteries, he continued, usually possessed 360 degrees range of fire, and the difficulties of the horizontal base accumulated rapidly. When it became mandatory to have more than one for any battery, he would, if necessary, sacrifice the fire commander's in time of peace to obtain some definite and reliable results from practice with the mortars. The mortars, Harris continued, were the only modern ordnance the troops were permitted to fire with service charges. Even so, little was known of their capability of hitting the target.

The more he learned about the various seacoast fortifications, the more convinced Harris became of the "impracticability of following any hard and fast rule for such cases."

The original scheme to have a local board settle these matters was, in principle, the best. But the ignorance of most Artillery and Engineer officers to the capability of the various available instruments and the certainty of irreconcible clashes between the two corps led to its abandonment.

In reference to the Fort Pickens mortar battery, the distance from the fire control station to the directing pit was 541.66 yards. The Type A DPF, as constructed, only allowed for 500 yards as the distance for conversion from position finding to directing the gun. Although this could be corrected at a small expense, this would also have to be done in the instruments for the mortar batteries at Winthrop's Head, Massachusetts, and Fort Washington, Maryland.

Recently, he and several other officers had taken a small boat out into the Gulf. At a distance of 5 miles, they had examined the skyline behind the Santa Rosa Island and Fosters Bank batteries. What they saw satisfied them that at distances greater than 3,500 yards, it would be impossible to make out a 60-foot position finding station, if it were painted dark green, from a vessel standing offshore.[3]

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3. Harris to Story, Sept. 6, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/8.

In late September, Captain Harris learned that the inside measurements of the station to be placed on top of the tower to house the Type A DPF were 10 by 10 feet. This troubled him because the DPF must of necessity occupy the mid-point of the area, and the distance from the vertical axis of the instrument to a vertical line tanget to the posterior position of an observer at the DPF was 4 feet 6 inches. From this, it was apparent that there would be little space available for other persons or material.[4]

Chief Engineer Wilson, on reviewing the subject, found that the question of fire control at seacoast defenses had been the subject of reports by three boards. The first had been convened by Special Order No. 236, October 6, 1898, and consisted of Maj. J. P. Story and Capt. Henry L. Harris. It had defined the location and height of several fire commander's and battery commander's stations. Their report called for erection of numerous skeleton towers of considerable height at low lying sites.

A tower was subsequently designed and erected by the Corps of Engineers at Fort Hancock in 1899. This tower had been tested by a board convened by Special Order No. 148, June 26, 1899, and chaired by Col. H. C. Hasbrouck. Shots were fired and tests conducted and the board concluded, "It is believed that the tower is admirably suited to its purposes in every respect." Where range finder towers were to be built, the Hasbrouck Board recommended that they be of the Fort Hancock type.

The third board had merely reported in regard to the necessary harbor charts for fire control purposes.

Although the Chief Engineer had at no time looked with favor on "the general principle involved in the erection of high towers on low sites, for the purpose of installing the delicate and complicated instruments known as range and position finders," he had been ready to adapt these towers to the wishes and convenience of the Artillery officers. The Hasbrouck Board's report had been accepted by the Corps as the expression of mature judgment of the Artillery arm, and that type of tower station had been repeated in many places without any complaint until Harris'.

If the Corps could ascertain the current desire of the Artillery, provided it was sanctioned by the Secretary of War, General Wilson would modify this plan to the extent permitted by the appropriations. To enlarge the station room would necessitate new plans "to make the structure safe" in the hurricanes encountered on the Gulf and South Atlantic coasts.[5]

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4. Harris to Adj., Fort Barrancas, Oct. 6, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/10.

5. Wilson to Adj. Gen., Oct. 27, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/10.

Major Story, commenting on the reports for the War Department, noted that high towers for position finding were a novelty in the American service. The question to be settled was: the stability of the tower, i.e., whether vibrations caused by the fire of the great guns would prevent accurate and prompt observation of the position finder. No officer present at the Fort Hancock test had ever conducted practice by the principles prescribed for fire control and direction.

He could sympathize with the Chief Engineer, in his annoyance, because the Artillery could not agree on the subject. But, Story continued, few artillerists had fully utilized station houses for DPF's, and the "best methods of employing such instruments is yet in a state of development."[6]

Chief Engineer Wilson reminded the Artillery that a number of these range finder towers were under construction by contract. The suggested changes would necessitate the annulment of these contracts, and lead to litigation. He accordingly recommended that all towers for which materials had been ordered be completed.

Meanwhile, the Board of Engineers would devise plans and specifications for a "new family of towers." To insure that these drawings were satisfactory to the Artillery arm, it was recommended that Major Story appear before the Board, while the subject was under study, and "state the height of towers, and dimensions of rooms corresponding thereto, which should be used at the sites selected by the Artillery Board for range-finder stations."[7]

Secretary of War Elihu H. Root, on reviewing the correspondence, approved the course of action outlined by Chief Engineer Wilson. This resulted in the Department pigeonholing its directive for District Engineer Judson to prepare plans for a fire commander's station, pending a decision on changing the dimensions of the station enclosure.[8]

B. District Engineer Judson Erects a Shelter for a Position Finder

In May 1901, before a decision was reached on a "new family of towers," Chief of Ordnance Adelbert R. Buffington alerted the Corps of Engineers that his people would soon issue to Fort Pickens a Rafferty range

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6. Story to CG, Dept. of the East, Nov. 27, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/10.

7. Wilson to Adj. Gen., Dec. 6, 1900, N A, RG 77, Correspondence 1894-1923, Doc. 35518/10.

8. Executive Documents, Serial 4279, p. 834; Executive Documents, Serial 4444, p. 736.

finder and eight extra bases. The latter differed materially from those used for the Type B Lewis DPF presently installed at various coastal defense installations.[9]

On checking with the post commander, District Engineer Judson learned that only one base would be employed for target practice this year, and it had been positioned. As soon as the post commander had selected the remaining locations, Captain Judson asked for and was granted a $140 allotment to fund the project.[10]

During the autumn of 1901, the shelter for the Rafferty position finder was erected.[11]

C. The Army Activates and Tests a Novel System

1. Major Whistler's proposal for a horizontal base system of position finding

In Fiscal Year 1900, the Corps of Engineers had continued the installation at certain harbor defenses of range- and position-finders as required by the Board for Regulation of Seacoast Artillery Fire. Then, on May 25, 1900, President McKinley signed into law a bill appropriating $150,000 for continuation of this work. Many details of the fire control system, however, were being debated by service personnel involved. Especially vexing was the question of how to best employ the DPF range finders at sites near sea level. After a number of towers had been built for these DPF's, modelled after the experimental tower at Fort Hancock adopted by a mixed board of Artillery, Ordnance, and Engineer officers, objections were made to the size of the observation room. Work on the towers was stopped until the Artillery could resolve the problem.

Chief Engineer Wilson took the position that fire control was a tactical problem to be resolved by the Artillery. Maj. G. W. Whistler was given the task by the Chief of Artillery of resolving this problem, as well as installing an extensive system of position finders employing long horizontal bases. If successful, it would permit more accurate fire of seacoast guns by triangulation.[12]

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9. Buffington to Chief Engineer, May 22, 1901, N A, RG 156, Doc. 39429. Rafferty range finders were also issued at this time to: Fort Williams, Me.; Fort Caswell, N.C.; Forts DuPont and Delaware, Del.; Fort Hancock, N.J.; Fort Howard, Md.; Fort Morgan, Ala.; and Fort Taylor, Fla.

10. Judson to Gillespie, June 18, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 39479/29.

11. Executive Documents, Serial 4279, p. 834.

12. Executive Documents, Serial 4089, pp. 10-11; Serial 4279, pp. 10-11.

In the autumn of 1901, Major Whistler located three base lines--one at Fort Pickens and two on Fosters Bank. He then called on the Engineers to make the necessary triangulations "to permanently and definitely locate these base lines." Because of the trees, it would be necessary to erect towers that could be seen above the vegetation.[13]

The Chief Engineer's Office allotted $150 for this work[14]

On January 3, 1902, the Board of Ordnance and Fortification met to consider Major Whistler's report on location of an "experimental installation of a horizontal base system of position finding for fire control and direction in Pensacola Harbor." After careful consideration, the Board recommended that Pensacola Bay be selected for the experimental installation in accordance with the Whistler report. The system's wiring was to be placed in permanent conduits. To implement the project, the Board allotted $15,000.[15]

Major Whistler's proposal called for one General Fire Control Station (GFCS) at Pensacola. It was to be at Fort Pickens, as the Fire Command (FC) at Fort McRee was merely a detached battery. The FC at Pickens called for four stations: the fire commander's station (FCS) and three battery commander's (BC) stations. There was to be an interval of 25 yards between stations with traverses of sufficient width to protect adjoining stations from the fragments or concussion of a shell exploding in one of them.

The base lines were to be so located that should one station be destroyed, the fire direction of the battery could be carried on from another. To meet this requirement, all base lines from the GFCS were to be of identical length and azimuth. They were to parallel each other.

The FCS and three BC stations were, when permanently installed, to be built in accordance to the most recent design prepared by the Corps of Engineers, with proper cover and traverses between sections. A covered way would be constructed along the traverses, connected with balconies in rear of the structures. Stairways were to provide easy access.

The height of the instruments in the GFCS were not to be less than 32 feet above mean high water. There were to be two base lines from the GFCS to cover the entire field of fire.

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13. Whistler to Adj., Fort Barrancas, Nov. 22, 1901, N A, RG 77, Correspodence 1894-1923, Doc. 35518/19.

14. Abbot to Judson, Nov. 30, 1901, N A, RG 77, Correspondence 1894-1923, Doc. 35518/19.

15. Miles to Secretary of War, Jan. 6, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/21. Lt. Gen. Nelson A. Miles was president of the subject board.

There were to be four base lines, each of 2,000 feet, extending from the GFCS to the general secondary stations (GSS). To insure parallelism, the azimuth of the GSS was to be the same as that of the GFCS, and the distance between the secondary instruments to be the same as that between the primary instruments -- 93 feet.

The stations in the GSS could be small rooms about 6 feet square, interior dimensions, with openings for viewing the field of fire. The height of the GSS principal base was to be 32 feet above mean high water.

Major Whistler had located the GSS supplementary base on Fort Barrancas. Small structures on the parapet would be all that were necessary. The FCS was likewise at the Third System fort. As it was intended for a DPF instrument, it would be necessary to construct a building of sufficient height to provide a vertical base 100 feet above mean high water.

As this was an experiment, Major Whistler recommended that temporary structures be erected on concrete piers. If the experiment were successful, the temporary buildings could be removed, and permanent structures substituted.

The Fort McRee fire command required a single BC station, a well protected switchboard room below, and two secondary stations--C and D. The former would require cover, and must be 32 feet above mean high water. The secondary station at "D" would not require cover, as it was screened by vegetation. It must, however, be given additional height to permit the observers to see over the trees.

As the entire system was dependent on the use of DPF's, proper datum points were vital. Whistler had located them in shallow water as follows:

No. 1 near the shore in front of Barrancas Barracks.

No. 2 near a reference mark on the navy yard wharf.

No. 3 near shore of Santa Rosa Island so it could be seen from the Fort McRee BC.

No. 4 on Deer Point just offshore.

No. 5 in the lagoon just within the 5-mile circle.

These lights were needed for the project:

(a) A 30-inch electric control searchlight at Fort Barrancas for the fort commander.

(b) A 30-inch electric control searchlight from the Fort Pickens FC station.

(c) Two 24-inch minefield hand-operated searchlights.

(d) Two 30-inch blindig hand-operated searchlights.

(e) 30-inch illumination light for Battery Cullum, to be positioned in front and to the left of the GFCS.

(f) 36-inch illuminating light for Battery Pensacola, to be controlled from the BC station, and positioned to the left of the Battery Cullum light.

(g) 36-inch illuminating light for Battery Worth, to be operated from the BC station. This light would require two positions, one for outside and a second for inside work.[16]

2. Estimates are submitted and funds allotted

District Engineer Raymond, having discussed the project with Majr Whistler, submitted estimates for construction of the required temporary wooden towers with concrete piers. Five towers were for both Type A and Type B instruments, one for Type A alone, and six for Type B. The breakdown of the figures revealed:

Concrete in towers for Type "A" instruments, 252 yards at $17.00	$4,284.00	(Permanent)
Concrete in towers for Type "B" instruments, 189 yards at $17.00	3,213.00	(Permanent)
Lumber in towers for Type "A", 84,000 feet, B.M., at $20.00	1,680.00	
Lumber in towers for Type "B", 18,300 feet, B.M., at $20.00	366.00	
Labor on framing on towers for Type "A"	956.00	
Labor on framing on towers for Type "B"	450.00	
Iron work, material and labor	85.00	
Painting	100.00	
Roofing, material and labor	120.00	
Sundries	216.00	
Shutters	225.00	
Doors	36.00	
Iron piles for datum points	840.00	(Permanent)
Driving piles for datum points	210.00	(Permanent)
Conduits for electric cable, material and labor	620.00	
Transportation	525.00	
Contingencies, etc. (10 percent)	1,392.60	
TOTAL	$15,318.60	

16. "Special Report on Installation of Fire Control System" by Maj. G. N. Whistler, undated, N A, RG 77, Correspondence 1894-1923, Doc. 35518/25; "Pensacola Harbor, Fla; General Project for Defense, Proposed by the Board of Engineers: Plate II, Harbor Chart showing location of Primary and Secondary Stations and Lights, Also location of Datum Points," Drawer 77, Sheet 31-7. A copy of this plan is on file at the Florida Unit, GUIS.

Of this sum, $8,547 was for permanent improvements. In addition to this total, another $2,000 was required for vista clearing.[17]

Chief Engineer Gillespie allotted $8,547 for permanent character work, while Lieutenant Raymond was directed to look to the Board of Ordnance and Fortification for money to cover the temporary improvements.[18]

The Board, in April, made available the $8,771.60 needed to bring the total allotment up to the sum estimated by Lieutenant Raymond for the experimental system of range and position finding.[19]

3. The system is installed

Although funds had been allotted, construction dragged. When called on for an explanation, Lieutenant Raymond noted that the Corps' work consisted of construction of 12 range towers or stations, the laying of cables for distribution of electric power, trenching for the telautograph cables to be laid by the Signal Corps, and construction of five datum points. It had been planned to complete this work in November.

By August, the eight Fort Pickens towers had been completed though the Signal Corps did nt take possession until October. The towers at Fort McRee and on the mainland were ready by the date required. All the Engineers' cable was laid in November. Not only were the trenches dug, as required by the Signal Corps, but all cables, except one, were positioned by Engineer employees, assisted by the garrison. The cables, where possible to avoid expense of a number of parallel trenches, were laid in a single ditch.

The datum points, excepting four piles, had been positioned in November.

The Signal Corps, however, had not kept pace. Only one telautograph had been installed, and many connections had not been made.

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17. Raymond to Gillespie, March 21, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/55.

18. Abbot to Raymond, March 26, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/55.

19. Miles to Root, April 5, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/59.

As yet, all the range finders provided by the Ordnance Department had not been installed. Some that had exhibited a structural weakness which would have to be corrected before a satisfactory test of the system could be made.[20]

By late winter of 1903, all elements of the experimental system had been installed. The primary stations were situated at 93-foot intervals between centers on the base line and the secondary stations at like intervals on the same lines. There were thus four distinct base lines, each having the same azimuth and length. It was, therefore, possible to operate any battery from its battery commander's station, or from its fire commander's station, or from any other station of the same group by employing a proper spanner to relocate for the gun from the new station. Two batteries could be fought from a station, provided they were firing on the same target.

The general arrangement of the primary (principal) stations was similar to the "type plan" prepared by the Board of Engineers. What differences there were in construction resulted from the experimental nature of the structures. The concrete piers were heavier than called for, as vibrations were feared, and the bases were 10 feet square. To save material and to keep the centers of gravity low, the upper portions of the piers were hollow.

Concrete foundations, independent of the piers, were built for the temporary wooden towers, the frames of which were securely bolted together and to the foundations, to prevent them being overturned by high winds. All piers were enclosed by wooden sheathing nailed upon the tower frames.

By constructing the roofs on cantilever frames, the telescope slots were left unobstructed over the entire field of fire. There were no windows, the light for the plotting room entering through the telescope slots and skylights over the plotting boards. Roofs were covered with tarred asbestos roofing felt.

The secondary stations contained one 6'3" by 6'3" room.

Plotting rooms of the primary (principal) stations were 15'3" deep by 16' wide. This was of suitable size, even with the full circle plotting board employed for Battery Worth and the fire commander's stations. The difficulty of plotting over one of these large boards, Captain Raymond believed, might mandate the use of two semicircular boards with a space of several feet between. This would not affect the width of the room but its depth should then be increased to 18-20 feet.

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20. Raymond to Gillespie, Dec. 22, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/78.

A width of 16 feet had been found satisfactory for the observation room, allowing sufficient space around both instruments.[21]

The rooms intended as storage battery rooms, however, were too small and damp. Temporary wooden structures (25 by 12 feet), provided with strong benches for cells, were built at Batteries Worth and Slemmer. The doors were placed in the ends of the buildings, and sliding windows of the greatest possible width built in the sides to be opened when the guns were firing.[22]

The generating plants had been removed from Batteries Pensacola and Cullum and installed in the flanking casemates of Fort Pickens' northeast bastion.[23]

The Fire Commander's Station (FC) at Fort Pickens for the primary stations was about 200 yards east of the superior slope of the masonry fort's southeast bastion. It was flanked on the east by Battery Worth's BC station and on the west by the BC station for Battery Pensacola. Battery Cullum's BC station was to the west of Battery Pensacola's.

The secondary stations for the Santa Rosa Island fire command were near the bay shore, 1,000 yards east of Battery Worth. They were positioned in the same relation as at the primary stations.[24]

4. The telautograph booths and niches for the seacoast and mortar batteries

On June 21, 1902, Lieutenant Raymond, after a meeting with Major Whistler, had submitted estimates of the cost of installation of a telautograph system for the Pensacola defenses. He called for:

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21. Raymond to Suter, May 9, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/104; "Sketch of Base Line Stations of Fire Control System at Fort Pickens, Pensacola Harbor, Fla.," Drawer 77, Sheet 31-11. A copy of the subject plans is on file at the Florida Unit, GUIS.

22. Raymond to Suter, May 9, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/104.

23. Ibid.

24. "Forts Pickens, Barrancas, and McRee, Pensacola Harbor, Fla., showing the location of underground electrical conductors and conduits installed by the Engineer Department," Drawer 78, Sheet 106-2. A copy of this drawing is on file at the Florida Unit, GUIS.

1,800 feet Duplex, L.C. cable 150,000 C.M. at $550.00 per M	$ 990.00
4,100 feet, same, No. 5 at $130.00 per M	533.00
300 feet, same, No. 12 at $100.00 per M	30.00
7,900 feet, same, No. 6 at $125.00 per M	937.50
6,930 feet, same, No. 5 at $130.00 per M	900.90
1,200 feet submarine cable, No. 6, at $300.00 per M	360.00
Freight	200.00
Expert Labor	200.00
	$4,201.40
Contingencies, 10 percent	420.14
TOTAL	$4,621.54

To this must be added the cost of wiring the stations for lighting, viz:

54 lights at $2.00--$108.00, plus 10 percent	118.80
Making a total of	$4,740.34

It was, however, unclear whether the small storage batteries for the system were to be supplied by the Engineers or Signal Corps. If by the former, another $1,320 must be added to the allotment.[25]

Chief Engineer Gillespie allotted $4,740 to fund the project on the assumption the Chief Signal Officer would provide for the storage batteries.[26]

In the autumn of 1902, steps were taken to cut telautograph niches, 20 inches deep and 30 inches wide, in the side walls of the loading platforms in the Batteries Pensacola, Cullum, and Slemmer emplacements.[27] Two hundred dollars were allotted, but another $100 had to be programmed for cutting niches for installation of the telautograph and firing wires.[28]

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25. Raymond to Gillespie, June 21, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/65.

26. Gillespie to Raymond, June 28, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/65.

27. Whistler to Randolph, Oct. 20, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/72.

28. Raymond to Gillespie, Nov. 10, 1902, N A, RG 77, Correspondence 1894-1923, Doc. 35518/72. Details of the telautograph booths are found on these drawings: "Defenses of Pensacola Harbor, Fla., Details of Telautograph (continued)

D. The April 1903 Test

1. The firing plan

By April 1, 1903, preparations for the test were completed, and Col. Samuel M. Mills issued necessary orders. Battery commanders were to make all arrangements for firing and to assure themselves that the ammunition was on hand and properly used. As only one gun in each battery was to be fired for any single division of the test, except in case of salvo fire, the spare trucks should be used with the gun to be fired, and a projectile placed on each one.

For the various phases of the second division of the test, 15 rounds would be fired from Batteries Pensacola and Slemmer and 17 rounds from Battery Cullum, including sighting shots. During this division of the test, as all firing was supposed to be at vessels underway, no two shots from the same gun were to be fired at an interval of less than 2 minutes.

During the test's third division, each battery was to fire ten rounds, inclusive of sighting shots.

A sighting shot was authorized, preparatory to the daily firing. To eliminate wind effects as much as possible, this shot was to be fired as nearly as practicable at right angles to the wind direction, and at a range of 5,500 yards.

The point selected would be carefully relocated for the primary and secondary stations and each instrument set accurately on azimuth before the gun was fired.

Since the firing was to be controlled from a distant station, the battery officers were to be particularly careful that no shot endangered any vessel.[29]

2. The guns roar

On April 18, the Board (Cols. Charles R. Suter and Amos Stickney, Lt. Col. William R. Livermore, and Majs. Rogers Bernie and Sedgwick Pratt) arrived at Pensacola and spent the next two days inspecting the batteries and the proposed fire control system. The test, which included

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28. (continued) Booths and Niches," and "Defenses of Pensacola Harbor, Fla., Locations of Telautograph Booths and Niches." Copies of these plans--numbered Drawer 78, Sheet 90-13, and Drawer 78, Sheet 90-14--are on file at the Florida Unit,

29. General Order 21, Fort Barrancas, April 1, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/99.

Batteries Pensacola, Cullum, Worth, and Slemmer, began on the 21st. The Board took position at the Fort Barrancas Fire Commander's Station, where they were joined by Major Whistler.

Major Whistler by telephone gave the fire commanders at Forts Pickens and McRee their targets and orders for trial shots, and the guns opened fire after an average lapse of 4 minutes 26 seconds. A second service began. Grass fires in front of Batteries Pensacola and Cullum caused a two-minute delay to extinguish.

That afternoon, the Board took position in the FC and BC stations at Fort Pickens to witness the fire of Battery Worth's eight 12-inch mortars at "a constant angle of elevation of 45 degrees at moving targets."

On April 22, the Board again took station at Forts Barrancas and Pickens to watch further tests of the guns at moving targets and the firing of the mortars at 52 degrees elevation. Because of the atmospheric haze, the day's tests were cancelled. The Board then dispersed.[30]

3. Evaluating the results

After the firing ceased, District Engineer Raymond carefully examined each emplacement and range station. No damage had been done to the platforms or other masonry of the emplacements, except at Battery Pensacola. There, the brick lining of magazine No. 1 was badly cracked, several bricks from the top course having been dislodged. Mortar that had been shaken down behind the lining had obstructed the drains of the airspace, causing water to flow across the floor of the magazine, which had heretofore been dry. The lining walls of the adjacent shellroom were fractured but not displaced. No damage had been done to the lead ceilings.

At Battery Cullum, the blast aprons had been shattered by previous firings. No further damage had occurred, except for one 200-pound fragment being lifted and overturned.

Batteries Slemmer and Pensacola did not have blast aprons. There, the sand under the muzzles had been only slightly disturbed, although 25 rounds had been fired from Battery Pensacola. Thus, it seemed that sod protection was ample, and not only were aprons non-essential, but they constituted a danger from a shell burst hurling fragments about the emplacements.

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30. Suter to Gillespie, July 31, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/104; "Map of Entrance to Pensacola Harbor, Fla., showing Installation of Experimental Fire control System, Tested April 20-23, 1903," Drawer 77, Sheet 31-10. A copy of this drawing is on file at the Florida Unit, GUIS.

Little damage had been suffered by the fire control stations, except at Fort McRee. At this station, on the right flank of Battery Slemmer, a Type A instrument had been knocked out of adjustment, one window sash in the switchboard room smashed, several lights dislodged or broken, and the telautograph thrown to the floor.[31]

Meanwhile, the Army's Chief Signal Officer, Brig. Gen. Adolphus W. Greely, had complimented Chief Engineer Gillespie on the success that had attended the operation of the telautographs and telephones in the recessed booths during the test of the experimental horizontal base range finding system, although the shock of firing with service charges had been "so great as to affect the face of concrete in place, yet the telephones and telautographs withstood the concussion admirably." In no case was any of the electrical apparatus protected by the recessed booths disturbed.[32]

The War Department, after reviewing and evaluating Whistler's experimental system, found that the long horizontal base for indirect position-finding had proved itself. In Fiscal Year 1904, it was adopted by the Army for installation at the Nation's coastal defense fortifications.[33]

E. The Fire Control System Becomes Highly Sophisticated

1. Improvements to the system--1903-06

In October 1903, the post engineer called for an allotment to build a box over each of the Battery Worth telautograph receivers to prevent deterioration of instruments because of moisture in the rooms.[34] These coverings were to be light pine doors, similar to those already hung at Batteries Cullum, Pensacola, and Slemmer.[35]

The project was promptly approved and implemented.

Early in May 1906, the post commander, in accordance with G.O. 72, April 11, 1906, called for installation of circular benches for

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31. Ibid.

32. Greely to Gillespie, May 5, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/102.

33. Executive Documents, Serial 4444, pp. 11-12; Serial 4636, p. 12.

34. Sheen to Post Adj., October 2, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/117.

35. Cavanaugh to Adams, Oct. 14, 1903, N A, RG 77, Correspondence 1894-1923, Doc. 35518/117. Lt. Col. Henry M. Adams was division engineer for the Gulf Division, with headquarters at New Orleans. He had succeeded Colonel Hains as Division Engineer in July 1901.

observing the instruments and plotting boards in the fire commander's and battery commander's stations, and for corrugated rubber floor cloth.[36] The latter was to cover the floors in the plotting and observing rooms, and the connecting stairs where it would deaden noise.[37]

The Department allotted $500 for the corrugated rubber flooring and $170 for circular benches. This work was undertaken under Captain Cavanaugh's supervision.[38]

2. The BC stations are relocated and the towers proliferate

To improve the efficiency of its indirect range finding system for seacoast batteries, the Army, beginning in 1904, began relocating the Battery Commander's stations by placing them at the emplacements. In 1904, a BC station for Battery Worth was constructed on top of the parapet between pits A and B.

In 1908, upon completion of the splinter-proof BC station for Battery Pensacola at the emplacements, the frame 1902 station was listed as obsolete. It was destroyed by fire on February 24, 1911. Splinter-proof BC stations were built at Battery Cullum in 1914-15 and Battery Slemmer in 1908.[39]

In the early 1920's, three steel fire control towers were built at Barrancas Beach to house secondary stations for Batteries Langdon, Worth, and Pensacola. When Battery Pensacola was disarmed in 1934, its B"S" was reassigned and performed a similar mission for Battery GPF.[40]

The September 20, 1926, hurricane destroyed the 1902 secondary stations (B"S") on the marge of the bay, 1,000 yards east of Battery Worth. At this time, these stations served Batteries Cullum and Worth. Also wrecked

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36. Cavanaugh to Mackenzie, May 24, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 35518/159.

37. Abbot to Cavanaugh, May 29, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 35518/159.

38. Abbot to Cavanaugh, June 23, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 35518/159.

39. Fort Pickens, Fort Record Book, N A, RG 392.

40. "Defense of Pensacola, Fla., Fire Control Structure, Secondary Station Pensacola," Drawer 78, Sheet 90-28; Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, July 15, 1936, N A, RG 407.

by this storm was the secondary station for Battery Sevier housed at Fort McRee, in the structure formerly employed as the Battery Slemmer BC station.[41]

In 1930, the Engineers erected three steel frame towers, supported on concrete piers, near the beach 800 yards northwest of Battery Langdon. Positioned on these towers, which cost $3,996 each, were 10-by 10-foot, interior dimensions, fire control stations. Atop each station was an observation platform with a pipe handrail. From west to east, these stations, designated the Butler Group, served as secondary stations for Batteries Sevier, Cullum, and Langdon. In 1933, after Batteries Sevier and Cullum were withdrawn from the Defense Project, the westernmost station was assigned to Battery GPF and the middle one to Fire Group II.[42]

By the 1930's, another trio of towers, known as the Davis Group, had been erected about 300 yards west of Battery Langdon. The middle tower served as Battery Worth's secondary station, while the one to the west was assigned to the Harbor Defenses and the eastern structure was for auxiliary purposes.[43]

3. World War II brings radar and an increase in base lines

During World War II, the fire control system became more complex. Battery Langdon was provided with one primary and four secondary stations. The station B'S' in the Butler Group was retained; the B"S" tower at Barrancas Beach was replaced by a double tier station; double tier towers B""S""and B""S"" were erected, the former near Deer Point and the latter at Red Bluff; and a tower B""'S""' at Bald Point. The primary station (B'S') for construction No. 233 was on the lower tier of the Barrancas Beach fire control tower, its B"S" in one of the Butler Group towers and its B"'S"' in the lower tier of the Red Bluff tower. The primary station (B'S') for construction No. 234 was at the Butler Group; its secondary station B"S" was at Barrancas Beach; and its secondary station (B"'S"') was in the lower tier of the Deer Point tower.

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41. Fort Pickens Historical Record Book, N A, RG 392.

42. Annexes to Harbor Defense Project, Harbor Defense of Pensacola, July 15, 1936, N A, RG 407; Fort Pickens Historical Record Book, N A, RG 392; "Final Relocation of Three New Steel Towers--Old Secondary Group, Replacing Wooden Towers Destroyed in 1926," Drawer 78, Sheet 106-30.

43. Ibid.

Battery Langdon and Construction Nos. 233 and 234 were each provided with an SCR-296 radar. It was expected that these units could track targets "up to 20,000 yards."[44]

44. Supplement to the Harbor Defense Project, Harbor Defenses of Pensacola, July 1, 1945, N.A., RG 407.

XVI. PROTECTING THE DEFENSES AGAINST THE SEA AND WINDS

A. The Turn of the Century Efforts to Check the Sea's Encroachments

The Pensacola Endicott fortifications would have to be protected from encroachments by the sea and the surging surf and flood tides that accompanied the feared Gulf Coast hurricanes. Also, along this section of coast, there is a gradual migration of the offshore barrier islands from east to west. In the 1860's, this phenomenon had doomed masonry Fort McRee, and had seen an accretion to the shoreline of Santa Rosa Island west of Fort Pickens.

As a harbinger of what to expect, a late winter storm hammered the Florida panhandle in 1899. On the morning of February 23, the tug Menefee passed the navy yard en route to Fosters Bank. She had in tow the gravel-laden barge Clyde. Buffeted by high waves, the barge collided with the monitor Passaic, starting a bad leak. When they reached the Fort McRee wharf, the barge was anchored, while workmen unloaded the tug's deck load of cement. Before they were finished, the barge was driven hard aground on a shoal fronting the lagoon.

As soon as Menefee was unloaded, Assistant Engineer Turtle told the captain to return to the yard and pick up one of the Army's barges to lighten Clyde.It was mid-afternoon before she returned, and, by then, the surf was running too strong to lash the barges together. The next morning, the gravel was transferred from Clyde to the other barge.

During the night of the 24th, the storm worsened, and Clyde, dragging her anchor, was driven aground and pounded to pieces. A contractor's barge loaded with gravel was also lost during the blow.[1]

Consequently, during the late 1890's and the first 5 years of the 20th century, the Corps of Engineers spent small sums to protect from the sea Battery Center on Fosters Bank and the site of battery No. 3 (Alexander Trueman) on Santa Rosa Island. For details on these projects, the reader is referred to the chapters describing the construction history of Batteries Center and Alexander Trueman.

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1. Flagler to Wilson, June 23, 1899, N A, RG 77, Correspondence 1894-1923, Doc. 31614.

Expenditures for this activity increased sharply in 1904. In that year, District Engineer Cavanaugh called for repair of the north groin of Fort McRee to cost $2,750, and for this work at Fort Pickens:

Purchase of 1,500 tons of riprap	$4,500
Placing 4,750 tons of stone in jetties	4,750
Collecting and placing old masonry from ditch of Fort Pickens and from Battery Cullum	1,000
Superintendence	500
TOTAL	$10,750[2]

The Department promptly allotted the requested sum, and by winter the subject improvements had been completed.[3]

B. The September 1906 Hurricane

1. A hurricane roars in from the Gulf

The riprapping and groins were tested and found wanting by the killer hurricane of 1906. On the night of September 26, the eye of the hurricane that had stormed into the Gulf of Mexico through the Yucatan Channel ripped into the area. At this time, the 22d Company Coast Artillery (1st Lt. L.S. Edwards commanding) was posted at Fort McRee; the 15th Company (Capt. W.F. Stewart) at Fort Pickens; and the 7th, 9th, and 20th Companies, and the 8th Band, Coast Artillery Corps, at Fort Barrancas.

For several days before the hurricane arrived, there had been strong winds out of the south. At flood tide, on the morning of the 26th, the surf lapped into the ruins of old Fort McRee, which was being used as a guardhouse. Most people now concluded that the storm had climaxed. But during the night, the winds became stronger, registering a velocity of 85 miles per hour, and changed directions several times. This caused the water to "pile up" in Pensacola Bay, and it reached a depth of 10 feet above normal high tide at Fort Pickens and 12 feet at Fort McRee.

Captain Stewart and his men of the 15th Company fled their frame quarters and barracks for the safety afforded by Fort Pickens. To

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2. Cavanaugh to Mackenzie, May 16, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 51148.

3. Abbot to Adams, May 23, 1904, N A, RG 77, Correspondence 1894-1923, Doc. 51148.

keep from being swept away by the surf as they crossed the island to the old masonry fort, the soldiers lashed themselves together with rope safety lines.

The situation on low lying Fosters Bank was worse. There, the sea tide surged over the post with little warning from the Gulf side. Lieutenant Edwards and most of the men of the 22d Company fought their way through the inky blackness to Battery Slemmer, where they spent the remainder of the night. About 20 people were isolated at the quarters when the sea flooded the railroad embankment leading from the post housing to Battery Slemmer. Many of these people sought refuge on the roof of the ordnance storehose. There, they remained with difficulty till morning. Among this group was Electrician-Sergeant Paul Crank and his wife. The storehouse was washed off its bearings, but the field guns stored within kept it from being swept away.

The remainder of the people cut off at the quarters fled from building to building as they felt them giving away. Ordnance-Sergeant Lewis H. Prentice watched in helpless horror as his wife and son were carried to their death. Several took refuge on an "overground cistern." When it started to disintegrate, three soldiers sought to swim to the Barrancas side of the lagoon. By utilizing drift timbers, two of them struggled to safety. Quartermaster-Sergeant Morris G. Oberlander, however, was swept out to sea and never seen again.

Most of the isolated soldiers and dependents finally made it to the water tank to which they clung. Before morning, Pvt. Roy A. Jordan lost his grip and was washed to his death.

At the Barrancas, no lives were lost, although all buildings were damaged. As soon as it was light, Capt. L.S. Miller called for volunteers to rescue the people cut off on storm-battered Fosters Bank. Because of the wind and waves, this was a hazardous undertaking. Finally, a boat manned by Capt. Fred L. Austin, 2d. Lt. Lawrence C. Crawford, and eight enlisted men succeeded. Their courage and self-sacrifice was recognized by the Army in General Orders.[4]

2. Captain Cavanaugh submits estimates for repair of damages to the fortifications and Engineer property

District Engineer Cavanaugh rushed from Montgomery to Pensacola to survey the damage and direct salvage. All telegraph lines were down so Cavanaugh sent his chief clerk, William L. Campbell, back to Montgomery to apprise Washington of the extent of damage to Engineer property. On September 30, Campbell reported:

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4. Fort Barrancas Historical Record, N A, RG 392, Coast Artillery Districts and Commands; General Order No. 42, Nov. 12, 1906, Department of the Gulf.

Slemmer--slopes one-half gone, concrete uninjured; Center--slopes gone, concrete badly injured; Trueman--slopes gone, concrete uninjured; Payne--slopes gone, concrete uninjured; Van Swearingen--slopes half-gone, concrete uninjured; Cullum--slopes one-third gone, concrete uninjured; Pensacola--no injury; Worth--no injury; Cooper--slopes one-third gone, concrete uninjured; launch Arrow and boathouse destroyed; all electrical installations more or less injured; wharf somewhat damaged; dredge Cucus all right; much wreckage will have to b removed.

To meet emergency needs, $10,000 was required immediately.[5]

No funds, however, were available from "Preservation and Repair," as the appropriation for Fiscal Year 1907 had already been allotted. But Chief Engineer Mackenzie was agreeable to employing such funds as were already in the District Engineer's hands and unobligated to "prevent present damages leading to worse conditions."[6]

By early November, Captain Cavanaugh was able to submit estimates of the costs of repairing the batteries and Engineer property at Forts Pickens and McRee. The repair of the battery slopes would be very expensive because the "supply" of sand nearby had been "exhausted by the construction program or swept away" by the hurricane. Henceforth, all sod and soil would have to be transported from the mainland. As the snd parapet of Battery Cullum had been excessive, Cavanaugh proposed to restore it "only so far as may be necessary to make it conform to present practice."

The cost of repairs to the wharf, fire control stations, and other structures requiring lumber would be unusually high because of the great loss of standing timber during the storm, followed by escalating prices.

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5. Campbell to Chief Engineer, Sept. 30, 1906, N A, RG77, Correspondence 1894-1923, Doc. 61026.

6. Abbot to Campbell, Oct. 1, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 61026.

The estimates called for:

FORT PICKENS

BATTERY PAYNE		
Plant and railroad track	$ 600.00	
Cleaning away debris	250.00	
Sand filling	4,000.00	
Sodding and top soil	2,500.00	
	$7,350.00	
Superintendence and contingencies (15%)	1,102.50	$8,452.50
BATTERY TRUEMAN		
Plant and railroad track	$ 750.00	
Cleaning away debris	50.00	
Sand filling	4,250.00	
Sodding and top soil	2,500.00	
	$7,550.00	
Superintendence and contingencies (15%)	1,132.50	$8,682.50
BATTERY COOPER		
Plant and railroad track	$1,000.00	
Sand filling	3,200.00	
Sodding and top soil	3,500.00	
	$7,700.00	
Superintendence and contingencies (15%)	1,155.00	$8,855.00
BATTERY CULLUM		
Sand filling and repairing slopes	$1,600.00	
Sodding and top soil	7,000.00	
Cleaning up debris and minor repairs	300.00	
	$8,900.00	
Superintendence and contingencies (15%)	1,335.00	$10,235.00
BATTERY VAN SWEARINGEN		
Sand filling	$1,250.00	
Sodding and top soil	1,400.00	
Cleaning up debris and minor repairs	400.00	
	$3,050.00	
Superintendence and contingencies (15%)	457.50	$3,507.50

FORT McREE

BATTERY CENTER

Plant and railroad track	$ 900.00	
Removing damaged concrete and repairing masonry of battery, including entire reconstruction of Emplacement No. 4	6,500.00	
Sodding and top soil	1,800.00	
Other minor repairs	250.00	
	$12,250.00	
Superintendence and contingencies (15%)	1,837.50	$14,087.50

BATTERY SLEMMER

Plant and railroad track	$2,400.00	
Sand filling	7,500.00	
Sodding and top soil	4,500.00	
Repairs to power house	250.00	
New workshop	700.00	
	$15,350.00	
Superintendence and contingencies (15%)	2,302.50	$17,652.50

MISCELLANEOUS

Wharf at Fort Pickns	$1,800.00	
Boathouse	1,200.00	
Office	1,800.00	
Repairing track system	1,500.00	
Repairing fire-control stations, including reconstruction of two secondary stations	2,400.00	
Repairing loading room	100.00	
Repairing torpedo storehouse	250.00	
Repairs to electric lighting and power installations and lines	1,500.00	
Cleaning up debris left by storm and moving quarters back to original locality	1,000.00	
	$11,550.00	
Superintendence and contingencies (15%)	1,732.50	$13,282.50
Purchase of new launch		2,000.00
Replacing lumber carried away		500.00
TOTAL		$87,255.00

During the storm, Captain Cavanaugh continued, the surf had surged across Santa Rosa Island and Fosters Bank to a depth of 10 feet above mean low water, flooding most of the magazines. Some provisions would have to be made to prevent a reoccurrence. One solution was to construct retaining walls to enclose the parades of the batteries where this had occurred. At Batteries Cooper and Worth, where the references of the magazine floors were respectively 10 and 12, no such protection was essential.

The cost of retaining walls Cavanaugh placed at:

Batteries Cullum and Van Swearingen	$11,000
Battery Pensacola	2,750
Battery Payne	300
Battery Trueman	300
Battery Slemmer	4,750
Battery Center	3,000
TOTAL	$22,100[7]

The Department, on reviewing the estimates, decided to forego construction of the retaining walls in favor of far more expensive seawalls. The seawalls, however, were mandated by the need to protect the defenses from another hurricane of similar severity. In any event, an allotment for funding these estimates would have to await action by the next session of Congress.

3. Repairing the damage

On March 2, 1907, President Theodore Roosevelt signed into law an act appropriating $200,000 for "Preservation and Repair of Fortifications." Whereupon, the Department called on Captain Cavanaugh to submit a program for expenditure of $50,000 for "repair and restoration of batteries and other structures appurtenant to the defenses of Pensacola." On doing so, he called for spending "practically" all this money at Fort Pickens because the batteries there were more important and "no work can be economically arried on at Fort McRee prior to the reconstruction of the wharf at that place by the Quartermaster" people. His recommended distribution called for:

7. Cavanaugh to Mackenzie, Nov. 6, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 61026/27.

Battery Matthew Payne	$ 8,452.50
Battery Alexander Trueman	8,682.50
Battery George Cooper	8,855.00
Battery Cullum	10,235.00
Battery Van Swearingen	3,507.50
Miscellaneous:	
Repairing track systems	1,500.00
Repairing fire control stations	1,200.00
Repairing electric lighting and power installations and lines	1,500.00
Repairs and additions to wharf	1,200.00
Purchase of new lighting cables to connect Batteries Pensacola and Cullum with the central plant, replacing cables which have become unserviceable since the storm	3,500.00
Minor repairs at Batteries Slemmer and Center, and Fort McRee	1,367.50
TOTAL	$50,000.00

The work would be done by day-labor and the Government plant. It was expected to purchase the soil and sod required by contract after proposals were solicited.[8]

Chief Engineer Mackenzie promptly approved the program and allotted the $50,000.00.[9]

Captain Cavanaugh soon had the plant on-site and a large force at work. Before all the funds were expended or the project completed, Captain Cavanaugh was transferred and replaced as District Engineer by Captain Ferguson.

On May 27, 1908, President Roosevelt signed an act appropriating $225,000 for "Preservation and Repair of Fortifications." The Chief Engineer's office accordingly notified Captain Ferguson to prepare a program for expenditure of $59,355 "to complete the repair and restoration of batteries and other structures" at Pensacola. On doing so, Ferguson asked for:

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8. Cavanaugh to Mackenzie, Mar. 22, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 61026/68.

9. Abbot to Cavanaugh, Mar. 29, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 61026/68.

FORT PICKENS

BATTERY COOPER		
Completing sandfilling, sodding and top soil	$3,000	
BATTERY CULLUM		
Completing sandfilling, sodding and top soil	2,000	$5,000

FORT McREE

BATTERY SLEMMER		
Plant and railroad track	$2,400	
Sandfilling	7,500	
Sodding and top soil	4,500	
	$14,400	
Contingencies (15%)	2,160	$16,560
TOTAL		$21,560

A project for expenditure of the remainder of the appropriation would be submitted in the near future. This partial program was forwarded because funds for the repair of Batteries Cooper and Cullum were nearly exhausted, and Ferguson did not want to lay off his experienced force.[10]

4. Battery Center is enlarged and rebuilt

Within 2 weeks, Captain Ferguson had prepared and transmitted a program for expenditure of the remainder of the $59,355 allotment. Most of it would be disbursed in rebuilding Battery Center. When constructed, the distance between gun centers had been 29 feet. The latest Ordnance Department drawing for 15-pounder rapid-fire battery emplacements called for 62 feet between gun centers. Consequently, the simultaneous fire of these guns covered a 110-degree arc instead of an arc of 140 degrees, as planned. Moreover, the District Artillery Officer had complained repeatedly of the magazines' small size.

Captain Ferguson proposed to repair the battery by removing emplacements No.2 and 4 and repairing emplacements No. 1 and 3 which, when repaired, would constitute emplacements No. 1 and 2. Emplacement No. 1 was to be served from present magazines No. 1 and 2, and emplacement No. 2 to be serviced from present magazines No. 3 and 4.

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10. Ferguson to Marshall, July 11, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/74.

Emplacement No. 4, he explained, had been destroyed by the 1906 hurricane, while emplacement No. 2 had been badly undermined. They would be replaced by two emplacements to the left of emplacement No. 3. This would make the distance between gun centers 58 feet, 62 feet, and 62 feet, respectively.

To prevent a reoccurrence of the damage wrought by the 1906 hurricane, the section of seawall designed to protect the battery's left flank would be built before the battery was extended.

Captain Ferguson estimated the cost of rebuilding the battery at:

Plant and railroad track		$ 1,800	
Restoring old emplacements 1 and 3:			
New steps and alterations	$1,000		
Sandfilling	2,500		
Sodding and top soil	2,700	6,200	
Building two emplacements to left of old emplacement No. 3		24,000	
		$32,000	
Contingencies (about 15%)		5,195	$37,195

The remainder of the $59,355 appropriation, $600, would be employed for construction of retaining walls at Batteries Trueman and Payne.[11]

The Department approved the project as outlined.[12]

The District Artillery Officer, on learning that Battery Center was to be rebuilt, was disappointed to learn that the Driggs-Seabury balanced-pillar mounts were to be retained. He and his officers considered these carriages defective and extremely troublesome. He urged that pedestal mounts be substituted for the balanced-pillar mounts.[13]

When this subject was referred to the Chief of Artillery, he had bad news--there were no surplus 3-inch pedestal mounts to replace the Model 1898 carriages. The Ordnance Department, however, was remodeling

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11. Ferguson to Chief Engineer, July 28, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/76.

12. Abbot to Ferguson, July 24 & Aug. 13, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/74 and 61026/76.

13. Dist. Art'y. Officer to Adj. Gen., Dept. of the Gulf, Dec. 11, 1908, N A, RG 156, Doc. 5506/12.

the balanced-pillar mounts as funds permitted. This would not cause any delay in rebuilding the battery because these changes would not dictate any alterations in the concrete of the emplacements.[14]

In 1910, District Engineer Ferguson turned a large force out, and the battery was rebuilt.[15]

C. The Construction of the Seawalls and Roadways and Landscaping the Enclosed Areas

1. Captain Cavanaugh's plan is submitted and approved

The heavy damage caused by the hurricane, along with past beach erosion problems, led the Chief Engineer to conclude that the only way to protect the Endicott defenses was by seawalls. District Engineer Cavanaugh was called on to prepare a project for protection of Forts Pickens and McRee against future hurricanes.

To shield Fort Pickens, Cavanaugh proposed to construct a seawall to enclose all the Quartermaster structures and all the batteries, except Worth and Cooper. The glacis of the Third System fort would be utilized as a part of this protection--one end of the projected wall was to abut on the 1830's counterscarp while the other end extended into the glacis slope.

On Fosters Bank, a seawall enclosing Batteries Slemmer and Center would meet all requirements because it was understood that the Quartermaster Department did not plan to rebuild its structures at Fort McRee.

Cavanaugh recommended a concrete wall 5 feet wide on top, 13 feet wide at the base, and 11 feet in height. The foundations were to be at reference (2). To prevent it being undercut by the surf, two rows of interlocking sheet piling 12 feet long were to be employed, reinforced by riprap positioned on the slopes in front and in rear of the wall. This protection to be heaviest along the north and west beaches "where the exposure is greatest."

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14. Murray to Marshall, Dec. 28, 1908, & Crozier to Adj. Gen., Jan. 9, 1909, N A, RG 156, Doc. 5506/12.

15. Fort McRee Historical Record Book, N A, RG 392.

The estimated cost of the seawalls was:

Fort Pickens, Fla.,--length 6,200 feet		
22,800 cubic yards concrete @ $12.00	$271,600	
10,000 cubic yards stone @ $7.00	70,000	
18,600 cubic yards excavation @ $.50	9,300	
3,720 M ft. B.M. sheet piling @ $60.00	223,200	
248,000 lbs. iron @ $.10	24,800	
Contingencies (about 15%)	67,400	
		$666,300
Fort McRee, Fla.,--length 2,200 feet		
8,100 cubic yards concrete @ $12.00	$ 97,200	
4,000 cubic yards stone @ $7.00	28,000	
6,600 cubic yards excavation @ $.50	3,300	
1,320 M ft. B.M. sheet piling @ $60.00	79,200	
88,000 lbs. iron @ $.10	8,800	
Contingencies (about 15%)		240,800
TOTAL		$907,100[16]

The Department included $400,000 for funding construction of the Pensacola seawalls in its program for Fiscal Year 1908. When enacted by Congress and signed into law by President Roosevelt on March 2, 1908, the Fortifications Act appropriated the requested sum for building seawalls for protection of the sites of Forts Pickens and McRee. On being notified of this, Captain Cavanaugh prepared a program for expenditure of this sum. He proposed to expend the entire appropriation at Santa Rosa Island. He believed this money to be sufficient for the portion of the wall on the south, west, and greater part of the north sides of the Fort Pickens Reservation. Construction of the remainder of the north wall and so much of the east wall as necessary to abut on the Fort Pickens glacis was to be deferred until Congress voted additional funds for the undertaking.

The project would be accomplished by contract to the lowest responsible bidder.[17]

Chief Engineer Mackenzie approved the expenditure of the $400,000 as outlined.[18]

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16. Cavanaugh to Mackenzie, Dec. 12, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 61026/52.

17. Cavanaugh to Mackenzie, May 3, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 61026/69.

18. Abbot to Cavanaugh, May 7, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 61026/69.

2. Captain Ferguson builds the Forts Pickens and McRee seawalls

Proposals for carrying on this program were solicited, received, abstracted, and reviewed. A contract was awarded to the lowest responsible bidder.

To accompany the specifications, Captain Ferguson (Captain Cavanaugh's replacement as District Engineer) had prepared and circulated a drawing of the "Proposed Sea Wall, Fort Pickens, Florida."[19]

During the summer of 1908, Captain Ferguson proposed to reprogram $52,000 of the subject appropriation to construct that "portion of the seawall," 600 linear feet, to be built in shoal water off Fosters Bank to enclose the left flank of reconstructed Battery Center. It was to be similar to the wall under construction on Santa Rosa Island. The pilings were to be 24 feet long and creosoted. Ferguson's estimate called for:

165,000 feet (B.M.) sheet piling, creosoted @ $60 in place	$ 9,900
2,000 cubic yards concrete @ $12 in place	24,000
2,000 tons riprap @ $7 in place	14,000
	$47,900
Contingencies (10%)	4,790
TOTAL	$52,690[20]

The Chief Engineer, before sanctioning the project, sought details on the status of the contract for the Fort Pickens seawall.[21]

Captain Ferguson replied that the contract price for the subject wall was for $236,545. This, together with the expenses of inspections and other minor items, would leave more than enough money to underwrite the Battery Center seawall. The Fort McRee work was to be accomplished by hired labor and the materials contracted for.[22]

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19. "Proposed Sea Wall, Fort Pickens, Florida," Drawer 78, Sheet 89-5. A copy of the subject drawing is on file at the Florida Unit, GUIS.

20. Ferguson to Chief Engineer, July 28, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/79.

21. Abbot to Ferguson, Aug. 14, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/79.

22. Ferguson to Abbot, Aug. 20, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/79.

Satisfied that there would be no overrun, the Chief Engineer approved Ferguson's request.[23]

The Fortifications Act, signed into law by President Roosevelt on March 3, 1909, included $507,100 for "completing sea walls for the protection" of the batteries and necessary post structures at Forts Pickens and McRee.[24]

After reviewing the books, Captain Ferguson found that there remained available from the 1907 appropriation sufficient money for completion of the Pickens seawall and that portion of the McRee seawall authorized to shield the Battery Center site.[25]

In response to a call from the Chief Engineer, Captain Ferguson submitted a proposal for expenditure of the 1909 appropriation. If given the go ahead, he would:

(a) Complete the seawall at Fort McRee, raise the level of the enclosure to within about 4-1/2 feet of the top of the wall, and cover the same with sod and plant Bermuda.

(b) Backfill behind the Fort Pickens wall, the fill to be about 100 feet in width and raised to elevation 8.5, or to within 4-1/2 feet of the top of the wall, and to provide a suitable roadway alongside the wall. To prevent erosion, the backfill on the inside of the roadway was to be sodded and planted in Bermuda.

(c) Construct retaining walls behind Batteries Cullum, Van Swearingen, Pensacola, Slemmer, and Center.

(d) Place additional riprap on the north beach fronting the Fort Pickens wall. This riprap was in addition to that placed in front of the Fort Pickens wall, and in addition to that called for in the present contract.

Captain Ferguson planned to complete the Fort McRee seawall by contract, and accomplish the other projects by purchase of materials on competitive bids and place the materials by hired labor.[26]

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23. Abbot to Ferguson, Aug. 27, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 61026/79.

24. Abbot to Ferguson, Mar. 15, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 61026/83.

25. Ferguson to Chief Engineer, Mar. 24, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 61026/84.

26. Ferguson to Chief Engineer, June 2, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 61026/85.

Chief Engineer William L. Marshall reviewed and sanctioned these projects.[27]

That autumn, Captain Ferguson called for proposals for construction of the Fort McRee seawall. Interested bidders were permitted to review the specifications and plans and sections for "A Proposed Sea-Wall, Fort McRee, Fla." On doing so, they learned that the approximate quantities of materials required were:

Concrete	5,280 cubic yards
Sheet piling	216,000 feet (B.M.)
Sheet piling (creosoted)	432,000 feet (B.M.)
Iron	21,600 pounds
Excavation	4,000 cubic yards
Riprap	2,300 tons
Vitrified 6-inch pipe	80 linear feet[28]

The contract for the remainder of the Fort McRee seawall was awarded to the lowest responsible bidder.

To position the fill behind the Forts Pickens and McRee seawalls, Captain Ferguson purchased a 15-inch centrifugal pump and engine, boiler, hoisting engine, and 2,050 feet of pipe. This unit rehandled and distributed spoil that the dredge Caucus dumped in front of the wharf.[29]

In 1910, Captain Ferguson secured permission from the Chief Engineer to spend up to $5,000 for construction of a barge on which to mount the dredging plant. This proved to be a more satisfactory arrangement than positioning the plant on the wharf.[30]

3. Major Fitch "guilds the lily" with his landscaping and roadway projects

By late May 1911, the contractor had completed the Fort McRee seawall and the day-labor force had raised the area within high enough to exclude water from the low places, and to give "it a finished and pleasing appearance." Its elevation, however, had not been raised to the projected

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27. Abbot to Ferguson, June 8, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 61026/85.

28. "A Proposed Sea-Wall, Fort McRee, Fla.," Drawer 80, Sheet 71-2. A copy of this drawing is on file at the Florida Unit, GUIS.

29. Ferguson to Chief Engineer, June 2, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 61026/26.

30. Ferguson to Chief Engineer, May 23, 1910, N A, RG 77, Correspondence 1894-1923, Doc. 61026/88.

grade. Sodding and seeding the fill had been deferred until such time as it could be accomplished in conjunction with work of a similar character at Fort Pickens.

No funds from the June 1909 allotment for backfilling behind the Fort Pickens seawall had been obligated, although nearly two years had slipped passed. Neither had the programmed retaining walls at Batteries Cullum, Van Swearingen, Pensacola, and Center been erected.

Workmen, however, had finished placing riprap in front of the Fort Pickens seawall.

On May 27, 1911, Lt. Col. Graham Fitch, who had replaced Captain Ferguson as District Engineer, estimated the cost of completing the project at:

(a)	Covering Fort Pickens enclosure with fertile earth and planting Bermuda	$10,500
(b)	Continuing sandfill, etc.	85,000
(c)	Protecting magazines from flood tides	30,000
(d)	Contingencies	12,000
TOTAL		$137,500

Colonel Fitch at this time made a pitch for more money and a change order. He pegged his argument on the fact that Fort Pickens was now an important subpost, garrisoned by two officers and a company of Coast Artillery. Located on a "sand island," the post and its surroundings were "very unattractive." The seawall cut off most of the sea breezes, and the glare from the white sand added much to the discomfort of the troops. Moreover, the sand was unstable so there was "considerable movement" during wind storms.

Within the seawall, the Santa Rosa Island terrain was very irregular, varying in elevation from 1 to 8 feet above mean low water. The only vegetation was a "small area of swamp grass."

To make the area more attractive and afford better protection against the ravages of the sea, Colonel Fitch recommended that these projects be authorized in lieu of those sanctioned in June 1909:

(a) To cover with fertile earth and to plant Bermuda grass over the area enclosed by the sea wall at Fort McRee.

(b) To bring the elevation of the entire enclosure within the sea wall at Fort Pickens to 7 feet above mean low water by filling in with and by leveling where the surface is above 7 feet; to cover the same with fertile earth and bermuda grass roots.

(b.1) To fill for a width of about 100 feet along the bay (or north) face of the wall to an elevation of 7.5 feet.

(b.2) To construct a concrete walk 6 feet in width along the north face of the wall, and a suitable roadway along and inside of this. The roadway to be of brick or other suitable material.

(c) To construct retaining walls, and other additional protection to magazines of Battery Cullum; also retaining walls as may be necessary in rear of Batteries Van Swearingen, Pensacola, Slemmer, and Center.

(d) To repair the engineer dock at Fort Pickens at an estimated cost of $6,000. This dock was used continuously during the erection of the seawall, and it is necessary to repair it to the extent estimated in order to place it in approximately the same condition in which it was prior to use during construction of the seawall.

Colonel Fitch placed the cost of this work at $400,000. His proposal to contract for the sandfill and to accomplish the other projects by hired labor was approved by the Department.[31]

On June 21, Colonel Fitch submitted estimates for the concrete walk and roadway:

WALKWAY ALONG NORTH SIDE OF SEAWALL

Preparing sub-foundation	$ 120
Concrete--258 yards @ $7.50	1,935
Contingencies	300
TOTAL	$2,355

30-FOOT ROADWAY PARALLELING NORTH SEAWALL

Preparing sub-foundation	$ 360
Concrete pavement--1,249 yards @ $7.50	2,664
Contingencies	2,000
TOTAL	$5,024

Upon further study, Colonel Fitch determined to recommend construction of a 12-foot concrete roadway from Battery Alexander Trueman along the western and southern portion of the reservation to connect with the 30-foot roadway in rear of Fort Pickens near the torpedo storehouse. Such a road was necessary for communication about the post. Without it, the only utility of the 30-foot roadway paralleling the seawall would be protection against breakers washing over the barrier. He placed the expense of the 12-foot roadway at:

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31. Fitch to Chief Engineer, May 27, 1911, N A, RG 77, Correspondence 1894

Preparing sub-foundation	$ 240
Concrete--736 yards @ $7.50	5,520
Preliminary work on railroad	480
Curbing--434 yards @ $8	3,872
Contingencies	1,516
TOTAL	$11,628

The drainage of the walkway and road was to be connected with the drainage system now partially installed.

The length of the walkway was to be 2,319 feet; of the 30-foot roadway, 2,248 feet; and of the 12-foot roadway, 3,266 feet.[32]

The Department approved this project, provided the drainpipes passing under the road were not less than 6 inches in diameter.[33]

In November 1911, District Engineer Fitch notified the Department that three barges were needed for transporting "fertile earth" for filling from the Escambia River to Fort McRee. These barges could be rented at $100 per month each.[34]

The Chief Engineer sanctioned the lease of a towboat and the barges. This arrangement sufficed until late January, when Colonel Fitch purchased barges No. 106, 108, and 148 from the Navy.[35]

By mid-May 1912, the fill was positioned and the roadway staked. It now became apparent that the road must be extended eastward to the Caucus storehouse, adjacent to the ramp giving access to the Engineers' Wharf. In addition, the authorized width, 30 feet, was wider than concrete roads in many populous areas.

Colonel Fitch believed the money saved by reducing the width of the roadway from 30 to 24 feet would pay for its extension to the Caucus storehouse and carrying the walkway up to the ramp crossing the seawall at the Engineers' Wharf.

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32. Fitch to Chief Engineer, June 21, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 61026/99; "Fort Pickens, Fla., Proposed Roadway and Walk," Drawer 78, Sheet 89-7. A copy of the subject plan is on file at the Florida Unit, GUIS.

33. Chief Engineer to Fitch, July 1, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 61026/99.

34. Fitch to Chief Engineer, Nov. 8, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 61026/100.

35. Fitch to Chief Engineer, Dec. 9, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 61026/101.

This change order, Colonel Fitch explained to the Chief Engineer, would "extend the apron feature practically the entire length of the north seawall, and with the walk and curbs, would form an apron 34 feet wide."[36]

Chief Engineer William H. Bixby, on May 21, reviewed and approved the change order.[37]

4. Major Brown completes the landscaping

Maj. Earl I. Brown relieved Colonel Fitch as District Engineer in July 1912. On December 6, he submitted, in response to a telegram from the Department, a report on the cost of work still required under the approved project for "Repair and Protection of Defenses." All projects, he noted, had been completed except:

(a) Placing of "fertile earth and bermuda roots" at Forts Pickens and McRee;

(b) Repairing the jetty at Fort McRee;

(c) Protection of the magazines at Batteries Cullum, Van Swearingen, Pensacola, Slemmer, and Center; and

(d) Completing the roadway.

The estimated cost of these undertakings was:

Fertile earth to be positioned, including placing Bermuda roots:	
Fort Pickens--45,000 cubic yards @ $5	$225,000
Fort McRee--5,000 cubic yards @ $5	25,000
Repairs to jetty at Fort McRee	1,000
Protecting magazines	29,000
Completing roadway	15,000
Contingencies	10,000
TOTAL	$305,000

36. Fitch to Chief Engineer, May 16, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 61026/114.

37. Ralston to Fitch, May 21, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 61026/114.

There was available, as of October 1, for these projects $305,418.78, in addition to $35,000 from the appropriation for "Improving Channel from Appalachicola River to St. Andrews Bay." The latter had accrued through the Pensacola appropriation being charged $35,000 as its share of the cost of construction of the dredge Blackwater. Colonel Fitch had proposed to employ the dredge for filling. This work, however, had been accomplished under contract.[38]

The Chief Engineer's office, on reviewing the projects, had some hard questions. Earlier estimates had seemingly placed the cost of "covering enclosure with fertile earth, and planting bermuda roots" at $10,500, and now Major Brown had boosted this figure to $250,000. Chief Engineer Bixby challenged the "propriety of proceeding on such a scale with work that can scarcely be called essential to the effectiveness of the defenses, while funds are urgently required for essential work elsewhere."[39]

Responding, Major Brown contended that the $10,500 was for placing "fertile earth and bermuda roots" on the enclosure inside the Fort McRee seawall. Including the slopes of Batteries Slemmer and Center in this estimate increased the earlier figure to $17,000. Because of continued deterioration of the slopes and inflation, the cost had been increased to $25,000.

At Fort Pickens, his predecessor had contemplated "only a small fringe of fertile earth around the roadway" to cost $85,000. Since then, this figure had been inflated as a result of the decision "to extend the area to be so covered to include practically the entire area, excluding the batteries and buildings within" the Fort Pickens seawall.

Major Brown agreed that the $250,000 could be better utilized to increase the effectiveness of the defenses.

To secure the loose sand and to increase the grade of the post, he recommended sowing on the reservation grasses and shrubs adapted to growth on exposed barrier islands. This, he believed, could be done for about $10,000.[40]

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38. Brown to Chief Engineer, Dec. 6, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

39. Brown to Brown, Dec. 20, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

40. Brown to Chief Engineer, Dec. 30, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

Chief Engineer Bixby endorsed Major Brown's proposal to limit expenditures for landscaping to $10,000. The unexpended balance, $265,000, was reported to Congress for "re-appropriation for use elsewhere."[41]

Meanwhile, it had come to the attention of Division Engineer Lansing Beach that covering of sand surfaces by manure served a two-fold purpose by preventing blowing of loose sand by the winds and of encouraging and maintaining a vegetable growth.[42] Major Brown, however, did not believe manure would be practicable because the only local supply came from stables where it was mixed with straw in such quantities that it was pulverized. Moreover, the Fort Pickens winds were so strong that the manure would offer no more resistance to them than the sand.[43]

Colonel Beach reassured Major Brown. Manure had been employed to combat sand erosion at Galveston and other windy points along the Texas coast. There, it had secured the sand and produced a vegetable growth which bound the top soil.[44]

Major Brown, accordingly, agreed to experiment with manure as well as marsh mud from the Santa Rosa Island salt marshes. To fund his experiment, he asked for and was given authority to spend about $2,500 on each category of ground cover.[45]

By July 30, the experiments had progressed sufficiently to indicate that both coverings would be satisfactory. While manure was cheaper, it was more difficult to obtain locally than marsh mud. Meanwhile, the situation had continued to deteriorate at Fort McRee, where the sand parapet of Battery Center was being eroded away by the winds. To cope with this problem, Major Brown asked for a $6,400 allotment to sod Fort McRee with marsh mud.[46]

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41. Chief Engineer to Chief of Staff, Feb. 25, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

42. Beach to Brown, Mar. 21, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

43. Brown to Chief Engineer, April 10, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

44. Beach to Chief Engineer, April 28, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

45. Brown to Beach, May 1, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/116.

46. Brown to Chief Engineer, July 30, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/120.

Division Engineer Beach, to support Brown's plea for funds, reminded the Department that the recently completed Fort Pickens concrete roadways were frequently blocked by sand drifts. On a recent visit, portions of the road that had been "uncovered resembled a small canal while other parts were two feet or more below the sand."[47]

Chief Engineer Bixby, accordingly, approved the project on August 6, 1913.[48]

By the summer of 1915, the project of landscaping the areas inside the seawalls by covering them with "a manure" and planting grass to hold and fix the sand and to relieve the glare was well underway.[49]

D. The 1916 Hurricane

1. The storm strikes

On July 5-6, 1916, the Pensacola area, as it had a decade before, found itself in the eye of a hurricane. The winds, which were clocked at 104 miles per hour, did major damage to the Quartermaster property.

At the Barrancas, nearly every building lost part of its roofing. The wharf flooring was torn loose by the waves. A small frame building near the wharf in which target materials and paints were stored was demolished. One of the radio masts was bent and many trees uprooted.

At Fort Pickens, the Quartermaster wharf was badly damaged, and the wharf near the secondary stations swept away. The boardwalk to Battery Worth was floated off its foundation.

The wind and raging surf at Fort McRee wrecked the half of the wharf nearest the shore, and washed away the railway from the wharf to Battery Slemmer, excepting the section within the seawall. The building occupied by the caretaker detachment was undermined on one side, causing it to tilt at a rakish angle.[50]

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47. Beach to Chief Engineer, Sept. 4, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 41006.

48. Chief Engineer to Brown, Aug. 6, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 61026/120.

49. Brown to Chief Engineer, June 30, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 94520.

50. Fort Barrancas Historical Record Book, N A, RG 392.

2. Assessing the damage

Protected as most of the defenses were by seawalls, the damage to them was not as extensive as in the 1906 blow.

District Engineer C. L. Sturdevant, by August 1, had inventoried and reported the damage. He listed:

FORT McREE

(a) Powerhouse -- One side of addition forming part of boilerroom dislodged from foundations; one corner of main building racked, causing it to lean; and some windows and lights damaged. Estimated cost of repair--$68.

(b) Primary Station--Steps leading to observation room damaged and paint stripped off. Cost of repair--$184.

(c) Time Range Boards--The hoods and time range boards were slightly damaged and needed to be cleaned and painted at an estimated cost of $56.

(d) Secondary Station--This station, 2,000 yards west of Fort McRee, had been undermined by the surging surf, and the woodwork and steps would have to be replaced. Cost of straightening the tower and replacing the woodwork was placed at $130.

(e) Searchlight No. 5--The shelter was uninjured, but the roof covering and steps were gone and a new coat of paint required. The estimated cost--$8.

FORT PICKENS

(f) Powerhouse; 60-inch searchlight--This building had not been injured, although the flood tide had reached 7.7 feet above mean low water and backed into the powerhouse until it stood at a depth of 19 inches, submerging the generator armature. To prevent reoccurrence, this structure should be raised 3 feet at a cost of $310.

(g) 60-inch Searchlight House--Though the structure had not been injured, wind and sand had damaged the paint and it would have to be repainted at a cost of $30.

(h) Oil Storeroom--This structure had floated off its brick foundation. To raise and restore the same would cost $57.

(i) Pole Line of Controlling System--Three poles were down and it would be necessary to straighten others at a cost of $10.

(j) Secondary Stations--The lower flight of stairs from each of the three stations had been wrecked, and the paint stripped off the structures. To effect repairs would cost $240.

(k) Primary Stations--The roofing paper on the three stations had been badly injured, while some of the framing pieces were decayed and should be renewed at the same time the paper was replaced. The paint had also been pitted. The cost of these repairs was estimated at $420.

(l) Searchlight No. 3--The house needed a new door, repainting, and minor repairs to cost $70.

(m) Mine Primary Station--The concrete structure had not been damaged, but a portion of the pole line needed to be replaced and the structure repainted at an estimated cost of $48.

(n) Mine Secondary Station--Minor repairs to cost $120 were required to the windows, doors, and roof as well as repainting.

(o) Battery Cooper--To repair the foot of the badly eroded sand slopes and reposition poles for lighting would cost $74.

(p) Battery Commander's Station, Battery Pensacola--The doors and windows should be repainted for $5.

(q) Searchlight No. 4--The shelter needed to be repainted at a cost of $11.

(r) Cable Tank Storehouse--A number of shingles had been torn off by the wind. These should be replaced and the roof repainted for $55.

(s) Loading Room--It would be necessary to renew 250 slates at an estimated cost of $12.

(t) Engineers' Quarters Buildings--One structure would have to be reshingled for $115, and the four buildings repainted at a cost of $140.

(u) Engineers' Wharf--The superstructure had been swept away, leaving only the piling.

(v) Engineers' Room at Engineers' Wharf--It would have to be repainted.[51]

On August 11, the Chief Engineer allotted $2,100 from the appropriation for "Preservation and Repair" to fund repair of the hurricane damage.[52]

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51. Sturdevant to Chief Engineer, Aug. 1, 1916, N A, RG 77, Correspondence 1894-1923, Doc. 61026/135.

52. Chief Engineer to Sturdevant, Aug. 11, 1916, N A, RG 77, Correspondence 1894-1923, Doc. 61026/135.

E. The October 18, 1916, Cyclone

Before most of the damage had been repaired, a cyclone struck the area on the morning of October 18, bringing with it 114-mile-per-hour winds. At Fort Pickens, the Quartermaster wharf was again smashed; the mine defense boathouse wrecked; and one mining yawl crushed and a second badly damaged. The tide-gauge on the Engineers' Wharf was flattened; the housing for searchlight No. 3 was blown against the engine; the recently repaired stairways, giving access to the secondary stations, were damaged; and several hundred feet of cable near the secondary stations ruined.

At Fort McRee, a cable terminal box near the wharf was thrown to the ground; the foundations of the water tower undermined, causing it to lean 30 degrees; the pumping plant wrecked; the Ordnance storehouse badly battered; and the caretaker detachment quarters further damaged.

Several chimneys were toppled at Barrancas Barracks; slate roofs damaged; many shade trees uprooted; and the frame building used as a messhall in conjunction with the 1840's brick barracks blown down.[53]

F. The September 28, 1917, Hurricane

The September 28, 1917, hurricane sent surf sweeping across the area occupied by the construction plant for the 12-inch battery. This was east of the area protected by the Fort Pickens seawall and the high ground at Battery Worth. The roof of the cement shed was torn loose, and more than $4,000 worth of cement ruined. The derrick, water tank, lighting tower, and electric pole line were blown down. The railroad track was undercut, and the rails thrown out of alignment. Engines were clogged with sand and had to be overhauled. Lumber was scattered. Two large barges, anchored in the cove, were driven aground, and the rudder stack of Santa Rosa jammed. District Engineer Sturdevant estimated the cost of repaining this damage at $9,231.[54]

The old Engineers' Wharf was swept away, leaving only the pilings.

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53. Fort Barrancas Historical Record Book, N A, RG 392.

54. Sturdevant to Black, Nov. 19, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 18957/55.

Damage to the fortifications had been repaired at a cost of:

Battery Worth secondary station--replacement of shutters	$ 5.00
Battery Pensacola secondary station--repair of pier foundation and stairs	150.00
Battery Cullum secondary station--repair of foundations and stairs	175.00
Mine defense secondary station--repair of window lights and roof	25.00
Battery Worth--repair of storehouse roof and window lights	25.00
Battery Worth primary station -- repair of roof and 4 shutters	25.00
Battery Pensacola primary station--repair of roof, shutters, and door	35.00
Battery Cullum primary station--repairs to roof and shutters, walkway and steps in rear of station	70.00
Mine defense primary station--repairs to roof and windows	35.00
Battery Pensacola--repairs to hoods on time range boards	25.00
Searchlight No. 4--shelter blown down	250.00
Battery Payne--slight repairs	10.00
Battery Trueman--slight repairs	10.00
Mine loading room--slight repairs	6.00
Torpedo Storehouse--repairs to roof	35.00
Cable Tank--repairs to roof	15.00
Searchlight No. 5--repairs to roof and door of shelter	20.00

Battery Slemmer Powerhouse--renewing window lights	15.00
Engineer Quarters and Storehouse--repairs	300.00
TOTAL	$1,230.00

At Battery Cooper, the sand exterior slope had been badly washed. As this was the third time this had occurred, the foot of the slope would be protected by a concrete apron.[55]

G. The September 20, 1926, Hurricane

The hurricane of September 20, 1926, caused severe damage to military installations, shipping, crops, and the property of civilians. Winds, which registered gusts up to 130 miles per hour, left a medium sized steamer high and dry near Battery Langdon; an oil tanker stranded in the bay north of Fort Pickens; the Navy's tug Allegheny ashore; and a number of Naval Air Station subchasers, patrol boats, etc., "strewn through the woods adjoining Bayou Chico." The Naval Air Station lost nearly all its seaplanes. All bridges on the main highway between the Barrancas and Pensacola were down. The Navy, however, hoped to have the bridge across Bayou Grande reopened to traffic within 48 hours. The trolley line between Pensacola and Barrancas was shut down, its bridges, tracks, and power lines seriously damaged.

Forts McRee and Pickens were flooded by the surf and surging flood tides, and at times, were "completely submerged." At Fort Pickens, most of the buildings suffered damage. In some instances, it was slight, amounting to only a few dollars. It consisted of overturned chimneys, damaged roofs, broken window lights, and sagging plaster. The corrugated iron roof had been ripped off the torpedo storehouse; the Engineers' Office and storehouse were seriously damaged; and three of the 1902 secondary stations were down and the instruments in two of them destroyed. All power stations were flooded, and, in several instances, the 25-kilowatt generators entirely submerged. The magazines of Batteries Cullum, Sevier, Payne, and Trueman, three days after the blow, still had 4 feet of water, and it was impossible for Maj. Walter Singles, the post commander, to estimate the damage to the ammunition stored within. Much of it, however, was in hermetically sealed cases. Both the Engineers' and the Quartermaster wharves were severely damaged, the decking and boathouses carried away.[56]

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55. Sturdevant to Chief Engineer, Nov. 21, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 18957/82.

56. Singles to Adj. Gen., Sept. 23, 1926, N A, RG 77, Harbor Defense File, Doc. 600.913.

At Fort McRee, the old unserviceable wharf was further damaged, while at Fort Barrancas, nearly all the structures had suffered damage in varying degrees. Miraculously, no Army personnel had been killed or injured. Major Singles placed the damage to War Department property at between $50,000 and $100,000.

After reassessing the situation, Major Singles concluded that the seawalls at Forts Pickens and McRee had served their purpose "admirably" as "a buffer against the force of the waves." But, he continued, they had also served as reservoirs. When constructed, floodgates had been installed to allow trapped water to escape into the bay. But, when the area within the walls was sandfilled and sodded, the floodgates became inoperable. In addition, the magazines of Batteries Cullum and Sevier had "been converted into enormous reservoirs by their construction,...for the prevention of ingress of water...in case of storm." The construction was excellent, provided water did not spill over the seawall. But, when it did, as in the September 20 hurricane, the magazines became huge cisterns. To drain them, a fire engine had to be transferred from the mainland to Fort Pickens.[57]

57. Singles to Adj. Gen., Oct. 6, 1926, N A, RG 77, Harbor Defense File, Doc. 600.913.

XVII. IMPROVEMENTS TO AND REPAIR AND MAINTENANCE OF HARBOR DEFENSE PROJECT FACILITIES: FISCAL YEARS 1906-1917

A. Fiscal Year 1906 Brings Limited Funds for Repair and Maintenance

1. Captain Cavanaugh submits his program

During this 11-year period, improvements were made to the four seacoast batteries (Cullum, Worth, Pensacola, and Slemmer) designed to make them more effective. Maintenance and repair of the various elements of the Harbor Defense Project were a constant drain on available resources. These charges, which could not be foreseen and programmed for, included the heavy costs required to repair damages inflicted on the Pensacola Defenses by the killer hurricanes of 1906 and 1916. This chapter details the improvements, repairs, and maintenance items covered by annual programs and funded from the appropriations for "Preservation and Repair of Fortifications."

On March 9, 1905, the Chief Engineer called on his district engineers for estimates of funds necessary for "Preservation and Repair of Fortifications" in Fiscal Year 1906. In view of the small sum ($300,000) appropriated by the Congress, only the most urgent needs could be considered.

When he submitted his estimates, Captain Cavanaugh arranged under each battery, in order of their urgency, first class defects. Of these, those required to "put the electric installations of batteries Pensacola and Cullum in serviceable condition, and to provide the current required for lights and ammunition service" were believed of first importance.[1]

His program called for:

BATTERY WORTH

Cleaning and painting doors and other iron work	$ 70	
Whitewashing interior of rooms and galleries	25	
Darkening concrete surfaces	25	
Resurfacing pavements in galleries to facilitate movement of ammunition trucks	360	
Repairs to guardroom	150	$630

BATTERY PENSACOLA

Completing repairs to electric light installation including new feeder for lighting circuit, installed in trench	$710	
Cleaning and painting doors and other iron work	90	
Whitewashing interior	25	
Darkening concrete surfaces	50	875

1. Cavanaugh to Mackenzie, Mar. 22, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 18957/13.

BATTERY CULLUM

Repairing electric light installation	$750	
Lead covered cable for distributing mains for motors and lights, installed in ducts including necessary manholes (This cable is necessary to complete installation at battery; much of the material required for the installation proper is on hand and not included in this estimate.)	1,760	
Cleaning and painting doors, platform extension, and other iron work	300	
Repairing slopes	100	
Darkening concrete surfaces	50	
Whitewashing interior	50	
New steel doors for tool room	100	
Wooden steps at flanks to prevent sentry walking on slopes	25	3,135

BATTERY VAN SWEARINGEN

Cleaning and painting doors	$ 10	10

BATTERY SLEMMER

Cleaning and painting doors and other iron work	$ 80	
Repairs to slopes	50	
Repairing Lidgerwood boiler in electric plant	120	
Installing condensing plant to correct trouble with feed water	150	
Repairing Case engine	200	
Repairs to electric light installation adding platform lights and placing all wires in conduit	1,600	2,200

BATTERY CENTER

Cleaning and painting steel doors and beams	$ 10	
Repairing latrines and removing obstruction from sewer	45	55

CENTRAL POWER PLANT

Repairs to engine and dynamo of 15 k.w. generating set	$375	
Repairs to engines of 10 k.w. and 8 k.w. generating sets	150	525

MISCELLANEOUS

The salary of the civilian electrician should be provided for during the entire fiscal year

An allotment should be made available for general repairs to the machinery, including minor ones not specifically provided for in the above estimates, and others, the necessity for which may arise from time to time, as the possession of such an allotment greatly facilities the work of the Engineer Department in making repairs called for by the Artillery from time to time.

Salary of civilian electrician	$1,200	
General repairs machinery, electric plant, etc.--Fort Pickens	500	
General repairs machinery, etc.--Fort McRee	200	
Repairing and painting roof torpedo storehouse	75	1,975
TOTAL		$9,405

Captain Cavanaugh then listed the more expensive items of "general repair" that were deemed more urgent:

Purchase and installation of new generating set in central plant	$ 3,750
Feeder cable for motors of chain hoists--Battery Cullum, installed in trench	2,640
Purchase and installation of new boiler for electric plant--Battery Slemmer	1,350
Widening loading platforms--Battery Pensacola	3,500
Repairing waterproof lining in magazine, emplacement No. 1, Battery Pensacola	550
Waterproofing top of traverse--Battery Worth	1,400
Completion of three shell rooms, relocator room, and platform extensions, in connection with the installation of chain ammunition hoists at Battery Cullum	15,500
Installation of electric lighting plant--Battery Van Swearingen	710
Installation of electric lighting plant--Battery Center	1,260
TOTAL	$30,660

Commenting on these, Captain Cavanaugh noted that repair of the magazine lining in Battery Pensacola's emplacement No. 1 and waterproofing the traverse of Battery Worth would "remove the greatest causes of complaint due to leakage and make serviceable parts" of these two batteries, which could not now be used.[2]

2. The Department pares the program to $2,500

Chief Engineer Mackenzie, on reviewing the proposals and evaluating the Corps' nationwide responsibilities, allotted $2,500 to fund those projects indicated by a checkmark (✓) on the estimates. For the more expensive entries, it was unlikely there would be any money before Fiscal Year 1907.[3]

3. Major Rowan's January-February 1906 inspection

Maj. Hamilton Rowan of the Inspector-General's Department spent the week of January 29-February 5, 1906, at the Pensacola forts.

As he walked through Battery Cullum, he pointed out to District Engineer Cavanaugh that, except in emplacement No. 4, the shot trolleys did not lead to the ammunition hoists. At No. 4, the room at the foot of the stairs was too wet for any use.

In explanation, Captain Cavanaugh replied that the shellroom in emplacement No. 3 had been modified, and the trolley rails erected for the new ammunition service. As soon as the new trolleys, adapted to the I-beam rail, were received, its ammunition service would be satisfactory.

At emplacements Nos. 1 and 2, the trolley rails had been installed in the hoist-room, and it was believed that by storage of a limited amount of ammunition in this room, a satisfactory ammunition service could be had, pending the completion of new shellrooms. The extension of the existing trolley system from the old shellrooms to deliver ammunition to the recently installed Taylor-Raymond hoists was not recommended. Cavanaugh anticipated that the new trolleys would be installed by July 1.

Captain Cavanaugh then explained that the Department had been unable to allot any funds for remodeling the shellrooms for emplacements Nos. 1 and 2.

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2. Cavanaugh to Mackenzie, Mar. 22, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 18957/13.

3. Abbot to Cavanaugh, May 10, 1905, N A, RG 77, Correspondence 1894-1923, Doc. 18957/13.

The storeroom, the wetness to which Rowan had called attention, was of slight use and importance.[4]

Major Rowan also complained that the shot hoist gallery of Battery Pensacola's emplacement No. 1 was very damp, while magazine No. 1 was "too wet for use."

Repair of these rooms, Captain Cavanaugh cautioned, would be expensive. Heretofore, he had believed it best to budget the small sums allotted by the Chief Engineer for this work to other batteries where a number of damp rooms had been waterproofed at a modest expense.[5]

B. The 1907 Fiscal Year Program Sees Major Improvements to Batteries Cullum and Pensacola

1. Captain Cavanaugh calls for $26,250

Major Rowan's criticisms were fresh in Captain Cavanaugh's mind when Chief Engineer Mackenzie called on his district engineers for estimates of money "considered necessary for Preservation and Repair of Fortifications" in Fiscal Year 1907. Captain Cavanaugh submitted his program in mid-June.

To correct minor existing defects and those that may, from time to time, occur, he asked for $3,000. This sum would be utilized for painting, whitewashing, darkening concrete surfaces, repair of slopes and sodding, general repairs, etc.

Larger sums were required to fund these improvements:

For completing shellroom and galleries in connection with installation of new ammunition hoists at Battery Cullum	$12,500
For relining magazines of Battery Pensacola's emplacement No. 1, repair of shellroom lining, and other necessary work to combat leakage	2,500
For repair of railroad tracks connecting batteries	1,000
For stopping seepage into Battery Worth	2,000

4. Cavanaugh to Mackenzie, May 5, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 59177.

5. Ibid.

For extension of Battery Pensacola's loading platforms	4,000
For repair and painting fire control stations	400
For reconstructing boardwalk between Fort Pickens and Battery Cullum	400
For sodding around mining casemate and loading room	350
For painting mine defense structures	100
TOTAL	$23,250

To justify his requests, Captain Cavanaugh pointed out that the "condition of the defenses of Pensacola is so far from satisfactory" that he wished "to emphasize the necessity for the most liberal allotment possible." If allotments could be made upon need alone, the harbor "would receive much larger ones than many other more important harbors."

Battery Pensacola, the most important element in the defenses, he reminded the Department, had been a constant source of complaint because of leakage and its narrow loading platforms.[6]

2. The Department allots more than $25,000 for improvements and repairs

The Department, taking cognizance of Cavanaugh's remarks, allotted $16,500 from the appropriation for "Gun and Mortar Batteries" for completing the shellroom and galleries at Battery Cullum and exending the Battery Pensacola loading platforms; $450 from the account for "Preservation and Repair of Torpedo Structures" for maintenance of features belonging to the mine defense and $8,300 from "Preservation and Repair of Fortifications" for the remainder of the enumerated projects, except the one involving the railroad tracks. This the Chief Engineer declined to do because the work pertaining to his Department at Santa Rosa Island was nearly completed. When it was, the railroad system would be transferred to the Quartermaster Department.[7]

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6. Cavanaugh to Mackenzie, June 15, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 18957/14.

7. Abbot to Cavanaugh, July 31, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 18957/14.

3. Cavanaugh implements the program

Before turning his men to work on the two major projects for which the Chief Engineer had made allotments, Captain Cavanaugh had his staff prepare two sets of drawings, "Plans and Details for Modernizing Battery Cullum" and "Plans and Details of Platform Extensions, etc., Battery Pensacola." As soon as the Chief Engineer had approved the subject drawings, in the spring of 1907, construction began.[8]

One aspect of the program, the construction of a Battery Commander's station at Battery Cullum, ran into difficulty. Captain Cavanaugh on May 29, 1907, raised the question whether one or two BC stations should be built. In a letter to Chief Engineer Mackenzie, he explained that the battery was armed with four 10-inch guns on disappearing carriages, and, in drills, was divided into two-gun commands, each manned by a company of Coast Artillery. Officers stationed at Fort Barrancas had argued that Battery Cullum, to reflect this situation, ought to be provided with two BC stations--one for emplacements Nos. 1 and 2 and the other for emplacements Nos. 3 and 4.[9]

The Department approved the proposal to construct two BC stations at Battery Cullum in conjunction with the project for completion of shellrooms and galleries. Although drawings were prepared, the Department lacked funds to implement this change order, and it was deferred until Fiscal Year 1915.[10]

C. The Fiscal Year 1908 Program Focuses on Batteries Slemmer and Pensacola

1. Captain Cavanaugh asks for $12,255

On March 2, 1907, the Department called for estimates for preservation and repair of fortifications in Fiscal Year 1908. Captain Cavanaugh accordingly formulated a program calling for:

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8. "Fort Pickens, Fla., Plans and Details for Modernizing Battery Cullum," Drawer 78, Sheet 81-17, and "Fort Pickens, Fla., Plans and Details of Platform Extensions, etc., Battery Pensacola," Drawer 78, Sheet 90-15. Copies of these drawings are on file at the Florida Unit, GUIS.

9. Cavanaugh to Mackenzie, May 29, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 35518/168.

10. Abbot to Cavanaugh, June 4, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 35518/168.

(a)	Repair of minor existing defects and repair of similar ones which might from time to time occur	$4,000
(b)	Correcting leakage in Battery Worth	2,250
(c)	Addition of Battery Commander's station and splinter-proof roofs over delivery tables in connection with installation of Taylor-Raymond ammunition hoists at Battery Slemmer	1,880
(d)	Construction of Battery Commander's station and splinter-proof roofs over delivery tables of ammunition hoists of platform level in conjunction with extension of the Battery Pensacola loading platforms	2,500
(e)	Reconstruction of boardwalk between Fort Pickens and Battery Cullum	780
(f)	Painting fire command stations	600
(g)	Beach protection near secondary stations	120
(h)	Repainting cable tank building, iron doors and windows of torpedo storehouse, and iron work of mining casemate	125
	TOTAL	$12,255[11]

2. The Department allots $11,550

The Chief Engineer approved the program, except the $750 for the boardwalk which would have to be funded by the Quartermaster Department.[12]

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11. Cavanaugh to Mackenzie, Mar. 22, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 18957/15.

12. Abbot to Cavanaugh, Mar. 22, 1907, N A, RG 77, Correspondence 1894-1923, Doc. 18957/15.

3. The installation of Taylor-Raymond hoist at Slemmer and construction of BC stations at Slemmer and Pensacola

The previous year, Inspector-General Rowan had called attention to the obsolete manually-operated platform ammunition hoists at Battery Slemmer. Captain Cavanaugh had reassured Major Rowan that funds had been allotted for replacing them with Taylor-Raymond hoists.[13]

In January 1905, Captain Cavanaugh had submitted a "Plan for Installing Chain Ammunition Hoist, Battery Slemmer," and on March 18, 1907, a "Sketch of Part of Battery Slemmer showing Proposed Addition of Battery Commander's Station and Splinter Proof." After these drawings had been reviewed by the Chief Engineer, they were approved and construction commenced.[14]

Orders for materials for the Battery Pensacola Battery Commander's station were placed in June 1907. Work was commenced before Captain Cavanaugh was reassigned and before Maj. Clarence O. Townsley assumed command of Fort Barrancas. Reinforced concrete was employed in the structure rather than steel because of its lower cost, freedom from maintenance charges for painting, and its better adaptability to the area. A steel building, Captain Cavanaugh reminded the Department, would be subject at all seasons to condensation, and, in summer, would be unbearably hot.[15]

D. Fiscal Year 1909 Brings a Reduction in Expenditures

1. Captain Ferguson submits his first program

In mid-June 1908, District Engineer Ferguson, Captain Cavanaugh's replacement, transmitted to Washington an estimate of funds necessary for repair and preservation of the fortifications in Fiscal Year 1909. Funds were needed for:

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13. Cavanaugh to Mackenzie, May 5, 1906, N A, RG 77, Correspondence 1894-1923, Doc. 59177.

14. "Plan for Installing Chain Ammunition Hoist, Battery Slemmer, Pensacola Harbor, Florida," Drawer 80, Sheet 59-13; and "Sketch of Part of Battery Slemmer showing Proposed Addition of Battery Commander's Station and Splinter Proof," Drawer 80, Sheet 52-12. Copies of these drawings are on file at the Florida Unit, GUIS.

15. Cavanaugh to Mackenzie, April 6, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 35518/184.

(a)	Painting ironwork, whitewashing, repairs of machinery and minor defects, etc.	$3,000
(b)	Light cable from central plant to Battery Pensacola	500
(c)	Light cable from Battery Payne to Battery Trueman	400
(d)	Covers for manholes in rear of Battery Cullum	150
(e)	Repainting fire control stations	600
(f)	Repainting Engineer buildings	120
TOTAL		$4,770[16]

2. Funding the program

The Department allotted the sums requested for general maintenance and the electrical work, but failed to provide the $720 needed for painting the fire control stations and Engineer buildings.[17]

3. Improvements to the Battery Worth trolley system

During this period, funds were also secured from the Chief Engineer to make improvements to and extend the Battery Worth trolley system. This was done to facilitate and expedite handling of ammunition.[18]

E. The 1910 Program Underwrites the Introduction of Ventilating Shafts, Improvements to the Battery Cullum Magazines, Etc.

1. Captain Ferguson prepares his second program

In response to a call from the Department, District Engineer Ferguson, in March 1909, prepared and submitted his maintenance program for Fiscal Year 1910. He included:

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16. Ferguson to Chief Engineer, June 17, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 18957/18. At present, the Battery Trueman lights were connected with the post lighting system while those at Battery Pensacola were tied in with the power cable.

17. Abbot to Ferguson, July 6, 1908, N A, RG 77, Correspondence 1894-1923, Doc. 18957/18.

18. "Battery Worth, Santa Rosa Island, Fla., showing half of Trolley System," Drawer 78, Sheet 86-5. A copy of the plan is on file at GUIS.

(a)	For painting ironwork of batteries, whitewashing, repairs to machinery, and such minor defects as may arise	$5,000
(b)	For painting fire control stations	600
(c)	For painting Engineer buildings	120
(d)	For purchase of and installation of new cable for lighting mining casemate	250
(e)	For construction of stairway from mining casemate to M-station	375
	TOTAL	$6,345[19]

2. The Department funds selected maintenance and repairs

Chief Engineer Marshall, after reviewing the correspondence, allotted most of the funds requested, but eliminated the $720 for repainting the fire control stations and the Engineer buildings.[20]

3. Funds are allotted to combat seepage into Battery Cullum's magazines

In the spring of 1909, the district artillery commander asked Captain Ferguson to stop the seepage which made the magazines at Battery Cullum, except magazine No. 4, too damp for storage of powder. One way to correct this situation, Captain Ferguson pointed out, was to line the powder magazines with brick, leaving an air space. This, however, would considerably reduce their size.

After studying the problem, he recommended that the old shellroom and present powder magazine be made into one room by removing the wall separating them, except for about one foot on either end. This projection would act as a pillar for support of an I-beam that was to replace the present wall. The enlarged room would be lined with brick, leaving an air space behind, and the ceiling sheeted with copper to conduct seepage

19. Ferguson to Chief Engineer, March 13, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 18957/19.

20. Abbot to Ferguson, April 21, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 18957/19.

into the space between the brick wall and the concrete. From there, it could be led out of the magazine by drains. Ferguson estimated the cost of his proposal to be $2,000.[21]

The Chief Engineer, on approving and funding the project, cautioned Ferguson to leave ample space for the lower terminals of the Type C powder hoists which were scheduled for early installation.[22]

4. Ventilating shafts are opened at three of the batteries

Captain Ferguson, responding to a call from the Department, prepared and submitted drawings of shafts for ventilating the shellrooms and powder magazines of Batteries Slemmer, Pensacola, and Cullum. Involved were one ventilating shaft at Slemmer and four each at Pensacola and Cullum.[23]

5. The relocation of and improvements to the Battery Pensacola plotting room

During the winder of 1909-10, the Battery Pensacola plotting room was removed from the primary station to the battery, and a self-contained horizontal base range finder issued. District Engineer Fitch, in the autumn of 1911, had the speaking tubes removed from the primary station and installed in the battery plotting room.[24]

F. The Corps Limits Its Maintenance-Oriented Projects in Fiscal Year 1911

1. Captain Ferguson's third program

To fund maintenance and repair of the Pensacola Harbor defenses in Fiscal Year 1911, Captain Ferguson requested:

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21. Ferguson to Chief Engineer, June 2, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 18957/20; "Battery Cullum, Pensacola Harbor, Florida, Showing Proposed Alteration of Powder Magazine," Drawer 78, Sheet 81-22. A copy of the subject drawing is on file at the Florida Unit, GUIS.

22. Acting Chief Engineer to Ferguson, June 10, 1909, N A, RG 77, Correspondence 1894-1923, Doc. 18957/20.

23. "Sketch of Ventilating Shafts as Per Mimeograph No. 117," Drawer 78, Sheet 90-16. A copy of this drawing is on file at the Florida Unit, GUIS.

24. Allen to Fitch, June 16, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 35518/207.

(a)	For pay and subsistence of one mechanic and one or two laborers	$2,000
(b)	For material	1,000
(c)	For renewing sills, where defective, in primary and secondary stations, and painting stations	350
(d)	For painting roof and sides of cable tank storehouse and roof of torpedo storehouse, and repair of window shutters	200
TOTAL		$3,550[25]

2. The Department allots $2,150

Because of the limited sum ($300,000) appropriated by Congress for "Preservation and Repair," the Department only allotted $2,150 for maintenance in Fiscal Year 1911. Two hundred dollars, the sum requested, was made available from the appropriation for "Preservation and Repair of Torpedo Structures" for improvements to the cable tank and torpedo storehouse.[26]

G. The 1912-13 Improvements

1. Colonel Fitch employs a surplus for improvements to Batteries Slemmer, Center, and Cullum

Colonel Fitch, who had replaced Ferguson as district engineer, found on reviewing the books that there was a $13,223.67 balance in the "Repair and Preservation" account. If the Department were agreeable, which it was, he proposed to employ this sum to:

25. Ferguson to Chief Engineer, April 18, 1910, N A, RG 77, Correspondence 1894-1923, Doc. 18957/22.

26. Chief Engineer to Ferguson, July 20, 1910, N A, RG 77, Correspondence 1894-1923, Doc. 18957/22.

(a)	Cover slopes of Batteries Slemmer and Center with sod and to plant Bermuda	$6,500.00
(b)	Complete placing of vitrified conduit from the central powerhouse to Battery Cullum, including manholes	260.00
(c)	Contingencies	676.00
	TOTAL	$7,436.00
	BALANCE	$5,787.67[27]

2. Truck recesses are provided for Battery Cullum

On October 23, 1912, District Commander Ridgeway called for three brick recesses to be provided at each of Battery Cullum's emplacements Nos. 1, 2, and 3. This was necessitated by the Type C powder hoists being so placed as to make the old truck recesses useless.

At emplacement No. 4, the two ammunition hoists no longer in use should, in the interest of safety, be floored over to provide additional truck recesses.[28]

District Engineer Brown, on recommending the project, estimated its cost at $800.[29]

Chief Engineer Bixby, on reviewing the plans submitted by Major Brown, allotted $800 from the appropriation for "Preservation and Repair of Fortifications" to cover cost of the truck recesses.[30]

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27. Fitch to Chief Engineer, May 27, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 61026/98.

28. Ridgeway to Brown, October 23, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 18957/23.

29. Brown to Chief Engineer, Oct. 26, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 18957/23.

30. Chief Engineer to Brown, Mar. 12, 1913, N A, RG 77, Correspondence 1894-1923, Doc. 18957/23.

H. The 1911 Theft and the Rewiring of the Seacoast Batteries

1. The theft of an important cable to the secondary stations

On May 1, 1911, the Battery Worth power station was closed down for repairs. The brick boiler settings were taken down, the chimney reset, and the brickwork rebuilt. These details were completed by June 27, but other repairs kept the station shut down until mid-August. It was the outdoor season, so the plant was fired up at weekly intervals.

During the last week of September, Master Electrician Geltz discovered that the lead covered, twin conductor cable connecting the powerhouse with the secondary stations had been stolen. District Artillery Officer J.A. Berry began an intensive investigation. He found that a Corps of Engineers' employee had recently seen a pile of short pieces of cable on the beach near the secondary stations. This had not aroused his suspicion because Signal Corps personnel had been working along the cable lines.

Captain Berry visited the Santa Rosa Island Life-Saving Station, but the lifesavers had not seen anything unusual. The Warrington and Pensacola junk shops were searched and the manifests of the steamers Manteo and Tarpon examined. No clues, however, were found to the whereabouts of the missing cable.[31]

On December 19, Col. Samuel E. Allen, commanding the Pensacola Artillery District, called on the Engineers to replace the cable which had provided current for instrumental and station lights in the isolated secondary stations.[32]

As sufficient power for the instrumental lights was provided by the serviceable conductors in "the old 7-conductor mine cable," it was determined to defer replacing the missing cable until installation of the standard fire control system.[33]

2. Battery Cullum is rewired

In 1915, Colonel Ridgeway complained that the electric lighting circuits in Battery Cullum were rapidly deteriorating, and unless measures were taken to rewire the structure, there would soon be no lights.

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31. Berry to Post Adj., Feb. 12, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 35499/253.

32. Allen to Adj. Gen., Eastern Division, Dec. 19, 1911, N A, RG 77, Correspondence 1894-1923, Doc. 35499/250.

33. Adj. Gen., to C.O., Pensacola, Feb. 26, 1912, N A, RG 77, Correspondence 1894-1923, Doc. 35499/250.

It had been hoped that by replacing some of the bad wire with new temporary relief would be afforded. Little success, however, attended these efforts because the fixtures were "so impregnated with salts from the concrete that they readily grounded one or both sides of the circuit, even when new wire is pulled into the conduit."

The wiring at Batteries Van Swearingen and Worth was nearly as bad.[34]

On examining the battery, Major Brown saw that the old wiring consisted of rubber insulated wire pulled through brass tubing. He recommended that it be "torn out" and new wiring installed. To rewire the battery, he called for:

4 switch panel boxes (4-circuit)
3 switch panel boxes (6-circuit)
19 junction boxes
4 plug-in boxes
363 outlet couplings, type X
4 portable lamps
81 ceiling lamp fixtures
76 wall lamp fixtures
1,205 cable hangers for No. 12 armored cable
2,400 feet of No. 12 armored cable

Major Brown estimated the labor cost of taking out the old and installing a new system at $1,100.[35]

Chief Engineer Kingman approved the project and allotted $1,250 for material and $1,100 for labor.[36]

By late winter of 1916, the battery had been rewired "in accordance with instructions of the Board for Standardization." Estimates, in the meantime, were submitted for rewiring Batteries Pensacola, Worth, and Slemmer.[37]

The estimates were reviewed by the Department, and, in Fiscal Year 1917, the three batteries were rewired.

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34. Ridgeway to District Engineer, Jan. 30, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 18957/28.

35. Brown to Chief Engineer, Feb. 2, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 18957/28.

36. Chief Engineer to Brown, Mar. 9, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 18957/28.

37. Keller to Chief Engineer, Feb. 17, 1916, N A, RG 77, Correspondence 1894-1923, Doc. 94520/6.

XVIII. THE CONSTRUCTION HISTORY OF BATTERY LANGDON

A. Steps are Taken to Modernize the Endicott System

1. Increased firepower afloat causes concern

The relative ease with which the big guns of Kaiser Wilhelm's German Army, in August 1914, pounded the powerful forts guarding the approaches to Liege and Namur into surrender had repercussions in the United States. The Corps of Engineers was dismayed and disappointed at the inability of these fortifications, although not yet 30 years old, to withstand bombardments by the Kaiser's huge howitzers.

There were emplaced at this time on the Atlantic and Gulf coasts 272 12-inch mortars and 81 12-inch rifles. Sixty-four of the latter were mounted on disappearing carriages and 17 on barbette carriages. Two hundred and fortyeight of the mortar positions and 60 of the 12-inch gun emplacements had been designed and commenced before the Spanish-American War. The last of these mortar emplacements were begun in 1900-01, and the latest type 12-inch gun positions, Battery Parrott at Fort Monroe and Battery Wheaton on Narragansett Bay, had been started in 1903.

Of the Navy's battleships, the two oldest still listed as first line, Michigan and South Carolina, had been laid down in 1903, or about the time that the newest eastern seaboard battery was being completed. Judged by naval standards, the Coast Artillery did not have on the Atlantic or Gulf frontiers a single "first line" emplacement.

The Navy for years had been educating Congress and the public that the life of a battleship was limited. That after a comparatively few years, a battleship must be relegated to the second line; then after a few more to the reserve; and,when 20 or 25 years old, to be classified as obsolete, to be scrapped or used as a target.

Unfortunately, the War Department had failed to adopt a similar policy. Instead, it had permitted it to be understood that a seacoast battery, once constructed, would not become obsolete. The Taft Board, in 1905, had sought to bring the subject of modernization before Congress, and revised estimates were prepared of the number of guns still to be emplaced and of the cost thereof. But nowhere in the report was attention called to the fact that emplacements became obsolete, and "to keep our coast defenses efficient, fortification construction must go on practically continually."[1]

The Taft Board, to which reference was made, had been convened by President Theodore Roosevelt and chaired by Secretary of War William Howard Taft. Its mission had been to review and update the Endicott Board's

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1. Kingman to Chief of Staff, Nov. 27, 1914, N A, RG 77, Correspondence 1894-1923, Doc. 95991.

program because in the two decades that had passed, a number of developments had occurred that required to be incorporated into the coast defense system. Some were technical, but others involved extending the system to the new territories the Nation had acquired in the Pacific and Caribbean.

As a result of the report of the Taft Board, a number of innovative technical changes that had been introduced but never fully implemented were given priority. Among these were large numbers of searchlights for illuminating the minefields and to light-up targets for nightime firing, a modern system of range-finding for seacoast guns and mortars, and expansion of the electrical system to all facets of harbor defense.[2]

As a step in the right direction, the Taft Board had prepared estimates for modernizing older batteries, and, under this heading, Congress had appropriated about $1,090,000. With these funds, much had been accomplished. Projectile hoists had been improved, and loading platforms widened to provide easier and more efficient ammunition service, thereby insuring a more rapid fire. Ventilation systems had been introduced to prevent dampness in the magazines, while modern appliances had been installed.

Such modernization, Chief Engineer Daniel C. Kingman noted, was analagous to "repairs and overhauling which are periodically done on our battleships and in spite of which periodical overhauling, our attleships" still became obsolete. Consequently, it was never expected that the emplacements could be "kept up to date by merely tinkering with them."[3]

The Nation's seacoast defenses had been designed, Kingman observed, to withstand fire from guns of the 1890's, with a "fair factor of safety" to allow for improvement in ordnance. Since then, advances in armament had been so rapid that many of the older magazines were inadequately protected against the powerful rifles found on dreadnaught class battleships. In many cases, additional protection could be provided by excavating sand and adding concrete to the exterior and superior slopes. This, however, had the disadvantage of usually reducing the range of the gun(s).

Many of the batteries were also deficient in overhead protection because at the time they were built, a battleship's turrets did not permit high angle fire.

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2. Lewis, Seacoast Fortifications, pp. 89-90.

3. General Kingman had replaced William T. Russell as Chief Engineer on October 12, 1913.

It was essential, General Kingman argued, that "our seacoast fortifications" and guns be at least as powerful as the armament which may be brought against them. To adapt the emplacements to heavier and more powerful guns also called for the design of new carriages.

To enable the United States to modernize its seacoast defenses, General Kingman called for increased appropriations to enable the Army, during each of the next 10 years, to construct and arm an average of not less than eight major caliber guns and 24 seacoast mortars. He estimated the annual cost of such a program at $5,500,000.[4]

2. The War Department studies the situation

General Kingman's memorandum had immediate repercussions. On December 16, 1914, Secretary of War Lindley M. Garrison constituted a Board to study the situation caused by the "increased size, caliber, and offensive power of guns now on or contemplated to be placed on naval vessels," in relation to the armament mounted in the Nation's coastal fortifications. The Board was to consider whether any changes, in view of this technological revolution, should be made in "our coast defense and their armament," and, if so, what.[5]

The Board convened in Washington on December 17 and adjourned on the 19th. They agreed that the "old type 12-inch guns and mortars" were "not equal in range and power to major caliber guns afloat." It was agreed that minor changes be made in the "old type 12-inch gun" to permit an elevation of 15 degrees and, by use of a lighter 700-pound projectile, to secure an increase in range from 15,500 to about 20,000 yards.

They concurred that the "great majority" of 14-inch guns with the slight modification, already ordered, and lighter projectiles were equal in power and range to any attacking naval task force.

Most of the emplacements were satisfactory, with the possible exception of some of the older magazines which must be protected against plunging fire.

The Board called for a policy of providing through annual appropriations for such modernization of fortifications as "will result in keeping pace with the improvement in armament afloat."

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4. Kingman to Chief of Staff, Nov. 27, 1914, N A, RG 77, Correspondence 1894-1923, Doc. 95991.

5. Gen. Order No. 91, Dec. 16, 1914, N A, RG 77, Correspondence 1894-1923, Doc. 95991/3. Members of the Board were: Assistant Secretary of War Henry Breckinridge; Maj. Gen. Leonard Wood; Brig. Gens. William Crozier, E.M. Weaver, and D.C. Kingman; and Capt. Frank S. Cocheu.

Where modernization involved extensive changes in emplacements, gun carriages, etc., the policy would be to "construct new works and provide new armaments adequate for the demands of the situation." Where practicable, the older Endicott System works were to be retained as a secondary line of defense.

Wherever it was mandatory to construct new works--at entrances to principal harbors, naval bases, etc.--major caliber guns were to be 16-inch mounted so as to have the greatest possible protection and a 360-degree fire where necessary.

Hereinafter, mortars were to be not less than 12 inches with a range of 21,000 yards.

Hereinafter, the guiding principle of the Nation's coastal defense policy must be "to mount armament of greater range and power than any which can be brought against it."[6]

On June 7, 1915, one month after the sinking of Lusatania had precipitated a crisis in German-American relations, Chief Engineer Kingman returned to what had become his favorite subject. He advised the Army's Chief of Staff that, in his opinion, existing coast defense did not "in general furnish a reasonably adequate protection." While they could "put up a fairly efficient defense against a naval raid, it was not believed that any of them are sufficiently strong to stand a long and sustained attack" such as had occurred at the Dardanelles.

Although it would be comparatively easy in most cases to provide sufficient protection against naval ordnance for most of the primary batteries, it was not feasible to transform these batteries into efficient modern emplacements by merely replacing the armament by more powerful guns. In the first place, General Kingman noted, the additional protection could, in most instances, be added, only by restricting the field of fire. Next, many of the older emplacements had been designed when the desired rate of fire was much slower than now deemed necessary.

It would be impossible to mount in these emplacements more powerful guns unless they were of the identical size and could be positioned on the same carriages as the ones replaced without rebuilding the emplacements by removal of great quantities of concrete. This was a costly operation because it cost 20 to 25 times as much to remove concrete as to place it. Finally, the emplacements had been built and were oriented to obtain the maximum effect of the power and range of 1890s' guns. Consequently, these emplacements were generally located on the "shores of channels or estuaries" where more powerful and longer ranged weapons would lose these advantages. In General Kingman's view, except in the most unusual circumstances, it

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6. Board to Secretary of War, undated, N A, RG 77, Correspondence 1894-1923, Doc. 95991/3.

would be advisable and probably more economical to mount the new and heavier armament in emplacements specially constructed for them.[7]

3. The Board of Review takes action

Meeting on June 17, the War Department's Board of Review, after studying the report of the Breckinridge Board and the Kingman correspondence, concluded that existing defenses at a number of harbors must be supplemented by additional "12-inch guns mounted for long-range fire."[8]

Three weeks later, on July 8, Chief of Coast Artillery E. M. Weaver recommended to the Commander of the Eastern Department that the existing defenses of Pensacola (two 12-inch, four 10-inch, two 8-inch rifles on disappearing carriages, and eight 12-inch mortars) be "supplemented by 2--12-inch rifles mounted for long range fire for the protection of the city and navy yard against long range naval bombardment."[9]

The War Department's Board of Review concurred with General Weaver's recommendation, and, on September 4, the Commanding General, Eastern Department, was directed to select a site for emplacement of two 12-inch rifles, mounted for long-range fire, at Pensacola.[10]

Chief Engineer Kingman next called on the District Engineer to consult with the post commander and identify a site for the proposed battery to be armed with "two 12-inch guns on carriages adapted for high-angle fire." Congress would be asked for an appropriation to underwrite the project in Fiscal Year 1917, so District Engineer Brown was to give priority to preparation of plans and estimates. To assist him, the Chief Engineer enclosed a study sketch dated November 23.[11]

In the months since June, Germany, in response to pressure from the United States, had abandoned unrestricted submarine warfare. Passions had cooled and Congress failed to include funds for the new

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7. Kingman to Chief of Staff, June 7, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 95991/7.

8. Proceedings of Board of Review, June 17, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 38148/1.

9. Weaver to Board of Review, July 8, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 95991/11.

10. Adj. Gen. to Commanding General, Eastern Dept., Sept. 4, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 95991/16.

11. Chief Engineer to District Engineer, Nov. 23 & Dec. 2, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 38148.

emplacements in the Fortification Act for Fiscal Year 1917. Then on March 6, 1916, General Kingman, who had been championing the program, died. His replacement as Chief Engineer was Brig. Gen. William M. Black.

B. The Ordnance Department Secures an Appropriation and Begins Production of High Angle Barbette Carriages

Meanwhile, Secretary of War Garrison, on December 22, 1915, called for fabrication of 17 barbette carriages for high angle fire on which to mount 12-inch rifles already on hand. These guns were to be positioned: two at Fort Pickens; two at Fort Levett, Maine; two on the Nahant Reservation, Massachusetts; two at Fort Rodman, Buzzards Bay, Massachusetts; four at Fort Hancock, New Jersey; two at Fort Crockett and one at Fort Travis, Texas; and two at Fort Berry, California.[12]

The Ordnance Department was, accordingly, prepared to act when President Woodrow Wilson signed into law on July 6, 1916, legislation for Fortifications and Other Works of Defense. The money was earmarked by Chief of Ordnance Crozier for the manufacture of these guns and carriages: 72 3-inch antiaircraft guns and mounts; 29 12-inch barbette carriages; 4 6-inch guns and carriages; one 14-inch gun on railroad mount; 6 16-inch guns on disappearing carriages; and one 16-inch gun turret.

Of this ordnance, two 12-inch barbette carriages and two 3-inch antiaircraft guns and mounts were slated for delivery to Fort Pickens.[13]

C. Plans and Estimates are Prepared, Revised, and Approved

The lame duck session of the 64th Congress convened in the first week of December 1916. Anticipating an appropriation for construction of the new type emplacements for high angle barbette carriages, Chief Engineer Black transmitted to District Engineer Sturdevant a copy of a typical plan for a two-gun 12-inch battery. Current policy, he noted, required that emplacements be so arranged to permit the firing of the guns at any elevation from the horizontal up to 30 degrees.

"Mature consideration" was to be given to the question whether it was "necessary to provide for magazines in the interior" of the "condensation-proof structures shown in type plan." Their omission, if justified, would result in a material decrease in the overall front-to-rear dimension of the traverses.[14]

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12. Scott to Secretary of War, Dec. 22, 1915, N A, RG 77, Correspondence 1894-1923, Doc. 95991/34.

13. Crozier to Chief Engineer, July 22, 1916, N A, RG 156, Doc. 025/43.

14. Winslow to Sturdevant, Dec. 29, 1916, N A, RG 77, Correspondence 1894-1923, Doc. 38148.

During the next 2 months, while Captain Sturdevant prepared his plans and formulated his estimates, events at sea had launched Germany and the United States on a collision course. On January 31, 1917, the German ambassador informed the United States that on the next day his country would resume unrestricted submarine warfare. Then, on February 3, President Wilson, in a speech to Congress, announced that he was severing diplomatic relations with Germany.

On February 26, Captain Sturdevant returned to the Department the revised "standard plan and estimates" he had prepared for the battery.

The site selected, he explained, was about 2 miles east of Fort Pickens, and some 600 feet from the north shore of Santa Rosa Island and 1,700 feet from the Gulf beach. It was on a low sand ridge which would be leveled off to an elevation of about 6 feet.

He had made these changes to the "standard drawings" to adapt them to local conditions:

Parade Wall--It was believed that the engine and radiator room, as shown, was not of adequate size. Because of the battery's distance from other fortifications, the economy of interconnected electrical service was debateable, and, consequently, the installation of a reserve source was desirable. Furthermore, the approved searchlight project called for positioning two 60-inch seachlights 1,200 to 1,300 feet east of the battery. To power these, two 25 kilowatt sets were required. Captain Sturdevant urged that these units be positioned at the battery by an extension of the flanks of the parade wall.

As no naval fire could be delivered against the battery from any point in rear of the line of the pintles, the parade wall had been drawn parellel with the line of the pintles. This permitted rectangular shaped rooms. To provide space for the two additional 25 kilowatt generators, the parade wall would be extended on the right flank. A storeroom, to eliminate noise, would be housed in the area between the radiator room and plotting room. On the left flank, the parade wall was designed to make the structure symmetrical and provide a switchboard room. At the west wall of the engine room and east wall of the switchboard room, the parade wall would become a retaining wall, and be extended toward the guns. The top, for a distance of 25 feet, was carried at elevation 30 to push forward the earthern "slope lines of elevation 30 and greater, thus retaining the original protection over the rooms." From the outer extremities of the wall, the wings sloped down to the gun platform level.[15]

15. Sturdevant to Chief Engineer, Feb. 26, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148/58.

Relocation of Officers' Room--The change in location of the engine and radiator rooms led to the relocation of the officers' room. It was positioned in the area assigned to the engine and radiator room by the "typical design."

Battery Commander's Stations--Although the dimensions of the BC stations were unchanged, Sturdevant enlarged the floor space of the observation station to facilitate installation of the instruments. The steps leading from the BC stations onto the slopes in direction of the guns had been eliminated. This was due to the instability of the white sandfill constituting the slopes. Moreover, the parade wall, as extended, afforded an excellent BC walk.

Rear Corridor--The corridor in rear of the traverse had been extended to all rooms. Although this boosted the cost, it, with the sliding doors between the columns, would increase the housed-in space.

Interior Passages--Floors of passages to the shellroom and magazines were to have a fall in the first 8 feet of about 2 inches. This was to prevent rain being driven into interior rooms. A catch basin with a grated cover was to be positioned at the interior end of the slope to lead off water.

Damp-proofing Magazines--As conditions on Santa Rosa Island favored condensation, it was vital to retain the damp-proofing, as depicted. Captain Sturdevant proposed to supplement this scheme by introduction of a "brick lining sufficiently porous to absorb condensation should it occur."

Trolleys--To make the trolley lines independent, six would be needed in each corridor. The width of corridors would permit this without the very undesirable use of switches.

Steel Reinforcings--Reinforced steel would be used in the ceilings of all rooms and passages.[16]

The Wharf--His estimates called for construction of a wharf at the site because the round-trip distance from the battery to the Fort Pickens Engineers' Wharf was 4 miles. Captain Sturdevant calculated that the cost of moving materials over this distance by rail would exceed the cost of handling them over a wharf at the site, due to anticipated breakdowns in equipment.[17]

On March 10, the Chief Engineer approved the proposal to extend the parade wall, the rectangular room plan, and passage drainage. Vetoed were the proposals to increase the floor space of the observation room,

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16. Ibid.

17. Ibid.

to eliminate the steps leading from the BC stations onto the slopes, and extending the cover of rooms in the rear. The installation of searchlight generating sets should not be considered at this time.

As for the trolleys, there would be only one rail into each "truck corridor leading from the outside into the shellroom," with standard fixed frogs. A "special device of a carriage running on two parallel rails" was contemplated for the powder magazines.[18]

The next 5 weeks were spent by Captain Sturdevant and his staff revising the plans and estimates to reflect the Department's comments. These documents were forwarded to Washington on April 13, 7 days after the United States had declared war on Germany.[19]

The estimates read:

1.	Preliminary work; survey of site; staking out of battery, various rooms, etc.; collecting railroad iron and transferring to site; and various small items of work	$ 372.00
2.	Constructing wharf near site on bay shore, piles to be creosoted, labor and material	5,200.00
3.	Cost of necessary track material not on hand	670.00
4.	Cost of laying tracks, including grading	475.00
5.	Constructing cement shed, 22'x85', at site, labor and material	520.00
6.	Constructing blacksmith shop	130.00
7.	Constructing office	140.00
8.	Constructing 2 kitchens and 2 dining rooms, etc., each building to be 14'x64'x8'	730.00
9.	Constructing sleeping quarters, 2 -- one for white and one for colored, 10'x66'x8'	730.00

18. Winslow to Sturdevant, March 10, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148/58.

19. "Defense of Pensacola, Florida, Emplacements for Two 12-inch Guns, Mounted on Barbette Carriage Mod. 1917," Drawer 77, Sheet 39. A copy of the subject drawing is found in the files, Florida Unit, GUIS.

10.	Sand excavation, preliminary to erection of battery	1,730.00
11.	Cost of plant installed, tools, etc.	21,000.00
12.	Framing lumber for forms, 125,350' B.M. @ $24.00 per M. delivered	3,007.00
13.	Sheathing lumber for forms, 76,400' B.M. @ $22.00 per M.	1,834.00
14.	Sheathing lumber, over rooms, 23,200' B.M. @ $24.00 per M	557.00
15.	Sheathing lumber, for gun wells, 5,500' B.M. @ $22.50 per M.	132.00
16.	Framing for gun wells, forms, 9,480' B.M. @ $20.00 per M.	190.00
17.	Piling for gun wells, 6"x9"x22', 33,600' @ $20.00 per M.	672.00
18.	Form lumber for gun wells, 2,300' B.M. @ $22.50 per M.	52.00
19.	Lumber for tunnels, 6,300' B.M. @ $22.00 per M.	139.00
20.	4,000' B.M. 2"x4" lumber, for general use, @ $20.00 per M.	80.00
21.	15,000' 1"x6" lumber, foundation forms and bracing @ $20.00	300.00
22.	1,000 running feet of coving, 4"x4"	40.00
23.	Re-inforcing steel in place, 38,828 lbs. @ .07	2,718.00
24.	Nails	92.00
25.	Cost of blacksmith and fuel coal	2,532.00
26.	Excavation for gun wells, 2,200 cubic yards	1,760.00
27.	Driving 334 piles in gun wells	532.00
28.	Placing 1,247 cu. yds. of concrete in gun wells @ $8.25 including labor on forms	10,288.00
29.	Placing 380 cu. yds. of concrete in walls of damp-proofing including labor on forms @ $10	3,800.00

30.	Placing 187 cu. yds. of concrete in tunnel for M.I. @ $8.00 including labor on forms	1,496.00
31.	Placing 11,095 cu. yds. of concrete in battery including labor on forms @ $7.25	80,439.00
32.	Removing forms and re-surfacing exposed surfaces of concrete walls	1,322.00
33.	One latrine, installed, including toilet	210.00
34.	One toilet, installed, including 100 ft. of 6" pipe	117.00
35.	Tank for toilet, installed	68.00
36.	Electric pump for permanent water supply including house	410.00
37.	For one fireplace, brick flue	40.00
38.	For 8,090 lbs. trolley rails, installed @ .07	566.00
39.	Ceiling officers quarters, labor and material	108.00
40.	Hand railing, in place	82.00
41.	For two grating doors, installed, with locks	124.00
42.	Installing M.I. device, including chains and fairleaders	240.00
43.	For 11 iron doors installed, with locks	682.00
44.	For 7 windows installed	196.00
45.	Standards for instruments and speaking tubes in B.C. station, installed	62.00
46.	Installing 14 iron doors, to close up rear of splinter roof	1,640.00
47.	Installing of electric lights for night operation using 25-K.W. set now installed	1,000.00
48.	Miscellaneous iron fittings, for trolley rails, etc.	170.00
49.	Painting rear of battery, labor and material	72.00
50.	Painting interior of plotting room with white concrete paint	26.00

51.	Painting iron work, labor and material	255.00
52.	Installing lights, gasoline sets and switch-boards, not including cost of material	955.00
53.	For four platform lights installed	140.00
54.	Transporting guns, carriages, etc., from cars, labor and material	990.00
55.	Setting base ring and bolts	334.00
56.	For one concrete cess pool, 10' in diameter, including excavation	448.00
57.	Sand fill on slopes and bring site to elevation of 10 feet, 50,700 cubic yards	15,210.00
58.	Covering sand slopes with swamp sod and planting Bermuda roots	4,570.00
59.	Two sumps to take rain water from gun wells	704.00
60.	Boats, crews, fuel and oil, towing and transportation of employees	6,500.00
61.	Mess, services and rations	7,350.00
62.	For blacksmith and miscellaneous labor	1,060.00
63.	Cost of operating electric plant	2,100.00
64.	Cost of constructing narrow gauge railroad from Engineers Wharf at Ft. Pickens to proposed site of land defense	15,568.00
65.	Traveling expenses	240.00
66.	Repair of barges, necessary for transporting material	7,605.00
67.	Engineering, office expenses and contingencies	20,000.00
TOTAL		$233,521.00
	Already allotted (E.D. 38148/58, Mar. 7, 1917)	30,000.00
	Additional allotment required	$203,521.00[20]

20. Sturdevant to Chief Engineer, April 13, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148/58.

Calling the Department's attention to the $11,070.46 increase over his February 26 estimate, Sturdevant attributed it to the increase in the cost of coal and subsistence, the expense of the plant, and the cost of repairs to barges caused by failure of Congress to enact the "Rivers and Harbors" bill.[21]

After Chief Engineer Black had reviewed and endorsed the plans and estimates, they were approved by Secretary of War Newton D. Baker on May 24.[22]

D. Two 12-inch Long-Range Guns Join the Project

1. Building the battery

To facilitate construction of the battery, Chief Engineer Black, on March 7, authorized Captain Sturdevant to build a wharf on the bay, north of the site. Operations were immediately commenced. To reduce costs, a dredge was employed to make a cut from deep-water to a point near the shore. This reduced the length of the wharf from 800 to 124 feet.[23]

The Department, in mid-March, gave Captain Sturdevant permission o build a narrow gauge railroad from the wharf to the battery site.

To expedite construction of the battery, Captain Sturdevant purchased for the plant: one cableway with boiler--$3,050; a concrete bucket--$210; a clam-shell bucket--$850; a swinging engine--$385; a steel bull wheel--$100; and a steam boiler--$500.[24]

On April 6, the United States declared war on Germany. First, the rush to volunteer and then the draft caused a labor shortage on the Gulf Coast. This caused a rapid escalation in wage rates. The inflationary spiral also drove up the price of materials. Then, on September 28, a hurricane struck the Florida panhandle, causing $9,231 in damage to the plant and construction site.

By early July 1918, it was evident to Assistant Engineer Turtle that more money was necessary to complete the project. On July 11,

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21. Ibid.

22. Black to Baker, May 14, 1917, & Baker to Black, May 24, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148/58. Baker had replaced Garrison as Secretary of War on March 9, 1916.

23. Sturdevant to Chief Engineer, April 30, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148/64.

24. Sturdevant to Chief Engineer, March 2, 1917, N A, RG 77, Correspondence 1894-1923, Doc. 38148/64.

he called for an allotment of $50,488.95. He justified the overrun by the high cost of labor and the destruction wreaked by the hurricane. After reviewing the estimates, Chief Engineer Black programmed another $50,500 for the 12-inch battery.[25]

Costs continued to accelerate, and, on January 22, 1919, Assistant Engineer Turtle notified the Department that, to finish the project, he needed another allotment. To document his case, he submitted estimates:

For concrete	$ 6,570
For sandfill	18,375
For sodding slopes	6,870
For rolling doors in rear of battery	3,160
For installing trolley rails	2,250
For transporting and mounting guns	990
For miscellaneous other work	10,710
For dismantling and storing plant	3,000
Total	$51,925
Less current balance	10,000
Total	$41,925

Once again, Chief Engineer Black made the requested sum available.[26]

During the months following the armistice ending the Great War, work was permitted to drag. It was February 1923 before the battery was completed and turned over to the Coast Artillery by the Corps of Engineers. Although the armament was on hand, it hadnot been mounted. District Engineer J. J. Loving, in accordance with Army Regulation, prepared drawings of the emplacements, illustrating the battery's electrical and drainage systems and power station.[27]

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25. Turtle to Chief Engineer, July 11, 118, & Chief Engineer to District Engineer, July 22, 1918, N A, RG 77, Harbor Defense File.

26. Turtle to Chief Engineer, Jan. 12, 1919, & Chief Engineer to District Engineer, Jan. 20, 1919, N A, RG 77, Harbor Defense File.

27. "Defenses of Pensacola, Fla; Emplacements for 12-in. L.R. Battery," Drawer 78, Sheet 106-21; "Defense of Pensacola, Fla., Electric Lighting & Drainage for 12 in. L.R. Battery," Drawer 78, Sheet 106-22; "Defense of Pensacola, Fla., Power Station for 12 in. L.R. Battery," Drawer 78, Sheet 106-23. Copies of these drawings are on file at the Florida Unit, GUIS.

2. Naming the battery

The War Department had named the emplacements. On March 27, 1922, it was announced that hereinafter they were to be known as Battery Loomis L. Langdon.[28]

The officer honored had a long association with the area. Loomis L. Langdon, upon graduating from the U.S. Military Academy in the class of 1854, was commissioned a bvt. 2d lieutenant in the 1st U.S. Artillery and ordered to Fort Monroe. Before the year was over, he was in Florida. He served in the Third Seminole War, and fought at Big Cypress Swamp on April 7, 1856.

Lieutenant Langdon spent 1857-59 at Fort Brown, Texas, and was posted at nearby Brazos-de-Santiago in 1859-60. Langdon reported to Lieutenant Slemmer at Fort Pickens in February 1861, and remained on Santa Rosa Island until January 1862. He was then ordered to Fort Jefferson. Langdon soldiered on the coast of South Carolina in late 1862 and throughout most of 1863, participating in the July operations against Battery Wagner. He commanded a brigade of artillery at Olustee on February 20, 1864, and fought with the Army of the James from May to September 1864.

Langdon remained in the Army during the post Civil War years, being stationed at many of the Nation's coastal defenses. He retired on October 24, 1894, as a brigadier general, having reached the mandatory retirement age of 64. General Langdon died in New York City on January 7, 1910.

His son, Russell, was delighted to learn of the honor extended his father's memory. Writing the War Department, he noted that his father had been posted at Pensacola on three occasions. In 1861, he had commanded a battery of 10-inch seacoast mortars at Fort Pickens. He had returned to the area in 1874 as a captain in the artillery battalion stationed at Fort Barrancas, and again in 1885 as lieutenant colonel of the 2d U.S. Artillery.

Recalling his youth and years on the Gulf Coast, Russell Langdon wrote:

> That whole region had a wild fascination for me as a boy. I have hunted snipe over almost every foot of the vicinity, and used to look for old historic sites with some success.[29]

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28. GO 13, War Department, March 27, 1922.

29. Langdon to Brady, April 9, 1922, found in Battery Langdon Emplacement Book, N A , RG 392.

3. Arming the battery

During the early summer of 1923, Battery Langdon was armed. The guns were mounted:

GUNS

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.	MANUFACTURER
No. 1	12-inch	1895 M1	14	Bethlehem Steel
No. 2	12-inch	1895 M1	62	Watervliet

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
No. 1	Barbette	1917	19	Poole Eng. Mfg. Co.
No. 2	Barbette	1917	25	Poole Eng. Mfg. Co.

On August 8, the powerful 12-inch guns were finall proof-fired from the battery.[30]

E. The Battery in the 1920's and 1930's

1. Repair of damage wrought by the 1926 hurricane

The September 1926 hurricane wrecked the Battery Langdon wharf and the railroad connecting the emplacements with Battery Worth. Swept from the tracks, the H.K. Porter Co. locomotive and 16 flat cars were buried under tons of sand and debris. The cars were uncovered, rebuilt, and turned over to the Post Quartermaster. It was 1943, however, before the locomotive was excavated and sold as scrap.[31]

In 1930, troops assigned to Fort Barrancas rebuilt the narrow gauge railroad from Battery Worth to Battery Langdon and searchlights Nos. 6 and 7. Upon its completion, this project facilitated movement of stores and material from the Quartermaster Wharf to Battery Langdon. Light loads and passengers were transported by a gasoline-powered locomotive, "eliminating the difficult travel through the sand of Santa Rosa Island." To handle heavier items, the Battery Langdon wharf was rebuilt and the channel approach dredged.[32]

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30. Fort Pickens Historical Record Book, N A, RG 392.

31. Ibid.

32. Ibid.; Coast Artillery Journal, "Harbor Defenses of Pensacola," Vol. 74, pp. 66-7.

2. The temporary BC station

In 1931, a Battery Commander's station was constructed on the Battery Langdon traverse. An inexpensive frame structure covered with tarpaper, it was abandoned and razed in 1941.[33]

3. A typical active season

Battery Langdon, as the most important and powerful element in the local Harbor Defense System, received much attention during the years between the wars. The spring season was habitually a "rushing one and everyone from the 'Kernel' to the latest joined cosmoliner was on the jump." To start the outdoor season off with a bang in 1932, there was a ceremony marking Army Day, April 6. Soldiers of the 13th Coast Artillery and supporting units in "full service uniform of the new issue khaki, with white gloves and bayonets fixed" made an imposing sight.

At the conclusion of gunners' school and ensuing examinations, officers and men of Batteries A and B, 13th Coast Artillery, were drilled intensively, preparatory for their annual firing from the seacoast guns. Battery A was to fire their practice from Battery Langdon, and Battery B from Battery Sevier. After days of towing of pyramidal targets by harbor boats, Jenkins and Condon, and many sub-caliber practices from Langdon and Sevier, the post commander designated April 25 as the day for record firing.

Among the brass in attendance were Maj. Gen. Edward L. King, IV Corps Area Commander; Brig. Gen. William S. McNair, commanding Fourth Coast Artillery District; Maj. Walter K. Dunn, District Adjutant; and Maj. Burton O. Lewis, Corps Ordnance Officer. As so frequently the case during record practices, the weather turned bad. A low hanging fog bank over the towing course limited target observation by both gun pointers and observers. The Battery Sevier practice of 4 trial and 11 record shots was fired by Battery B, Capt. K.C. Bonney commanding. At the conclusion of the Sevier practice, which, despite the weather, was successful, personnel and observers were transferred to Battery Langdon via the "intricate rail-net" and the towing tugs started the Langdon run. While the trial shots were being fired, the "tug-bolts on the bracket holding the recoil cylinder" on one of the 12-inch guns was stripped, and the practice suspended.

Generals King and McNair then inspected the post and summer training camp facilities. They expressed themselves as pleased with the appearance of the area and the arrangements made for housing and training of ROTC, CMTC, Organized Reserve Corps, and National Guard units during the forthcoming summer encampment.[34]

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33. Fort Pickens Historical Record Book, N A, RG 392.

34. E.A. Manthey, "Notes from Harbor Defenses of Pensacola," Coast Artillery Journal, Vol. 75, p. 309.

In accordance with orders from General McNair, the 13th Coast Artillery moved out of its barracks at the Barrancas and into tents at Fort Pickens on Saturday, May 21. This was preparatory for the annual war condition alert. Battery A camped in rear of Battery Langdon; Battery B near Battery Sevier; and Headquarters & Service Battery at various points on the island, with a detachment at Fort McRee. The latter unit provided manpower for all "artillery engineer installations and the fort command stations."

During the lulls between engagements with the "foe," a power line to provide commercial current was installed between Batteries Worth and Langdon, and the right-of-way of the railway sysem cleared of weeds and undergrowth. Morale during the week in the boondocks was high. This was partially the result of good planning and hard work by the mess sergeants "who conducted friendly competition as to who could serve the greatest quantity and best quality of chow."

During the week's maneuvers, the Harbor Defense Command defended the area against simultaneous air and naval attacks on the night of the 25th. At 10:30 p.m., the men of Battery A opened fire at a range of 6,500 yards from Battery Langdon on moving targets towed by the tugs Jenkins and Condon. Although the emplacements mounted 12-inch guns, with a range of 20,000 yards, the firing was with sub-caliber 3-inch rifles. The artillerists fired first on the target towed by Jenkins and then shifted to the second target towed by Condon, some distance behind the first. The tugs and targets represented an enemy bombardment squadron. Eleven rounds were fired at the first target and 12 at the second. Seventeen hits were registered by the gunners of Battery A.

The problem was secured on the 28th, and the troops struck their tents and returned to Fort Barrancas.[35]

F. The Guns are Casemated

1. The World War II modernization

The attack on Pearl Harbor which plunged the United States into World War II brought major structural changes to Battery Langdon changes, which were made everywhere to this "family of emplacements," were dictated by lessons learned by the belligerents in the Spanish Civil War and in Europe betwee September 1, 1939, and December 7, 1941. Devastating attacks by "Stuka" dive bombers had been particularly demoralizing to artillerists manning guns where there was no ovehead protection. In the Philippines those coastal defense guns and mortars of Corregidor and the other Manila Bay forts mounted "en barbette" or pits, without overhead cover, were either disabled or neutralized by aerial bombardment and the fire of Japanese heavy artillery in April and early May 1942.

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35. Ibid., pp. 309-10.

To cope with this situation, it was determined to construct massive casemates of reinforced concrete for the 1915 family of emplacements. Once again, as in the "Third System" fortifications of the 19th century, many of America's coast defense guns would fire from casemates. New seacoast fortifications constructed during World War II accordingly would have their big guns either protected by casemates or by armored shields or turrets similar to those of Construction Nos. 233 and 234.

The modernization of Battery Langdon was accomplished in 1942-43 at an expense of more than $600,000 which was twice the original cost. Massive concrete casemates, with walls 10 feet thick and 17 feet of masonry overhead, now protected the guns and crews. Construction of the casemates reduced each gun's field of fire from 360 to 145 degrees. Each emplacement was connected with the magazines in the traverse by reinforced concrete corridors, with more than 8 feet of masonry, 20 feet of sandfill, and a 2-foot burster course of concrete overhead.

A new power room in the rear of the traverse was built. Protected by 5-foot concrete walls with 5 feet of concrete and more than 6 feet of sandfill overhead, this structure was divided by concrete interior walls into a power room, storeroom, water cooler room, muffler gallery, corridor, and two exhaust tunnels. On either side was a fuel storage tank positioned in a pit.[36]

The cost of the modernization of Battery Langdon was:

Casemates and corridors added to original magazine	$475,097.27
Power room added to central traverse magazine	131,745.63
Electrical power extension	1,760.77
Gasproofing system installed	6,582.54
Alterations to septic tank	1,510.84
Additions to ventilating system of traverse magazine	2,463.22
New wood doors (power magazine room)	590.35
Blastproofing modificaions resulting from gunfire tests	4,068.18
TOTAL	$623,818.80[37]

The task of converting the guns from barbette to casemate was completed in July 1943.[38]

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36. Emplacement Book, Battery Langdon, N A, RG 392.

37. Ibid.

38. Fort Pickens Historical Record Book, N A, RG 392.

Battery Langdon, during World War II, was the primary element in the Harbor Defense of Pensacola. Its mission was:

(a) To protect Navy shore installations, harbor facilities, and shipping in Pensacola Bay from naval gunfire in minor attacks;

(b) To deny to enemy ships access to Pensacola Bay; and

(c) To support the defense against amphibious attack within range of its armament.[39]

2. Disarming the battery and scrapping the armament

The atomic bomb which hastened the surrender of Japan in August 1945, besides bringing World War II to a close, helped make seacoast fortifications such as Battery Langdon obsolete. The development of carrier task forces and evolutions in amphibious warfare also contributed to the demise of fixed coastal defenses mounting long-range guns.

Re-evaluating its strategic thinking in the immediate post-war years, the military determined to dispense with its fixed emplacements. In May 1947, the War Department declared the Pensacola Harbor Defense surplus to the Nation's needs and ordered it deactivated. Consequently, during June and July, 12-inch guns Nos. 14 and 62 and barbette carriages Nos. 19 and 26 were demilitarized, mutilated, and salvaged.[40]

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39. Supplement to the Harbor Defense Project, Harbor Defense of Pensacola, N A, RG 407.

40. Fort Pickens Historical Record Book, N A, RG 392.

XIX. THE ANTIAIRCRAFT AND AMTB BATTERIES

A. Antiaircraft Guns Become Part of the System

1. World War I brings antiaircraft guns to Fort Pickens

The Kaiser's zeppelins and the heavy bombers of the allies and central powers added a new dimension to warfare before the United States entered the Great War. Although there was little immediate danger of aerial attack, the Coast Artillery in 1917 moved to incorporate antiaircraft guns into its various harbor defense projects.

In November, workmen began construction of platforms for two 3-inch antiaircraft guns on Santa Rosa Island. The site selected was 1,000 yards east of Battery Worth. The platforms were completed in March 1918 and transferred to the Coast Artillery by the Engineers on April 29, 1921.

Mounted on these platforms were these guns and carriages:

GUNS

EMPLACEMENT	CALIBER	LENGTH	MODEL	SERIAL NO.	MANUFACTURER
No. 1	3-inch	175.67"	1917	32	Watervliet
No. 2	3-inch	175.67"	1917	46	Watervliet

CARRIAGES

EMPLACEMENT	TYPE	MODEL	SERIAL NO.	MANUFACTURER
No. 1	Antiaircraft	1917	24	Watertown
No. 2	Antiaircraft	1917	25	Watertown[1]

In 1928, the Corps of Engineers supervised construction of a reinforced concrete magazine and storeroom for Battery Fixed, as the emplacements had been designated. The structure contained two rooms, cost $1,400, and was 100 yards southwest of the two 3-inch antiaircraft guns.[2]

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1. Fort Pickens Historical Record Book, N A, RG 392. The Navy, during the war, constructed platforms for eight antiaircraft guns on the Gulf beach south of the Battery Langdon construction site, and the Army four platforms a short distance southeast of Battery Cullum.

2. Ibid.

2. Relocating Battery Fixed

The War Department in the mid-1930's revised its Antiaircraft Defense Project for Pensacola. Battery Fixed was to be relocated to a site east of Battery Langdon, and the other two 3-inch antiaircraft guns were to be positioned southwest of Fort Pickens. The fixed antiaircraft gun batteries were to be supported by six portable searchlights and 32 .50 caliber antiaircraft machine guns. The war reserve and battle allowance of 3-inch ammunition was stored in "old Fort Pickens."[3]

This project was only partially implemented. Battery Fixed was relocated to its new site, several hundred yards east of Battery Langdon. An iglootype reinforced concrete magazine was erected for storage of the battery's ammunition. The 3-inch battery programmed for construction southwest of Fort Pickens was cancelled and the guns and carriages transferred.[4]

When Battery Fixed was relocated and new platforms built, it was armed with different guns and carriages. They were:

GUNS

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.
No. 1	3-inch	1917 M1	169
No. 2	3-inch	1925 M1	12

CARRIAGES

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.
No. 1	3-inch	1917 M1	164
No. 2	3-inch	1917 M1	167[5]

On April 1, 1945, the 3-inch antiaircraft guns emplaced in Battery Fixed were declared obsolete. World War II ended before it was determined what armament would replce them. The four 90mm guns of the AMTB Battery could, if necessary, be employed against aircraft as a secondary mission.

Also, constituting the antiaircraft defense at this time were five 60-inch mobile searchlight units (M1942A) and three SCR-268 radar

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3. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, July 15, 1936, N A, RG 407.

4. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, Jan. 22, 1943, N A, RG 407.

5. Fort Pickens Historical Record Book, N A, RG 392.

units. Assigned to the defense were these automatic weapons, which were distributed:

Tactical No. of Battery	NAME	40mm Guns	37mm Guns	.50 Caliber Machine Guns
1	Construction 233	2		2
2	Payne			2
3	Trueman			2
3A	AMTB		2	4
4	Construction 234	2		2
5	Langdon	4		4
6	Fixed			4[6]

B. World War II's AMTB Battery

On April 17, 1943, the War Department authorized an AMTB battery for the Project for Defense of Pensacola Bay against motor torpedo boats. For this purpose, four 90mm guns were made available. Two of these hard-hitting dual purpose weapons were emplaced about 25 yards in front of the Fort Pickens seawall and 150 yards southeast of Battery Cullum. The other pair of 90's were mobile and did not have a fixed position.

A reinforced concrete igloo-type magazine was constructed in which ammunition for the Battery was stored.[7]

The fixed guns assigned to the battery were:

GUNS

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.
No. 1	90mm	M1	7241 GMC-43
No. 2	90mm	M1	7078 GMC-43

CARRIAGES

EMPLACEMENT	CALIBER	MODEL	SERIAL NO.
No. 1	90mm	M3	252-FBD-43
No. 2	90mm	M3	211-FAD-43[8]

6. Supplement to the Harbor Defense Project, Harbor Defense of Pensacola, July 1, 1945, N A, RG 407.

7. Ibid.

8. Fort Pickens Historical Record Book, N A, RG 392.

XX. THE STRUCTURAL HISTORY OF CONSTRUCTION NOS. 233 AND 234

A. The Coast Artillery Adopts a New Type of Battery

Responding to the grave threat to the Nation's security and that of the Western Hemisphere caused by the sweeping victories won by the German military in the spring of 1940, a special War Department board convened to prepare a new master plan for coastal defense. Subsequently, this plan was combined with several individual projects prepared for overseas areas. This resulted in a comprehensive construction program that ultimately extended to 33 Harbor Defense Projects. The type of emplacements and weaponry involved was standardized to an unprecdented degree. "With a few exceptions, the entire spectrum of artillery requirements for harbor defense was covered by only two classes of armament--the primary 16-inch (naval) gun of the 1920's, and a newly developed 6-inch secondary piece with a 15-mile range."[1]

The 6-inch guns were not to be casemated, but were to be provided with all around curved shields of cast-steel four to six inches thick. These shields, which resembled turrets, furnished protection against machine gun and light artillery fire. The battery's magazines, power station, air conditioning equipment, communication, storage, and service rooms were in an earth-covered concrete traverse positioned between the two guns.[2]

The War Department, in September 1940, allotted two of these new 6-inch batteries to the Pensacola Harbor Defense Project. A board selected the sites. Construction No. 233 was to be built on Fosters Bank, inside the Fort McRee seawall, and Construction No. 234 on Santa Rosa Island, several hundred yards west of former Battery Cooper, now known as Battery GPF.[3]

B. Siting and Building the Batteries

Some two years later, nine months after the Nation went to war, a civilian representative of the Chief Engineer's Office visited the Pensacola area. First he stopped in Mobile and reviewed with the staff of the District Office the plans they had prepared of the two batteries. Both the drawings and specifications were "practically completed," and a Mr. Knight and his staff had an "excellent picture of the work." Upon studying the plans, it was seen that Knight and his people had called for "louvered doors with a circular type gasproofed opening similiar to those used in the 16 inch batteries in Providence." Mr. Dell told them to change this to fin type louver. He also asked them to check the intensity of light which might be expected in the plotting room. It was then discussed and agreed that the

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1. Lewis, Seacoast Fortifications, p. 116.

2. Ibid., p. 118.

3. Annexes to Harbor Defense Project, Harbor Defenses of Pensacola, Jan. 22, 1943; "Modernization of Harbor Defense Projects, Continental United States," AG 660.2 (9-14-40) M-WPD-M, N A, RG 407.

fill at the battery sites would be positioned by the hydraulic method rather than the hoist type emplacement.[4]

Dell then traveled to Pensacola, and, on the morning of September 22, 1942, visited Fort McRee to inspect the Construction No. 233 site. He found that it was on the area currently occupied by abandoned Battery Slemmer. The local officers, to justify their decision, pointed out that a trunnion height of 30 feet was necessary for the new battery. This would make the floor of its magazine about the same height as the superior slope of extant Battery Slemmer. Dell agreed that such an elevation was mandatory, if the gunners were to see over the sand dunes to their right. The elevation of the ground inside the seawall being only 3 or 4 feet above mean high tide, this would necessitate a fill of 20 to 21 feet. Dell also recommended and it was agreed to relocate the site of Construction No. 233 in rear of Battery Slemmer, so as to avoid the cost of Slemmer's demolition.[5]

That afternoon, Dell visited and approved the proposed site of Construction No. 234. The site, he saw, was west of Battery Cooper, and must also be filled to meet the required trunnion height. Here, the fill would be more expensive than at Fort McRee, "as they will have to pump from the Bay side and unless expensive barricades are built the fill will have to take its natural slope of about 1 on 12." Even so, the fill should not cost more than 15 cents a cubicyard, or between $15,000 and $20,000 for the battery.[6]

As a follow-up to Dell's visit, the Chief Engineer's Office secured the General Staff's approval for establishing the elevation of the gun platforms at Construction No. 233 at 22 feet and at Construction No. 234 at 12 feet.[7]

The sites and plans approved, construction was commenced on the two 6-inch batteries. The work was done by hired labor, with materials purchased from the lowest responsible supplier. By the time the batteries were completed in the autumn of 1943, the tide of war had turned decisively against the Axis power. Consequently, their arming received a low priority.

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4. Dell to Wilson, undated, N A, RG 77, Records of the Office Chief Engineers (Geographic File, 1918-45).

5. Ibid.

6. Ibid.

7. Cotter to Asst. Chief of Staff, Operations Div., Oct. 16, 1942, N A, RG 77, Records of the Office Chief Engineer (Geographic File, 1918-45).

C. The Carriages and Shields are Salvaged

In 1946, the shields and barbette gun carriages were finally received. Carriages Nos. 55 and 56 and their shields were mounted at Construction No. 233, and carriages Nos. 61 and 62 and their shields at Construction No. 234. The 6-inch guns were never received from the Ordnance Department.

Following the decision to deactivate Forts McRee and Pickens, the four barbette carriages and the cast-steel shields, in the summer of 1947, were demilitarized, mutilated, and salvaged.[8]

An exhaustive search of records on file at National Archives and the Federal Records Centers at Suitland, Maryland, and East Point, Georgia, and telephone inquiries to the Mobile and Atlanta Engineer Offices failed to locate plans and drawings for Constructions 233 and 234. There are, however, on file at the Sandy Hook Unit, Gateway National Recreation Area, plans and drawings (sheets 442-74) for Construction 219, a similar type emplacement. Copies of these plans should be secured from Area Manager, Sandy Hook Unit, Gateway National Recreation Area.

8. Fort Pickens Historical Record Book, N A, RG 392.

XXI. THE MASONRY FORT PICKENS AT THE TURN OF THE CENTURY

A. The Obsolete Fort Pickens Armament

In 1898, the year construction commenced on Battery Pensacola, there were mounted at Fort Pickens these obsolete guns and mortars: on the Tower Bastion, a 15-inch Rodman, its carriage broken; and on each of the northeast and southeast bastions, a 10-inch mortar on iron carriage and wooden platform. On hand, but not mounted, were: two 15-inch Rodmans, four 10-inch Rodmans, six 300-, six 200-, and four 100-pounder Parrotts, four 13-inch mortars, and eight 8-inch siege howitzers. There were these carriages at the fort but not emplaced: four 15-inch center-pintle Rodmans, four 10-inch front-pintle Rodmans, six 300-, six 200-, and four 100-pounder front-pintle Parrotts, three 8-inch front-pintle converted rifles, and three 13-inch seacoast mortars.[1]

Two and one-half weeks after the sinking of Maine, orders were issued to ship three converted 8-inch Rodman rifles to Fort Picken as auxiliary armament. One of these pieces was to come from Fort Barrancas and the others from Fort Monroe.[2]

Upon their April arrival at Fort Pickens, the rifled Rodmans were mounted on platforms Nos. 24, 27, and 28 of the barbette tier on the northwest channel front. Meanwhile, the long-time disabled carriage of the Tower Bastion's 15-inch Rodman was replaced. These four smoothbores were sighted to command the submarine minefield to prevent its penetration by Spanish torpedo boats.

The two mortars emplaced on the northeast and southeast bastions were dismounted, and the one emplaced on the latter removed.[3]

In the autumn of 1900, the 15-inch Rodman and its carriage were dismounted. This gun and its carriage, along with all the other dismounted Santa Rosa Island cannons, mortars, and carriages, were sold for scrap.

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1. "Fort Pickens, Pensacola Harbor, Florida," to accompany armament report of February 16, 1898, Drawer 254, Sheet 25-12. A copy of this plan is on file at the Florida Unit, GUIS.

2. Mackenzie to Flagler, March 4, 1898, N A, RG 77, Correspondence 1894-1923, Doc. 7383.

3. Mahan to Wilson, March 29 & April 14, 1898, N.A., RG 77, Correspondence 1894-1923, Doc. 7383; "Fort Pickens, Pensacola Harbor, Florida," to accompany armament report for Dec. 31, 1898, Drawer 254, Sheet 25-15. A copy of this drawing is on file at the Florida Unit, GUIS.

Still mounted on the barbette tier were the three rifled Rodmans.[4] They were destined to remain in position another three years.

B. The Fiscal Year 1898 Repairs

In Fiscal Year 1898, the Corp of Engineers, to accommodate the construction hands employed on the Endicott System fortifications and quartered on Santa Rosa Island, allotted $1,000 from the appropriation for "Preservation and Repair" to be applied to Fort Pickens.[5]

These funds were employed to rebuild the porch fronting the officers' quarters, repair two casemates, and repave with bricks 60 square yards of the barbette tier.[6]

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4. "Fort Pickens, Pensacola Harbor, Florida," to accompany the armament report of Dec. 30, 1900, Drawer 254, Sheet 25-28. A copy of this drawing in on file at the Florida Unit, GUIS.

5. Wilson to Mahan, June 14, 1897, N A, RG 77, Correspondence 1894-1923, Doc. 18957.

6. Executive Documents, Serial 3746, p. 736.

XXII. DARKENING THE CONCRETE SURFACES AND CAMOUFLAGING THE BATTERIES

A. Darkening the Concrete Surfaces with Lampblack

For a number of years, the exposed concrete surfaces of the batteries were darkened to reduce glare. This treatment called for a wash of 30 parts Portland cement and 1 part lampblack, by weight, mixed when dry, and sufficient water added to bring the mixture to a consistency of whitewash.

It was applied while "fresh" with an ordinary whitewash brush, "the mixture being constantly stirred to prevent settling." The treatment, applied to all battery exterior concrete surfaces, gave a "soft, dark color, very grateful to the eye." It lasted for several years with "little loss of color" and could "be renewed yearly for a very small fraction of the cost of oil paint or other similar mixtures."[1]

B. Protective Concealment in World War II

In the years immediately before and during World War II, the Army adopted tone-down painting for the "old fortifications" and installations such as Batteries Payne and Trueman and the searchlight and radar installations. Included in this scheme was erection of "frames supporting properly garnished nets, pattern planting (on small scale) of indigenous vegetation to simulate nature."

Camouflage of Battery Langdon and Construction Nos. 233 and 234, except at Construction No. 233's mount No. 2, included only such "planting and topsoiling" as was necessary to safeguard sand slopes of the fortifications against erosion by wind and water. A dummy house, designed to roll on a track, was constructed over mount No. 2.[2]

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1. Executive Documents, Serial 4788, p. 3727.

2. Supplement to the Harbor Defense Project, Harbor Defense of Pensacola, N A, RG 407.

APPENDIX

BATTERY FACT SHEETS

HARBOR DEFENSE PROJECT

PENSACOLA BAY
1896-1923

BATTERY CULLUM

corrected to November 1, 1920

1.	Battery commenced.	1895
2.	Battery completed.	June 29, 1898
3.	Date of transfer	#1 1896 #2 1898
4.	Material of construction	concrete
5.	Portland or Rosendale.	both
6.	Cost to date of transfer	$94,460.12
7.	Connected to water supply.	Yes
8.	Connected to sewer	No
9.	Type of latrine.	No latrine
10.	Type of data transmission.	Telephone
11.	Trunnion elevation in battery. . . .	30.73'
12.	Datum plane.	M.L.W.
1.	Sources of electric current.	Central power plant, Fort Pickens
2.	Max. Kw. required for lights	5.8 Kw.
3.	Max. Kw. required for motors	25 Kw.
4.	Present condition of battery	good: grating doors deemed necessary
5.	Rooms wet or dry	Shot galley, dry; shell room No.2, floor wet; shell room No.2, dry; magazines, ceilings and side walls, dry; floors, damp.
6.	How ventilated	Magazines and shell rooms by vertical shafts, 20" in diameter; shafts provided with covers to exclude rain.
7.	Remarks.	Guns Nos. 48 & 49 removed during World War I.

BATTERY CULLUM (continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	10-inch	367.25"	1888	48	Watervliet	No
2.	10-inch	367.25"	1888	49	Watervliet	No

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Dis.	1894	8	Kilby Mfg.	8 H.P. 110 V.D.C.
2.	Dis.	1896	38	Bethlehem Iron Works	do

Ammunition Delivery

	Type	Delivery	Serial No.	Maker	Horsepower	Volts
1.	Chain, Taylor & Raymond	back	91662	General Electric	5	110
2.	do	back	91167	General Electric	5	110

	RMP	Type of control	Date of control	Remodeled for long points
1.	1540	street car	1903	1918
2.	1540	street car	1903	1918

BATTERY SEVIER

corrected to November 1, 1920

1.	Battery commenced	1895
2.	Battery completed	June 29, 1898
3.	Date of transfer	#1 1896 #2 1898
4.	Material of construction	concrete
5.	Portland or Rosendale	both
6.	Cost to date of transfer	$94,460.12
7.	Connected to water supply	Yes
8.	Connected to sewer	No
9.	Type of latrine	No latrine
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	30.5'
12.	Datum plane	M.L.W.
1.	Sources of electric current	Central Power Plant, Fort Pickens
2.	Max. Kw. required for lights	3.8 Kw.
3.	Max. Kw. required for motors	25 Kw.
4.	Present condition of battery	good
5.	Rooms wet or dry	Shell room, magazines, ceilings and side walls dry; floors damp
6.	How ventilated	Magazines and shell rooms by vertical shafts, 20 inches in diameter, with covers to exclude water.
7.	Remarks	Grated doors deemed necessary.

BATTERY SEVIER (continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	10-inch	367.25"	1888	25	Watervliet	Mounted
2.	10-inch	367.25"	1888	42	Watervliet	Mounted

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Dis.	1894	6	Bethlehem Iron Works	8 H.P. 110 V.D.C.
2.	Dis.	1894	7	do	do

Ammunition Delivery

	Type	Delivery	Serial No.	Manufactured	Horsepower	Volts
1.	Chain, Taylor & Raymond	back	91970	General Electric	5	110
2.	do	back	91677	General Electric	5	110

	RMP	Type of control	Date of control	Remodeled for long points
1.	1540	street car	1903	1918
2.	1540	street car	1903	1918

BATTERY WORTH

corrected to November 1, 1920

1.	Battery commenced	1897
2.	Battery completed	1899
3.	Date of transfer.	June 30, 1899
4.	Material of construction	concrete
5.	Portland or Rosendale	both
6.	Cost to date of transfer.	$123,093.14
7.	Connected to water supply	No
8.	Connected to sewer.	No
9.	Type of latrine	No latrine
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	15.83'
12.	Datum plane	M.L.W.
1.	Sources of electric current	A.C. commercial from Pensacola via Fort Barrancas.
2.	Max. Kw. required for lights.	4 Kw.
2.	Max. Kw. requried for motors.	None
4.	Present condition of battery.	Good
5.	Rooms wet or dry	Guard rooms wet; magazine and shot galleries dry.
6.	How ventilated.	Vertical shafts, 8" diameter; with hood to exclude rain; 2 in plotting room; one in each guard room; one in each oil room; three in shot galleries; grating in each outside door, 23" x 34".

Mortars

Pit A

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
No. 1	12-inch	11.76'	1890	23	Watervliet	No
No. 2	12-inch	11.76'	1890	38	Watervliet	Yes
No. 3	12-inch	11.76'	1890	3	Niles Tool	No
No. 4	12-inch	11.76'	1890	45	Watervliet	Yes

Pit B

No. 1	12-inch	11.76'	1890	5	Niles Tool	Yes
No. 2	12-inch	11.76'	1890	4	Niles Tool	No
No. 3	12-inch	11.76'	1890	21	Builders Iron	Yes
No. 4	12-inch	11.76'	1890	18	Builders Iron	No

Carriages

Pit A

	Type	Model	Serial No.	Manufactured	Motor
No. 1	Mortar	1896	109	Providence Steam Engine	None
No. 2	Mortar	1896	97	Robt. Poole & Sons	None
No. 3	Mortar	1896	99	Robt. Poole & Sons	None
No. 4	Mortar	1896	98	Robt. Poole & Sons	None

Pit B

No. 1	Mortar	1896	129	Robt. Poole & Sons	None
No. 2	Mortar	1896	111	Providence Steam Engine	None
No. 3	Mortar	1897	128	Robt. Poole & Sons	None
No. 4	Mortar	1896	110	Providence Steam Engine	None

BATTERY VAN SWEARINGEN

corrected to November 1, 1920

1.	Battery commenced	1898
2.	Battery completed	1898
3.	Date of transfer	June 29, 1898
4.	Material of construction	concrete
5.	Portland or Rosendale	Portland
6.	Cost to date of transfer	$7,467.94
7.	Connected to water supply	No
8.	Connected to sewer	No
9.	Type of latrine	No latrine
10.	Type of data transmission	None
11.	Trunnion elevation in battery	20.55'
12.	Datum plane	M.L.W.

1.	Sources of electric current	Central power plant, Fort Pickens
2.	Max. Kw. required for lights	.5Kw.
3.	Max. Kw. required for motors	None
4.	Present condition of battery	Good
5.	Rooms wet or dry	Dry
6.	How ventilated	Not ventilated
7.	Remarks	Guns dismounted and shipped; carriages on hand.

BATTERY VAN SWEARINGEN

(continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	4.7-inch	188.3 inches	Armstrong	9717	Armstrong	No
2.	4.7-inch	188.8 inches	Armstrong	9719	Armstrong	No

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Pedestal mount	Pedestal all-round fire	10836	Armstrong	None
2.	Pedestal mount	Pedestal all-round fire	10891	Armstrong	None

BATTERY PENSACOLA

corrected to June 30, 1929

1.	Battery commenced	1898
2.	Battery completed	1899
3.	Date of transfer.	June 30, 1899
4.	Material of construction.	concrete
5.	Portland or Rosendale	both
6.	Cost to date of transfer.	$128,707.04
7.	Connected to water supply	Yes
8.	Connected to sewer.	No
9.	Type of latrine	None
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	32.08'
12.	Datum plane	M.L.M.

1.	Sources of electric current	Two 25 K.W. G.E. Co. gasoline engine generating sets; A.C. commercial from Pensacola.
2.	Max. Kw. required for lights.	5.9 Kw.
3.	Max. Kw. required for motors.	25 Kw.
4.	Present condition of battery.	good, except earth slope.
5.	Rooms wet or dry.	dry, magazines, ceilings, side walls, shot galleries.
6.	How ventilated.	ventilated by 24" electric fan
7.	Remarks	none

BATTERY PENSACOLA

(continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	12-inch	40 cal.	1895	7	Watervliet	Yes
2.	12-inch	40 cal.	1895	6	Watervliet	Yet

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Dis.	1897	3	Robt. Poole & Sons	Holster
2.	Dis.	1897	4	Robt. Poole & Sons	Cabol 8-M-P. 110-V D.C.

Ammunition Delivery

	Type	Delivery	Serial No.	Maker	Horsepower	Volts
1.	Chain, Taylor & Raymond	back	643799	General Electric	7.5	110
2.	Chain, Taylor & Raymond	back	753243	General Electric	7.5	110

	RMP	Type of control	Date of control	Remodeled for long periods
1.	800	contractor	Remodeled & transferred April 30, 1920.	1918
2.	800	contractor	1903	1918

Note: Exhaust fan installed in plotting room June 1929; fan has 5,000 cu. ft. per minute capacity

BATTERY CENTER

corrected to November 1, 1920

1.	Battery commenced	1899
2.	Battery completed	1901
3.	Date of Transfer	May 12, 1901
4.	Material of construction	concrete
5.	Portland or Rosendale	both
6.	Cost to date of transfer	$20,603.84
7.	Connected to water supply	Yes
8.	Connected to sewer	No
9.	Type of latrine	No latrine
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	No. 1 19.246' 2 19.246' 3 19.172' 4 19.200'
12.	Datum plane	M.L.W.

1.	Sources of electric current	Central power plant, Fort McRee
2.	Max. Kw. requried for lights	2.4 Kilowatts
3.	Max. Kw. required for motors	None
4.	Present condition of battery	Good
5.	Rooms wet or dry	Dry
6.	Remarks	Guns in storeroom; battery remodeled in 1910 by increasing gun interval between Nos. 1 & 2 and rebuilding emplacements Nos. 3 & 4.

BATTERY CENTER (continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	3-inch	154.5	1898	10	Driggs-Seabury	No
2.	3-inch	154.5	1898	11	Driggs-Seabury	No
3.	3-inch	154.5	1898	20	Driggs-Seabury	No
4.	3-inch	154.5	1898	25	Driggs-Seabury	No

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Barbette	1898	10	Driggs-Seabury	None
2.	Barbette	1898	11	Driggs-Seabury	None
3.	Barbette	1898	20	Driggs-Seabury	None
4.	Barbette	1898	25	Driggs-Seabury	None

BATTERY GEORGE A. COOPER

corrected to November 1, 1920

1.	Battery commenced	December 1905
2.	Battery completed	August 15, 1906
3.	Date of transfer	September 15, 1906
4.	Material of construction	Concrete
5.	Portland or Rosendale	Portland
6.	Cost to date of transfer	$56,743.85
7.	Connected to water supply	Yes
8.	Connected to sewer	No
9.	Type of latrine	No latrine
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	#1 24.92' #2 24.86'
12.	Datum plane	M.L.W.

1.	Sources of electric current	Commercial A.C.
2.	Max. Kw. required for lights	2.5 Kw.
3.	Max. Kw. required for motors	None
4.	Present condition of battery	Good
5.	Rooms wet or dry	Dry
6.	How ventilated	Ventilated air ducts; natural draft 6'6" in rooms and galleries; 4'10" in magazines.
7.	Remarks	Guns dismounted and shipped; carriages still installed.

BATTERY GEORGE A. COOPER

(continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	6-inch	310.4"	1903	42	Watertown	No
2.	6-inch	310.4"	1903	53	Watertown	No

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Disappearing L.F.	1903	32	Wellman-Seaver-Morgan Company	None
2.	Disappearing L.F.	1903	31	do	None

BATTERY MATTHEW PAYNE

corrected to November 1, 1920

1.	Battery commenced	1904
2.	Battery completed	1904
3.	Date of transfer	January 7, 1908
4.	Material of construction	Concrete
5.	Portland or Rosendale	Portland
6.	Cost to date of transfer	$28,102.50
7.	Connected to water supply	Yes
8.	Connected to sewer	No
9.	Type of latrine	No latrine
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	20.01' (Both guns)
12.	Datum plane	M.L.W.

1.	Sources of electric current	Fortification power plant
2.	Max. Kw. required for lights	2 Kw.
3.	Max. Kw. required for motors	None
4.	Present condition of battery	Good
5.	Rooms wet or dry	Dry
6.	How ventilated	Not ventilated
7.	Remarks	None

BATTERY MATTHEW PAYNE

(contined)

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	3-inch	154.35"	1902	24	Bethlehem Steel Co.	Yes
2.	3-inch	154.35"	1902	17	Bethlehem Steel Co.	Yes

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Pedestal	1902	24	Bethlehem Steel Co.	None
2.	Pedestal	1902	17	Bethlehem Steel Co.	None

BATTERY ALEXANDER TRUEMAN

corrected to November 1, 1920

1.	Battery commenced	1905
2.	Battery completed	1905
3.	Date of transfer	January 7, 1908
4.	Material of construction	Concrete
5.	Portland or Rosendale	Portland
6.	Cost to date of transfer	$28,332.50
7.	Connected to water supply	Yes
8.	Connected to sewer	No
9.	Type of latrine	No latrine
10.	Type of data transmission	Telephone
11.	Trunnion elevation in battery	#1 19.91' #2 19.25'
12.	Datum plane	M.L.W.

1.	Sources of electric current	Central Power Plant, Fort Pickens
2.	Max. Kw. required for lights	2 Kw.
3.	Max. Kw. required for motors	None
4.	Present condition of battery	Good
5.	Rooms wet or dry	Dry
6.	How ventilated	Not ventilated

BATTERY ALEXANDER TRUEMAN

(continued)

Guns

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	3-inch	154.35"	1902	25	Bethlehem Steel Co.	Yes
2.	3-inch	154.35"	1902	16	Bethlehem Steel Co.	Yes

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Pedestal	1902	25	Bethlehem Steel Co.	None
2.	Pedestal	1902	16	Bethlehem Steel Co.	None

BATTERY LOOMIS L. LANGDON

corrected to March 3, 1923

1.	Battery commenced	April 1, 1917
2.	Battery completed	May 17, 1923
3.	Date of transfer	March 3, 1923
4.	Material of construction	Concrete
5.	Portland or Rosendale	Portland
6.	Cost to date of transfer	$308,786.32
7.	Connected to water supply	No
8.	Connected to sewer	Yes
9.	Type of latrine	Standard urinal & closets
10.	Type of data transmission	None
11.	Trunnion elevation in battery	
12.	Datum plane	10.00' ref. mean low
1.	Sources of electric current	Two 25 Kw. gasoline-electric generating sets
2.	Max. Kw. required for lights	Ten
3.	Max. Kw. required for motors	Twenty
4.	Present condition of battery	Good
5.	Rooms wet or dry	Dry
6.	How ventilated	Magazine & shot galleries through large gallery having metal grating doors. Other rooms have 2-1/2" clearance below doors.
7.	Remarks	Guns now completely mounted.

BATTERY LOOMIS L. LANGDON

(continued)

	Caliber	Length	Model	Serial No.	Manufactured	Mounted
1.	12-inch	37' 1"	1895M-1	14	Bethlehem	No
2.	12-inch	37'11"	1895M-1	62	Watervliet	No

Carriages

	Type	Model	Serial No.	Manufactured	Motor
1.	Barbette	1917	19	Pooles Eng. Mfg. Co.	Yes
2.	Barbette	1917	25	Pooles Eng. Mfg. Co.	Yes

Ammunition Delivery

	Type	Delivery	Serial No.	Maker	Horsepower	Volts
1.	None	-	626659	General Electric	10	110
2.	None	-	626667	General Electric	10	110

RPM	Type of control	Date of transfer	Remodeled for long points
800	Steel car.		
800	Steel car.		

Note: Battery completed with the exception of mounting of guns, which has to be done by the Ordnance Department.

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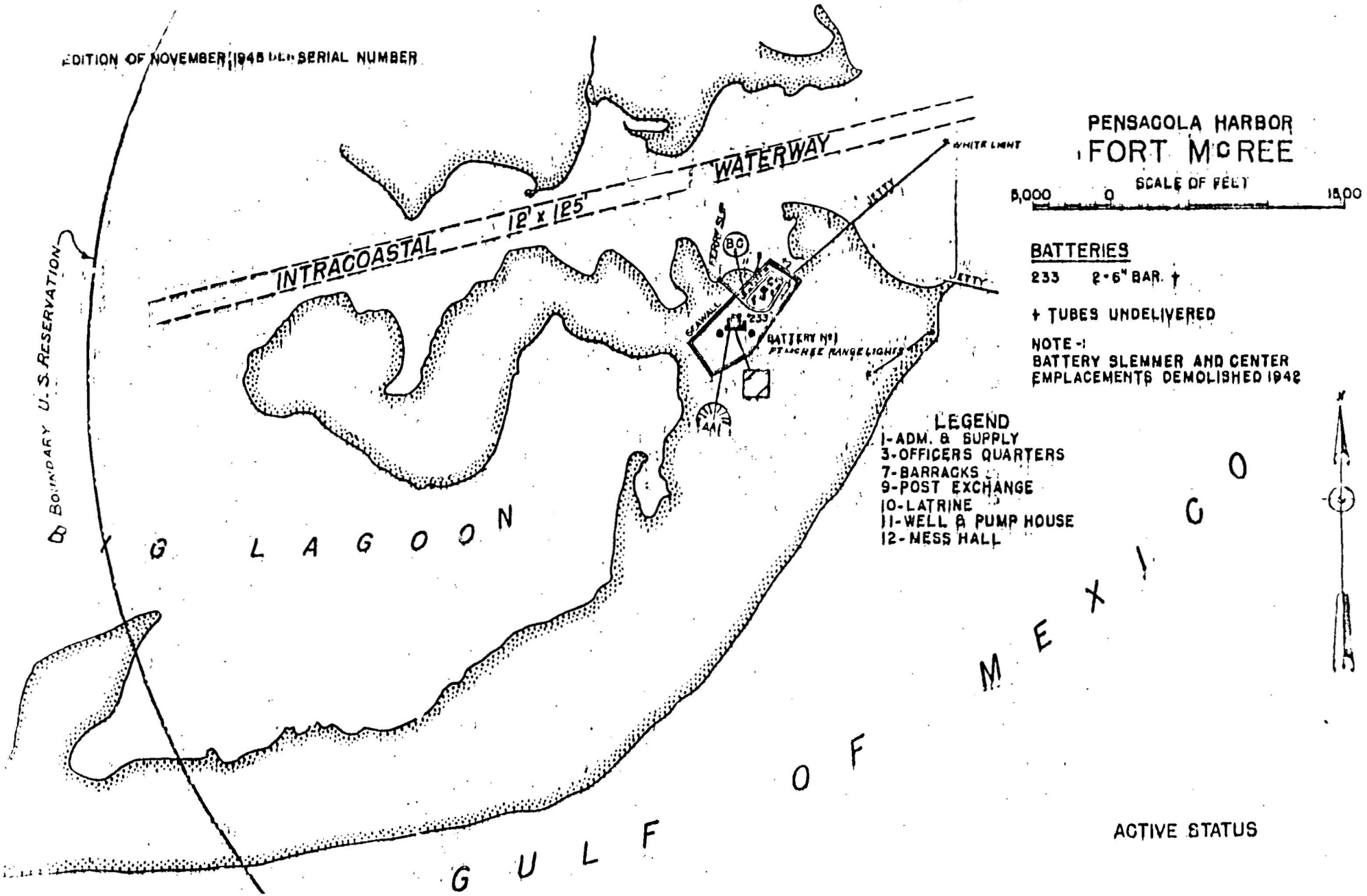
ILLUSTRATIONS

Illustration 1.

Harbor Defenses of Pensacola.
Fort McRee, November 1945.

Courtesy Washington National
Records Center. Record Group 77.

EDITION OF NOVEMBER 1948 DES. SERIAL NUMBER



PENSACOLA HARBOR
FORT McREE

SCALE OF FEET
5,000 0 10,00

BATTERIES

233 2-6" BAR. †

† TUBES UNDELIVERED

NOTE -1
BATTERY SLEMMER AND CENTER EMPLACEMENTS DEMOLISHED 1948

LEGEND
1-ADM. & SUPPLY
3-OFFICERS QUARTERS
7-BARRACKS
9-POST EXCHANGE
10-LATRINE
11-WELL & PUMP HOUSE
12-MESS HALL

ACTIVE STATUS

Illustration 2.

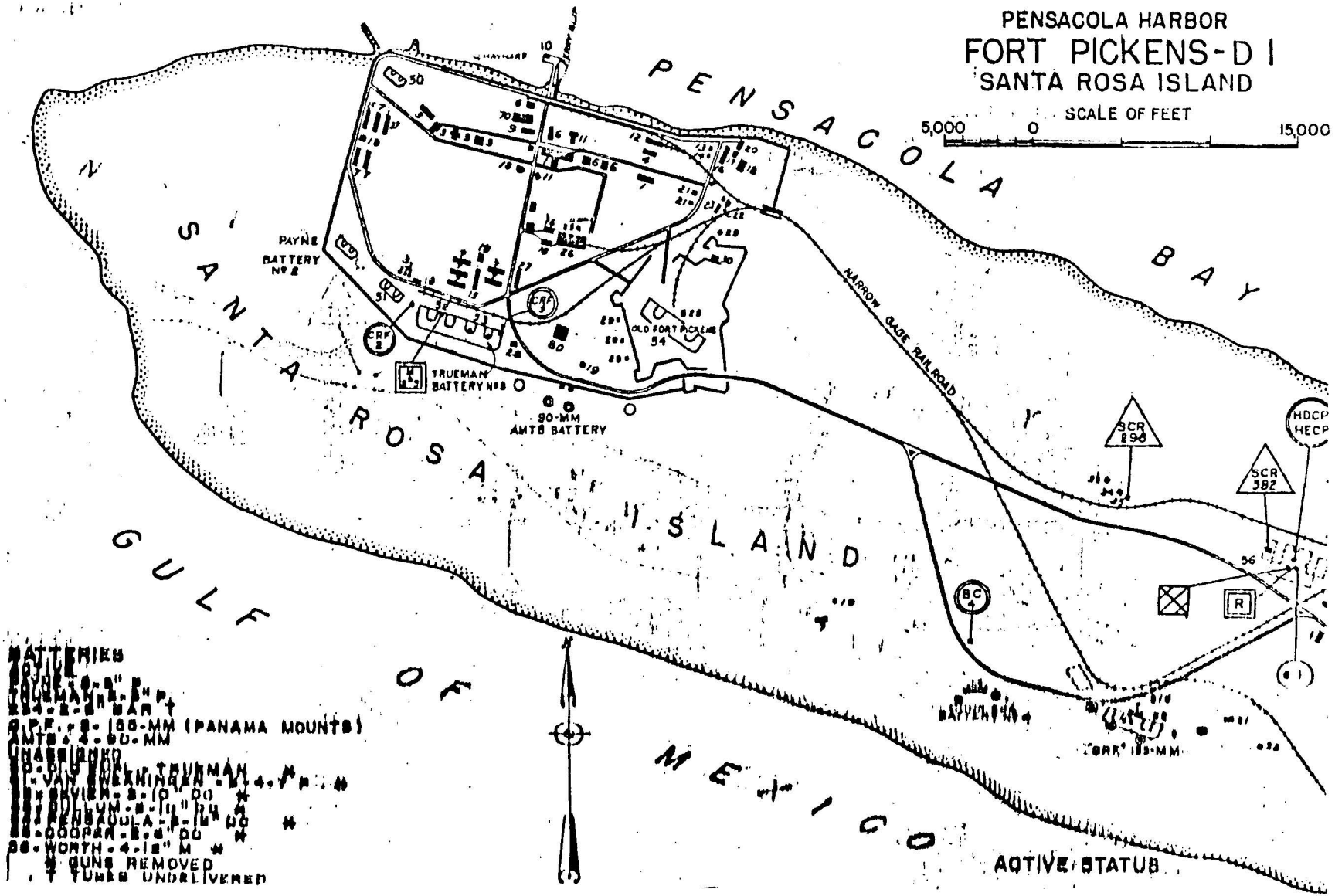
Harbor Defenses of Pensacola.
Fort Pickens--D1, Santa Rosa Island,
November 1945.

Courtesy Washington National Records
Center. Record Group 77.

EDITION OF NOVEMBER, 1945

PENSACOLA HARBOR
FORT PICKENS - D I
SANTA ROSA ISLAND

SCALE OF FEET
5,000 0 15,000



LEGEND

- POST ADMIN. BLDG.
- ...ORS QUARTERS
- ...TAL
- ...S QUARTERS
- ...G. QUARTERS
- ...ARKS
- GUARD HOUSE
- POST EXCHANGE
- ...HARF
- ...NE STATION
- ...OUSE R.R.
- ...PHOUSE
- ...TER TANK
- ...S & KITCHEN
- ...AREHOUSE
- ...R. SHOP
- ...E STOREHOUSE
- ...TRINES
- ...HOUSE
- ...P HOUSE & PLANT
- TRANSFORMER HOUSE
- ...OLINE PUMPS
- TRACTOR SHED
- ...LER HOUSE
- ...DNANCE SHOP
- ...MIN. & SUPPLY
- NAVY BLDG.
- MAGAZINE
- ...STATION (OLD)
- STOREHOUSE (COOPER)
- ...TTING ROOM (COOPER)
- ...ER BLDG.
- ...IPMENT BLDG.
- ...TOWER
- ...WAREHOUSE
- ...PLANT)
- ...NGE
- ...OUT TOWER (U.S.C.G.)
- ...GUARD STA.

BATTERIES
...
...
...

Illustration 3.

Harbor Defenses of Pensacola.
Fort Pickens--D2, Santa Rosa Island,
November 1945.

Courtesy Washington National Record
Center. Record Group 77.

EDITION OF NOVEMBER, 1945

LEGEND

EE FORT PICKENS - DI

PENSACOLA HARBOR

FORT PICKENS - D2

SANTA ROSA ISLAND

SCALE OF FEET

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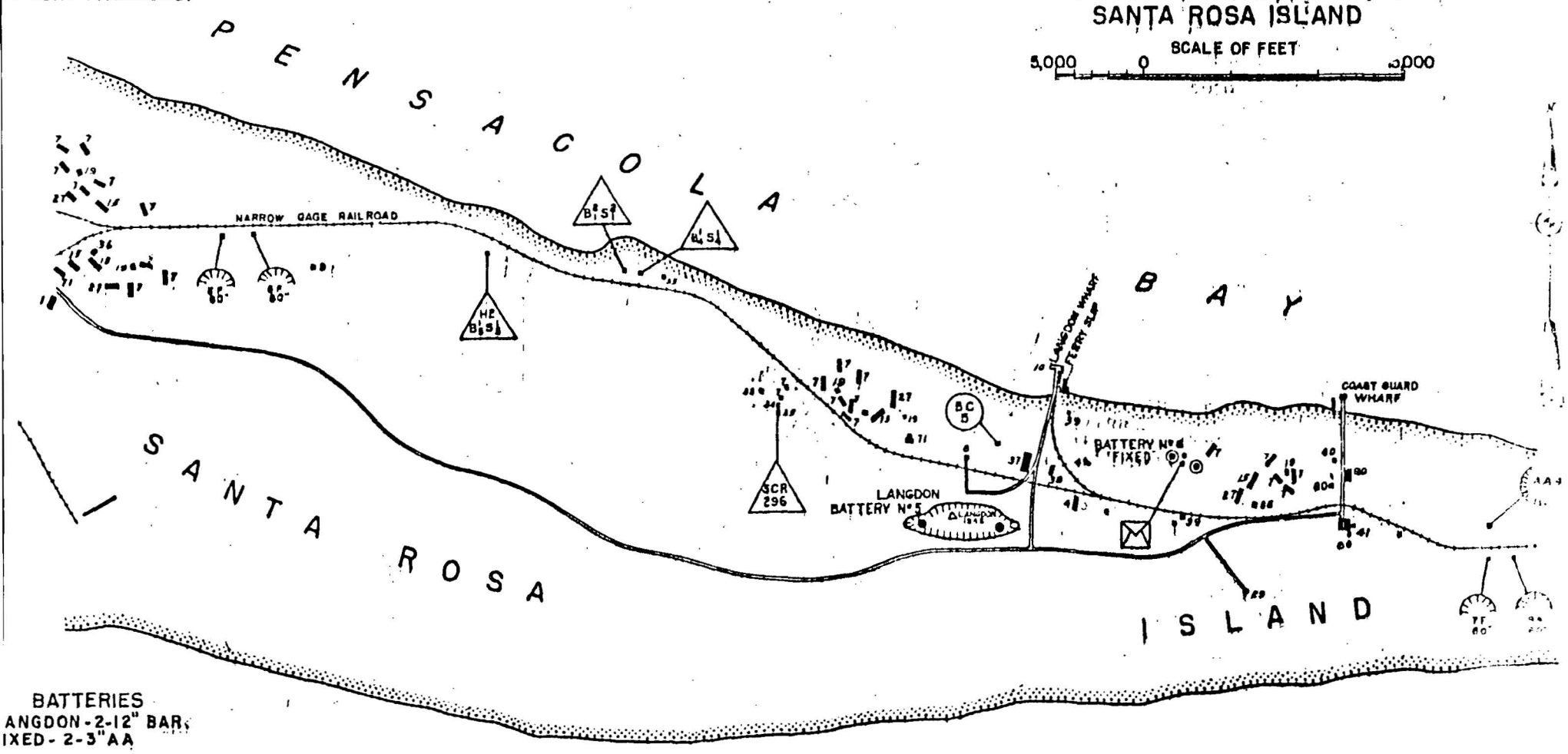

BATTERIES

ANGDON - 2-12" BAR

IXED - 2-3"AA

GULF OF MEXICO

ACTIVE STATUS

Illustration 4.

The East 12-inch Gun of Battery Pensacola Blasts Away at a Towed Target Far Out in the Gulf, Circa 1920s.

Courtesy GUIS.

Illustration 5.

West 12-inch Disapperaing Rifle of Battery Pensacola Fires and Its Muzzle Blast Stirs up a Dust Storm, Circa 1920s.

Courtesy GUIS.

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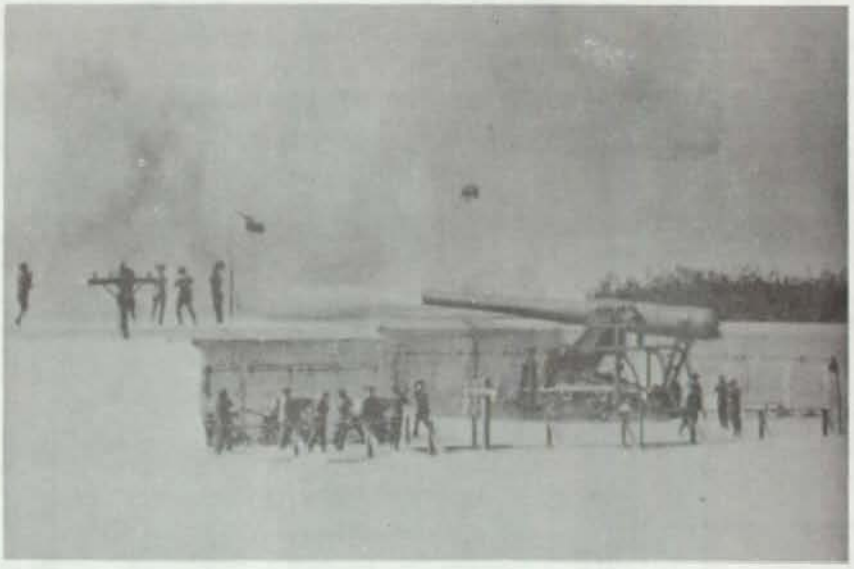


Illustration 6.

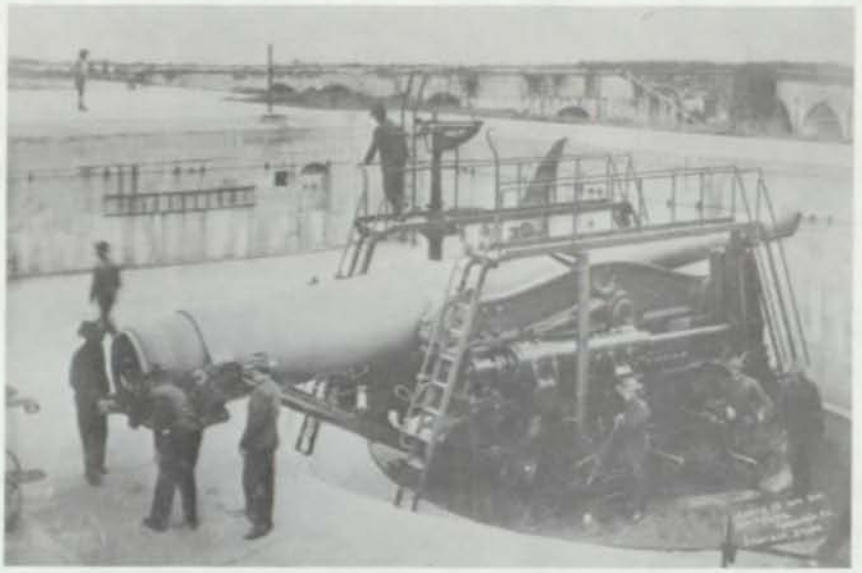
Loading West 12-inch Gun at Battery Pensacola, Circa 1920s.

Courtesy GUIS.

Illustration 7.

Battery Worth's Pit A Subsequent to Removal of Two of Its 12-inch Mortars in May 1918.

Courtesy GUIS.



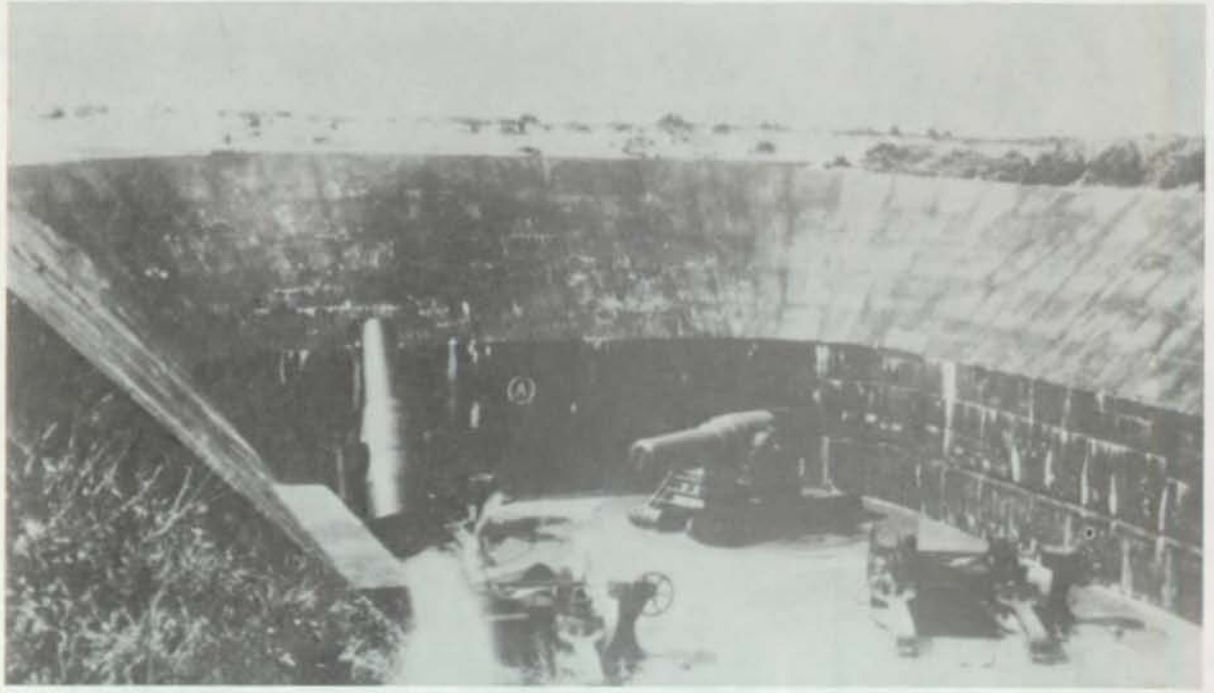


Illustration 8.

Two of Battery Worth's 12-inch Mortars, Circa 1930s.

Courtesy GUIS.

Illustration 9.

Battery Worth's Pit A. An Early 1920s Firing Mission.

Courtesy GUIS.

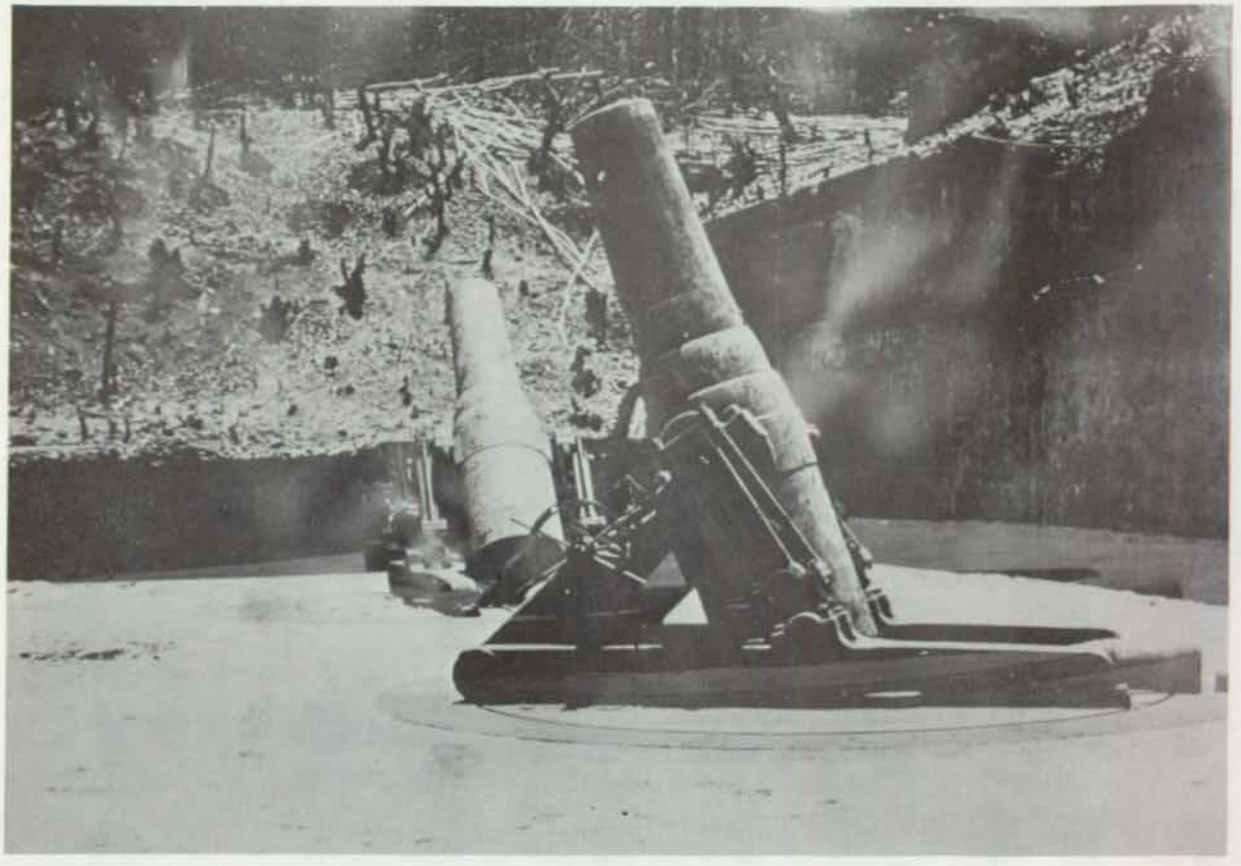


Illustration 10.

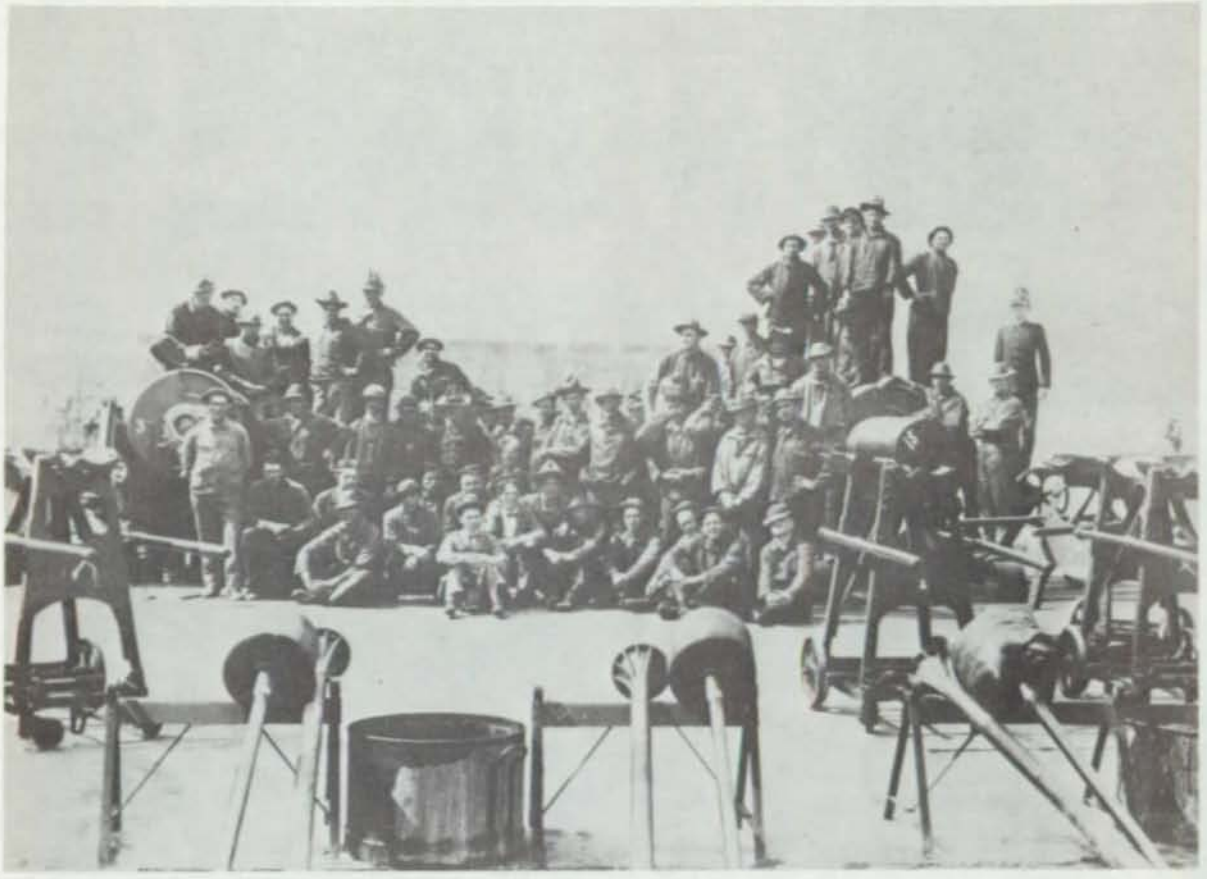
Battery Worth--12-inch Mortars, Their Equipment and Personnel, Circa 1910.

Courtesy GUIS.

Illustration 11.

One of Battery Cooper's 6-inch Guns Elevated Preparatory to a Simulated Firing Mission, Circa 1915.

Courtesy GUIS.



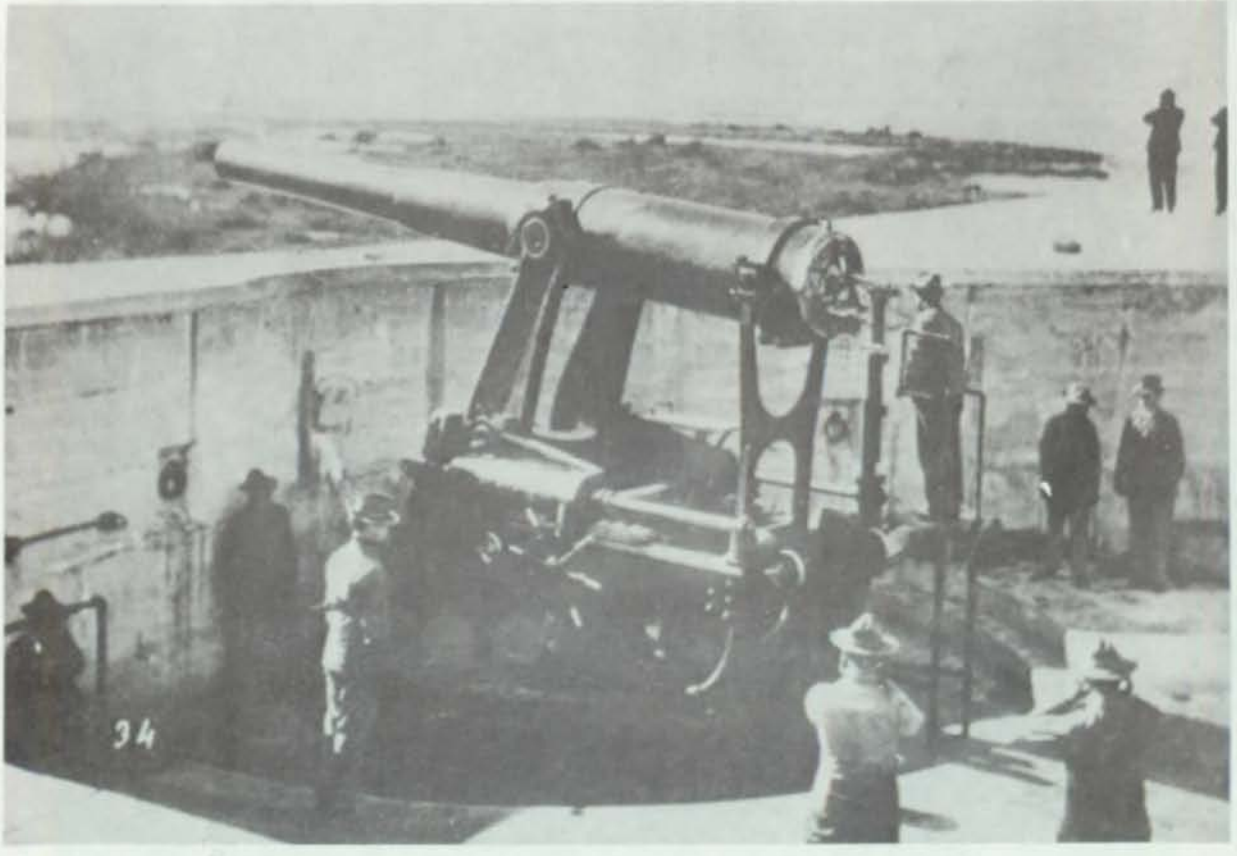

34

Illustration 12.

The Two 3-inch Rapid-Fire Guns of Battery Alexander Trueman, Circa 1930s.

Courtesy GUIS.

Illustration 13.

One of Battery Loomis L. Langdon's 12-inch Rifled Guns Roars, Circa 1930s. This was during the years when the guns were mounted en barbette.

Courtesy GUIS.

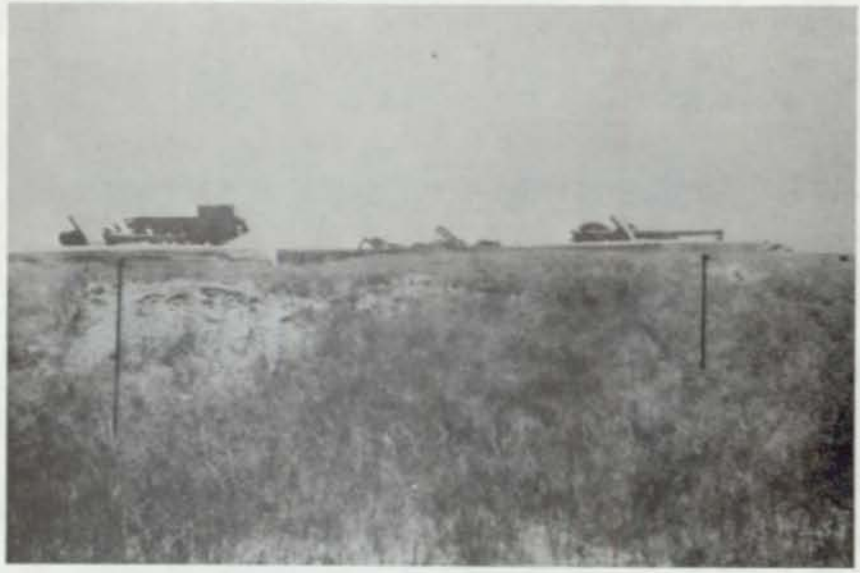


Illustration 14.

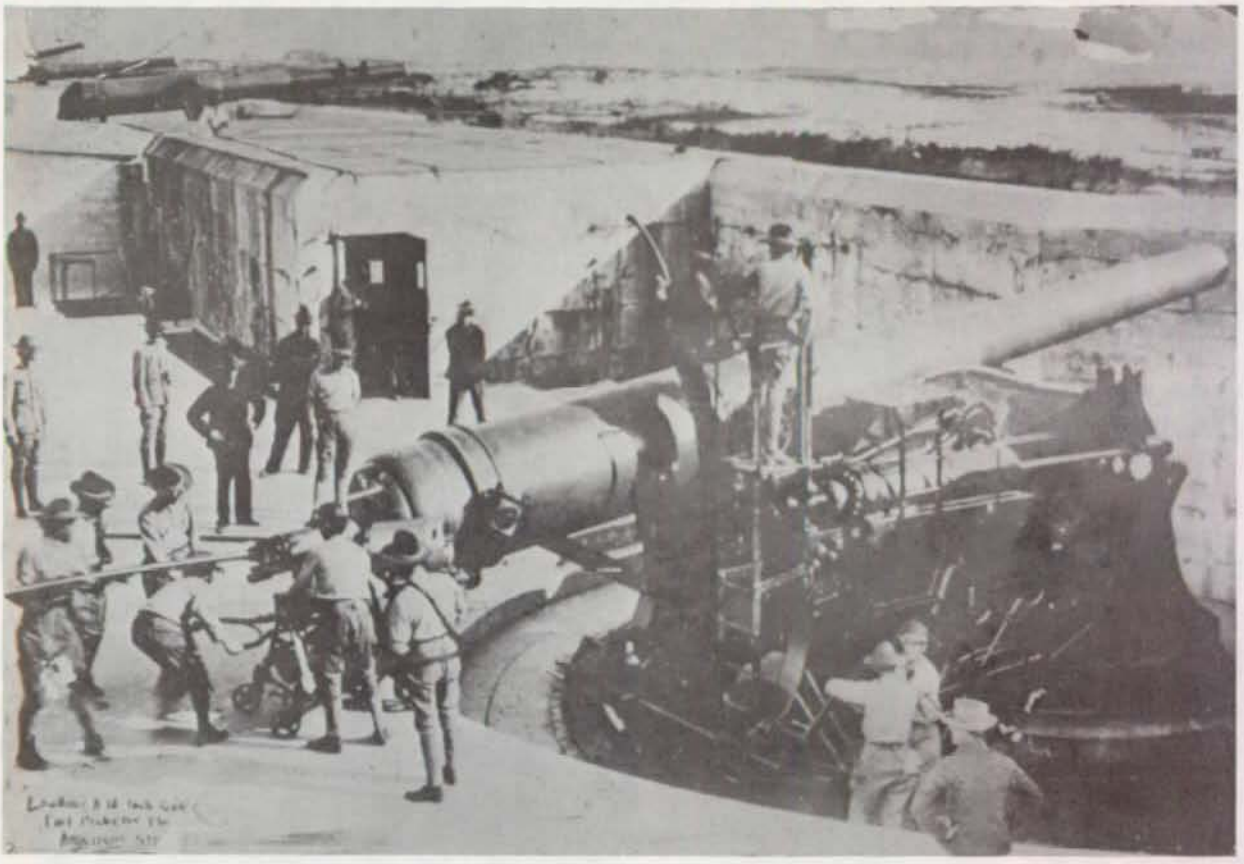
Loading 10-inch Gun at Battery Sevier, Circa 1920s.

Courtesy GUIS.

Illustration 15.

Ten-inch Projectiles on Shell Carts at Battery Cullum, Circa 1930.

Courtesy GUIS.



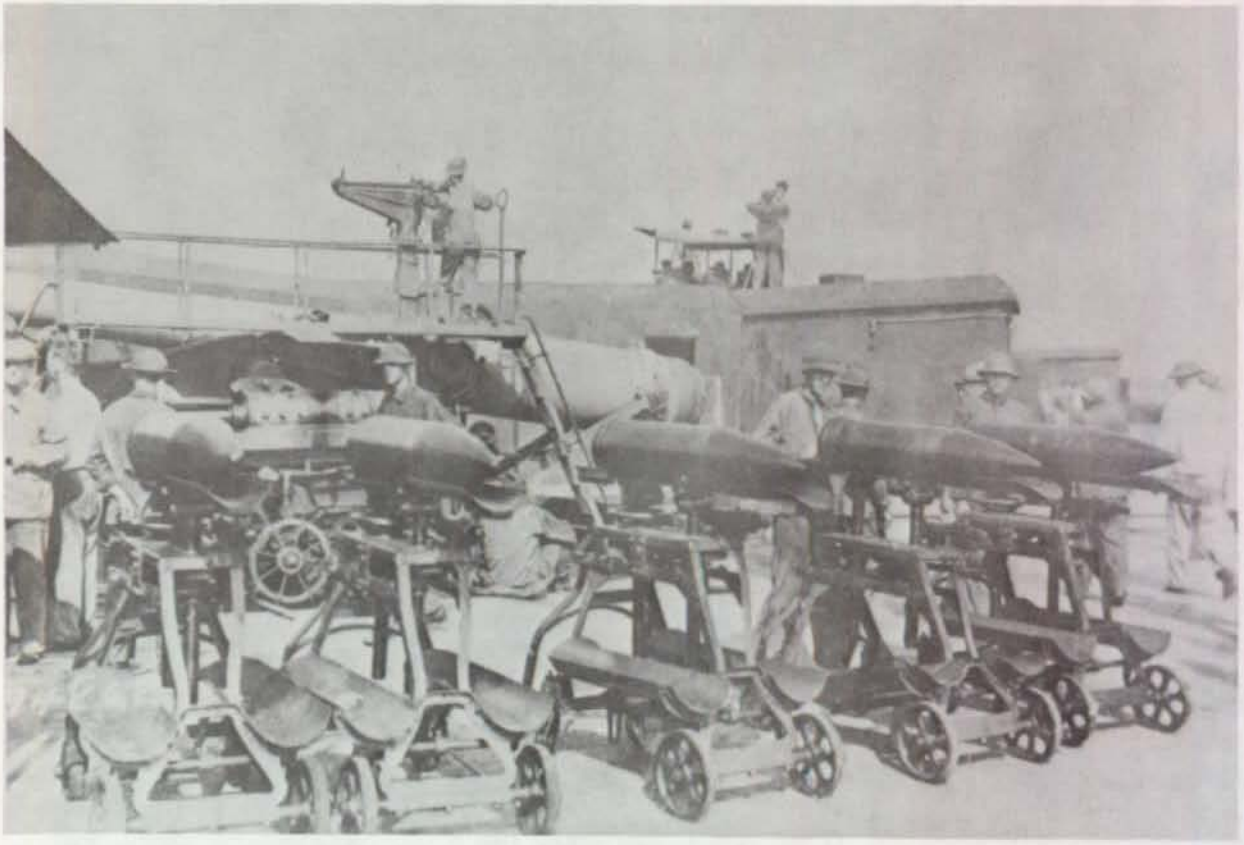


Illustration 16.

Battery Cullum-Sevier from the East. Note Foster's Bank in the Distance and Magazine in the Foreground, Circa 1930.

Courtesy GUIS.

Illustration 17.

Big Guns of the Pensacola Harbor Defense Project Zero on Towed Targets, Circa 1930s.

Courtesy GUIS.

Illustration 18.

Towed Target, Showing Effect of Hit by Big Caliber Shell, Circa 1930s.

Courtesy GUIS.

Illustration 19.

Narrow Gauge Engine and Ammunitian Train Emerges Through Fort Pickens Sally Port, Circa 1930.

Courtesy GUIS.

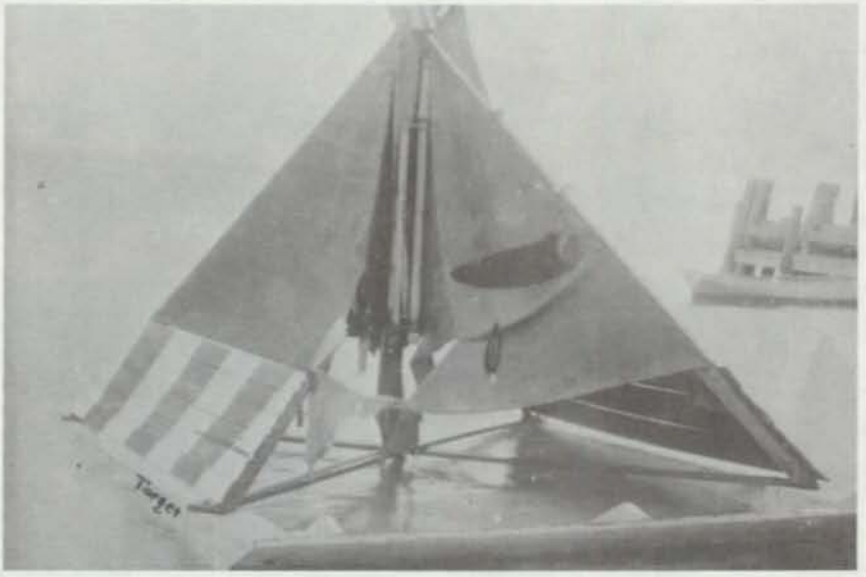


Illustration 20.

Fort Pickens and Disarmed Battery Pensacola. Note Roadway Built by Florida State Park People Through Counterscarp and Glacis, Circa 1955.

Courtesy GUIS.

As the nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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