D-2080
vol 2

historic structure report
historical data section
fort jefferson: 1846-1898

File:
Dry
Tortugas
NP

july 1983

Pkg. 103

FORT JEFFERSON



NATIONAL MONUMENT / FLORIDA

PLEASE RETURN TO:
TECHNICAL INFORMATION CENTER
DENVER SERVICE CENTER
NATIONAL PARK SERVICE

Color Scans
9/6/2002

HISTORIC STRUCTURE REPORT

HISTORICAL DATA SECTION

FORT JEFFERSON: 1846-1898

FORT JEFFERSON NATIONAL MONUMENT
Monroe County, Florida

By

Edwin C. Bearss

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS xviii

FOREWORD xix

CHAPTER I: ADMINISTRATIVE DATA--FORT JEFFERSON . . . 1

A. Name and Number of Structures 1
B. Statement of Significance 1
C. Proposed Use of Structure(s) 1
D. Provision for Operating Structures 2
E. Cooperative Agreements, if any, Executed or Proposed for Operating Structures 2
F. Brief Description of Preservation/Restoration Activity . 2

CHAPTER II: ENGINEERS' PRELIMINARY STUDIES AND PROJECTS . . 3

A. Commodore Porter's 1824-25 Reconnaissance . . . 3
B. Tattnall Survey of 1829-30 3
1. Commodore Rodgers Has a Different Perspective . 3
2. Josiah Tattnall Surveys the Tortugas . . . 4
3. Tattnall's Report 6
4. Secretary's Recommendations 7
C. Foreign Relations Cause the Nation to Look Toward the Straits of Florida 8
D. Congress Makes a $50,000 Appropriation for Fortifications on the Florida Reef 8
E. Bache-Graham Survey 10
F. Captain Barnard's Report 11
1. Totten Charges Barnard with an Important Mission . 11
2. Barnard's Plan of Defense 12
3. He Proposes a Use for the Major Keys . . . 13
4. Its Cost 14
5. Difficulties of Maintaining a Blockade . . . 14
6. Sources of Water 15
7. Establishing Construction Priorities . . . 15
8. Sources of Materials and Manpower 15
9. Additional Details are Provided on Services and Costs of Materials and Labor 16
10. Barnard Defends His Thesis that the Tortugas are a Strategic Necessity 17
G. Smith-Chase Preliminary Report 17
1. Chief Engineer Totten Constitutes a Board . . 17
2. Reviewing the Geography and Its Implications . . 18
3. Bombproof Cazerne as Proposed 18
4. Planning for Seven Batteries 19
5. Focusing on Materials and Priorities . . . 20
6. Totten Responds to the Smith-Chase Report . . 20

H. Congress Refuses to Boost the Appropriation 21
I. Board's Final Report 21
1. Documenting the Need and Developing Costs . . . 21
2. Defining the System's Key Elements and Mission . . 24
3. Minority Reports as to Details 24
4. Major Smith Dissolves the Board 25

CHAPTER III: CONSTRUCTION BEGINS: 1846-1848 27

A. Captain Fraser is Selected as Superintending Engineer . . 27
B. Totten's Memoir to Guide His Superintending Engineer . . 28
1. Safeguarding the Rights of the Lighthouse Board . . 28
2. Instructions for Positioning the Fort 28
3. Guidelines Governing Foundations and Casemate Arches 29
4. Directions for Locating the Ditch and Laying Out the Counterscarp 30
5. Totten Lists the Permanent Parade Structures . . . 30
6. Rules Governing Construction of Six Frame Temporary Structures 31
7. Program for Erecting Sections of the Quarters and Barracks 32
C. Drawings are Prepared, Reviewed, and Approved . . . 33
D. Lieutenant Wright's Four Hectic Months 33
1. Wright Replaces Fraser as Superintending Engineer 33
2. Totten and Wright Decide to Contract for Two Additional Temporary Buildings 34
3. Norton and Parker Contract 36
4. Wright Purchases a Schooner, Mill, and Steam Engine 38
5. War Department Secures Prerequisite Jurisdiction . . 38
E. Wright's First Weeks on the Reef 40
1. He Arrives on Garden Key and Finds its Configuration Changed by the October 1846 Hurricane 40
2. Staking the Fort and Locating the Temporary Structures 41
3. Wright Locates and Evaluates Tortugas Building Materials 41
4. He Recommends Early Construction of a Section of the Counterscarp 42
F. Andrew B. Vennard Positions the Eight Temporary Buildings 43
1. Norton and Parker Renege on the Contract . . . 43
2. Vennard is Awarded the Contract 43
3. Seven Slaves Flee Garden Key 44
4. Vennard's People Finally Erect the Buildings and Position the Wooden Cisterns 45
G. Fiscal Year 1848 Construction Program 46
1. Stockpiling of Materials 46
2. Three Detached Brick Kitchens are Erected and Protected from the Surf 46
3. 69' 3" Section of the Officers' Quarters is Raised and Enclosed 47

4. Wright's Proposal to Defer Construction of Barracks is Approved 47
H. Congress Fails to Enact a Fortifications Bill for Fiscal Year 1848 48

CHAPTER IV: WRIGHT AND THE DEPARTMENT PERFECT ARRANGEMENTS TO PUSH CONSTRUCTION 51

A. Furloughs and Other Duties Give Wright a Vacation 51
1. His 1850 Furlough is Cut Short 51
2. He Combines Pleasure and Business 52
3. St. Augustine Interlude 53
4. He is Called to Washington and Jacksonville . . . 53
5. Yellow Fever Ravages the Florida Reef 54
6. His Pleas Finally Earn Him Reassignment 55
B. Wright's Regulations Governing Access to the Tortugas . . 56
C. Labor Force: Its Wages, Problems, etc. 57
1. Primitive Working Conditions Sap the Men's Morale . . 57
2. Principal Overseer Phillips Wins a Pay Raise . . . 58
3. Rearranging the Workmen's Sleeping Quarters . . . 59
4. Decision is Reached to Suspend Work During the Sickly Season 60
5. Rules and Regulations Governing the Employment of Slaves 60
6. Wright Reorganizes the Workforce for a Resumption of Construction 61
7. Inflationary Forces Cause Overseer Phillips to Ask for Another Raise 63
8. Increased Workforce Compels Wright to Provide Additional Quarters and Messing Facilities . . . 64
D. Inspecting, Purchasing, Transporting, and Stockpiling Materials 64
1. Wright Reports on Availability and Costs of Materials and Provisions 64
2. Wright Seeks Where Possible to Avoid Contracts . . 65
3. Wright's 1850 Visit to Mobile and Pensacola and Reports on the Character of Bricks Kilned There . . 65
4. Wright's 1852 Visit to and Report on New England Brickyards 67
5. Wright's 1853 Trip to Washington and the New York Agency 69
6. Moody and Boultier Timber Contract 70
7. W.H. Wall & Co. Contract 71
8. Wright Contracts with Abercrombie and Raeford for Six Million Bricks 71
a. Wright Returns to the Gulf Coast Brickyards 71
b. Wright and Scarritt Recommend the Use of Pensacola Brick 72
c. Wright Contracts with Abercrombie and Raeford . 73
d. Abercrombie and Raeford Have Trouble Making Their Initial Deliveries 76
e. Wright Receives Authority to Purchase Shaped Bricks from Abercrombie and Raeford . . . 77

9. Benner and Tift Contract 78
10. Boating Sand for Masonry 78
11. Gathering and Boating Coral for Aggregate from Bush Key 78

E. Corps' Experiment with a Trémie for Laying Masses of Concrete Underwater Benefit the Art 79
1. General Totten Calls on Lieutenant Wright to Undertake Some Important Experiments 79
2. Wright Submits His First Report 80
3. Totten Commends Wright and Makes a Valuable Suggestion 82
4. Wright Continues the Program 82
5. Wright Formulates Five Principals 82
6. Disseminating the Results 83
7. Totten Provides Guidance on Mixing Concrete and Introduction of Lime 84

F. A Communications Lag Causes Problems with the Treasury 85

V. FORT RISES ABOVE THE KEY: 1848-56 87

A. Fort Gets a Distinguished Name 87
B. Planning, Funding, and Programming 87
1. Fiscal Year 1848 Program 87
2. Fiscal Year 1849 Program 88
3. Wright Campaigns for Larger Annual Appropriations . . 90
4. Fiscal Year 1851 Program 90
5. Wright Estimates That to Complete the Fort Will Cost More Than $1,210,000 91
6. Congress Fails to Appropriate any Monies to Underwrite the Program in Fiscal Year 1852 . . . 92
7. Closing Down Operations 92
8. Fiscal Year 1854 Program 92
9. Fiscal Year 1855 Program 93
10. Fiscal Year 1856 Program 94

C. Wharves are Built to Facilitate Construction 94
D. Completion and Maintenance of the Section of Officers' Quarters Used as Engineers' Offices 95
E. Counterscarp Takes Shape 97
1. Wright Outlines His Goals and Alternatives . . . 97
2. Totten Provides Guidelines 99
3. Wright Looks to Captain Dutton for Assistance . . 100
4. Wright Refines His Plan for the Foundations . . . 100
5. Totten Gives Wright Authority to Proceed . . . 101
6. Wright Introduces an Approved Manner of Cofferdamming 102
7. Progress in the Year Ending September 30, 1849 . . 103
8. Progress in the Year Ending September 30, 1850 . . 104
9. Progress in the Year Ending September 30, 1851 . . 104
10. One of Two Gaps is Closed 104
11. Locating and Detailing the Sluiceways and Gates . . 105
12. Enrockment is Positioned to Forestall Erosion on Fronts No. 5 and 6 106
13. Wright Identifies Some Structural Failures . . . 106

F. To Combat Subsidence Pier Grillages are Decided Upon 107
1. To Determine the Degree of Subsidence to Anticipate a Brick-Laden Table is Positioned 107
2. Table Warns the Corps to Expect Considerable Subsidence 108
3. Totten Calls for Cheap Grillages 109
4. Wright Submits His Recommendations 109
5. Totten Drafts a Change Order 110
6. Wright Attributes Much of Unequal Subsidence to Boring by Shrimp and Worms 112
7. Positioning the Grillages and Laying the Piers is Expedited 113
G. Scarp Takes Shape 113
1. Wright Seeks Change Order 113
2. Work on the Cofferdam, Foundations, and Superstructure Begins 115
3. Foundations and Superstructures of Bastions A, B, and F, and Fronts Nos. 1 and 6 are Raised to Reference (0) 115
4. Material Shortages Slow Progress 116
5. Work is Accelerated and the Scarp Rises 117
H. Perfecting Plans and Details for the Fort's Drainage . . 118
1. Totten Provides Guidelines for Constructing and Positioning the Outlet Drains 118
2. Wright Submits Drawings for Sewers, Privy Vaults, Drains, and Outlets 119
3. Totten Gives His Comments 120
4. Agreement is Reached on the Details 121
5. Wright Prepares a Drawing 122
6. Work Accomplished in the 12 Months Ending September 30, 1855 123
I. Coping With a Shortage of Potable Water 123
1. Vennard Cisterns Cause Problems 123
2. Plans are Prepared and Approved for Incorporating Cisterns in the Chapel-Offices' Foundations . . . 123
3. Wright Introduces General Changes 124
4. Reservoir is Completed and Partially Filled . . . 124
5. Construction of Two Concrete Cisterns 124
6. Flooring the Casemate Cisterns 126
J. Building-up and Levelling the Parade 127

VI. MAJOR CHANGES IN THE STRUCTURE ARE MANDATED 129

A. International Tensions Focus Attention on Coastal Fortifications 129
B. Technological Improvements in Weaponry Result in a Revised Armament Schedule 130
C. Wright Calls for Structural Details Necessary in Implementing Major Changes 131
D. Department Transmits Several Drawings 132

E. General Totten Gives Directions 132
1. About the Embrasures 132
2. About Structural Changes to Lower and Second Tier Piers and Arches 133
3. About the Advantages of Flagging the Casemate Floors 134
4. About Cistern Manholes, etc. 134
5. About Sally Port Pit and Guardroom Cisterns . . . 134
F. Progress Precludes One of Totten's Changes 135
G. Pintle-Blocks and Tongue-Hole Lintels are Determined Upon and Ordered 135
H. Department Forwards Plans and Sections of the First and Second Tiers of Five of the Six Bastions 136
I. Wright Submits an Important Drawing 136
J. Department Transmits Drawings of the Roof Surfaces of Five of the Six Bastions and Plans and Sections of NW Bastion 137
K. Department Provides Drawings and Instructions for Building the Gateway 138
L. Wright Provides Data on Pump Pipes, Manholes, etc. . . 140

VII. THE WOODBURY YEARS: 1856-60 141

A. Woodbury as a Manager 141
1. Woodbury Becomes Superintending Engineer . . . 141
2. Woodbury Vainly Seeks to Transfer from Fort Jefferson to Fort Taylor 142
3. Woodbury's Final Three Years on the Project . . . 145
B. Planning, Funding, and Programming 148
1. Department Seeks Data to Enable it to Establish Long-Range Priorities 148
2. Fiscal Year 1857 Program 149
a. Carrying on in Anticipation of an Appropriation 149
b. Congress Votes $150,000 for Fort Jefferson . . 150
3. Wrestling with a Program 150
4. Fiscal Year 1858 Program 151
5. Fiscal Year 1859 Program 152
6. Fiscal Year 1860 Program 153
7. Woodbury's July 1, 1859, Estimate for Completing the Fort 154
8. Fiscal Year 1861 Program 157
C. Construction Progress Under Captain Woodbury's Superintendence 157
1. In the 12 months Ending September 30, 1856 . . . 157
2. In the 12 months Ending September 30, 1857 . . . 158
3. In the 9 months Ending June 30, 1858 158
4. In the 12 months Ending June 30, 1859 159
5. In the 12 months Ending June 30, 1860 159
D. Change Orders: Both Those Approved and Those Vetoed . . 160
1. Involving Elimination of Certain Manholes and Enlarging Communications Under Certain Passageways . 160
2. Totten Vetoes a Proposal to Relocate Certain Long Front Manholes 160
3. Totten Turns Down a Proposal to Introduce Ventilators into the Lower Tier Casemates . . . 161

4. Making the Casemate Cisterns Watertight 161
5. Authority is Sought and Given for Introduction of Stairway Tower Loopholes 162
E. Laying-up the Totten Embrasures 162
1. Craighill Calls for Guidance 162
2. Totten Sends Plans and Gives Detailed Instructions for Construction of 1st Tier Curtain Embrasures . . . 163
a. Ironwork and its Function 163
b. Introduction of a Sole Stone 165
c. General Instructions as to Mode of Construction 165
d. Guidelines as to Use of Lead Concrete . . . 165
e. Instructions on Arch Construction 166
f. Use of a False Pintle and Forms to Facilitate Good Workmanship and to Secure Precision . . 166
g. Woodbury is Directed to Order 111 Sets of Irons 167
3. Department Forwards Drawings of the 1st Tier Flanking Embrasures 168
4. Fabricating the Embrasure Irons 168
5. Most of the 1st Tier Embrasures are Completed . . 169
6. Department Provides Plans for the 2d Tier Embrasures 169
F. Department Provides Plans of Barbette Tier Details . . 169
G. Subsidence Becomes a Serious Problem 170
H. August 1856 Hurricane and the Loss of Activa 171
I. Storehouses and Protecting the Materials 172
1. May 15, 1857, Fire Costs the Project a Storehouse . . 172
2. Overseer Phillips Builds and Operates a Small Store 173
J. Bacon and Abercrombie Provide Millions of Bricks at $21 per Thousand 174
K. Labor Force and Working Conditions 175
1. Establishing Comparable Wages 175
2. Rations and Recreation 176
3. Senator Mallory Pressures the Department to Make Full Use of Slave Labor 177

VIII. THE CIVIL WAR COMES TO THE FLORIDA REEF 179

A. Captain Meigs' Thirteen Exciting Weeks 179
1. New Superintending Engineer is Ordered to Fort Jefferson 179
2. Meigs Reaches the Tortugas at a Critical Time . . 180
3. Meigs is a Man of Action 182
4. Major Arnold and a Garrison Occupy the Fort . . . 183
5. Fort Receives its First Big Guns 183
6. Department Commends Meigs' Zeal 185
7. Meigs Recommends Several Structural Improvements . . 185
8. Meigs Further Strengthens the Fort's Armament . . 186
9. Meigs Proposes Additional Defenses to Protect the Fleet Anchorage 188
10. Meigs Ends His Exile 188

B. Morton's 12 Months on the Florida Reef 188
1. Morton Becomes Superintending Engineer 188
2. Secretary Cameron Rules Against the Engineers . . 189
3. Thomas Jekyll is Hired as a Draftsman 191
4. Morton Secures a 90-Day Leave 191
C. Planning, Funding, and Programming 192
1. Fiscal Year 1862 Program 192
2. $100,000 Windfall 193
3. 1st Session of the 37th Congress Appropriates $100,000 for Fort Jefferson 194
4. Bleak Financial Outlook Threatens to Shutdown the Project 194
5. Eleventh Hour Reprieve 196
D. Totten's New Instructions for "Arranging" the Barbette Tier 197
1. Generalizations 197
2. Changes in Details of the Curtain Platforms . . . 197
3. Changes in Details of Bastion Breast-Height Walls 197
4. Substituting Brick for Stone in the Cordon and Coping 198
5. Traverse Magazines 198
6. Outlets Through the Breast-Height Wall 198
7. Keeping the Cisterns Watertight in View of the Increased Overburden 199
8. Revetting the Breast-Height Wall 199
9. Forming the Surmounting Blocks 200
10. Providing for Drainage and Unequal Subsidence . . 200
11. Banquettes and Traverse Circles 201
12. Changes to Coping of Circular Stairway Tower Walls and Addition of a "Drip" 201
13. Composition of Terreplein Surface 201
14. Details of Bastion Roof Surfaces and Drainage . . 202
15. Blind Embrasures 203
16. Details of Columbiad Platforms 203
17. Loading Recesses 203
18. Peculiarities Found in the Roof Surfaces of Bastion F 204
19. Changes Mandated by the Ordnance People 204
E. Plans and Instructions for Building Detached Parade Magazines 205
1. Grillages and Foundations (General) 205
2. Grillages and Foundations (Specific) 206
3. Anteroom 206
4. Shot-and-Shell Proof Porch 207
5. Walls and Piers 207
6. Ventilating the Structure 208
7. Roofing and Bombproofing the Structure 208
8. Door Jambs and Lightning Rods 209

F. Laying-up Concrete in the Masonry Piers 209
1. Totten Provides Guidelines 209
2. Morton's Method of Mixing and Laying Concrete 210
3. Morton's Method of Mixing and Laying Lime-Concrete 212
4. Totten's Comments 213
G. Work Accomplished in Fiscal Year 1861 213
H. Two Shot Furnaces are Located and One Commenced . . 214
I. Documenting the Rate and Degree of Subsidence . . 215
J. Increasing the Fort's Armament 215
1. Situation in October 1861 215
2. "Trent Affair" Results in a Crash Program . . 217
3. 15-inch Rodmans are Slated to Replace the Six 10-inch Columbiads 218
K. Engineers and Line Officers Cooperate for Area's Defense 218
1. Major Arnold Gives Morton a Number of Projects . 218
2. Labor Shortage Plagues Morton 219
3. Colonel Brown and Morton Reach Agreement . . 220
4. Proposal to Build a Causeway and Wharf is Shelved 220
5. Department Agrees to Construction of a Horse Railway 221
6. Water Distilling Machines Supplement the Cisterns 221
7. Union is Transferred and Tortugas Armed . . . 222
8. Quartering the Garrison 223
9. Bird Key Fortifications 224
10. Providing Facilities for Storage of Naval Ordnance Stores 225
L. Supplying the Project with Materials 226
1. Bacon & Abercrombie Abrogate Their Contracts . 226
2. Coping with Financial and Labor Shortages . . 226
3. New York Agency Scrounges for Bricks . . . 227
4. Agency is Directed to Ship Cutstone for Stairtowers 228
5. Morton Seeks to Maintain an Equilibrium . . . 228
6. W.P. Trowbridge Takes Charge of the New York Agency 228
7. Trowbridge Ships 111 Sets of Casemate Traverse Irons 229
M. Mobilizing and Maintaining a Large Labor Force . . 229
1. Wage Scales 229
2. Fatigue Parties and Prisoners Augment the Workforce 231
3. Fort Jefferson Volunteer Sappers and Miners . . 232
N. Stranding of J.C. Chambers 232

IX. THE MCFARLAND SUPERINTENDENCY 233

A. McFarland Manages the Project Through Assistants 233
1. McFarland is Felled by Yellow Fever and Goes on Leave 233
2. Jekyll is Fired and Frost Hired 234
3. Hilton Head Interlude 235
4. Lieutenant Holgate Assists James McFarland . . . 236
5. Flying Visit to New Orleans 237
6. McFarland Seeks Field Service 237
7. McFarland's Orders to Join the XIII Corps in Texas are Canceled and He Spends Four Months in the North 239
8. Major Burnham and Lieutenant Livermore Report to McFarland as Assistants 241
9. McFarland's Final Months on the Florida Reef . . . 241

B. Funding and Programming 242
1. Fiscal Year 1864 Appropriation and Program . . . 242
2. Congress Fails to Appropriate Any Funds for the Garden Key Fort in Fiscal Year 1865 243
3. Fiscal Year 1866 Appropriation and Program . . . 246
4. Fiscal Year 1867 Appropriation and Program . . . 247
5. Fiscal Year 1868 Appropriation and Program . . . 248

C. Construction Progress Reported During the McFarland Years 249
1. Work Accomplished: May-August 1862 249
2. Work Accomplished in Fiscal Year 1863 250
a. Frost Orders Galvanized Iron and Granite for 52 Service Magazines 250
b. Use of Spoil from the Ditch as Fill . . . 251
c. Measures Taken to Flush Stagnant Water from Ditch 251
d. McFarland Calls for Iron Floor Beams . . . 251
e. McFarland's Annual Report 251
f. Photographs are Introduced to Document Progress . 253
3. Work Accomplished in Fiscal Year 1864 253
a. Repairing the Wharves 253
b. Shortages of Maine Bricks Compels Readjustment in Priorities 253
c. Ironwork for the Quarters and Barracks . . . 254
d. McFarland Calls for Plans and Elevations of Other Structures on the Parade. 254
e. Progress Described in the Monthly and Annual Reports 255
4. Work Accomplished in Fiscal Year 1865 256
5. Fiscal Year 1866 Program 258
a. Friction Between the Corps and Garrison . . . 258
b. Plans and Guidelines for Roofing the Barracks and Quarters 259
c. Department Revises its Guidelines for Construction of Breast-Height Walls, Parapets, and Platforms for Barbette Batteries 260
d. Modification of Certain Barbette Platforms . . 260

e. Strikebreaking in the 1860s 262
f. Work Accomplished During the 12 Months Ending June 30, 1866 262
6. Implementing the Fiscal Year 1867 Program . . 263
D. Changes Mandated for the Barbette Tier Platforms . . 265
1. Totten Calls for Stronger Traverse Stones . . 265
2. Implementing the Change Order on Curtains Nos. 3 and 6 265
3. Totten Provides Plans and Instructions for 15-inch Centre-Pintle Bastion Platforms . . . 266
4. Department Forwards Plans for 15- and-10-inch Front-Pintle Platforms 268
E. Boosting the Fort's Armament 268
1. Totten Calls for a Report of Effect of Recoil on Platforms of Barbette Guns 268
2. Armament Mounted and Dismounted in Mid-March 1863 269
3. June 1863 Armament Report 270
4. Department Calls for More Guns and Carriages . . 270
5. Armament and Platforms in December 1863 . . . 271
6. Recesses are Cut in the Breast-Height Wall of Barbette Tier to Increase Traverse of 42-pounders 271
7. Armament and Platforms in 1864 271
8. Armament and Platforms in 1865 272
9. Armament and Platforms in 1866 274
10. Armament and Platforms in 1867 275
11. Steps are Taken to Prepare the Six Bastion Terrepleins for Their Armament 276
F. Frost Describes and Holgate Records the Subsidence 276
G. Magazine Capacity and Powder Stored Therein . . . 277
H. Construction of and Responsibility for Shot Beds . . 278
I. Struggle to Supply the Population with Potable Water 278
J. Measures Taken to Restrict Access to the Fort by Unauthorized People 280
K. Maintaining an Effective Workforce 280
1. Phasing Out Slave Labor 280
2. General Banks Reinforces the Labor Force with Louisiana Blacks 281
3. Employees Win a Pay Raise 282
4. Employment of Military Convicts 283
L. Quality and Quantity of Key Materials Plague the Corps 284
1. Failure of Salvaged Lime 284
2. Wartime Shortages Effect the Quality and Quantity of Bricks 285
3. Stockpiling and Use of Materials in 1863 . . 286
4. Shortage of Quality Bricks is Compounded by Skyrocketing Prices 287
5. McFarland Lists Materials Needed to Complete Certain Structures. 287
6. Poor Quality Bricks Continue into the First Post-War Year Construction Season 288

M. The October 1865 Hurricane 288
N. Yellow Jack Scourges the Tortugas 290
1. Dread Plague Smites the Garrison in 1867 . . 290
2. An Investigation 292
3. Corps Takes Measures to Meet Board's Recommendations 292

X. THE "MODERNIZATION" YEARS: 1868-1874 295

A. Colonel Simpson Becomes Superintending Engineer . . 295
B. Simpson Wrestles with Residual Problems 295
1. Corps and Garrison Row Over Quarters . . . 295
2. Coping with Foul Odors and Sewer Filth . . . 297
3. Preparations are Made to Expedite Completion of the Ditch and Counterscarp 299
4. McFarland Clarifies the Situation Pertaining to Flagging and Eccentric Traverse Circles . . 299
C. 1868 Construction Season 300
1. Simpson's Plan of Operations 300
2. Chief Engineer Humphreys' Guidelines . . . 301
3. Work Accomplished in the 1868 Season . . . 301
4. Simpson Calls for $100,000 302
D. Fiscal Years 1869 and 1870 Construction Programs Focus on the Quarters and Barracks 303
1. Major Blunt Succeeds Colonel Simpson . . . 303
E. 1869-1870 Construction Season 303
1. Blunt Charters a Schooner 303
2. Organizing a Workforce for the 1869 Season . . 303
3. Blunt Submits a Program to be Funded from Contingencies 305
4. Addition of Blinds to the Quarters' Piazza is a Mistake 306
5. Progress Made During the Second Six Months of Fiscal Year 1869 307
6. Department Cautions Against Over Spending . . 307
7. Construction Progress Through May 1, 1870 . . 309
F. Increasing the Fort's Armament in 1869-70 . . . 309
1. General Humphreys Gives Instructions and Blunt Responds 309
2. Small Recesses are Mandated to Give the Barbette Guns a Full Traverse 311
3. Platforms are Readied and 29 Additional Guns Mounted 311
G. Construction Programs for Fiscal Years 1871-1874 . . 312
1. Fiscal Year 1872 Appropriation and Program . . 312
2. To Escape the Quarantine the Construction Season is Postponed 313
3. Department Sanctions Hire of a Tender . . . 313
4. Alabama Claims Crisis Changes Priorities . . 314
a. Work Accomplished on the Counterscarp . . 314
b. Work Accomplished on the Barracks . . . 315
5. Fiscal Year 1873 Appropriation and Program . . 315
6. Blunt Increases the Work Day and Wages . . . 316
7. Counterscarp (Seawall) is Finally Completed . . 316

8. Closing Down the Project for the 1872-73 Season 316
9. Fiscal Year 1874 Appropriation and Program . . 317
10. October 1873 Hurricane and Repairing the Damage 317
H. Bolstering the Barbette Tier's Armament to Meet Challenges from Abroad 319
1. Plans are Prepared, Submitted, and Approved for Modernizing the Armament 319
2. Threat of War with Britain Results in a Crash Program 323
3. Salient Angles are Prepared for the 15-inch Rodmans 325
4. Securing and Positioning Timber Platforms . . 327
5. Problem with Traverse Wheels Causes Delays . . 328
6. Ten Big Guns: Six 15-inch Rodmans and Four 300-pdr. Parrotts are Mounted 329
7. The "Virginius Crisis" Causes a Brief Furor . . 329
8. Limited Fiscal Year 1874 Program 330
9. Fiscal Year 1876 Improvements 331
10. Department Calls for Annual Armament Drawings . 331
11. Delinating the Fort's Field of Fire . . . 331
I. Quartermaster Department Funds Repair of One of the Wharves 332
J. October 20, 1870, Hurricane 333
K. Hospital is Housed in the Barracks 334
L. Corps Razes Three Temporary Parade Structures . . 335
M. Corps Enforces a Policy Against Photographers . . 335
N. Garrison is Withdrawn from the Tortugas 336
1. August-September 1873 Yellow Fever Outbreak . . 336
2. Captain Langdon Levels Grave Charges Against the Corps 337
3. Troops are Transferred 338
4. Corps Counterattacks 339
5. Corps Takes Mitigating Action 340

XI. THE CORPS' FINAL GARDEN KEY YEARS: 1874-1890 . . . 341

A. Repair and Maintenance of the Fort During the Smith Years: 1874-1876 341
1. Captain Smith Takes Charge 341
2. Smith's Plan to Replace the Privy Vaults with Water Closets Flushed by Gravity 344
3. Fort Gets No Construction Funds in Fiscal Year 1875 343
4. September 1875 Hurricane 343
5. Maintaining the Fort in Fiscal Year 1876 . . 344
6. Smith's Fiscal Year 1877 Program 344
7. Board's 1876 Inspection and Report 345
B. Wrought Iron Lighthouse Tower is Positioned on C Bastion and the 1826 Tower Razed 346

C. Fort Jefferson as Shown on Coast Survey Charts . . . 348
D. Captain Heuer's First Superintendency 349
1. Captain Heuer Replaces Major Smith 349
2. Heuer's 1877 Annual Report and Recommendations . . 349
3. Colonel Davis' April 1877 Inspection and Report . . 350
4. Repairs, Maintenance, and Protection in Fiscal Year 1878 351
a. Financial Situation 351
b. Heuer Spends the Funds Remaining on the Books for Repairs to Quarters, Barracks, Kitchens, etc. 351
5. Fort's Condition in Winter of 1877-78 352
a. Captain Heuer's February 1878 Report . . . 352
b. Heuer's Estimate for Correcting Deficiencies . . 353
6. General Hancock Vainly Seeks to Have the 15-inch Platforms Rebuilt 354
7. Sewer System Continues to Plaque the Military . . 356
8. Department Seeks to Cut the Keeper's Salary . . . 357
9. Maintenance and Protection in Fiscal Year 1879 . . 357
10. Maintenance and Protection in Fiscal Year 1880 . . 357
11. Maintenance and Protection in Fiscal Year 1881 . . 358
12. Professor Agassiz's Field Trip to the Tortugas . . 358
13. Maintenance and Protection in Fiscal Year 1882 . . 359
a. Captain Heuer Proposes to Employ Funds on the Books to Provide for the Fort's Protection . . . 359
b. Guarding and Caring for the Fort and Public Property 360
14. Maintenance and Protection in Fiscal Year 1883 . . 360
a. Allotment 360
b. Deterioration of Certain Features Accelerates . 361
c. Plans are Made to Dismount the Rodmans . . . 361
d. Fort's Armament 362
e. Condition of the Quarters, Barracks, etc. . . 362
E. Captain Turtle's Seven Months as Superintending Engineer . 364
1. Maintenance and Protection in Fiscal Year 1884 . . 364
a. Appropriation and Allotment 364
b. Fort Jefferson Gets a New Superintending Engineer 364
c. Fort's Condition on June 30, 1884 364
F. Captain Rossell's 15 Months as Superintending Engineer . . 365
1. Maintenance and Protection in Fiscal Year 1885 . . 365
a. Appropriation and Allotment 365
b. Captain Rossell Replaces Captain Turtle . . . 365
c. Keeper is Laid-off 366
d. Maintenance and Protection Problems Haunt the Department 366
e. Rossell Gets $350 for Emergency Repairs . . . 368
f. Department Calls for Figures on Placing the Guns and Magazines in Serviceable Condition . . . 369
g. Fort's Condition on June 30, 1885 369

2. Maintenance and Protection in Fiscal Year 1886 . . 370
a. The Need 370
b. The Allotment 371
G. Heuer's Second Superintendency: November 1885-November 1887 371
1. His Return 371
2. His February 1886 Inspection 372
3. He Orders Materials for Repair of Barbette Magazines 372
4. Professor Brooks and His Students Visit Garden Key . 373
5. Fort and its Armament on June 30, 1886 373
6. Congress Refuses to Appropriate Funds for Obsolete Fortifications 374
7. Mid-August 1886 Hurricane 374
8. Fort in June 1887 374
H. Army Pulls Out of Garden Key 375
1. Captain Fisk Becomes Superintending Engineer . . . 375
2. Captain Fisk's March 1888 Visit to the Fort and His First Annual Report 376
3. September 1888 Storm 376
4. Lighthouse Service Expands its Facilities . . . 376
5. Army Agrees to Turn the Fort and Certain Keys Over to the Marine-Hospital Service 376
6. George Phillips Describes the Fort in April 1889 . . 377
7. Marine-Hospital Service Takes Charge 378

XII. GARDEN KEY AS A QUARANTINE STATION 381

A. Marine-Hospital Service Opens Station 381
1. Plans are Made 381
2. Quarters Selected and Laboratory Established . . . 381
3. Surgeon's Wyman's Mid-November 1890 Report . . . 381
4. Operations in Fiscal Year 1891 382
B. Construction and Outfitting the Quarantine Wharf . . . 383
C. Fiscal Year 1892 Maintenance 384
D. Station Facilities in Fiscal Year 1894 384
1. Improvements and Maintenance 384
2. Condition of the Disinfecting Plant 385
3. Problems with Wharf's Location 385
E. Surgeon Murray's Fiscal Year 1895 Report 385
1. Condition of Fort 385
2. Condition of Structures Exterior to Moat . . . 386
3. Maintenance and Repairs 386
4. Construction of Bird Key Lazaretto 387
F. Station in Fiscal Year 1896 387
1. Maintenance and Repairs 387
2. Needed Repairs 387
3. Quarantine Season Activities 388
G. Station in Fiscal Year 1897 388
1. Quarantine Season Activities 388
2. Maintenance and Repairs 388
3. Furnishing the Lazaretto 389

H. Station in Fiscal Year 1898 389
1. Quarantine Season Activities 389
2. War Comes to the Station 389
3. Maintenance and Repairs 390
4. Condition of the Fort's Weaponry 390
5. Navy Begins Development of Site as Coaling Station 391
I. Station in Fiscal Year 1899 391
1. Disinfecting Troops Returning from Cuba . . . 391
2. Presence of Naval Contractors Cause Difficulties 393
3. Improvements and Maintenance 393
J. Closure of Garden Key Quarantine Station . . . 393
1. Final Quarantine Season 393
2. Station is Closed and Turned Over to Navy . . 394

APPENDIX A: GLOSSARY 397

PART II: THE U.S. NAVAL COAL DEPOT, DRY TORTUGAS, FLA., 1898-1916 405

1. A Change in Jurisdiction at Fort Jefferson, 1898-1900 . . 407

2. Constructing a Naval Coal Depot, 1898-1901 408

3. Use as Coaling Depot, 1898-March 1912 410

4. Marines at Dry Tortugas, 1901-1906 411

5. The Naval Coal Depot, 1907-1916 415

Hurricane, October 1910 416

Fire, January 1912 421

Disposing of the Coaling Plant, 1912-1916 423

APPENDIXES:

Appendix A. Specifications, June 24, 1901, for repair of the Fort Jefferson Moat 427

Appendix B. Report of Hurricane Damage at Naval Coal Depot, October 28, 1910 431

Appendix C. Report of Fire at Dry Tortugas, January 19, 1912 . 437

Appendix D. Inspection Report of Conditions at Dry Tortugas, April 19, 1916 441

BIBLIOGRAPHY 447

ILLUSTRATIONS 457

NATIONAL ARCHIVES DRAWINGS 500

LIST OF ILLUSTRATIONS

1. Aerial view of Fort Jefferson, circa 1935 458

2. View west across parade, circa 1867 460

3. View northeast across parade, circa 1867 462

4. Interior of Fort Jefferson, showing parados of Front No. 3, circa 1867 464

5. Interior of Fort Jefferson, showing the parados of Bastion D and Front 3, circa 1867 466

6. Southeast curtain of Fort Jefferson, circa 1899 . . . 468

7. View of Fort Jefferson parade toward soldiers' barracks, circa 1900 470

8. Fort Jefferson, 2d tier casemates, circa 1899 . . . 472

9. Second tier bastion casemates, circa 1900 474

10. Fort Jefferson sally port, ditch, and bridge, circa 1899 . 476

11. Distilling plant and southeast spit coalsheds, circa 1899 . 478

12. Soldiers in quarantine, Spring 1899 480

13. Naval coalsheds on southeast spit, December 3, 1899 . . 482

14. Ten-inch Rodmans on iron casemate carriages, circa 1899 . 484

15. Barbette tier gun and traverse magazine, circa 1899 . . 486

16. Barbette tier armament, circa May 1900 488

17. Company C, 5th U.S. Infantry, May 1898 490

18. View across Fort Jefferson from officers' quarters piazza, circa May 1898 492

19. Fort Jefferson officers' quarters southeast elevation, circa 1898 494

20. Dr. Samuel Mudd's Cell, circa 1898 496

21. Counterscarp, ditch, bridge and sally port, looking toward Bastion C, May 1898 498

FOREWORD

This report has been prepared to satisfy the research needs for Fort Jefferson as outlined in the Task Directive, dated May, 1978, and as evaluated in on-site discussions with Historical Architects Henry Judd and John Garner in September, 1977, and in subsequent telephone conversations with Historical Architects Harold LaFleur and Douglas S. Ashley. Our goal, in accordance with these guidelines, is to provide a comprehensive structural history of Fort Jefferson and its dependencies from the mid-1840s through 1916, years when Garden Key and Tortugas Harbor were important elements in the Nation's defense scheme.

Supervisory Historian Edwin C. Bearss researched, compiled, and drafted the sections of this report featuring the Army's role in the fort's construction, occupation, and administration (1844-1889); while Historian Charles W. Snell researched and wrote the section of the report focusing on the years Tortugas Harbor served as a naval installation (1898-1916).

A number of persons have assisted with preparation of this report. Particular thanks are extended to our long-time friends in on-site study of American seacoast fortifications--Historical Architects Henry Judd, formerly Chief, Historical Architect, National Park Service Cultural Resources Management Division, and John Garner, Historical Architect, Southeast Regional Office. Besides reconnoitering the area with us, they pointed out anomalies in the fabric, and reviewed preservation and policy problems. More important, Mr. Judd, now retired, has long been a friend to Fort Jefferson and on many occasions has fought the lonely fight with management for its preservation. Mr. Garner, besides his well-known and appreciated abilities as an architect, has a keen perception of the role of the historian in preparation of Historic Structure Reports. It was through his foresight that documentary research on the Southeast Region's coastal forts was consolidated at a considerable saving in money and a great increase in efficiency.

Architects Harold LaFleur and Douglas Ashley and Historian John Paige of the Denver Service Center's Southeast/Southwest Team had a thankless task of providing advise, administrative support, handling the review process, and arranging for the report's reproduction and distribution.

Superintendent John M. Good of the Everglades National Park made arrangements for our visit to Fort Jefferson; Ralph Miele took the time to make the flight enjoyable and worthwhile; and Area Manager Larry Brown and his staff, through their cooperation, insured that we were able to take maximum advantage of our limited time on Garden Key.

At National Archives and the Federal Record Center in East Point, Georgia, we, as many times in the past, would have missed many key documents but for the assistance of such well informed and helpful archivists and technicians as Dale Floyd, Tim Ninninger, Mike Musick, Richard Cox, John Matias, Raymond Cotton, Mike Stanchie, James Dillon, Gayle Peters, and C.A. Rayden.

Longtime friend and confidant, Dr. E. Raymond Lewis, Librarian of the House of Representatives and author of Seacoast Fortifications of the United States, shared with us his encyclopedic knowledge of America's coastal defenses.

A special debt is owed former Park Service Historian Albert C. Manucy. Long before we knew that the Service had historians, his article, "Ghost in the Gulf," in The Saturday Evening Post introduced us to this subject. His studies, "Fort Jefferson History" and "A Construction History of Fort Jefferson: 1846-1874" made our task that much easier.

Our colleagues--Historical Architects John Garner, Harold LaFleur, George Thorson, and Douglas Ashley; Chief Park Service Historian Harry Pfanz; and Denver Service Center Historians John Luzader and John Paige--reviewed the draft manuscript and made valuable suggestions. Last, but not least, we wish to thank Mrs. Virginia Fairman and Mrs. Beverly Ritchey, who had the thankless task of turning the manuscript into a typed document, ready for reproduction and distribution.

Edwin C. Bearss

I. ADMINISTRATIVE DATA--FORT JEFFERSON

A. Name and Number of Structures

Fort Jefferson, Monroe County, Florida, is an 11 structure complex. These structures constitute an ensemble that is of First Order of Significance. On the List of Classified Structures for Fort Jefferson National Monument these features are identified:

Garden Key (Tortugas) Lighthouse	HS-01
Large (Principal) Powder Magazine	HS-02
Small Powder Magazine	HS-03
Shot Furnace	HS-04
Dr. Samuel Mudd's Presumed Cell	HS-05
Officers' Quarters	HS-06
Enlisted Men's Barracks	HS-07
Engineer Officers' Quarters	HS-08
Bakery	HS-09
Cistern (Foundations of Chapel-Office)	HS-10
Fort Proper (Counterscarp, Ditch, Scarp, Casements, Bastions, Stair-Towers, Parapets, Terreplein, etc.)	HS-11

B. Statement of Significance

Fort Jefferson represents the apogee of mid-nineteenth century military engineering. Schooled and guided by Brigadier General Joseph G. Totten, United States Army Engineers supervised construction of a number of masonry coastal fortifications that brought this form of military architecture to its highest form. Of these, Fort Jefferson was the most extensive and ambitious, and deemed to be the most vital to the Nation's security. It also escaped modification during the Endicott and Taft periods.

In mid-nineteenth century America, General Totten and his engineers were the Nation's preeminent builders of huge masonry structures, and innovators in use of concrete construction. They were the acknowledged experts in the use and form of the arch. They authored a number of monographs on builders' arts that were widely distributed and their practices adopted by many of their civilian counterparts.

Fort Jefferson is also significant as illustrative of United States territorial expansion during the age of manifest destiny. Its role as a base for blockaders focuses on the Union Navy's vital activities in the Civil War. During and after that conflict, the fort served as a place of incarceration for military convicts and political prisoners. After the emergence of the United States as a world power, upon defeat of Spain in 1898, the Navy sought to develop Tortugas Harbor as an important coaling station.

C. Proposed Use of Structure(s)

Fort Jefferson and its dependencies will be stabilized, preserved, and protected as an outstanding example of mid-nineteenth century American

military engineering and architecture. Where feasible structures, i.e. the engineer quarters, may have their interiors adapted to provide for a compatible usage.

D. Provision for Operating Structures

Fort Jefferson will be preserved and interpreted as a structure(s) significant to the Nation's engineering, architectural, political, and military history.

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 Preservation/Restoration Activity

This will be discussed in the Architectural Data Section of this Historic Structure Report to be prepared by the historical architect.

II. ENGINEERS' PRELIMINARY STUDIES AND PROJECTS

A. Commodore Porter's 1824-25 Reconnaissance

In the years immediately following the 1822 acquisition of Florida, the attention of the United States was called to the strategic significance of the Dry Tortugas. Situated some 65 miles west by northwest of Key West, these islets, if occupied by a hostile force, would control access to the Gulf of Mexico by way of the Straits of Florida. As to be expected, the Navy first became interested.

Commodore David Porter, sent to suppress piracy in the Caribbean, reconnoitered the Dry Tortugas in late December 1824 and early January 1825. He was on the lookout for a site for a naval station. Unimpressed with what he saw, he notified the Secretary of the Navy that the Tortugas were unfit for any kind of naval establishment. He reported that they

> consist of small sand Islands a little above the surface of the Ocean, on some of which is some low shrubbery, but all are liable to changes from gales of wind. Their insulated situation, and distance from the continent renders blockade easy; they have a good inner harbour for small craft and a tolerable outer one for ships of war; but they have no fresh water, and furnish scarcely land enough to place a fortification and it is doubtful if they have solidity enough to bear one.[1]

B. Tattnall Survey of 1829-30

1. Commodore Rodgers Has a Different Perspective

Commodore John Rodgers and a team of engineers visited the Gulf Coast in May 1829. Their task was to examine the Pensacola Navy Yard and select a site for a Naval Hospital and other facilities, and to investigate the land purchased for a live oak reservation. On his return to Washington from Pensacola, Rodgers took passage aboard the sloop-of-war Erie. A four-day stop was made at Dry Tortugas to enable Rodgers to reconnoiter the anchorage.[2]

---

1. The Territorial Papers of the United States, The Territory of Florida, 1824-1828, Clarence E. Carter, compiler (Washington, 1956), Vol. XXIII, pp. 161-62.

2. "Report of John Rodgers, July 3, 1829," found in Message from the President of the United States to the Two Houses of Congress at the Commencement of the 1st Session of the 21st Congress, December 8, 1829, Serial 192 (Washington, 1830), Senate Doc. 1, pp. 231-36; Niles' Register, June 18, 1829. Commodore Rodgers stopped at Key West in the second week of June, where he (Continued)

The veteran naval officer was delighted with what he found. The Tortugas, he reported, consisted of 11 small keys and surrounding reefs and banks, over which the sea broke. Within were an outer and inner harbor--the former which, besides affording a safe anchorage at all seasons, was large enough to enable all the navies of Europe to ride at anchor. Of more importance, the inner harbor combined a sufficient depth of water for ships-of-the-line, with a narrow entrance of not more than 120 yards.

When he studied his charts, Rodgers found the geographic location ideal. If occupied and fortified, the Dry Tortugas would constitute the "advance post" for a defense of the Gulf Coast. These islands, he reported to Secretary of the Navy John Branch, were "directly in the track of all vessels passing to and fro, not only between . . . them and the Mississippi, but between every part of West Florida, and our Eastern States." At the same time, no other site presented the "same facilities in communicating" with ports in Cuba and on the Mexican Gulf Coast. If the Dry Tortugas were fortified, he waxed enthusiastically, the commerce of La Habana and "even the homeward bound trade of Jamaica, would be subjected to its grasp."

But, he added, there were certain disadvantages, inasmuch as there was no fresh water or firewood of any consequence on the keys. Water, however, could be supplied by cisterns, while wood could be secured from Key West or on the east coast of Florida.[3]

2. Josiah Tattnall Surveys the Tortugas

Secretary of the Navy Branch, after reviewing Rodgers' report, determined to have a detailed survey made of the Dry Tortugas. Lieutenant Josiah Tattnall, a veteran of the War of 1812, was placed in charge of the project.

Lieutenant Tattnall sailed from Washington for the Tortugas aboard the sloop Florida in the first week of September, 1929. The vessel tied up at Savannah on the 16th. When informed of Tattnall's mission, the editor of the Savannah Republican informed his readers that the United States had ordered a survey to ascertain the usefulness of the Tortugas as a naval base. According to Commodore Rodgers, the anchorage was a good one, "capable of admitting the largest ships of the line," and was perfectly secure from heavy winds. The proximity of the keys to Cuba, 90 miles away, made them "a desirable resort" for Commodore Porter's squadron engaged in suppression of piracy in the Gulf of Mexico.[4]

---

2. (Continued) told several people that he favored the establishment of a naval station in the area, as a base for the West India Squadron in its campaign against piracy. Rodgers sailed for Norfolk aboard Erie on the 11th.

3. "Report of John Rodgers, July 3, 1829," Serial 192, Senate Doc. 1, p. 236. Seven of the keys were covered with mangroves and shrubbery, while the other four had little vegetation. Fish, birds, and turtles were found in "greatest abundance."

4. Niles' Register, October 17, 1829.

Florida reached the Tortugas on October 3, after a longer passage than anticipated. Work was commenced immediately, with the men frequently standing in water up to their shoulders, under a blazing sun. Several officers and men, already weakened by exposure on the run down from Washington, were soon confined to sick bay with "intermittent fever." The workforce was so reduced that Tattnall hailed a fishing boat and had it carry a message to La Hábana. He requested that the United States Consul send him several seamen to help man his small craft.[5]

Tattnall was relieved to find the climate of the Tortugas conducive to good health, especially as Key West had been swept by yellow fever. Out of 150 inhabitants, 65 had died. Tattnall attributed the favorable health situation on the Tortugas to the absence of ponds and mud banks. His experiences satisfied him that they were "as healthy as the deck of a ship in the same latitude."[6]

When no replacements from Cuba were forthcoming, Tattnall on October 20 suspended the survey and made a run over to La Habana in the sloop. His mission was to ship four seamen to fill vacant billets and to borrow a longboat from one of the United States cruisers operating off the north coast of Cuba.[7] In reporting his arrival at La Habana, Lieutenant Tattnall notified his superiors that he had been greatly inconvenienced in making soundings with Florida's small boat, and a larger craft was needed. If all went well, he hoped to be back at Dry Tortugas early on the 21st, and to complete the survey of the two inner harbors before another week has passed.[8]

Tattnall was disappointed to find no United States men-of-war on the north Cuban coast and that seamen's wages were higher than he was authorized to pay. He therefore returned to the Tortugas on the 22d. There, Tattnall and Lieutenant Thomas R. Gedney disembarked with four men, with the goal of "continuing such parts of the survey as our reduced force was equal to." Lieutenant Henry M. Morris then proceeded with Florida for Pensacola to secure supplies, a longboat, and recruit seamen.

The weather on the 22d, as Florida made sail, was clear, with a "fine breeze from the east." When he reached Pensacola, Lieutenant Morris was unable to obtain a longboat or recruits. To get these he was compelled to travel to New Orleans. It was December 8 before he was back at Pensacola,

---

5. Tattnall to Secretary of the Navy, October 6, 1829, NA, Microcopy 148, Ltrs. Recd. by Secretary of the Navy from Officers Below the Rank of Commander, 1802-1884.

6. Ibid.; "Tattnall's February 28, 1830, Report," found in Message from the President of the United States to the Two Houses of Congress at the Commencement of the 2d Session of the 21st Congress, December 8, 1830, Serial 193 (Washington, 1831), pp. 3-4.

7. There were two vacant billets in Florida, and the signing on of four seamen would make his crew two overstrength and facilitate the survey.

8. Tattnall to Secretary of the Navy, October 21, 1829, NA, Microcopy 148, Ltrs. Recd. by Secretary of the Navy from Officers below the Rank of Commander, 1802-1884.

and several more days passed before he had Florida ready to weigh anchor.[9]

Meanwhile, Lieutenant Tattnall had grown increasingly apprehensive as the weeks passed and Florida failed to return. He feared that she had foundered. Unwilling to brook any delay, Tattnall chartered a small sloop with a three-man crew for $100 per month. With this craft he pushed the survey. By the time Florida returned from Pensacola in the fourth week of December, the project was practically completed.[10]

The survey was quickly finished, and, by the first week of January 1830, the equipment had been loaded and the surveyors started for Washington. Florida, on her return from southern waters, was compelled to dock at Gosport, when it was learned that the Potomac was obstructed with ice.[11] Lieutenant Tattnall completed his trip to the capital by stage, where, on February 28, he submitted his report and charts of the survey to Secretary of the Navy Branch.

3. Tattnall's Report

Like Commodore Rodgers, Lieutenants Tattnall and Gedney were impressed with the possibilities of the Dry Tortugas as a fleet anchorage. The survey had shown that the large outer harbor had an average depth of eight fathoms, was clear of rock, and constituted a holding ground of first quality. There were three entrances from the sea, each with sufficient depth for the largest ships, from the southeast, southwest, and northwest. Tattnall considered the first two to be safest and easiest of access. Northwest Channel was more difficult, as it was intersected by shoals, and should only be attempted by large ships in emergency situations. Several hard blows had occurred while they were in the Tortugas, but on no occasion were the seas so rough as to make it an unsafe anchorage.

The inner harbor (Tortugas Harbor) consisted of two basins, the largest of which was 1,200 yards by 770 yards, and the smaller 600 yards by 400 yards. The depth of the former was from 28 to 40 feet, and of the latter from 16 to 24 feet. Once again, the bottom was clear of rock. There were two entrances from the outer harbor, by a 35-foot channel into the large and a 23-foot channel into the small. The two basins were connected by a 23-foot channel, so that a vessel "may haul from one into the other without passing into the other harbor."

---

9. Tattnall to Secretary of the Navy, October 22 and December 17, 1829, and Morris to Secretary of the Navy, December 9, 1829, NA, Microcopy 148, Ltrs. Recd. by Secretary of the Navy from Officers Below the Rank of Commander, 1802-1884.

10. Tattnall to Secretary of the Navy, December 17, 1829, NA, Microcopy 148, Ltrs. Recd. by Secretary of the Navy from Officers Below the Rank of Commander, 1802-1884.

11. Tattnall to Secretary of the Navy, February 24, 1830, NA, Microcopy 148, Ltrs. Recd., Secretary of the Navy from Officers Below the Rank of Commander, 1802-1884.

Tortugas Harbor was so well protected by keys and flats that the water, even in the worst gales, was calm. Vessels had nothing to cope with but the force of the wind. A wrecker had told Tattnall that in the last hurricane, two fishing smacks were at anchor in the small basin. One of them rode out the blow, while the other was driven ashore. After the gale had abated, she was refloated. Moreover, a sailor, who had been on one of the craft, swore that although the storm "was of almost unprecedented violence, there was not sea enough to cause the vessel to pitch."

Continuing, Tattnall observed that Lieutenant Matthew Fontaine Maury's oceanographic studies had demonstrated that seasonal winds blew to the disadvantage of shipping south of Cuba; and that passage became very difficult from January to April, the period when the southern cotton crop was transported to textile mills in Great Britain and New England. Tattnall further pointed out that the British, French, Spanish, and Danes had colonies in the Caribbean. Some of these island possessions were "said to be well fortified," whereas the United States had no suitable naval base along the 500-mile coast of its Gulf Frontier.

In event of war, these powers would menace the Nation, because most of the region's trade passed through the Straits of Florida. A powerful enemy squadron could, by blockading the straits, throttle the southwest. Lieutenant Tattnall was so concerned about the "encroachments" of Great Britain that, on maps supplementing his report, he marked with a black flag the possessions of this "island poacher," called attention to the important naval station in Bermuda, and remarked that from there British warships and "blackamoor" regiments might descend upon our South Atlantic ports and harbors.[12]

4. Secretary's Recommendations

On March 25 Secretary Branch forwarded Tattnall's report to President Andrew Jackson. In a covering letter, he pointed out that the Tattnall-Gedney survey "fully confirms the favorable anticipations" formed by Commodore Rodgers. In regard to its susceptibility for defense, a study would have to be undertaken by the Corps of Engineers. But, he added, it would be difficult to over-estimate its value as a naval rendezvous and depot, provided it could be made invulnerable to a bombardment and blockade by a superior naval force. In his opinion no other position afforded the same advantages for protection of the Gulf Coast.[13]

Nothing further was done at this time, however, to establish a naval base at the Tortugas. While the Navy lost interest in the Tortugas and focused its attention on the base previously established at Pensacola, the War Department soon became interested in the area.

---

12. "Tattnall's Report of February 28, 1830," found in Message from the President of the United States to the Two Houses of Congress, Serial 193, p. 3.

13. Branch to Jackson, March 25, 1830, found ibid., pp. 1-2.

C. Foreign Relations Cause the Nation to Look Toward the Straits of Florida

Then, in the decade of the 1830s, Texans declared and made good their independence from Mexico. Efforts to secure the Lone Star Republic's annexation to the United States were frustrated, for the time being, by the slavery and other sectional issues. Yet, Texas, as an independent nation, had acquired a navy, a national debt, and recognition by Britain and France. Sam Houston and other Texas political leaders hoped to employ these European contacts to secure the security and protection that would be afforded by annexation. European statesmen coincidentally viewed Texas as a commercial asset, as well as a bastion against farther United States expansion to the southwest. In 1844 the Mexican ministers in London and Paris were advised that, if their country recognized the Texas Republic, Great Britain and France would guarantee the independence of Texas and the boundaries of Mexico.

Complicating the equation was Cuba, only 90 miles from the Tortugas. Many Southerners feared that Spain would soon see the "Pearl of the Antilles" slip from her grasp. If this occurred, the island, provided it did not fall into the hands of the British, might become another Haiti.

On the Pacific Coast, the United States was also fishing in troubled waters. In 1842 Commodore Ap Catesby Jones, having heard rumors that the United States and Mexico were at war and California might be turned over to Britain, seized Monterey. The naval landing force was soon withdrawn, but relations between the United States and Mexico were further strained.

Farther north in the Oregon Country, joint-occupation of that region had further acerbated relations between the United States and Great Britain. Expansionists were calling on their government to end this arrangement, and in the election of 1844 the cry, "Fifty-four forty or fight," was raised.

The difficulty of overland communication with the Pacific Coast had aroused interest in a trans-isthmian route and engender additional suspicion of the British by Americans. In the years since President James Monroe had enunciated his doctrine the "ubiquitous Britisher" had seen an expansion of his influence throughout the Caribbean that seemingly boded ill for Uncle Sam.[14]

D. Congress Makes a $50,000 Appropriation for Fortifications on the Florida Reef

On January 11, 1844, against this background, the United States Senate called on President John Tyler to communicate to it correspondence from Brigadier General William Worth and others "relative to fortifying the Keys and Islands around Cape Florida; and connecting the waters of Matanzas

14. Albert C. Manucy, "Construction History of Fort Jefferson, 1846-1874," unpublished manuscript, files National Park Service, pp. 16-18.

river and Musquito Lagoon with Indian river at the Haulover, in East Florida, etc."[15]

The President referred this request to Secretary of War James M. Porter. Chief Engineer Joseph G. Totten and Quartermaster General Thomas S. Jesup were accordingly asked to submit position papers. Colonel Totten urged that preparation be made for fortifying the Florida Reef. The need for such action had long been apparent to those who had reflected on the strategic implications resulting from the geographic position of the Florida Peninsula, pointing dagger-like at the sea lanes linking the Atlantic and Gulf Coasts. This channel, known as the Straits of Florida, bounded to the south by Cuba, was only 90 miles across. Through this narrow passage, Colonel Totten noted, all the trade of the Gulf must pass.

Some four years before, in February, 1840, the Board of Engineers, in calling attention to the Dry Tortugas and Key West, had referred to Commodore Rodgers' report of July 3, 1829. In this document Rodgers had written that, "A naval force designed to control the navigation of the Gulf could not desire a better position than Key West or the Tortugas." The latter, Rodgers had continued, were said to "afford perfect shelter for vessels of every class, with the greatest facility for ingress and egress." If a hostile power should occupy the Tortugas, United States shipping in the Gulf would be in deadly peril, and "nothing but absolute naval superiority" could prevail.

In 1835, Totten continued, the Corps of Engineers had included figures for defense of the Tortugas and Key West in its general estimates. There had been no follow-up, and the questions now confronting the Department were:

(a) Will it be necessary to occupy both positions?
(b) If not, which is preferred?
(c) Is there any other harbor on the reef, or near it, which deprived of the other two, an enemy might occupy and employ as a base?

To answer these questions, the Department must possess "exact and minute Surveys," Colonel Totten advised Secretary Porter, and these must be entered upon without delay. The results could then be laid before the Board of Engineers to be used in preparing plans for an appropriate defense system.[16]

General Jesup, who had commanded United States forces in Florida during one phase of the Second Seminole War, referred Secretary Porter to Jesup's annual report for 1843. In that document he had observed that the Dry Tortugas, Key West, and Key Biscayne "are the great strategic points on our southern frontier," and they should be strongly fortified. Covered by a proper naval force, they would command the Straits of Florida entrance into

---

15. Journal of the Senate of the United States of America, Being the 1st Session of the 28th Congress. . . (Washington, 1843), p. 48.

16. Totten to Porter, January 30, 1844, found in Territorial Papers, Florida Territory, 1839-45, pp. 840-46. Needed were detailed surveys of the Tortugas, Key West, and a general reconnaissance of the Florida Reef.

the Gulf of Mexico, "and afford better protection to the commerce of the whole West and Southwest, than ten times the force employed at any other points, or in any other way."

Jesup believed these three positions could be made impregnable by expenditure of not more than $4,000,000. But they would be worth, in military terms, $50,000,000.[17]

After reviewing these documents, the 1st Session of the 28th Congress included a line item in the Fortifications Bill, appropriating $50,000 for "commencement of Fortifications on the Florida Reef including Key West and the Dry Tortugas." On June 14, 1844, President Tyler signed this legislation into law.

To expedite action, Florida Territorial Delegate David Levy (Yulee) pressured the Chief Executive. When Levy contacted Chief Engineer Totten, he was told that such an expenditure would be premature. But, Totten continued, since Congress had made a decision, the Corps would begin work the moment it was in possession of prerequisite surveys.[18]

Orders were accordingly issued for the Topographical Engineers to undertake preparatory "surveys and reconnaissances of the Florida Reef." Captain William H. Swift assigned this task to Captain Campbell Graham.[19]

E. Bache-Graham Survey

More than a year slipped by before the Topographical Engineers acted. And when they did, Major Hartman Bache was placed in charge of the project, and Captain Graham served as his assistant.[20]

Bache and his party reached Key West in mid-November 1845, chartered a boat, and began their work. In accordance with Colonel Totten's request, priority was given to the survey of Garden and Bird Keys. By mid-January they had completed the first phase of their work, and Bache mailed copies of the Garden and Bird Key surveys to Colonel John J. Abert in Washington.[21]

---

17. Jesup to Porter, January 16, 1844, found in Territorial Papers, Florida Territory, 1839-45, pp. 830-32.

18. Totten to Wilkins, September 3, 1844, found in Territorial Papers, Florida Territory, 1839-45, pp. 952-58.

19. Swift to Graham, September 5, 1844, found in Territorial Papers, Florida Territory, 1839-45, pp. 954-55.

20. Abert to Bache, November 1, 1845, NA, Ltrs. Sent, Topographical Bureau, Microcopy M-66.

21. Bache to Abert, January 14 and 19, 1846, NA, Register of Letters Received, Topographical Bureau, Microcopy M-506. Copies of the subject surveys are on file at Everglades National Park. Unfortunately, the transmittal letters and report are not on file at National Archives.

On the last day of January, 1846, Colonel Abert placed copies of the Garden and Bird Key surveys in Colonel Totten's hands.[22]

F. Captain Barnard's Report

1. Totten Charges Barnard with an Important Mission

Because of the political pressure, Chief Engineer Totten decided to take some preliminary measures. Learning that Captain John G. Barnard had absented himself from his post in New Orleans as superintending engineer for repair of Forts Jackson and St. Philip and for construction of Fort Livingston to visit his family in Massachusetts and would soon be returning to the Gulf Coast, Totten determined to have him make a preliminary survey of the area. On September 10, 1844, he had addressed a letter to Barnard, explaining that Secretary of War Porter was desirous that prompt measures be taken toward commencement of fortifications on the Florida Reef. Lack of geographical and topographical information, however, had proved frustrating.

As Totten explained to Barnard, "We know full well the importance of the object, the necessity of possessing ourselves of the good harbors of the reef for our own purposes, and the greater necessity of keeping them from the grasp of an enemy." But, he continued, we cannot ascertain from any acceptable sources to what degree this goal is practicable.

During the previous winter, Colonel Totten, in anticipation of such an undertaking, had called for preliminary surveys, and he had been led to believe that they were about to be commenced by the Topographical Engineers. He, however, held that an examination of several of the principal harbors by a competent engineer, such as Captain Barnard, might lead to early selection of one or two points that must be occupied by the military.

Barnard would therefore hasten to Key West and make a reconnaissance of that harbor and then proceed to the Dry Tortugas and make a similar examination. Upon completion of his mission, he would resume his duties at New Orleans.

After collecting all the information to be derived from existing charts (Gould's and Tattnall's), from discussions with fishermen and pilots, and personal observation, Barnard was to consider: (a) whether these sites must constitute a part of the general system of defense for the reef; (b) their order of importance in reference to other keys and harbors that may fall within the system; (c) if first in importance, what is to be the plan of local defense; (d) the magnitude, armament, garrison, liability to assault, bombardment and blockade, and cost of the works; and (e) the availability of materials and workmen.

Finally, he was to discriminate between Key West and the Tortugas as to their relative significance. A single position at the latter might "present

22. Abert to Totten, January 31, 1846, NA, Ltrs. Sent, Topographical Bureau, Microcopy M-66.

more decided advantages and have a less doubtful influence upon a complete system of defense than any at Key West," Colonel Totten reminded Captain Barnard. The latter responsibility would be great, Totten added, because the Department would give great value on his opinion as to "What harbors or roadsteads must necessarily enter into this system?"[23]

2. Barnard's Plan of Defense

In the last week of September, Captain Barnard sailed from New York City for the Florida Reef. He landed in Key West in mid-October.

Barnard spent the next several weeks reconnoitering the Florida Reef's harbors and keys. After familiarizing himself with the area, talking with fishermen and pilots, and reviewing existing charts, he concluded that the Tortugas and Key West were strategic necessities that must be fortified.

Upon preparing his report for Chief Engineer Totten, Captain Barnard first reviewed the Key West situation. Turning to the Tortugas, he referred the Department to the reports submitted by Commodore Rodgers and Captain Tattnall of the Navy. These officers had ably documented the arguments for securing the Tortugas anchorage as a coaling station and a port of refuge. Equally important, was the need to deny the harbor to an enemy force as a base from which to blockade the Gulf Coast ports.

To this, Barnard wished to add that, while a hostile fleet would encounter little difficulty in blockading the approaches to Key West, the Tortugas were "beyond the power of any nation to maintain a perfect blockade."[24]

Because Captain Tattnall's chart gave all necessary topographical and hydrographical details for the harbors and keys, Barnard had confined himself to "an examination of the different localities with a view to their suitability as sites of batteries."

It was, he informed Colonel Totten, "out of the question to think of defending" the entire area enclosed by the reef, although the greater part of it constituted a favorable anchorage for deep-draft vessels. Moreover, there were no suitable sites on which batteries could be erected to command the passes. The Corps must therefore confine itself to those areas of the anchorage described by Captain Tattnall as forming the outer and inner harbors.

To defend these harbors, Captain Barnard proposed a system of batteries, which would not be prohibitively expensive. These positions were:

Battery No. 1--On the "tail of a shoal putting out from Garden Key and intended jointly with Nos. 3 and 4 to prevent the approach of vessels from the N.W. entrance & to sweep the outer harbor." Here, there was a ledge of coral and rock partially covered with sand. The ledge was nearly bare at ebb tide.

---

23. Totten to Barnard, September 10, 1844, NA, RG 77, Ltrs. Sent, Chief Engineer.

24. Barnard to Totten, November 14, 1844, NA, RG 77, Ltrs. Recd., Chief Engineer.

As Garden Key was to be a place of deposit for supplies and material, a gangway should be built to connect it with battery No. 1.

Battery No. 2--To be on Bush Key. In conjunction with Battery No. 3, it was to defend Southeast Channel, and with Battery No. 6 to prevent hostile warships from approaching to within bombardment range of the inner harbor.

Bush Key, Barnard noted, consisted of a ledge of broken coral on its eastern front, while its opposite shore was more sandy. It was about 100 yards across at its widest point, but it would be possible to extend the battery onto the hard coral and sand shoal in the rear. Building materials landed on Garden Key could be shuttled across to Bush Key in barges.

Battery No. 3--To be sited on Sand Key, and to defend with Battery No. 2 Southeast Channel and with Batteries Nos. 1 and 4 to guard against warships seeking to fight their way through Northwest Channel. This key, Captain Barnard found, was partially surrounded by a horizontal bed of shell rock nearly level with the water.

The pilot, who took him out to Sand Key had fished the Tortugas for years, and had explained that this reef was occasionally "uncovered to a much greater extent, and that the centre of the island being a patch of about 50 yards in diameter was permanent," but that the rest was migrating.

Construction of a battery on Sand Key, Barnard cautioned, must be attended with considerable difficulty, because of the space factor and the problem in conveying materials to such an exposed site.

Battery No. 4--To be positioned on Brilliant Shoal. In conjunction with Batteries Nos. 1 and 3, it was to guard the approach to the outer harbor from Northwest Channel. This shoal was flooded by from 5 to 6 feet of water, and consisted of sand and coral. Construction problems, he forecast, would not be as formidable as those encountered at Fort Sumter in Charleston Harbor.

Battery No. 5--To be on White Shoal and designed to defend Southwest Channel and sweep the outer harbor. This site was similar to Brilliant Shoal, and presented identical building difficulties.

Battery No. 6--To be a Martello Tower, on the coral ledge off Garden Key, and with Battery No. 2 to be sited to prevent approach of an enemy squadron to within bombarding distance of the inner harbors. This ledge was dry at low water, and materials could be ferried to the site in scows from the Garden Key depot.[25]

3. He Proposes a Use for the Major Keys

Captain Barnard's object in outlining this system of defense was to illustrate an alternative for protection of the outer and inner harbors. A more exhaustive investigation may, he admitted, "devise an adequate system which will be less costly."

His project, it would be seen, left to the Navy, Garden and Bird Keys.

---

25. Ibid.

Each of these was situated on "one of the two small harbours forming the inner harbour." The subject keys were formed of shell sand, were "well elevated above the range of the tides," and should afford the Navy ample space for storehouses.

Long Key was a narrow ridge of sand, too restricted to be of much use for any military purpose. Its point, formerly extending toward the inner harbor for a distance of several hundred yards, had been eroded away in the 14 years since Captain Tattnall's survey.

Loggerhead Key, Captain Barnard informed the Department, was the largest islet in the Tortugas, and will be extremely valuable as a peacetime cantonment for the garrison. It consisted of shell sand founded on a horizontal bed of shell rock.[26]

4. Its Cost

In a survey such as just undertaken, Barnard reminded Chief Engineer Totten, it was impossible to fix on "the exact character" of each of the six batteries or designate its "precise magnitude." As none of them could be "besieged or battered" from the land, he believed that casemated batteries similar to those proposed for Key West were the answer. This would be used as a standard in estimating costs of the proposed defenses for the Dry Tortugas. It might be necessary, he cautioned, in view of the number of batteries projected to construct smaller works, to conserve space, and make some of them three tiers rather than two.

Utilizing his Key West figures, Captain Barnard placed the costs of Batteries Nos. 3, 4, and 5 at $550,000 each; Nos. 1 and 2, because they presented less difficulty of construction, at $450,000 each; and No. 6, being a tower designed to mount between 20 and 30 guns, at $150,000. Thus, the total cost of the system would be $2,700,000.

A garrison for each of the five large batteries was placed at 350 officers and men and for No. 6 at 150, a total of 1,900. They would mount about 500 cannon.[27]

5. Difficulties of Maintaining a Blockade

To blockade the Tortugas, Barnard wrote, a hostile squadron would have to be off Northwest Channel, anchoring in a "tolerably secure position inside the shoals." But, because of the number of reefs, this would be a hazardous anchorage. Squadrons guarding Southwest and Southeast Channels would be compelled to keep to the open sea, where they would be liable "to be driven into these dangerous shoals by storms, or to be swept away by the Gulf Stream in calm weather." If a blockade were attempted, warships would be unable to intercept small vessels loaded with supplies feeling their way over the shoals

26. Ibid.

27. Ibid.

or through the numerous narrow and intricate channels threading the reefs.[28]

6. Sources of Water

Barnard presumed that the amount of rainfall annually was sufficient, and, with proper arrangements, the absence of surface water could be compensated for. The large storehouses required by the Navy, along with the batteries' barbette tiers, would suffice to collect thousands of gallons of water in cisterns.

Consequently, the fleet anchorage, "if fortified & adequately defended would defy all efforts an enemy could make to take it from us." In respect to a healthful climate, he believed, the Tortugas were "probably unsurpassed by any locality in this latitude or perhaps in any other."[29]

7. Establishing Construction Priorities

Captain Barnard next turned to the question whether operations should be commenced immediately at either the Tortugas or Key West, employing the $50,000 appropriation recently made by Congress for the commencement of fortifications on the Florida Reef. If it were understood that this meant actual construction of the fortifications, this was impossible. This was because there were "preliminary operations at either place," which would require several months and possibly exhaust the present appropriation before the first foundation stone was laid.

Although the Tortugas were a strategic necessity, he was satisfied that there was "every reason for commencing operations at Key West." His threefold arguments were:

(a) The works at the Tortugas were far more extensive, requiring a far greater expenditure, thus mandating a policy of not commencing any element until the entire system had been determined upon.

(b) As it was anticipated that the Navy would establish a depot there, the system should be studied and agreed to by a joint Army-Navy Board.

(c) Not one of the six batteries recommended would by itself possess much efficiency. For example, though Battery No. 1 would be the most effective for commanding the entrance to the inner harbor and partially sweeping the outer harbor, ships lying in the inner harbor could be shelled by warships from outside the reef. In addition, it was to be sited on a "sunken foundation and would require minute examination, borings, etc. to ascertain the nature of the sub-foundation."[30]

8. Sources of Materials and Manpower

Focusing next on a discussion of materials, Captain Barnard noted, the "Tortugas rock" was quite different in character from that found at Key West.

---

28. Ibid.

29. Ibid.

30. Ibid.

The former appeared to be a "true concretion of fragments of shells & coral & is much harder than that of Key West." He, however, had not seen it above water.

Bush Key and the rocky ledge near it were a source of coral fragments which could be used as aggregate in concrete. Local sand consisted of a high concentration of shell fragments, while Key West rock could be quarried in large quantities for the proposed Tortugas fortifications.

All other building materials, i.e., lumber, brick, lime, and cement could be obtained and shipped from the North, from Pensacola, and Lake Ponchartrain with ease.

The standard wage paid mechanics at Key West was from $2.25 to $2.50 per day. Slave labor could be brought in from East or West Florida at a monthly rate of about $15 per man, the United States furnishing provisions. White labor would cost about the same.[31]

9. Additional Details are Provided on Sources and Costs of Materials and Labor

In mid-November, upon returning to New Orleans from Key West and reviewing his files, Captain Barnard provided the Department with additional data and sources on materials that would have to be shipped in for construction of the Florida Reef fortifications:

> Cement--Newark or Rosendale could be purchased in New York City for $1.25 to $1.50 per barrel. The cost of freighting it to Key West was 75¢ per barrel.
>
> Lime--Thomaston lime could be purchased for 63¢ per barrel, with the freight charge from Maine to Florida, adding another 75¢ to the cost.
>
> Bricks could be purchased in New York City, or some other northern locality for from $4.50 to $7 per thousand. The freight would be about $5. Pensacola bricks cost $7 per thousand, while those from Lake Pontchartrain brought $5 per thousand. Freight from either place would be about $8 per thousand.
>
> Granite, rough or rubble, could be landed at Key West for about $3 per ton. If dimensioned, the price per ton would be $5.
>
> Yellow pine could be purchased in New Orleans or Pensacola for from $7 to $10 per thousand, broad measure. Cypress cost from $20 to $30 per thousand, while northern white pine could be had for $20 to $35. Freight would be between $6 and $7 per thousand.
>
> Beef and pork cost from $5 to $10 per barrel in New Orleans, to which a surcharge of 75¢ per barrel for freight was necessary.[32]

---

31. Ibid.

32. Barnard to Totten, December 6, 1844, NA, RG 77, Ltrs. Recd., Chief. Engineer.

After discussing the situation with contractors, Captain Barnard concluded that $25 to $30 a month would have to be paid for hire of slave labor, because of "the insalubrity" of Key West. White labor could probably be had at $20 per month.[33]

10. Barnard Defends His Thesis that the Tortugas are a Strategic Necessity

Barnard took issue with a statement in Secretary of War Porter's Annual Report. The Secretary had noted that, unless the United States enjoyed naval superiority in the Gulf of Mexico, the projected fortifications at the Tortugas and Key West would merely be another Malta or Gibraltar to be seized by the enemy. While this was true in respect to Key West, it was not in regard to the Tortugas. On the contrary, Barnard wrote, "one of the great distinguishing features of this place is that, if fortified" with the system proposed, "it will be able to maintain itself not withstanding an enemy's naval superiority in the Gulf."

His reasons for this opinion were: (a) the "impregnability" of the proposed fortifications against a naval attack; and (b) the impossibility of maintaining an effective blockade for the length of time necessary to reduce the stronghold.

If, however, the United States confined its defensive efforts to the inner harbor, thus permitting an enemy to enter and occupy the outer harbor or to "lie securely" in the Southwest or Southeast Channels, all intercourse with the base could be cut off and the garrison starved into submission. "Under any other view of the capabilities of the Tortugas," Barnard cautioned, the beginning of construction, with a view of making the Tortugas "a naval depot & strategic point in the Gulf defence" would be an error. This was especially true, because the United States Navy did not possess the strength to maintain an ascendency in the Gulf in event of war with Great Britain or France.[34]

But, Barnard continued, if the United States were compelled by necessity to establish maritime supremacy in the Gulf, and Secretary Porter's ideas became national policy, and the Tortugas were lost, we would be guilty of "the folly he alludes to of preparing another Gibraltar for an enemy's conquest."[35]

G. Smith-Chase Preliminary Report

1. Chief Engineer Totten Constitutes a Board

Some two weeks after receiving Captain Barnard's preliminary report, Colonel Totten, on December 2, 1844, issued orders constituting a four-man board to

---

33. Ibid.

34. Barnard to Totten, December 14, 1844, NA, RG 77, Ltrs. Recd., Chief Engineer.

35. Ibid.

prepare projects for defense of the Florida Reef. The members were to be Majors John L. Smith and William Chase and Captains George Dutton and Henry Brewerton.

The majors reached Key West first and had reconnoitered the Tortugas before the ship with the two captains landed them at the Florida city on January 19, 1845. While on the keys, Smith and Chase had made necessary examinations and had questioned a number of pilots and wreckmasters familiar with the shoals and channels. On doing so, they reached the same conclusion as Captain Barnard regarding accuracy of Captain Tattnall's chart. They agreed that the project was not dependent upon any more surveys.[36]

2. Reviewing the Geography and Its Implications

Because of the urgency of the situation, Majors Smith and Chase, after talking with Captains Brewerton and Dutton, submitted a report on the 20th. Their views did not differ materially from those outlined by Captain Barnard nine weeks before. As an introduction, they reviewed in detail the geography and geology of the Tortugas, with emphasis on the channels.

They next discussed the suggested sites for a naval depot. The first of these included Sand Key and its adjacent shoals. But, the majors noted, its difficulty of access impaired its usefulness to the Navy as a refuge from pursuit and a shelter from storms. The Garden Key area was better suited in all respects as a depot, except its defense would be more difficult. Its greatest advantage was the facility "afforded by the various channels for approaching or leaving it in a sailing vessel with the wind at any point of the compass." Another element in its favor was the security afforded by its interior harbors and the great capacity of its exterior harbor, extending some 2 miles from Sand Key to Brilliant Shoal, and an equal distance from there along White Shoal to Bird Key Shoal in a direction at nearly right angles, within the area proposed for occupation by fortifications. In addition, Garden Key was favorably situated for establishment of bombproof structures and other facilities required for security and preservation of munitions and naval stores.[37]

3. Bombproof Cazerne is Proposed

The plan proposed called for location on Garden Key of a "bombproof cazerne arranged in bastioned fronts along the water's edge and embracing in their total length about 2,200 feet with cisterns under them and a parapet and terreplein over them." The cazerne was to have sufficient capacity to house ordnance, quartermaster, commissary and medical supplies, and water "adequate to the wants of the military and naval forces that may be employed at the Tortugas and other points on the Florida reef for more than one year."

---

36. Chase to Totten, January 19, 1845, and Smith for Board to Totten, January 21, 1845, NA, RG 77, Ltrs. Recd., Chief Engineer. Chase was senior engineer on the Gulf Frontier and superintending engineer for construction of the defenses of Pensacola Bay; Brewerton was superintending engineer for construction of Fort Montgomery, New York; Dutton was superintending engineer for the inner defenses of New York Harbor; and Smith was superintending engineer for the defenses of New York Harbor.

37. Ibid.

The scarp was to be "22 feet to the crest of the parapet, foundations 2 feet below low water mark and 2 feet above mean tide making the depth 6 feet." The flooring of the casemates was to be 3 feet above mean tide. The casemates, themselves, were to extend the entire length of the scarp, to be 50 feet deep, 15 feet wide, and 6 feet to the spring of the arch. The height of the parade wall above the parade was to be 15 feet 6 inches, and above the pier foundations 20 feet 6 inches. Cisterns were to be constructed between the piers, while the width of the casemate piers was to be 3 feet. There were to be 120 casemates, and as they were to be used as storerooms, they would not be embrasured. Flank defense would be provided by the Bush and Bird Key batteries.

The armament was to consist of 30 large caliber guns mounted on field carriages. Thus, the entire battery could be rapidly concentrated at one point. If flank defenses were recommended, one gun casemate on each flank could be constructed, in which to emplace carronades.[38]

4. Planning for Seven Batteries

To protect this depot from assault and bombardment, Majors Smith and Chase proposed to fortify Middle Shoal, Sand Key, White Shoal, Bush Key, Bush Key Shoal, Bird Key, and Brilliant Shoal. Their system, it was noted by the Board, differed from Captain Barnard's proposal in that Middle Shoal was substituted for Battery No. 1 on Garden Key Shoal and the occupation of Garden and Bird Keys.

Middle Shoal, it was pointed out, possessed the same advantages as proposed Battery No. 1, except for its relation to the west entrance into the inner harbors, labelled A and B on the attached drawing. This deficiency was countered by occupation of Bird Key. At the same time, a Middle Shoal battery, besides helping defend the entrances to harbors A and B, would afford more efficient defense for Southeast Channel, and with the Sand Key and Brilliant Shoal batteries compel a hostile fleet to take position farther to the northeast.

The only objection foreseen to substitution of the Middle Shoal battery for one on Garden Key Shoal would be the increase in cost necessary for its foundations. Occupation of Bird Key was dictated by the need to exclude a hostile squadron from the anchorage marked D, while its guns defended one of the entrances into harbors A and B.[39]

The seven batteries called for by Majors Smith and Chase varied in scope, armament, and cost. The data submitted read:

Designation	No. of Casemate Tiers	Barbette Tier	Armament	Cost
Middle Shoal	2	Yes	25 Guns	$100,000
Sand Key	1	Yes	100 Guns	250,000
White Shoal	2	Yes	75 Guns	200,000

38. Ibid.

39. Ibid.

Bush Key	1	Yes	150 Guns	$250,000
Bush Key Shoal	2	Yes	30 Guns	100,000
Bird Key	1	Yes	60 Guns	150,000
Brilliant Shoal	2	Yes	60 Guns	175,000[40]

The Board recommended that the fortifications be constructed as introduced, because this conformed to their relative importance. Early completion of the depot would expedite "prosecution" of the other projects by affording facilities for housing workmen and providing sufficient water for drinking and bathing.[41]

5. Focusing on Materials and Priorities

The area abounded, Majors Smith and Chase advised Washington, in "excellent materials for masonry adapted to this climate. All the shoals seemingly consisted of rock ledges covered for the most part with coral." The latter would suffice for aggregate and could be collected and transported to where it was to be used at an expense not exceeding 3 cents per cubic foot.

Bush Key was constituted of coral fragments, while the others were composed of pulverized shells, which could be used with the coral aggregate in making concrete. If beton (concrete made of coral, cement, and sand) were employed as masonry in the scarps, which they recommended, instead of limestone, the cost would not exceed $4 per cubic yard.

Because the climate was favorable to year-around construction, the project could be pushed ahead with celerity, provided requisite funds were available. If this were the situation, Majors Smith and Chase believed that the Garden Key depot could be completed, and the Middle Shoal, Sand Key, and White Shoal batteries well advanced by the end of Fiscal Year 1846. It was urged that work on the system be pushed to completion with the least possible delay.

Along with their report, the engineers enclosed a copy of a section of Captain Tattnall's chart, embracing the positions suggested as sites for the depot and batteries, and a sketch of Garden Key and a profile of the bombproof cazerne.[42]

6. Totten Responds to the Smith-Chase Report

Upon receipt of the Smith-Chase report, Chief Engineer Totten informed Secretary of War William Wilkins that it corroborated Captain Barnard's observations. Since they favored immediate commencement of construction at Garden Key, Totten was in agreement that operations should commence as soon as Congress supplied the means.

Should Congress, in view of the tense international situation caused by the continuing debate over annexation of Texas, demand a more "vigorous

---

40. Smith for Board of Engineers to Totten, January 21, 1845, NA, RG 77, Ltrs. Recd., Chief Engineer.

41. Ibid.

42. Ibid. Copies of the subject drawings are not on file at National Archives.

prosecution of the florida reef defences" than heretofore contemplated, Totten proposed that the Department call for an additional $150,000 to underwrite construction in Fiscal Year 1846.[43]

H. Congress Refuses To Boost the Appropriation

It was too late in the session to prevail on Congress to increase the appropriation for construction of fortifications on the Florida Reef in Fiscal Year 1846. The Fortifications Bill signed into law by President Tyler on March 3, 1845, thus included only $30,000 for the project.[44]

I. Board's Final Report

1. Documenting the Need and Developing Costs

In the days following posting of the Smith-Chase preliminary report, Captains Brewerton and Dutton visited the Tortugas. Upon their return to Key West, the full Board prepared and submitted a report on the project in its entirety.

As to be expected, they included a lengthy discussion of the geography of the Florida Reef, and its strategic importance to the United States for controlling the Straits of Florida access to the Gulf of Mexico. Members of the Board were in agreement that the "most prominent and important harbor" in the area was about Garden Key in the Tortugas. Key West, they held, was of lesser significance. The defense of these two areas "must include establishments for an extensive depot, at each, capable of containing at least a year's supplies for both positions." Such an arrangement was an indispensable precaution against failure by the Navy to keep open the supply lines.

The full Board concurred with Majors Smith and Chase on the mode of defense for the Garden Key depot.

It was mandatory that the Navy cooperate in protecting both the Tortugas and Key West depots, because, as it was pointed out, no system of defense would be "complete that did not provide for the maintenance of the communications with the arsenals and bases upon which they were dependent" for regular supplies of munitions, provisions, etc.

At the Tortugas no difficulty occurred in adapting the defenses to fulfilling this object, "as well as to the security of the harbors or the reciprocity of support which the positions to be occupied by the several works embraced in this system are capable of affording."

The Board had no differences of opinion as to the eligibility of the positions recommended to be occupied in the Smith-Chase preliminary report,

---

43. Totten to Wilkins, February 18, 1845, found in Territorial Papers, Florida Territory, 1839-45, p. 1013. Wilkins had suceeded Porter as Secretary of War in February 1844.

44. United States Statutes at Large, Vol. V, pp. 743-45.

though there were double on the practicability of constructing a battery on Middle Shoal. This induced three of the members to prefer the site for Battery No. 1 recommended by Captain Barnard on the tail of Garden Key Shoal. The fourth member (Major Smith) adhered to his opinion as expressed in the preliminary report.

A table was prepared documenting the differences in views as to the relative importance of the works, their armament, and cost:

	Member A (Smith)				Member B (Chase)				Member C				Member D			
For	Class	Tiers	Guns	Cost	Class	Tiers	Guns	Cost	Class	Tiers	Guns	Cost	Class	Tiers	Guns	Cost
Garden Key	1	1	30	$300,000	1	1	30	$300,000	1	1	25	$350,000	1	1	30	$350,000
Garden Key Shoal					3	2	20	60,000	2	3	80	300,000	2	3	80	300,000
Middle Shoal	2	3	30	100,000												
Sand Key	3	2	100	200,000	2	2	100	200,000	5	3	175	400,000	3	3	175	450,000
White Shoal	4	3	120	200,000	2	3	190	260,000	6	4	175	550,000	4	4	175	600,000
Bush Key	5	2	120	200,000	2	2	100	190,000	3	3	125	350,000	5	3	120	350,000
Bush Key Shoal	6	3	30	80,000	1	2	40	90,000	8	3	40	150,000	8	3	40	150,000
Bird Key	7	2	60	120,000	1	2	60	120,000	4	3	100	300,000	6	2	100	300,000
Brilliant Shoal	8	3	60	100,000	4	3	190	260,000	7	4	150	600,000	7	4	150	600,000
Total			550	$1,300,000			740	$1,480,000			870	$3,000,000			870	$3,100,000[45]

45. Board to Totten, February 17, 1845, NA, RG 77, Ltrs. Recd., Chief Engineer.

These differences were as to detail, and did not materially affect the principal features of the fortifications or the "results they are intended to produce." Where it related to cost, it was "mainly assignable to the comparative cheapness of beton which, in the formation of the lower estimates, has been adopted as a substitute for stone masonry for which the higher estimates provide."[46]

2. Defining the System's Key Elements and Mission

The Board was in agreement upon the essential elements relating to defense of the Tortugas: (a) the cooperation of the naval with the land forces; (b) the establishment of a depot on Garden Key capable of sustaining the land and naval forces charged with defense of the Florida Reef for one year; (c) the occupancy of positions in advance of the depot by batteries, their mission to shelter shipping anchored in the harbors from bombardment; (d) these positions to be Sand, Bush, and Bird Keys, Middle or Garden Key Shoal, and White, Brilliant, and Bush Key Shoals; and (e) there should be a floating dry dock and other facilities for repair of the cooperating naval squadron.

The Florida Reef, if fortified as proposed, the board continued, would become the "advance post of defence of the Mississippi and the adjacent coast." An amphibious force moving against the Gulf Frontier, as the British had in the War of 1812, would be exposed to an attack on its rear by a naval squadron based on the Tortugas or Key West. Consequently, the Board, in view of the increasingly grave international situation, recommended that these defenses be commenced and pushed to early completion, even if the cost far exceeds the estimates. The heavy investment was warranted by the security they would afford to "the most vulnerable portion of the country."[47]

3. Minority Reports as to Details

Three Board members filed minority reports on aspects of the study. Major Chase raised the cost question, as vital to Congress in making appropriations for underwriting defense of the Florida Reef in the "shortest possible time consistent with safe construction." If it could be documented that, by use of local materials and accomplishing the task within three years, major economies would result, a strong appeal to Congress could be made for adequate funding.

His experiences at Fort McRee and Captain Barnard's at Fort Livingston had enabled Chase to make estimates for the Florida Reef defenses, which although not detailed, embraced the principal items of construction and were sufficiently accurate to regulate his judgement in the matter.

The results of these estimates were such as to leave no doubt in his mind, but that $1,500,000 would suffice to place the Tortugas anchorage "under strong defense." This opinion was supported by one other member of the Board.

---

46. Ibid.

47. Ibid.

Chase had examined the walls of the Morro Castle at La Habana, which were built of the same kind of "secondary lime stone" as found at Key West. These walls were more than 100 years old, and the stone constituting their outer surfaces were as "intact and as hard as granite."[48]

Captains Brewerton and Dutton deemed that the "great difference" in the estimates arose from the high price of every "species" of labor at Key West, as well as from the fact that the keys "produce nothing of themselves, either in the way of provisions or materials," except limestone, concretion of shells, and coral. The latter, however, was considered to be an admirable material for mixing concrete, and must play a major role in construction of the Florida Reef defenses.[49]

4. Major Smith Dissolves the Board

The final report having been completed, the Board was dissolved by Major Smith, and the members scattered to their respective duty stations.[50]

48. Chase to Totten, February 17, 1845, NA, RG 77, Ltrs. Recd., Chief Engineer.

49. Brewerton and Dutton to Totten, February 17, 1845, NA, RG 77, Ltrs. Recd., Chief Engineer.

50. Smith to Totten, February 16, 1845, NA, RG 77, Ltrs. Recd., Chief Engineer.

III. CONSTRUCTION BEGINS: 1846-1848

A. Captain Fraser is Selected as Superintending Engineer

On February 18, 1845, Congress by joint resolution voted Texas into the Union. United States troops, in March 1846, occupied the disputed territory between the Neuces and Rio Grande. This led to hostilities, and, on May 19, six days after Congress declared war on Mexico, Chief Engineer Totten wrote Captain William D. Fraser, then stationed at Buffalo, New York, that the Fortifications Bill, recently enacted by Congress, included $200,000 for defense of the Florida Reef. Under the 1844 appropriation materials and a site had been purchased, and work commenced at Key West by Captain Dutton. Part of the $200,000 would be allotted to Dutton, while the remainder would be "devoted to the commencement of a still larger and more important work on Garden Key." This project was to be assigned to Fraser. As it was of "the greatest importance that all possible progress be made the present year," Fraser was to hasten to Washington and receive instructions as to the nature of the work, especially those incident to preliminary operations. He would not leave Buffalo until relieved by Lieutenant James H. Trapier, then stationed at Wilmington, North Carolina, as superintending engineer for repair of Fort Macon and construction of Fort Caswell.

Upon Trapier's arrival, Fraser was to turn over to him the works at Buffalo and Fort Niagara, and also the papers and funds belonging thereto.[1]

A New Yorker, Fraser had graduated from the U.S. Military Academy as No. 1 in the Class of 1834. Commissioned a 2d lieutenant of Engineers, he was ordered to duty as an assistant engineer for survey of the Ohio-Michigan boundary. In 1836, after a brief tour overseeing a project for improvement of navigation on the Hudson River, he was ordered to Fort Monroe, Virginia, as assistant engineer. Promoted captain in July 1838, Fraser was named superintending engineer for repair of Fort Niagara and construction of Fort Porter.[2]

It was the first week of June before Lieutenant Trapier reached Buffalo. On Thursday, the 4th, Fraser turned over to his successor responsibility for the Great Lakes projects, and the next day took leave of his friends and started for New York City.[3]

---

1. Totten to Fraser, May 19, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

2. George W. Cullum, Biographical Register of the Officers and Graduates of the U.S. Military Academy at West Point, N.Y., From Its Establishment . . . to the Army Re-Organization of 1866-67 (New York, 1868), Vol. I, p. 444.

3. Fraser to Totten, June 4, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

To facilitate preparations for beginning operations upon arrival in Florida, Fraser spent the next six weeks in and around the Nation's greatest seaport and metropolis. The stockpiling of materials and equipment was funded with $10,000 deposited to his credit in New York City's Bank of Commerce.[4]

B. Totten's Memoir to Guide His Superintending Engineer

1. Safeguarding the Rights of the Lighthouse Board

Captain Fraser spent several days in Washington discussing the undertaking with Chief Engineer Totten. He was given a set of drawings and a memoir containing guidelines. He learned that Garden Key was the site of the Tortugas Lighthouse, along with the keeper's quarters and outbuildings. These structures belonged to the Lighthouse Board, and permission must be secured from the Secretary of the Treasury for occupying the island for defensive purposes. Fraser was enjoined to see that nothing was done to interfere with "the reasonable possession and accommodations of the keeper and his family; or with the performance of the important duty entrusted to him." To accomplish this, Fraser was to see that the lighthouse property was fenced.[5]

2. Instructions for Positioning the Fort

As Fraser could see by reference to the plans, Colonel Totten explained, the projected fort was a "Hexangular casemated work, elongated, but symetrical; there being four longer sides of 467.88 feet each and, two shorter sides (which are opposite each other) of 324.88 feet each." The angles of the polygon were each 120 degrees. The magistral was taken on the outside face of the scarp wall, and 5-1/2 feet above the top of the foundation, at reference (5-1/2). Zero was assumed to be at the low-water level established in the survey submitted to the Topographical Bureau by Major Hartman Bache.

The magnetic course of the southeast face of the polygon would be north 50° east. To ascertain the position of this face, Captain Fraser was to measure from the southeast corner of the lighthouse keeper's dwelling, a distance of 42 feet, in a direction south 40° east. This would establish a point on that magistral. From there, running a line 186.88 feet at north 50° east, he would attain the eastern extremity of the face; and measuring from the same point south 50° west 290 feet, he would gain the other extremity of that face. This face determined, the position of the others would follow.

At each angle of the polygon, there was to be a tower bastion.

Under the casemates of the curtains, there would be cisterns. In the middle of each long curtain, two first tier casemates were to be arranged as magazines. All other first tier casemates of the long curtains, as well as those in the tower bastions, were to be appropriated as storerooms, a bakery,

---

4. Welcker to Fraser, July 8, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer. Lieutenant George L. Welcker was serving as an assistant to Chief Engineer Totten.

5. Totten to Fraser, undated, NA, RG 77, Ltrs. Sent, Chief Engineer.

etc., except three casemates near the middle of the southeast curtain, which would constitute the guardrooms, gateway, etc.

All first tier casemates in the short curtains were to be outfitted as gunrooms.

With the exception of a small magazine in the salient of each tower bastion, all casemate rooms on the second tier were to be armed.

The terreplein was to mount "a full armament" of barbette guns.[6]

3. Guidelines Governing Foundations and Casemate Arches

The bottom of the foundation of the scarp was to be at reference (-5), i.e., five feet below low-water; and the top at reference (3). The curtain foundations were to be 14 feet thick, those of the bastions 12 feet.

Upon these foundations, Captain Fraser was to raise the first portion of the scarp superstructure, "which will be every where--except where the cisterns encroach upon it on the short faces--10 feet thick and three feet high, the top being in the zero level and both faces being vertical." The next portion of the scarp would be raised, upon this mass, being vertical on the back and having a batter of 2 feet in a rise of 5-1/2 feet on the exterior slope. The bottom level of this section was to be 10 feet thick and the upper 8 feet. The top to be at reference (5-1/2) and the outer edge of it being the magistral.

The remainder of the scarp would rise with a batter on the exterior slope of 1/96 (1/8 of an inch to 1 foot). It was to "receive recesses, embrasures, reductions of thickness, etc., as shown on the profiles, and will be carried up to the crest of the barbette parapet" at reference (45).[7]

The foundations of the cisterns under the casemates of the two short fronts, and the piers, were to be a continuation inward of the foundations of the scarp. Similar foundations on the curtains of the long fronts were to "be three feet higher (the top thereof being on the zero level)."

Foundations of the piers connected to the tower bastions were to begin at reference (5), their top being at reference (7).

The floors of the first tier casemates were to be at reference (7-1/2), all cisterns being covered with flat arches.

All first tier casemates were to be roofed with flat arches, to bring the floors of the second tier casemates to reference (19). The arch keys of the second tier casemates were to be at reference (33). These arches were to be roofed to shed water and covered with sand, "so as to be entirely bomb-proof and bringing the terreplein at the tablet up to reference (39), and next to the parapet to (39-1/2)."

---

6. Ibid.

7. Ibid.

First tier casemates were to be 10 feet longer than those of the second tier, thereby affording a gallery all around the fort on the level of the second floor.

All rain water falling upon the terreplein and gallery was to be conducted into the cisterns, as well as that from the buildings to be erected on the parade.

From the level of the first tier floors, there was to be a gentle descent to the elevation of the parade, which would be at reference (5).[8]

4. Directions for Locating the Ditch and Laying Out the Counterscarp

In advance of the scarp, there was to be a wet ditch, its bottom at reference (-3). The arrondissement of the counterscarp, at each salient, was to be drawn with a radius of 30 feet, while the intervening portions were to be tangent to these curves. Where the counterscarp fell within the higher ground of the key, it was to be 3 feet thick at the top, 4 feet thick at the bottom, and rest on a foundation 6 feet 2 inches. Elsewhere it was to be 6 feet thick at the top, 8 feet at the bottom, and anchored upon a 10-foot 2-inch foundation. The superior slope of the counterscarp was to be at reference (6), the foot at reference (-3), and the bottom of the foundation at reference (-5). There was to be at least one sluiceway through the counterscarp, to be arranged to retain, at pleasure, the water at floodtide level.[9]

5. Totten Lists the Permanent Parade Structures

On the parade there were to be erected "many important buildings." Included were:

(a) five two-story independent magazines (two 48 by 28 feet and three 30 by 28 feet);

(b) a bombproof naval storehouse, 160 by 58 feet, and two stories in height;

(c) a two-story commanding officer's quarters (50 by 43 feet), with detached kitchen;

(d) a two-story chapel (66 by 53 feet), with six rooms for offices on the lower story;

(e) two blocks of officers' quarters, each three stories, the exterior dimensions 286' 4" by 44';

(f) a two-story hospital, 52' 4" by 52' 4'; and

---

8. Ibid.

9. Ibid.

(g) a 10-company barracks, three stories in height, its exterior dimensions 338' 5" by 35' 6", with a detached kitchen for each company.[10]

6. Rules Governing Construction of Six Frame Temporary Structures

Turning next to preliminary operations, Colonel Totten focused on construction of temporary buildings for reception of stores and workshops. Although these structures were indispensable, he noted, they were an expense which could not be recovered and "must be kept down to an absolute minimum." It would, he informed Captain Fraser, be necessary to erect these buildings:

(a) a two-story storehouse, 80 feet long and 25 feet wide;
(b) a one-story lime and cement store, 80 by 25 feet;
(c) a carpenters' shed, 40 by 25 feet;
(d) a single-story blacksmith shop, 25 by 25 feet;
(e) a single-story bakery, 25 by 30 feet; and
(f) a two-story stable (stalls below and loft above), 40 by 25 feet.

Allowance was to be made for erecting additions to the blacksmithy and stable.

As these were to be the only temporary structures erected by the government, measures would have to be taken to provide accommodations for the artisans, laborers, and master craftsmen. To accomplish this, Fraser was to give priority to construction of a portion of the permanent officers' quarters and barracks. Of the former, there was to be erected a "length of about 68 feet, which, being the full allowance of quarters for two companies, will afford ample accommodations for all the persons engaged in supervising and overseeing." In reference to the barracks, Fraser was to have erected a length of about 67 feet, an area calculated to shelter two companies, and sufficient to afford lodging and messing facilities for the workmen. Kitchens belonging to these sets of quarters and barracks were to be built concurrently.

These structures, both temporary and permanent, were to be built by contract. The contract(s) must provide that the frame buildings be prefabricated. They were to be accompanied by the mechanics and laborers who were to put them up and finish them off "in the shortest time practicable." The contractor(s) would be required to send to Garden Key rations and water for their work force, and the means of lodging them. The contract(s) must also provide that the "first portion of the covering of the frames shall be of the roof; which must be covered with the best cedar shingles, jointed and laid in the best manner, to be immediately provided with light and capacious eave gutters and vertical conduits made of jointed and planed board," hung to conduct all rain water from the temporary buildings into cisterns.[11]

A contract was to be drawn for providing cisterns, which must be completed and transported to the Tortugas at the same time as the prefabricated framing. These cisterns were to be of seasoned timber, put together in the best manner, the "form being slightly conical to allow of tightening by driving the hoops." It was deemed best to draw water from them by a pump inserted at the top, rather than a cock at the bottom.[12]

---

10. Ibid.

11. Ibid.

12. Ibid.

7. Program for Erecting Sections of the Quarters and Barracks

The sections of the quarters and barracks to be built by contract were to be of brick and have slate roofs. As in the instances of the temporary structures, the contractor(s) must take with him "everything necessary for the most expeditious construction of both." He would "carry" all the bricks, lime, slate, and other materials (except sand) for the foundations, walls, slating, plastering, chimneys, window and door sills and lintles, fireplaces, mantels, hearths, etc. All flooring, both planed and tongue and groove, must be ready to be laid; window and door frames finished and to rise from reference (4) to reference (6) and be 3 feet thick with vertical sides. They were to be concrete. Numerous openings (none less than 1- by 2-foot) were to be left in the foundations of both the outside and cross walls. The space under the lower floor was to be leveled at reference (4).

Doors were to be ready for hanging, and sashes glazed and prepared to be positioned.

As with the temporary buildings, cisterns, with proper gutters and conduits, would be prefabricated to receive rain water as soon as the roofs were finished. There were to be two cisterns to each structure.

No bricks were to be employed in construction of the quarters and barracks that were not hard burned and durable. Those used on exterior facings and exposed elevations, "if, of northern bricks must be thoroughly burned and handsome 'pressed'; and if of Gulf of Mexico bricks must be of the best 'facers.'" Care would be taken to insure that no brick was laid in these facings that were chipped on the edges. Workmanship was to be superior. One end of the quarters and both elevations of the barracks would become, when these structures were finally completed, "mere partition walls." They would therefore not be faced with pressed brick or facers, but be layed as partition walls. The exterior joints, however, were to be carefully pointed. Mortar used in all walls was to be made in the best manner, and was to contain "a portion of hydraulic cement."

Foundations were to be of concrete, containing one barrel of cement to one barrel of lime. They were to be laid on sand at reference (4), the sand having been first carefully rammed. The concrete was to be laid in 8-inch layers, each layer thoroughly rammed; and the foundations raised to a height of 16 inches, with a batter on the front side of 6 inches. A 9-inch offset would be made on the outside of all exterior walls. The remaining 8 inches in height of the outside foundations would be carried up vertically and faced on the exterior with common bricks.

All cross-wall foundations were to rise from reference (4) to reference (6) and be 3 feet thick with vertical sides. They were to be concrete. Numerous openings (none less than 1- by 2-foot) were to be left in the foundations of both the outside and cross-walls. The space under the lower floor was to be leveled at reference (4).

A granite water table (9 inches in height and 10 inches thick), with a slight level along the upper edge, was to be laid just above the top of the foundation. Its upper edge to be at reference (7), the same as the lower floor.

Under each outside door and window, there was to be a cutstone sill, and over each a cutstone lintle, except at the lower front doors and windows of the barracks, which were to be covered by a semi-circular arch. Wherever there were openings, even when covered by a stone lintle, there was to be an arch to receive the weight of the incumbent wall. These arches could be flat and need not exceed one brick in thickness.[13]

C. Drawings are Prepared, Reviewed, and Approved

Coincidentally, Lieutenant Montgomery C. Meigs, on duty in the Chief Engineer's Office, had prepared under Colonel Totten's supervision, a set of drawings to guide construction of the Garden Key fort. Included in the series were:

(a) Fortifications Florida Reef. Projected Fort for Garden Key, Tortugas;
(b) Casemates on Curtains of short Fronts;
(c) Casemates on Curtains of Long Fronts;
(d) Details of Store Rooms, Curtains Long Fronts;
(e) Postern Guard Rooms Prison;
(f) Details of Drawbridge;
(g) Bastion Containing Bakery;
(h) Bastions, excepting bakery;
(i) Plan of Bastion showing Roofs of arches;
(j) Detached Magazines; and
(k) Navy Storehouse.

These plans were reviewed and approved by Secretary of War William L. Marcy on November 16, 1846.

D. Lieutenant Wright's Four Hectic Months

1. Wright Replaces Fraser as Superintending Engineer

By late July 1846, the War Department was confronted by personnel problems in finding and assigning its limited number of senior engineers to duty with the armies being concentrated to carry the war into northern Mexico. Consequently, on the 27th, Chief Engineer Totten reassigned Captain Fraser. Instead of proceeding from Washington to Dry Tortugas, he was to travel to San Antonio, Texas. There he was to report to Brigadier General John E. Wool, who was organizing an army at that point to invade Mexico.[14] At the same time, Totten selected Fraser's replacement. He would be Lieutenant Horatio G. Wright of Connecticut, who had graduated as No. 2 in the Class of 1841 from the U.S. Military Academy. Commissioned a 2d lieutenant in the Corps of Engineers, Wright was ordered to duty as an assistant to the Board of Engineers.

---

13. Ibid.

14. Totten to Fraser, July 27, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

From August 1842 to July 1844, he was on the faculty of the Military Academy as an instructor in French and Engineering. He then returned to duty with the Board, interrupted in 1845 by a tour of inspection with the Secretary of War.[15]

After briefing Wright as to what had transpired, Totten enjoined him to exercise the "utmost activity in preparing for work, and in pressing forward every measure connected therewith." As he was in Washington, Wright was to receive "verbal information, as to the projected defences, as to the steps already taken, and the measures first to be adopted."[16]

Before leaving the Nation's capital for New Orleans, an intermediate stop on the way to Texas, Captain Fraser, in accordance with instructions, transferred to Wright responsibility for the $10,000 deposited to his credit with the Bank of Commerce, and the Totten Memoir and drawings.[17]

The 26-year-old Wright was duly impressed with the significance of his assignment, the more so because of his inexperience. After he was established at Garden Key and the first flush of enthusiasm had faded, he confided to the Chief Engineer:

> The kind of work is entirely new to me, and greater or less difficulty may be met with than I have allowed for.[18]

2. Totten and Wright Decide to Contract for Two Additional Temporary Buildings

On August 25 Lieutenant Wright was ordered by the Department to proceed from Washington to New York City. He was to establish temporary quarters there, preparatory to receiving proposals and contracting for the temporary structures to be erected on Garden Key. From New York City, he was to travel to Boston, Massachusetts, and Portland and Bangor, Maine, where he was to confer with prospective stone contractors.[19]

Chief Engineer Totten planned to be in Buffalo on official business in the second week of October. As he wished to discuss with Lieutenant Wright details of the proposed contract for erecting the temporary buildings, he directed Wright to meet him in there by the 11th.[20]

---

15. Cullum, Biographical Register, Vol. II, p. 5; Ezra J. Warner, Generals in Blue: Lives of the Union Commanders (Baton Rouge, 1964), pp. 575-76.

16. Totten to Wright, July 26, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

17. Fraser to Totten, July 28, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

18. Annual Report of Operations at Garden Key for the year ending September 30, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

19. Totten to Wright, August 25, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

20. Totten to Wright, September 30, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

Meanwhile, Wright had employed newspapers in a number of northeastern seaboard cities to solicit proposals for providing the needed structures. The bids were opened and abstracted on October 1. Wright rejected the proposals for the permanent buildings as exorbitant, but the offer of Benjamin H. Parker for construction of the temporary buildings seemed fair.[21]

At their October 11 meeting, Totten and Wright agreed that, in view of the builders' reluctance to bid on permanent structures, these additional frame buildings were needed:

(a) A two-story barracks, 80 by 25 feet, divided into four rooms by a cross hall in the middle of each floor, and designed to accommodate 160 mechanics and laborers. An alternative called for two 40- by 25-foot barracks, one for whites and the other for blacks. Subsequently, it might be necessary to erect a piazza around the barracks.

(b) A single-story messhall and kitchen, 75 by 25 feet. The kitchen was to be in the middle of the shed-like structure, and the messing facilities in the wings to enable the mechanics and laborers to eat at separate tables.

Parker's proposal for erecting these buildings could be accepted, but to satisfy legal requirements, Wright was to secure other bids.

Wright's recommendation to give priority to construction of three officers' quarters kitchens was approved. When completed, they could accommodate the clerk, master mason, and master carpenter. Another set of two kitchens could be put up at the same time for temporary accommodation of the superintending engineer. By opening one or more doors from one into the other, six rooms could be used by his family. These structures were to be erected by the United States.

Colonel Totten was unprepared to provide Wright with instructions as to priorities in erecting the fort, the mode of construction, or the materials to be employed as facings for the walls, until more data was available on the resources at Wright's command. One of Wright's first tasks was to secure this information and make recommendations. Another would be to reconnoiter the keys and reefs for "a supply of stone, and of materials for concrete." Numerous borings were to be made on Garden Key to "ascertain the depth of the subjacent rocks."[22]

From Buffalo, Wright returned to New York City by way of Portsmouth, New Hampshire, where he met with Benjamin Parker to review Parker's proposal for erecting the temporary buildings.[23]

---

21. Annual Report of Operations at Garden Key for the year ending September 30, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

22. Totten to Wright, October 11, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

23. Ibid.

3. Norton and Parker Contract

On October 27 Benjamin Norton and Benjamin H. Parker contracted with Lieutenant Wright to construct these buildings at Garden Key: (a) one frame two-story storehouse, 80 by 25 feet; (b) a frame one-story lime house, 80 by 25 feet 8 inches; (c) a frame two-story stable, 41 feet 4 inches by 25 feet; (d) a frame one-story carpenter shop, 40 by 25 feet; (e) a frame one-story bakehouse, 30 by 25 feet; (f) a frame one-story kitchen and messroom, 75 by 25 feet; (g) a frame two-story barracks, 80 by 25 feet; and (h) a frame one-story blacksmithy, 25 by 25 feet.

These eight structures, to be completed by March 20, 1847, were to be erected in accordance with plans and specifications prepared by Lieutenant Wright. The United States was to pay the contractors $8,535 for the buildings, whenever the work had been executed "in every particular, in conformity with the stipulations."

All timber used was to be white pine, yellow pine, or spruce, while all planks and boards were to be white or yellow pine. All boards, planks, and shingles were to be free of sap, and all the lumber to be free from shakes, cracks, splits, knotholes, bad or rotten knots, and to be of "good merchantable stuff." Bricks were to be hard burned and sound, the lime good, fresh unslaked stone lime.[24]

Cisterns to trap the run-off from these buildings could be built of cedar, white pine, or cypress. The various parts were to be "put together in a manner to secure their being perfectly water tight, and covered on the outside with two good coats of paint."[25]

Garden Key was devoid of "men, materials, provisions and fresh water," so Norton and Parker agreed they would prefabricate and matchmark the structures, to facilitate their reassembly, when the components were landed. Included would be doors, windows, shutters, flooring, gutters, and stairs. Cisterns were to be completed in every particular, including a thorough test of their tightness. The contractors were to provide themselves with necessary quantities of fire brick, common brick, and stone lime.

After these items had been attended to, Norton and Parker were to charter, at their expense and risk, a sufficient number of vessels to transport the prefabricated structures from Portsmouth to the Tortugas. The materials would be accompanied by a sufficient number of mechanics and laborers "to put the said buildings up with great expedition." While the workmen were engaged in assembling the eight buildings, the contractors were to supply them with provisions and water, and provide housing.

Norton and Parker were cautioned that care must be exercised to furnish enough water for the workmen, as well as for slaking common lime, though not for making mortar.

---

24. Norton and Parker's Contract with U.S., October 27, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

25. Ibid.

Lieutenant Wright was to indicate to the contractors, on their arrival in the Tortugas, the sites the various structures were to occupy.

Because of the need to store water, the frames of the buildings were to be first roofed, shingled, and gutters and conductors hung and connected with their respective cisterns.[26]

By November 11 Norton and Parker had secured the prerequisite bondsmen, whose creditability were attested to by the Portsmouth Collector of Customs.[27] When they notified Lieutenant Wright of this, they reported that they were "getting along very fast at present." If there were no unforeseen problems, they hoped to sail for Garden Key by Christmas.

The contractors now asked approval of a change order. They wished to make the shutters of "two thickness of 1 in. boards like the doors instead of 1½ plank . . . they being hung with wrought iron hinges instead of 1-L." They also desired to know whether the doors were to swing in or out, because the specifications were silent on this subject.[28]

Wright, upon forwarding the contractors' letter to the Department, recommended that the change order be approved.

Continuing, he noted that he was disappointed to learn that the contractors did not propose to put to sea earlier in the season, especially as he had been led to believe by Parker that they would depart Portsmouth at least four weeks earlier. He had accordingly predicated his arrangements on this schedule.[29]

By terms of the Norton and Parker contract, Wright reminded Colonel Totten, they were to be paid one-half the value of the materials whenever they were shipped. Since he could not be on-site when this occurred, he requested that Lieutenant Danville Leadbetter, the officer in charge of the Engineer's New York Depot, be ordered to Portsmouth to inspect the shipment and make payment.[30]

---

26. Ibid. Copies of plans and specifications for the eight buildings to be erected by Norton and Parker are on files at Everglades National Park. The plans are labeled: (A) plan, elevation, etc., of Stable and Barn; (B) plans and elevations of Lime House and Blacksmith's Shop; (C) plan, elevation, etc., of Store House; (D) plan and elevation of Carpenters' Shop; (E) plan, elevation, etc., of Bakery; and (F) plans of buildings for Workmen's Quarters and Mess Rooms & Kitchen.

27. The bondsmen were N.F. Mathews and Joseph B. Currier, who bound themselves to the United States for $2,845, jointly and severally.

28. Parker to Wright, November 11, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

29. Wright to Totten, November 16, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

30. Ibid.

Wright's correspondence was on the Chief Engineer's desk within 24 hours. Responding, Totten approved the Norton and Parker contract and the designated bondsmen. He also sanctioned the proposed change order involving the shutters, and the arrangements Wright had suggested for allowing Lieutenant Leadbetter to handle the final inspection and to make the required partial payment to Norton and Parker.[31]

4. Wright Purchases a Schooner, Mill, and Steam Engine

In mid-November, Lieutenant Wright notified Chief Engineer Totten that he had purchased the 112-ton schooner Activa and hired a six-man crew. Within a few days she would be loaded. He would then start for the Tortugas, thus gaining time before the arrival of the contractors to reconnoiter the keys for sources of stone, and to determine what could be accomplished in the way of procuring materials for construction of the permanent barracks and quarters on the southern markets.[32]

As the sailing date approached, Wright made inquiries concerning the cost of a steam engine and a Bogardus Mill, with all the machinery necessary to work a pug mill and "raise the sand to the same." The price, he was informed, would be about $2,000. This estimate had been made by a machinist recommended by Lieutenant Leadbetter, who would, if authorized, supervise the mill's construction and warrant that its operation would be satisfactory.

A circular saw could, without much expense, be attached to the mill, while with the addition of a pair of plates, costing about $50, they could grind the corn and grain required by the project workmen.[33]

Chief Engineer Totten sanctioned purchase of the steam-powered mortar mill. But, he cautioned, Wright was to first satisfy himself as to the best plan. If the Fort Adams pug mill could be of any use, it would be transferred from Newport to the Tortugas.

Totten agreed that an experienced machinist might be employed to lay out the machinery.[34]

5. War Department Secures Prerequisite Jurisdiction

Some 20 months before, in February 1845, Chief Engineer Totten had

---

31. Totten to Wright, November 17, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

32. Wright to Totten, November 16, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

33. Wright to Totten, November 17, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

34. Totten to Wright, November 19, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer. Before commiting the government, Wright was to determine the quantity of "perfectly ground paste" that a particular engine could grind in an hour.

suggested to Secretary of War Wilkins that application be made for an executive order reserving as a military reservation all islets constituting the Dry Tortugas.[35] A change in administration caused action to be deferred until December 17, 1845, when President James K. Polk by executive order proclaimed Garden Key a military reservation.[36]

The admission of Florida to the Union as the 27th state, on March 3, 1845, raised the spectre of added jurisdictional problems. Concerned about this, Lieutenant Wright inquired of the Department, Has Florida ceded to the United States jurisdiction over the Tortugas? It was, he noted, mandatory to secure this action before any ground was broken.

Currently, he reminded Colonel Totten, the Lighthouse Board was in possession of Garden Key, and Secretary of the Treasury Robert J. Walker's sanction of the fort's construction was necessary.[37]

Within 72 hours, the War Department transmitted to Lieutenant Wright a certified copy of the act by the Florida legislature ceding the Tortugas to the United States. Eight weeks before, the Chief Engineer had recommended to Secretary of War Marcy that he call upon Secretary of the Treasury Walker to transfer Garden Key to the War Department. No reply having been received, the recommendation was being resubmitted.[38]

Secretary of the Treasury Walker, before acting, referred the question to the General Land Office. Examining the records, Commissioner Richard M. Young found that the Tortugas had been reserved by the President for military purposes. He ascertained that, at the time the Garden Key Lighthouse was built in 1825, the land had not been surveyed and a reservation had not been deemed necessary.

Commissioner Young accordingly ruled that the keys, except the area absolutely necessary for use of the lighthouse, was under jurisdiction of the Army. But, until such time as Congress directed otherwise, the lighthouse "could neither be moved nor abolished."[39]

Upon receipt of Commissioner Young's letter, Secretary Walker advised the War Department of its contents and purport.

---

35. Totten to Wilkins, February 24, 1845, found in Territorial Papers, Florida Territory, 1839-45, p. 1016.

36. Young to Walker, September 9, 1847, NA, RG 26, Site File, Tortugas Light.

37. Wright to Totten, October 1, 1846, NA, RG 77, Ltrs. Recd., Chief Engineer.

38. Welcker to Wright, October 3, 1846, NA, RG 77, Ltrs. Sent, Chief Engineer.

39. Young to Walker, September 9, 1847, NR, RG 26, Site File, Dry Tortugas.

On November 29, 1847, the Department mailed to Lieutenant Wright copies of Chief Engineer Totten's August 15, 1846, letter to Secretary of War Marcy; the letter from the Commissioner of the General Land Office to Secretary of the Treasury Walker of September 9, 1847; and one from the Treasury Department to Secretary Marcy of September 15.

These letters, General Totten explained, documented that the War Department had jurisdiction over Garden Key, excepting so much of it as was necessary for operation of the lighthouse. To avoid any difficulties that might arise with Keeper Thompson, Wright was to define and fence the area intended for use of the lighthouse and its associated structures.[40]

E. Wright's First Weeks on the Reef

1. He Arrives on Garden Key and Finds its Configuration Changed by the October 1846 Hurricane

Lieutenant Wright sailed from New York City aboard Activa on December 1, as scheduled. He was accompanied by Jeremiah Phillips, a carpenter, and George Phillips, a master mason. On the fifteenth day out, the schooner was piloted into the clear, emerald waters of Tortugas Harbor. Wright saw a barren group of eight islets, covered with dusky green mangrove, bay cedar cactus, and buttonwood, except where the warm waters lapped up onto dazzling white sand beaches. Garden Key was barely three feet above sea level, a crude oval about 300 yards long by 200 wide with a stagnant pond in the center, but it had the advantage of fronting on the vast anchorage. The only year-round inhabitants were the lighthouse keeper and his family. Among its transient visitors were fishermen and wreckers, who lived in a few shanties, when ashore.[41]

One of Wright's first missions upon landing was a thorough reconnaissance of Garden Key to ascertain the effects of the October 11-12, 1846, hurricane. He saw that there had been considerable changes in the shoreline, sand having migrated from the northern to the southern extremity. At the head of the most southerly of the two wharves, shown on Major Bache's chart, where Bache had found a depth of between 7 and 8 feet of water, there was none except at floodtide. At ebbtide, there were several feet of sand beyond it. Other parts of the shore had also been altered, but Wright did not believe that the water had "deepened any on the shoals on which some portions" of the fort will rest.

Consequently, he wrote the Department, "the difficulties attending to the construction of these portions will not . . . be increased." More fill, however, would be required for the parade.

---

40. Totten to Wright, November 29, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

41. "Condensed History of Fort Jefferson, Garden Key, Tortugas, Florida, From December 1844 to June 1880," compiled from data collected by George Phillips, NA, RG 77, Ltrs. Recd., Chief Engineer.

When the storm was at its height, the lighthouse keeper reported, surf swept over the entire key, excepting the western ridge. One of the wharves had been wrecked, several small buildings flattened, and all vessels in the harbor damaged.[42]

2. Staking the Fort and Locating the Temporary Structures

The only drawing of the fort in Wright's files was a general plan. Utilizing this document, he endeavored to stake out the work, with sufficient accuracy to locate the eight temporary buildings to be erected by Norton and Parker with "such situations as not to interfere with any future operations."

He, however, was unable to site the fort with enough exactness, as to "direction of the lines." To correctly position the fort, he needed additional instructions, along with such drawings of "the lower part of the work as will be necessary to the commencement of operations."

In addition, he could not pinpoint any benchmarks identifying the planes of reference used by Major Bache in his survey.[43]

Upon receipt of this information, the Department transmitted to Lieutenant Wright a letter from Major Bache to Colonel Swift giving directions for locating his Garden Key benchmarks and planes of reference. Also enclosed was a copy of the instructions prepared for Captain Fraser containing information on siting the fort.[44]

A search of pertinent records groups at National Archives failed to turn up a copy of Major Bache's letter.[45]

3. Wright Locates and Evaluates Tortugas Building Materials

Lieutenant Wright, upon reconnoitering the area, saw that on Garden Key there were no building materials except sand, and it was inferior to that found on some of the adjacent keys. Loggerhead Key seemed to be underlaid by stone, outcroppings of which were seen near the shoreline. This stone was composed of fragments of "shells & ground coral, not very finely cemented together." The grain was coarse, and its hardness and tenacity somewhat less than concrete. After being taken from the water, and exposed to air it hardened. When dry, it weighed about 126 pounds per cubic foot.

Sand Key, likewise, seemed to be founded on a stone of similar characteristics.

---

42. Wright to Totten, January 7, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

43. Ibid.

44. Welcker to Wright, January 30, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

45. Letters Sent, Topographical Bureau, NA, Microcopy M-66.

The eastern and northern shores of Bush Key would furnish coral for aggregate. These coral fragments varied in size from "coarse sand" to several cubic feet.

The Loggerhead and Sand Key stone would, in Wright's opinion, answer for the walls of the "interior buildings and perhaps for interior work." It was easily quarried, and by employing specially designed sloops could be readily obtained.

Sand from Sand Key was "decidedly" the best ingredient for mortar of any he had observed on the Florida Reef, owing to the superior form of its grains.

If local stone could be employed in walls not exposed to action of the waves, a great saving could be effected in the cost of materials. He urged that it be given a trial in the kitchens of the officers' quarters, the first story walls of which would be 18 inches thick, and those above 15 inches. The exteriors were to be stuccoed.[46]

4. He Recommends Early Construction of a Section of the Counterscarp

Would it not, Lieutenant Wright inquired, be wise to commence that section of the counterscarp wall, beyond the floodtide line, simultaneously with the kitchens? If so, it would shield Garden Key from future batterings by hurricanes, such as had recently changed its configuration. Even with ordinary winds, a heavy surf pounded the shoals around that part of the key "north of the points at which the wall intersects the shore, and the stability of buildings exposed to its action would be endangered." A seawall at such an exposed area, Wright continued, must be of harder material than the local stone.

It would be difficult, if not impossible, to exclude water from that part of the fort situated on the shoal during the construction phase.

To test his thesis, a hole was dug about 3 feet square and 6 feet from the water's edge, to a depth of from 10 to 12 inches below the water line. It was impossible to keep this hole free from water with a bucket and equally impossible to fill it. This demonstrated that it would be necessary to work in water in laying the foundations.[47]

Colonel Totten had left for Mexico to join Major General Winfield Scott's army, so Captain George L. Welcker responded for the Department. On doing so, he mailed to Wright a copy of the instructions prepared for Captain Fraser. It was believed that these contained "all the information" desired as to location and construction of the scarp.[48]

---

46. Wright to Totten, January 7, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

47. Ibid.

48. Welcker to Wright, January 30, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

F. Andrew B. Vennard Positions the Eight Temporary Buildings

1. Norton and Parker Renege on the Contract

Norton and Parker notified the Department that they were bankrupt and were unable to fulfill their contract. Whereupon, Captain Welcker directed Lieutenant Leadbetter to call for new proposals for construction of the eight temporary buildings to be opened on April 1.[49]

Because of poor mail service between Atlantic seaboard cities and Key West, Lieutenant Wright was a long time learning that Norton and Parker had been foreclosed. When a number of weeks passed and they did not arrive, Wright, suspecting that they had failed, dispatched his principal overseer to Mobile aboard Activa. There, he was to secure proposal from various sawmills for "such lumber as would be needed for these buildings as well as other kinds required for the operations." He would also examine and evaluate the general market.

The results were favorable. Under his instructions, the overseer made such arrangements that, without committing the United States, "lumber of all desired dimensions could be obtained at the shortest notice and at a low price."

Meanwhile, Lieutenant Wright had obtained by mail a proposal from an agent for several Jacksonville, Florida, mills for lumber on terms slightly higher than the lowest Mobile offer. As the former mills had a lumber vessel, they could assure a better deadline for delivery.

Before he secured authority for purchase of lumber from either of these sources, Wright learned from newspapers that Lieutenant Leadbetter had invited new proposals for construction of the temporary buildings. Wright, upon notifying the Department of this, cited it as an example of the problems caused by uncertainty attending transmission of correspondence, because there was no regular mail service to Key West.[50]

2. Vennard is Awarded the Contract

When Lieutenant Leadbetter opened and abstracted the bids, he found that the most favorable offer was that of Andrew B. Vennard, Norton and Parker's principal Portsmouth creditor. His $13,800 proposal for erecting and completing the eight frame buildings by July 20 was accepted by the Department and the contract signed.[51]

---

49. Welcker to Wright and Leadbetter, February 17, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

50. Wright to Totten, March 14, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

51. Welcker to Wright, April 3, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

3. Seven Slaves Flee Garden Key

Until arrival of Vennard and the prefabricated structures little could be accomplished. As the weeks rushed by and there was no word of the contractor, Lieutenant Wright fretted.

In mid-May he hired from their owner 11 slaves, "at the rate of $20 per month, with rations, shelter & medical attendance." This exceeded the wage he had expected to pay, but it was the lowest offer received. It was also agreed that the owner was to be given a two-month notice before the blacks were discharged.

The slaves reported on the 26th. They were turned to strengthening the wharf, putting up a temporary building for their shelter, removing a wreck from in front of the landing, policing and clearing underbrush from sites staked out for the eight temporary structures, and opening roadways from the wharf.

If Vennard had likewise failed, Lieutenant Wright would find it difficult to keep even this small force employed. Moreover, there would now be hassles in securing lumber from Mobile or Jacksonville, because many vessels were under charter to the Quartermaster Department and employed supplying the American forces in Mexico. This had resulted in exorbitant freight rates.[52]

Sometime between midnight and dawn on Saturday, July 10, seven of the blacks fled Garden Key in the schooner Union, taking with them Virginia and Activa, as well as Lighthouse Keeper John Thompson's small boat.[53] After passing through Loggerhead Channel, they stove in and abandoned Virginia and Captain Thompson's boat. The latter grounded off Loggerhead Key and the former at the edge of Bird Key Shoal.

Lieutenant Wright being absent at Key West, Dr. D.W. Whitehurst, his second in command, organized the pursuit. But before doing so, the only available craft, an old and condemned vessel named Victor had to be repaired and outfitted.

It was after 8 o'clock before Dr. Whitehurst and eight men climbed into Victor and cast-off. Meanwhile, Keeper Thompson had sighted Union from the tower of the lighthouse. She was then about 12 miles west of Loggerhead Key. Since there was no wind, they found it a long hard pull on the oars, as they slowly overtook the blacks. By 2 P.M. Victor had closed to within three miles. Whereupon, the blacks lowered Union's jib and cut away both her masts. They then scrambled into Activa's boat and headed southward, pulling hard at the oars.

---

52. Wright to Totten, June 1, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

53. Union, a craft of between 10 and 12 tons, belonged to the Lighthouse Service, while Virginia and Activa were the property of the engineers.

Dr. Whitehurst and his companions soon boarded Union, and found that the blacks, besides sabotaging the rigging and rudder, had carried off clothing, Keeper Thompson's spyglass, and a barrel of water. It was impractical to refit Union so far from land and there being only a small cask of water aboard Victor, they gave up the chase and returned to Garden Key, where they arrived after dark. The wind having picked up, Dr. Whitehurst was satisfied that if the runaways encountered a squall, their craft must founder.

The blacks, however, were picked up by a vessel, and near Indian Key were ordered back into Activa's small boat and cast adrift. Landing on Indian Key, they were apprehended and brought to Key West.

Upon questioning them, Lieutenant Wright learned that Jerry and Jack were the ring leaders in the abortive escape. The other five were sent back to Garden Key, while Jerry and Jack were returned to their owners.[54]

To prevent a recurrence and guard against a possible servile insurrection, Wright established a watch, employing Keeper Thompson at $1 per night. This expenditure, he justified as a proper precaution, "when it is . . . impossible to ascertain the character & dispositions of the negroes employed," besides reassuring the owners of the security of their blacks. This confidence was mandatory, if the government were to employ large numbers of slaves to expedite future construction.[55]

Because of Chief Engineer Totten's absence, it was late December before the Department approved the hire of a night watchman.[56]

4. Vennard's People Finally Erect the Buildings and Position the Wooden Cisterns

It was mid-summer before Vennard's people and materials arrived at Garden Key. Because of mismanagement on the contractor's part, only five (the carpenters' shop, blacksmithy, limehouse, barracks, and combination messhall and kitchen) of the eight buildings were completed by September 30, more than ten weeks after the date, July 27, specified in the agreement. Of the others, the bakehouse was missing its large boiler kettle; the stables' upper floor and weatherboarding had not been finished; only the frame of the storehouse was up; and five cisterns had not been positioned. The only materials on hand to complete these were the storehouse flooring.

A major reason for the delay was occasioned by the limited work force sent to the Tortugas by Vennard. This was compounded by hot, humid days, which sapped the men's energy. Also there were deficiencies in materials. To alleviate the latter problem, Lieutenant Wright made available items from

---

54. Whitehurst to Wright, July 12, 1847, and Wright to Totten, July 21, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

55. Wright to Totten, July 21, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

56. Totten to Wright, December 23, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

the public stores and purchases in Mobile, Jacksonville, and Charleston. Then, to make matters worse, a vessel bringing lumber was lost at sea.[57]

During the autumn of 1847, the three remaining frame buildings were completed, and the five remaining cisterns assembled and connected.[58]

G. Fiscal Year 1848 Construction Program

1. Stockpiling of Materials

The failure by Vennard to complete the temporary structures as scheduled necessarily delayed beginning construction of the permanent buildings. Lieutenant Wright, however, had pushed ahead stockpiling materials. As of September 30, 1847, there had been landed and received for these structures 1,596 cubic feet of stone, 429,300 bricks, 300 barrels of lime, 500 barrels of cement, a "portion" of the lumber, and all the required hardware, glass, iron, etc. Arrangements had been perfected through the New York Engineer Depot for procuring the remainder of the lumber, about 230,000 feet; the balance of the bricks some 660,000; and such other necessary materials.

Workmen had been engaged, and were expected in the next vessel from New York City. When they arrived, construction was to commence on the permanent buildings.[59]

2. Three Detached Brick Kitchens are Erected and Protected from the Surf

By mid-October 1847, a small force of mechanics and laborers having arrived, Lieutenant Wright broke ground for the section of the officers' quarters necessary for project offices, hospital, etc., along with three detached kitchens. Because of the change in configuration of the key resulting from the October 1846 hurricane, the kitchen foundations were laid at reference (0) instead of reference (4') as called for. Concrete was employed instead of brick in the interest of economy. The foundations were carried up to reference (5'), the walls constructed of brick, and the kitchens completed in accordance with the plans.[60]

An "enrockment" was thrown up to shield the foundations against the surf. A gale, which pounded the Tortugas soon after the foundation of the second kitchen was laid, "swept away the sand so readily through the enrockment, as to show the protection to be entirely inadequate to the security of the buildings against the action of water in a Hurricane." Fortunately, the only damage

---

57. Annual Report of Operations at Garden Key for the year ending September 30, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

58. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

59. Annual Report of Operations at Garden Key for the year ending September 30, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

60. A copy of the plans, titled, "Plans and Sections of Officers' Quarters and Kitchens, Sketched by J.G. Foster," are on file at Everglades National Park.

was the "partial undermining" of the foundation, running perpendicular to the shore. The danger, however, was limited, because the superstructure had been carried up only several courses of bricks.

To guard against further damage from the surf, a coral barrier was erected around the kitchens, and the area between it and the buildings filled with sand and brushwood. This barricade was tested on September 25, 1848, in a wild storm. Although not to be compared to a hurricane, the winds and seas were unable to breach the wall, though powerful enough to tear off slates and turn up the lead on the ridge of the roof of the officers' quarters.

By the time the project was closed down and workmen laid off for the 1848 sickly season, two of the kitchens had been completed, excepting the board second-story partitions temporarily omitted for the convenience of the occupants. The third kitchen required for its completion, the hanging of four inside doors and positioning of door and window mouldings.[61]

3. 69'3" Section of the Officers' Quarters is Raised and Enclosed

Construction began simultaneously on a three-story section of one of the officers' quarters (69'3" long by 44' wide). By the time funds were exhausted in the spring of 1848, the walls had been raised and the building enclosed. In the interior, the only part entirely finished were two rooms at the northeast end of the lower story. The adjacent hall had one coat of plaster, while the rooms at the opposite end were furred and plastered with one coat, as were the partitions and closets between them. The flooring of the first story, except in these two rooms, had been laid.

On the second story, the floors were laid, but none of the interior work was up. On the third story, neither the flooring was down nor the interior work up.

Most of the materials for completing the quarters were on hand, and insofar "as the nature of the work permitted" were ready to position. All the doors were made, locks and hinges on hand, and baseboards prepared. Consequently, the balance of the remaining expenditure on the structure would be for workmanship.

Although the front and rear piazzas had not been built, stone plinths for the pillars and rear curbstones had been set, while the front curbstones had been cut.[62]

4. Wright's Proposal to Defer Construction of the Barracks is Approved

In mid-January 1848, Lieutenant Wright advised the Department that the balance of the appropriation remaining, after enclosing the officers' quarters,

---

61. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

62. Ibid.

would be too small to raise the barracks walls. This would be true, even discounting the cost of embanking the structure to protect it from the sea. Consequently, he recommended that he be allowed to spend the balance of the 1846 appropriation to finish the quarters and transport to Garden Key from Bush Key material for concrete.

Such a course was justified because:

(a) If future appropriations were no larger than the $100,000 voted in 1846, present accommodations for the workmen would suffice.

(b) If the barracks were partially raised but not enclosed, and Congress failed to appropriate monies for its completion, there would be great danger of its destruction by a hurricane.

(c) If Congress made an appropriation, the materials collected would be available for construction.

If the project were closed down, Wright proposed to save the $160 per month it cost to keep Activa ready for sea. She would be dismasted, her sails and rigging stored, and moored in the inner harbor. One man would be retained to keep her ship-shape.[63]

On February 9, 1848, the Department reviewed and approved Lieutenant Wright's plan of action.[64]

H. Congress Fails to Enact a Fortifications Bill for Fiscal Year 1848

Because of heavy expenditures for prosecution of the war against Mexico, Congress, in 1847, failed to enact a "Fortifications Bill," appropriating monies for construction of coastal defenses in Fiscal Year 1848. This would have little effect on the Tortugas fortifications, in view of delays already encountered. It could, however, prove to be embarrassing at Key West, where good progress was reported. Consequently, on May 10, 1847, Secretary of War Marcy directed that $15,000 from the $100,000 voted in Fiscal Year 1847 for the Tortugas project be transferred to Captain Dutton at Key West.[65]

The Department, to facilitate payment of obligations, made available to Lieutenant Wright $32,000 in drafts on New York City banks. Hereinafter, Lieutenant Leadbetter at the New York Depot, upon Wright's endorsement of the draft, could collect, insure, and mail the funds. Or he could retain any portion Wright directed to make desired purchases in the North.

If it were desirable for Wright to have money credited to his account in New York, remittances could, upon his rquest, be made direct to Leadbetter.

---

63. Wright to Totten, January 18, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

64. Totten to Wright, February 9, 1848, NA, RG 77, Ltrs. Sent, Chief Engineer.

65. Totten to Wright, May 10, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

Thus, the delay of sending the draft to Wright for endorsement could be avoided.[66]

66. Welcker to Wright, May 12, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

IV. WRIGHT AND THE DEPARTMENT PERFECT ARRANGEMENTS TO PUSH CONSTRUCTION

A. Furloughs and Other Duties Give Wright a Vacation

1. His 1850 Furlough is Cut Short

Lieutenant Wright was hard working, intelligent, conscientious, and innovative. Unlike most superintending engineers posted at southern forts, he did not in his early years make it a practice to absent himself from the project during the sickly season. There was in the winter of 1849-50 considerable illness among members of Mrs. Wright's family. Apprised of this, U.S. Representative John S. Pendleton of Virginia wrote Secretary of War George W. Crawford.[1] Unfortunately, we do not know the contents of the Pendleton letter, as it is not on file with either the letters received by the Secretary of War or the Adjutant General.[2]

Crawford was sympathetic and agreed that Wright deserved a short furlough. Notifying Wright of this, Chief Engineer Totten informed him that he could take leave of the project, provided necessary arrangements were made for security of the public property during his absence. Wright was to advise the Department as to the anticipated date of his departure and return.[3]

Wright was troubled by this letter. Responding, he announced that he did not plan to take leave. Moreover, he wished the Department to know that he had no part in prevailing on Pendleton to intervene in his behalf with the Secretary of War.[4]

Should he decide not to avail himself of the leave, General Totten answered, Wright was to apprise the Department, so it could be reported to the Adjutant General.[5]

Consequently, on June 18 Wright requested a furlough to begin August 1, and to terminate upon the October 15 return of the mail steamer. The Department promptly approved his application.[6]

---

1. Pendleton to Crawford, April 16, 1851, NA, Register of Ltrs. Recd. by Secretary of War, 1800-1860, Microcopy M-22.

2. Ltrs. Recd. by the Secretary of War and Adjutant General, NA, RG 107.

3. Totten to Wright, April 17, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

4. Wright to Totten, May 13, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

5. Totten to Wright, May 29, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer. Totten had been breveted a brigadier general to rank from March 29, 1847.

6. Wright to Totten, June 18, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

By this time, 42 months in the subtropics had taken their toll on the schooner Activa. She needed to be recoppered and caulked. Upon making several inquiries, Wright learned that this could be most economically accomplished in New York Harbor.[7]

The Department's permission obtained, Wright sailed for New York City aboard Activa. After disembarking and meeting with Major William D. Fraser at the Engineer Agency, Wright traveled to the Culpeper home of his in-laws-Samuel and Emily Bradford.

Wright was compelled to cut his furlough short. On September 28 General Totten notified him that his services would be required in New York City before expiration of his leave. Upon reaching the city, he was to oversee repair of Activa. He would also make such purchases of materials as were required and see that they were shipped to the Tortugas.

As soon as this was accomplished, Wright was to notify the Department and await further orders.[8]

Since his leave was not scheduled to expire until mid-October, the Department called on the Adjutant General to cancel the remainder. The days thus accrued could be used on his next trip North.[9]

Congress having appropriated $50,000 to continue operations into Fiscal Year 1851, the Department now directed Wright to be ready to return to the Florida Reef, as soon as arrangements for purchase and shipment of materials and hire of key personnel were perfected.[10] Wright, his tasks in New York City completed and Activa again outfitted for sea, accordingly sailed for Garden Key. He was back at the fort in mid-November.

2. He Combines Pleasure and Business

On March 20, 1852, with operations about to be suspended for want of funds, Lieutenant Wright requested a furlough to begin on or about June 1 and to end October 10, the day the mail steamer was scheduled to dock at Key West. It would be appreciated if the Chief Engineer saw fit to order him North to contract for materials. Such action would enable him to secure a transportation allowance.[11]

---

7. Wright to Totten, June 17, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

8. Totten to Wright, September 28, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer. Wright had married Louisa M. Bradford on August 11, 1842.

9. Totten to Wright, October 5, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

10. Totten to Wright, October 25, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

11. Wright to Totten, March 20, 1852, NA, RG 77, Ltrs. Recd., Chief Engineer.

General Totten was sympathetic, and orders were issued for Lieutenant Wright to avail himself of the first opportunity, after June 1, to report to the Chief Engineer's Office.[12]

To justify the round trip at government expense, Totten, upon Wright's arrival in Washington, sent him to New England to investigate sources for supplying bricks to the Forts Jefferson and Taylor projects. After completing this business, Wright traveled to Culpeper County.

3. St. Augustine Interlude

In 1852 Congress, for the second consecutive year, failed to appropriate any money for construction at Fort Jefferson. Since there would be no funds for the fort in Fiscal Year 1853, the Department found another assignment for Lieutenant Wright. Upon expiration of his furlough, he was to return to Florida, taking post at St. Augustine. There, he would be in charge of several projects--filling in behind the St. Augustine seawall, improving navigation on the St. Johns River, and connecting the waters of Indian River and Mosquito Lagoon at the "haulover."[13]

4. He is Called to Washington and Jacksonville

In the autumn of 1853, several months after construction was resumed at Fort Jefferson, Wright was called to Washington to sit on a board for formulating a plan for improvement of navigation on the St. Johns River. While doing so, he learned that his annual report for operations at Fort Jefferson for the 12 months ending September 30, which he had mailed from Key West, had not been received and had been probably lost in the capsizing of the mail schooner on her passage to Charleston. To provide data for Secretary of War Jefferson Davis, then preparing his annual report to Congress, Wright drafted and submitted a summary statement covering activities at the Tortugas during the subject period.[14]

As soon as he completed this document, Wright requested an 18-day leave to visit Culpeper. This was approved, and by the 19th he was at Culpeper. While there, he wrote General Totten that, about October 1, he had written the Department, requesting that $10,000 be deposited to his credit with the assistant treasurer in New York City. He now feared that this letter may also have been lost in the sinking of the schooner. Consequently, he was renewing the request for this sum to be placed in that depository to meet his expenditures for November and December.[15]

---

12. Totten to Wright, April 17, 1852, NA, RG 77, Ltrs. Sent, Chief Engineer.

13. Totten to Wright, October 10, 1852, NA, RG 77, Ltrs. Sent, Chief Engineer.

14. Wright to Totten, November 15, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

15. Wright to Totten, November 19, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

Soon after his late November return to Garden Key, Lieutenant Wright was notified that he was to have the project in such condition as to permit him to be at Jacksonville on January 14, 1854. There, he would meet with the other four members of the Commission for Improvements to Navigation on the St. Johns and for Protection of the Mayport Lighthouse.[16]

Wright, as directed, spent several days with the Commission.

5. Yellow Fever Ravages the Florida Reef

In May 1854 Lieutenant Wright was felled by yellow fever. This was the first recorded outbreak of the dreaded yellow jack in the Tortugas. Sixteen others, all residents of the officers' quarters, were stricken. There was one death.

Key West was also scourged. Among those taken ill was Captain Jeremiah M. Scarritt, the superintending engineer at Fort Taylor. On July 3 the Department, upon being apprised of this, called upon Lieutenant Wright, who had recovered to relieve Scarritt of his duties. If the latter died, Wright was to assume charge of the Key West defenses, in addition to his other duties, until some other provision could be made.[17]

By the time this communication reached Key West, Captain Scarritt was dead. He had died on June 22, four days after he was stricken.

Notifying General Totten of Scarritt's passing, Wright informed the Department that, before his death, Scarritt had directed Overseer Senac to continue operations at Fort Taylor until other orders were received.

Lieutenant Wright had words of caution for the Department in naming a replacement for Scarritt. He believed it would be a grave error to send an unacclimated person to Key West, until the fever abated in the autumn. For a number of months, he warned, yellow fever has existed here in its "most malignant form, having been accompanied by black vomit."

Upon opening Scarritt's official mail, Wright found instructions relative to the Abercrombie and Raiford brick contract.[18]

Some two months after Scarritt's death, the Department notified Wright that he was to turn over to Major Chase, upon his arrival at Key West from Pensacola, charge of Fort Taylor, along with all plans, instructions, property, and funds belonging thereto.[19]

---

16. Totten to Wright, December 10, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer. Other members of the Commission were: Captain J.F. Gilmer and Lieutenant John Newton of the Corps of Engineer, Lieutenant Charles H. Davis of the Navy, and Dr. A.S. Baldwin, an interested citizen.

17. Totten to Wright, July 3, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

18. Wright to Totten, July 5 and 19, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

19. Totten to Wright, August 26, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

It was early December before Major Chase, who had appealed in vain to a number of congressmen to stop his transfer, reached Key West. There, he was met by Lieutenant Wright and the necessary paperwork completed.[20]

6. His Pleas Finally Earn Him Reassignment

After nearly eight and a half years on the project, Lieutenant Wright concluded he was entitled to a new assignment. On May 1, 1855, he notified the Department that the portion of Fort Jefferson "below water" was essentially completed, and the first tier commenced. It thus seemed that this was the proper moment for naming an officer to replace him as superintending engineer.

In asking to be relieved, he reminded General Totten that he had been in charge since 1846 and had either been in the Tortugas or some other part of Florida for many years. So long a residence in the subtropics made "a change to a more temperate" climate particularly desirable.[21]

Wright, in a confidential letter to Totten, marshaled his arguments in favor of a reassignment to a northern activity. He had long been cognizant of the "enervating effects of this tropical climate on its residents." Although he had long observed these influences on those around him, he was now feeling its effect. Moreover, he was aware that "its strength is increased rather than diminished by length of residence." This sapping of his energy, he wished to shake off by a change in climate.[22]

Upon receipt of these letters, Chief Engineer Totten promised to take Wright's request under consideration.[23]

When three months passed and he heard nothing further on the subject, Wright, who had been promoted to captain, called the Department's attention to their previous correspondence. He reminded his superiors that, since landing on Garden Key in mid-December 1846, he had been present at his post, except for about 18 months when operations were suspended and he was on duty elsewhere. He was satisfied that nearly nine years' service at the Corps' most isolated post entitled him to a change of station.[24]

---

20. Wright to Totten, December 8, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

21. Wright to Totten, May 1, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

22. Wright to Totten, confidential letter of May 1, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

23. Totten to Wright, May 28, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

24. Wright to Totten, September 7, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

The Department finally acceded to Wright's request in mid-December. He was to be relieved as superintending engineer at Fort Jefferson by Captain Daniel Woodbury. Upon Woodbury's arrival at Garden Key, Wright, after turning over to his successor the funds, property, and papers belonging to Fort Jefferson, was to report to the Chief Engineer in Washington for duty as his assistant.[25]

B. Wright's Regulations Governing Access to the Tortugas

On April 23, 1847, Lieutenant Wright submitted for review and approval by the Department regulations, which he proposed to promulgate for the government of persons visiting the Tortugas. It was essential for the "preservation of the health & proper discipline" of the Corps' employees that:

(a) No vessel from any other port enter any of the inner harbors, "nor communicate with the land or any other vessels," until visited by a physician. This regulation was to be enforced during the sickly season and such other times as judged by the commanding officer to be necessary. This rule was vital, because fishing smacks, wreckers, and other vessels, particularly the first class, made frequent trips to La Habana and other places where there were frequent outbreaks of yellow fever.

(b) All vessels visiting the Tortugas were to "perform quarantine in the outer harbor for as many days as may be prescribed," whenever the commanding officer deems this precaution mandatory.

(c) No person was to land in the Tortugas without permission from the commanding officer, or in his absence of the man left in charge. All violators to be deemed guilty of trespassing and liable to a civil action. This was designed to prevent occupation of the keys by bootleggers intent on vending liquor to governmental employees.

(d) People having property on any of the keys were to remove the same within one week from the date the regulations were posted. Failure to do so would be viewed as a relinquishment of all claims thereto.

(e) Vessels, on entering the inner harbors, were to anchor in assigned positions. This was designed to prevent fishing smacks and wreckers from occupying anchorages required by vessels bringing in cargo for the United States. Though the inner harbors were restricted, there were frequently as many as eight or nine craft moored in the inner harbor, near the site of the proposed wharf or in the narrow entrance channel.

(f) To prevent dead fish, thrown out of "cans," from washing ashore on Garden Key, no fishing cans, except those belonging to persons employed by the United States, were to be anchored north of the southern extremity of that key.[26]

---

25. Totten to Wright, December 17, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

26. Wright to Totten, April 23, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

Soon after the regulations were posted, the conduct of a fishing smack's crew caused Lieutenant Wright to forbid it to land on any of the keys without permission. Although the master obeyed the order, several of the crew boldly declared they would do as they pleased, because no civil suit would "injure them as they had nothing to lose." They, however, would find themselves mistaken, Wright fumed, because both the master and owners would be held responsible for their conduct.[27]

Chief Engineer Totten assured Wright that, as the United States owned the Tortugas and possessed exclusive jurisdiction through action by the Florida legislature, there was no question but that the federal government had a right to promulgate and enforce all regulations deemed proper for preservation of health, maintaining order, and protection of all persons employed thereon. It could become necessary to forbid unauthorized persons from visiting or landing on the keys. In this regard, Colonel Totten directed Wright to issue orders prohibiting persons from building any wharves or erecting any sheds, shanties, or buildings on any of the keys without the Department's permission. No one was to use any of the Tortugas for drying, salting, or curing fish, nor were they to land any goods or other property thereon, without authority of the officer in charge.[28]

In implementing the regulations, Totten cautioned, it was "advisable to show in all cases a disposition to accommodate; and in no instance to give a preemptory order without feeling assured that you have the means of enforcing a compliance therewith." To give an order and have it disobeyed with impunity would bring Wright's authority into contempt. Orders should not be given unless some good is anticipated from their observance. For example, it seemed to be a matter of indifference whether persons were permitted to come ashore "in the Tortugas, unless, after landing, they made nuisances of themselves." Totten questioned whether a Florida court or jury would convict a person for merely landing on one of the keys. He also doubted whether any benefit would result from a regulation requiring vessels moored in the inner harbors to anchor in assigned positions.[29]

C. Labor Force: Its Wages, Problems, etc.

1. Primitive Working Conditions Sap the Men's Morale

Morale among the workmen was a problem. Lieutenant Wright attributed this to the area's isolation, the distance from metropolitan regions where skilled mechanics and laborers abounded, and the men's "ignorance of the locality." Consequently, he found it impossible "to obtain as good men as can be engaged on works more favorably situated." Messhall rations, because of the problems involved in securing wholesome provisions and the impossibility of preserving certain vegetables for any length of time, were bland.

---

27. Ibid.

28. Totten to Wright, May 12, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

29. Totten to Wright, May 14, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

Some men, accustomed to better fare, became so dissatisfied they left.

To improve this situation, Wright secured a contractor to operate the messhall. This man provided the workmen their board at a fair monthly rate.[30]

In an effort to boost morale of key supervisory personnel, Lieutenant Wright proposed to raise the wages of his overseers, master mechanics, etc. Vetoing this action, Chief Engineer Totten wrote, while there were valid reasons to raise the wages of workmen called to an isolated area, this did not bear upon the compensation of supervisory personnel.[31]

By mid-January 1848 most of the white workmen, although they had been in this tropical paradise only three months, were tired of the place and ready to return to their homes in the North at the first opportunity. As soon as the officers' quarters was completed, Wright planned to discharge them all, excepting 12 to 15 laborers to boat coral over from Bush Key.[32]

By May 1 Wright had laid-off the entire force, except for Dr. Whitehurst, a carpenter, and the crew of Activa. The money on hand from the 1846 appropriation, Wright notified Washington, was sufficient to pay all claims against the project and keep the schooner in commission until August 1.[33]

2. Principal Overseer Phillips Wins A Pay Raise

During the mid-summer of 1849, Principal Overseer Phillips reminded Lieutenant Wright that he was paid less than the men holding these positions at other Gulf Frontier fortifications. For example, Mr. Sweeny at Pensacola was paid $4 per day and Mr. Lane at Key West $100 a month.

If there were to be a pay differential, he fumed, it should be in his favor, because there was no place as isolated as the Tortugas. Besides being deprived of every luxury, he lacked many necessities for "it was next to an impossibility . . . to get any fresh provisions or vegetables here."

He urged that his pay be made commensurate to Sweeny's and Lane's.

Since the Department had rejected his previous application for a raise, he had visited with Chief Engineer Totten while in Buffalo in October 1848. At that time, Totten had remarked, "The increase shall be made you." Nine

---

30. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

31. Totten to Wright, December 23, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

32. Wright to Totten, January 17, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

33. Wright to Totten, May 5, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

months had now passed, Phillips reminded Wright, and nothing had happended.[34]

When he forwarded Phillips' letter to Washington, Lieutenant Wright noted that, in view of previous correspondence, he would not have done so, but for the overseer's statement regarding his conversation with General Totten. Wright, however, agreed that Phillips merited the same pay as the Key West overseer.[35]

On reviewing the correspondence, General Totten informed Wright that he did not concur that wages at Garden Key should equal those paid persons in similar positions at other Gulf Frontier defenses. The compensation must in each case depend on the extent and nature of the responsibility; on the personal qualifications and efficiency of the incumbent; on the probable duration of employment; and on the "uninterrupted, continuation, or intermission of the allowance," as circumstances warranted. In these there may exist, Totten noted, important differences even in localities within a particular region.

The Department would never withhold a "just compensation," but it was desirous that there be no room to "accuse the administration of admitting extravagant allowances." In this, it expected the cooperation of its superintending engineers.

After having made his points, General Totten approved an increase in Principal Overseer Phillips' pay to $100 per month from August 1. He, however, vetoed a proposed increase in the pay of Clerk-Physician Whitehurst.[36]

3. Rearranging the Workmen's Sleeping Quarters

The hot, humid weather during the summer of 1849 compelled many of the workmen to abandon the barracks at night and sleep under the stars. Believing that the night air was unhealthy, Lieutenant Wright decided to change the sleeping arrangements, which had resulted in one-half the frame barracks being unhabitable at this season.

He had the bunks and partitions running lengthways of the building taken down. Each story was then divided into four rooms by cross partitions and the bunks positioned against the partitions. Further work programmed consisted of erecting a "light piazza" on the east front.

---

34. Phillips to Wright, July 26, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

35. Wright to Totten, July 26, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

36. Totten to Wright, August 29, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

Workmen, at this time, were segregated, the whites bunking on the second story and the blacks on the first.[37]

4. Decision is Reached to Suspend Work During the Sickly Season

In September 1849 Lieutenant Wright recommended to the Department that, hereinafter, operations be limited in the summer. By June 1, in the future, he would reduce his force to those laborers necessary for driving piles, boating coral for concrete and receiving concrete, and several carpenters to be employed framing the cofferdam and repairing tools.

This force would not be reinforced until mid-October, "that being about the time when the change from summer to winter weather may be expected."[38]

Since this was the practice at other Corps of Engineers' projects in the South, where there was danger of yellow fever, the Department made no objection.

5. Rules and Regulations Governing the Employment of Slaves

On January 29, 1850, Chief Engineer Totten called Lieutenant Wright's attention to the Department's regulation prohibiting employment of slaves owned by supervisory personnel.[39]

Replying, Wright protested that he had not considered the employment of blacks belonging to Dr. Whitehurst, the work's physician-clerk, as covered by this article. Nor did he believe it was so construed by other superintending engineers. He did not view the clerk or physician position as constituting the incumbent an agent for the project. As everyone knew, the clerk had no supervision over the employees, or a voice in any expenditures except for medicines.

The Whitehurst slaves were as much the responsibility of Overseer Phillips, as those hired from other owners. To make matters more embarrassing, the Whitehurst slaves were the best hands on the job.[40]

Totten regretted that the rules operated to exclude good men, but the regulation in regard to employment of slaves was absolute. "As no agent of 'any sort' can be permitted the privilege, the Department" did not feel

---

37. Annual Report of Operations at Garden Key for the year ending September 30, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

38. Ibid.

39. Totten to Wright, January 29, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

40. Wright to Totten, February 22, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

at "liberty to make a discrimination in favor of a clerk," because it must regard him as an agent.[41]

On August 18, 1851, Wright notified the Department that a number of the slaves employed at Garden Key belonged to Senator-elect Stephen R. Mallory of Florida. Accordingly, he wished to know whether employment of the Mallory blacks, after he had taken his seat, would be considered a violation of the law of April 21, 1808, prohibiting "members of Congress from entering into, or being concerned in any contracts with the government."

There was, Wright explained, no contract existing between himself as agent of the United States and Mallory in the sense that he understood the terms. The Mallory blacks, as well as other slaves on the project, were employed on identical conditions to free labor, i.e., a fixed sum was paid for their services while they worked, and they were laid-off at the discretion of the agent, or the desire of their master. The only distinction was the substitution of the will of the master, in case of the slave, for that of the white employee. Both slaves and whites were hired without a formal contract. There was, however, an understanding with the owners that their slaves were not to leave the area without their permission.[42]

General Totten referred this question to the 2d Comptroller. After reviewing the act of April 21, 1808, Comptroller E.L. Phelps found that it seemed impossible to exempt the Mallory slaves from the "operation of the act." Moreover, although "no harm could probably result from the employment of these negroes, the transaction is not in principle entirely free from the operation of those reasons which induced the passage of the act."

On October 10 the Department forwarded to Wright the Comptroller's decision.[43]

6. Wright Reorganizes the Workforce for a Resumption of Construction

The project was closed down for more than a year, beginning in May 1852. Upon recall from his temporary duty in and around St. Augustine, Lieutenant Wright, in May 1853, traveled to Washington. From there he continued on to New York City, where he perfected arrangements for early resumption of work at Fort Jefferson. Contact was established with several key former employees. Three of these men--Dr. Whitehurst, the master of Activa, and the engineer-machinist--expressed an interest in returning to the Tortugas, provided they were given an increase in pay.

Wright was agreeable and recommended to the Department that the clerk-physician's compensation be boosted to $100 per month, the master's to $65,

---

41. Totten to Wright, March 18, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

42. Wright to Totten, August 18, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

43. Phelps to Totten, October 9 and Leadbetter to Wright, October 10, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer.

and the engineer-machinist's to $75. To support these increases, he informed Chief Engineer Totten that Dr. Whitehurst wore two hats, and had heretofore received $3 per diem, Sundays included. This sum, Wright noted, was usually paid clerks at major southern fortifications, and should not be less at Fort Jefferson, where the cost of living was very high, and "many privations are suffered which are not encountered at any other post, perhaps in the country." It seemed to Wright that Whitehurst's claim for additional compensation for his services as physician were reasonable.

As for the captain of Activa, he was responsible for many of the smaller purchases for support of the project made at Key West, while a "considerable part of the money used at Fort Jefferson" was received by him. His pay ought, Wright argued, be such as will secure the services of a proper person. It was difficult to determine what the pay of the master should be, but Wright was satisfied that he ought to receive more than the $50 and one ration per month allowed the revenue cutter's pilot.

The engineer-machinist was agreeable to returning to Fort Jefferson from the St. Johns at the salary cited.[44]

The Department approved these wage scales as submitted.

Lieutenant Wright, while in the New York City area, engaged Overseer Phillips, a master carpenter, and a few laborers to constitute the core of his workforce.

These men, along with materials and provisions purchased through the New York Agency, sailed for the Tortugas on July 1. The voyage was long and boisterous, and it was the 22d before they landed on Garden Key. They were joined on August 1 by Lieutenant Wright, who had traveled by way of Mobile and Pensacola.[45]

The isolated situation of Fort Jefferson was emphasized, with all its disadvantages, after a prolonged suspension of operations. Much time, energy, and money were expended in outfitting Activa for sea, reassembling the machinery, especially the steam engine and pumps, and caulking the barges.[46]

On September 30, 1853, there were employed on the Garden Key project:

No.	Occupation	Pay per month	Pay per day	Remarks
1	Clerk-physician	$100.00		No rations allowed

44. Wright to Totten, June 6, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer. Lieutenant Wright wrote this letter from his parents' home in Clinton, Connecticut.

45. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

46. Ibid.

1	Messenger	$ 8.00		1 ration per day
1	Overseer	100.00		No rations allowed
1	Suboverseer		$1.50	1 ration per day
1	Carpenter		3.00	No rations allowed
1	Carpenter		1.50	1 ration per day
1	Blacksmith		2.00	1 ration per day
1	White laborer		1.50	1 ration per day
2	White laborers		1.25	1 ration per day
12	White laborers		1.12½	1 ration per day
16	Black laborers		.90	1 ration per day
1	Cook	20.00		1 ration per day
1	Black laborer	8.00		1 ration per day
1	Master of Activa	65.00		1 ration per day
1	Mate	25.00		1 ration per day
3	Seamen	18.50		1 ration per day
1	Cook	23.50		1 ration per day[47]

7. Inflationary Forces Cause Overseer Phillips to Ask for Another Raise

Overseer Phillips continued to be plagued by the slow but steady rise in the cost of goods and services. In January 1855 this again caused him to ask for a corresponding increase in pay, because, as he complained, in 1854 he had only been able to meet his expenses. This, as Lieutenant Wright appreciated, was not what a prudent man in such an isolated place as this "should expect."

To add to Phillips' distress, there were the hardships incident to being cut off from "all society, disbarred from all comforts of life, and deprived of even the common schools for their children." He knew of few people who would willingly accept these disadvantages without the opportunity of economically bettering themselves. To add insult to injury, Phillips continued, Major Chase had recently increased the pay of the Fort Taylor overseer.[48]

When Lieutenant Wright forwarded Phillips' letter to Washington, he recommended that the overseer's pay be increased from $100 to $125 per month, to be retroactive to January 1, 1855.[49]

More than seven months slipped by before the Department approved Phillips' salary boost.[50]

---

47. Ibid.

48. Phillips to Wright, January 24, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer. Major Chase had been named superintending engineer at Fort Taylor in the autumn of 1854.

49. Wright to Totten, February 2, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

50. Totten to Wright, September 22, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

8. Increased Workforce Compels Wright to Provide Additional Quarters and Messing Facilities

The increase in the workforce, accompanying the accelerated construction program, led to crowding in the messhall and barracks. To provide additional accommodations, Lieutenant Wright proposed to refit the stables as quarters, and make a 16-foot addition to the messhall.[51]

On May 28, 1855, the Department sanctioned these projects and they were implemented during the summer.[52]

D. Inspecting, Purchasing, Transporting, and Stockpiling Materials

1. Wright Reports on Availability and Costs of Materials and Provisions

Lieutenant Wright, by the time he prepared his annual report for the year ending September 30, 1847, had been on the Florida Reef more than nine months. What he had seen and learned during this period satisfied him that Gulf Coast sources could with advantage be looked to for lumber and perhaps bricks. Mobile bricks were believed to be of superior quality and better able to withstand exposure to subtropical weather than those obtained from the North. Hereinafter, it was probable that bricks for the project could be secured from Mobile or its vicinity at a more reasonable rate. So far, northern bricks had been furnished at lower prices, because of higher shipping rates from Gulf Coast ports.

If the fort were to be built principally of brick, Wright urged the Department to take steps to ascertain whether they would be obtained on the Gulf Coast, because, at the same price per thousand, a great advantage would occur. This was because of the larger size of Gulf Coast brick in comparison to those kilned in the North. Moreover, there would be less danger to shipping plying the Gulf of Mexico, as opposed to the long, sometimes boisterous passage south by way of Cape Hatteras and through the Straits of Florida.[53]

This danger was underscored in the fourth week of September 1847, when word was received by the Department that the schooner John Howell had burned, with the loss of 49,000 bricks and 389 barrels of lime destined for the Tortugas. Fifteen thousand dollars in gold had been saved by the survivors, taken aboard the ship Pharsalia, and landed in Liverpool. From there, it was to be shipped to a bank in Boston or New York City to await a decision as to its ownership by a salvage court.

---

51. Wright to Totten, April 21, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

52. Totten to Wright, May 28, 1855 and Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

53. Annual Report of Operations at Garden Key for the year ending September 30, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

Meanwhile, Lieutenant Leadbetter was directed by the Chief Engineer's office to purchase and ship from New York City materials to replace those lost in the fire at sea.[54]

Lieutenant Wright found that most provisions could be purchased in the Gulf Coast states at fair prices. But, he had encountered difficulties in availing himself of this advantage, because of the uncertainty of communications and in securing transportation at proper times. He believed the former would be alleviated, when the regular mail service to Key West, recently authorized by Congress, commenced operation.

He, however, questioned whether vessels could then be more easily chartered, because there were few that sailed from the Gulf in ballast, and it was only in such craft that cargoes could be brought to the Tortugas at a fair rate. Compounding the problem was the knowledge that no return cargo can be provided. On the contrary, materials, etc., purchased in the North must be shipped on vessels willing to land them on Garden Key and risk obtaining another cargo in the Gulf ports or West Indies.[55]

2. Wright Seeks Where Possible to Avoid Contracts

Lieutenant Wright's practice, whenever possible, was to avoid formal written contracts, requiring the signature of both parties, and approval of the Department, because of the time involved. Instead, he merely received offers and accepted the most favorable, provided the bidder was responsible.

During the year ending September 30, 1849, lumber was the only material required, in which greater competition could be expected from advertising. For furnishing lumber, a number of offers were received. The lowest of these was withdrawn before the contract was assigned, owing to destruction of the successful bidder's mill by fire. Wright thereupon reassigned the contract to Moody and Byrne of Jacksonville, who had submitted the next most favorable proposal.[56]

3. Wright's 1850 Visit to Mobile and Pensacola and Reports on the Character of Bricks Kilned There

On October 25, 1850, the Department notified Lieutenant Wright that, as soon as practicable, on his return to the Florida Reef from New York City, he was to travel to Pensacola and Mobile and reconnoiter the local brickyards

---

54. Welcker to Wright and Leadbetter, September 23 and 24, 1847, NA, RG 77, Ltrs. Sent, Chief Engineer.

55. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 47, Ltrs. Recd., Chief Engineer.

56. Annual Report of Operations at Garden Key for the year ending September 30, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer. Moody and Byrne agreed to deliver 251,867 board feet of lumber at $17 per M and 239,867 board feet at $15 per M.

to ascertain their capability of providing the project with quality bricks.[57]

Several weeks after arriving back in the Tortugas, Wright sailed for Mobile on December 12. Because the most important point to determine was the durability of the bricks, he decided that his best course would be an inspection of Forts Morgan and Pickens, "works that had stood for many years exposed to the action of the sea air." As vessels were more readily chartered and could be secured on better terms at Mobile than Pensacola, he proceeded first to Mobile Point. There, he carefully examined the exposed surfaces of Fort Morgan, and made diligent inquiries as to the localities from where the bricks for its construction had been obtained.

He saw that the faces of the scarp, piers of arches, and the citadel walls had been extensively repaired by replacing "decayed bricks." Even so, these surfaces showed "large numbers more or less acted upon, giving an appearance of dilapidation to these portions of the work." In the soffits of the casemate arches, many of which had not been repaired, a large percentage of the bricks revealed extensive signs of decay, although they had been originally protected by plaster. These arches, Wright commented, were in the worst condition of any part of the fort. What he saw satisfied him that it would "not be prudent to trust to such bricks in the walls of a work so exposed as Fort Jefferson."

He was unable to document the source of these bricks. Superintending Engineer Jeremiah M. Scarritt and his master mason told Wright that most of them had been moulded and fired on the shores of Mobile Bay. A Mr. LeBaron disagreed. He stated that some came from the Pensacola brick yards and he had personally purchased several shiploads there. Major Chase explained that many were northern bricks.

Lieutenant Wright discovered that the bricks currently manufactured in and around Mobile were "not very compact, apparently contain a large proportion of clay, and consequently warp very much in burning, and are very rough and unsightly." Captain Scarritt told him that somewhere in the bay area there must be clay beds from which quality bricks could be kilned.

Wright, not wishing to experiment, traveled to Pensacola and, accompanied by Major Chase, closely inspected the exposed parts of Fort Pickens. They found the bricks in excellent condition. Very few, even in the most exposed face of the scarp, had yielded to the elements, and these very slightly in comparison to those at Fort Morgan. Those that had yielded were not hard burned. With more care in their selection, Wright believed, a wall might have been built that would have stood for years without any significant weathering.

Some of the casemate embrasure arches had decayed, but, Major Chase explained, these were Mobile bricks.

Pensacola bricks, Wright observed, were somewhat larger than Mobile bricks, besides being better looking. They also contained less clay and more

---

57. Totten to Wright, October 25, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

sand. Consequently, they warped less in burning and were hard and compact. Pressed brick were not kilned at either place.

Wright returned to Garden Key on New Year's Day. From there, he wrote Chief Engineer Totten, "We may more certainly rely on the resistance of the Pensacola bricks to the action of the sea . . . , though . . . from the appearance of the piers of our temporary buildings . . . bricks from Maine might stand." His experience with New York bricks in the officers' quarters had shown that they could not be depended upon. His only doubt as to resistance of the Pensacola bricks, if used for Fort Jefferson, rested on the "anomalous action of the air on lime and cement here when compared with that at the works on the gulf coast."

Major Chase, when asked why he employed lime mortar for pointing rather than cement, replied that the latter would not stand but crumbled and dropped out, while lime held fast. This contradicted Wright's experience at Fort Jefferson, where lime pointing in the officers' quarters revealed signs of decay within six months, while counterscarp joints, laid in cement, after two years were as perfect as the day they were laid.

In regard to prices, he found that Mobile bricks cost from $7 to $8 per thousand, while freight was dependent on the seasonal demand for shipping. Five dollars per thousand was calculated as an average. At Pensacola, the cost was $12 per thousand for bricks, a price established by the Navy. Transportation would be slightly higher than from Mobile.

Lieutenant Wright recommended to the Department that Pensacola brick be employed for the exposed surfaces, and northern brick for the rear courses next to the concrete core.[58]

The rejection by the House of the annual "Fortifications Bill" made Wright's arrangements for use of Pensacola brick in the forthcoming construction season academic. Instead measures were to be taken aimed at an early closing down of the project.[59]

4. Wright's 1852 Visit to and Report on New England Brickyards

In mid-June 1852, Lieutenant Wright, having received a four and one-half-month furlough while operations were suspended, passed through Washington. He was en route to Culpeper, Virginia, where he planned to spend his leave.

To accommodate his request for a temporary assignment, to defer the cost of transportation to and from his duty station, Chief Engineer Totten directed Wright to proceed to New York City, from where he was to travel to Boston, Portsmouth, Portland, Bangor, and such intermediate places as

---

58. Wright to Totten, January 4, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

59. Totten to Wright, February 25, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer.

necessary. He was to examine the quality of bricks made at these points, with a view to selecting such as were best "suited to resist the action of the air at Key West and the Tortugas." He was to secure from operators of kilns quotations as to the best terms upon which they would agree to furnish brick for next year's operations at Forts Jefferson and Taylor.

He would then return to New York City, remaining there until he had made arrangements for the purchase and shipment to the Gulf Frontier of tools, materials, and machinery required at Garden Key during Fiscal Year 1853.[60]

Upon reaching Boston from Culpeper, Wright called on Lieutenant Colonel Sylvanus Thayer, superintending engineer for the harbor's defenses. Responding to Wright's request, Thayer gave him names and addresses of firms supplying brick for third system forts. Among these were John Page of North Danvers, the Fresh Pond Brick Co. of Boston, and several firms in Yarmouth, Maine.[61]

When he called at the offices of the Fresh Pond Co., Wright was disappointed to learn that the president of the firm was out of the city, so it was impossible to come to any definite terms. The man in charge explained that their price for No. 1 bricks was $6.50 per thousand, and they would provide 1,000,000 or more bricks at the Charlestown wharves for $6.25 per thousand. These bricks were assorted and packed in cart bodies of 1,000 each. These carts were brought to Charlestown by rail, where wheels were put on the carts, and the bricks transported to the points desired. All breakage to the point of delivery was thus avoided.

As assorted, the first quality were pavers, all of which were very hard burned and generally vitrified on the surface; No. 1 consisted of the "perfect hard burned bricks of the kiln," including the pavers; No. 2 were the hard burned from which the pavers had been segregated; and No. 3 were soft bricks. The firm did not manufacture pressed bricks.

The firm's vice president claimed that Fresh Pond Co. could supply all the bricks needed for the Florida Reef, as fast as they could be taken aboard ship.[62]

Wright next visited several other Charlestown yards, where he observed that the common bricks were of better quality than those kilned by Fresh Pond Co. They, however, were small firms and their price was $7.50 per thousand delivered at the Charlestown wharves. Holt and Spaulding, who operated adjoining yards, stated that they could supply pressed bricks for $11.50 per

---

60. Totten to Wright, June 17, 1852, NA, RG 77, Ltrs. Sent, Chief Engineer.

61. Wright to Totten, August 2, 1852, NA, RG 77, Ltrs. Recd., Chief Engineer. The Yarmouth people had supplied bricks for the Boston defenses; John Page had furnished bricks for the Florida Reef defenses in Fiscal Year 1852; while the Fresh Pond Co. was the largest manufacturer of bricks in the Boston area.

62. Ibid.

thousand. They, however, knew nothing about shipping and would probably be unreliable as to deliveries.[63]

Stopping at Danvers, Wright learned that the brick industry was slack, because of the high cost of wages and materials. Only a few bricks were on hand at John Page's yard. His best offer was $8 per thousand for common bricks, $17 per thousand for pressed, and $13 per thousand for No. 2 pressed. The latter, Wright observed, would make excellent facings for the Fort Jefferson scarp below reference (O). They were very hard burned, and their off-color had resulted in this designation.[64]

At Portland, Wright was unable to see Frederick W. Clark, the area's major brickmaker. While at his yard, Wright learned that Clark manufactured three to four million bricks annually, had several yards, and could increase his business at pleasure. More important, his bricks were of superior quality, being equal to or better than those kilned at Danvers.

At Yarmouth, Wright saw a Mr. Killings, who stated that he could supply several hundred thousand bricks at $4.50 per thousand, rejecting all that were substandard. He, however, had never shipped farther than Boston but would make inquiries.

Since Colonel Thayer had had unfortunate experiences with the quality of Bangor bricks, while there were no important yards at Portsmouth, Lieutenant Wright did not stop off in these cities.[65]

Congress failed to make an appropriation to underwrite the project in Fiscal Year 1853, and there was no follow-up on these contacts established by Wright.

5. Wright's 1853 Trip to Washington and the New York Agency

In April 1853, Chief Engineer Totten wrote Lieutenant Wright, then on temporary duty at St. Augustine. After turning over responsibility for certain East Florida projects to Lieutenant John Newton, Wright was to travel to the New England coast and perfect arrangements for securing bricks for Forts Jefferson and Taylor. In the latter case, he was to act as agent for Captain Scarritt, who had been named as Captain Dutton's replacement at Key West. His previous year's trip to that region to inquire into the quality of New England brick should enable him to promptly discharge his mission. The price, quality, and rapidity of delivery were factors to be weighed.[66]

The Department took the initiative in perfecting arrangements for

---

63. Ibid.

64. Ibid.

65. Ibid.

66. Totten to Wright, April 13, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

Lieutenants Wright and Newton to meet in Washington.[67] The two officers met in the Chief Engineer's suite in late May. After they had transacted their business, General Totten directed Wright to travel to New York, and there make preparations for resumption of operations, such as procuring and shipping materials, machinery, etc., and engaging and sending to the Gulf those mechanics it was advisable to employ in the North. Having accomplished these tasks, along with making arrangements for purchasing bricks, he was to return to Washington, preparatory to resuming personal supervision at Fort Jefferson.[68]

6. Moody and Boultier Timber Contract

Wright, upon reaching New York City, called on Major Fraser at the Engineer Depot. Assisted by the depot staff, Wright made arrangements for purchase and transportation to the Dry Tortugas of needed materials, provisions, machinery, etc.

Meanwhile, he had advertised for proposals for supplying the project with lumber. When Wright opened and abstracted the bids, he found that Moody and Boultier's price of $22.50 per thousand board feet was the most favorable. Relaying this information to the Department, Wright noted that Moody and Boultier had furnished lumber to Fort Jefferson under the appropriations for Fiscal Year 1850 and 1851, and had fulfilled their obligations in a satisfactory manner. Although their price was higher than anticipated, it was doubtless the lowest that could be obtained, because all mills on the St. Johns and St. Marys had submitted proposals.[69]

On June 16, the previous day, the Department had directed Wright to secure his lumber on the best possible terms. A cheaper grade, he was informed, might suffice for some of the uses to which it was to be applied. If possible, he was to have shipped with the brick as deck cargo, pine, spruce, and hemlock.[70]

Wright, responding to this communication, advised the Department that all but a few thousand feet of this lumber was for special purposes, for which only yellow pine would answer. Consequently, he contracted with Moody and

---

67. Kurtz to Wright and Newton, April 26, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

68. Totten to Wright, May 26, 1853, NA, RG, Ltrs. Sent, Chief Engineer.

69. Wright to Totten, June 17, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer. The prices per 1,000 feet of the other operators were: Reed and Holmes, $24; E.S. Stirling, $25.94; S. Vendier, $26.37; Fairbanks and Co., $26.90; John Holmes, $28; S.H. Rokenbough, $30; and Joseph Grice, $35. Fraser had been made a brevet major on May 30, 1848, for meritorious conduct in the Mexican War.

70. Totten to Wright, June 16, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

Boultier for delivery of 240,000 board feet of yellow pine.[71]

Moody and Boultier encountered difficulty in making delivery. Two of the vessels they had under charter were lost at sea, and a third disabled by a storm and compelled to return to Jacksonville with loss of her deckload. As the project suffered no material damage from the contractors' failure to complete delivery by the date designated, February 28, 1854, and satisfied that they were exerting themselves to provide the lumber, Wright did not invoke the penalty clause.[72]

7. W.H. Wall & Co. Contract

In the spring of 1854, Lieutenant Wright called for proposals for supplying the United States with lumber for the casemate pier grillages and the floor timbers of the casemate cisterns. Upon abstracting the dozen bids received, he found that William H. Wall of Key West and William C. Dennis had made the most favorable offers. Each firm's price was $24 per 1,000 board feet.

Wright, satisfied that this was a reasonable figure, signed an agreement with Wall. This he justified by the company's greater facility for freighting timber. Wall owned two vessels, both of which he promised to employ in fulfilling the contract, while Dennis must either charter or purchase a ship.[73]

The Department, recognizing the merit in Wright's logic, sanctioned the contract with W.H. Wall & Co., subject to several minor modifications.[74]

8. Wright Contracts with Abercrombie and Raiford for Six Million Bricks

a. Wright Returns to the Gulf Coast Brickyards

United States Senator Jackson Morton of Pensacola, learning of the Army's needs, called upon Chief Engineer Totten. Morton told him that there were in and around his hometown not less than 3,000,000 excellent quality bricks, calculated to "resist the visistudes of the Gulf climate." Morton believed that their price per cubic yard would be no more than that of New England bricks.

---

71. Wright to Totten, June 17, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

72. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

73. Wright to Totten, April 19, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer. The proposals received ranged from $24 per thousand to $30 per thousand.

74. Totten to Wright, May 1, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

Forwarding this information to Lieutenant Wright, Totten noted that he was "unwilling that there should be the omission of anything that may possibly tend either to economy in expenditures, or strength and durability in the structure." Though he may have contracted already for New England brick, Wright was to proceed to Pensacola and Mobile and "thoroughly examine as to qualities, prices, time of delivery, etc.," of the local brick. He would then submit a report as to the expediency of procuring brick for Forts Jefferson and Taylor from that area.

Totten was of the opinion that the interior facings, if not the exterior scarp facings, may be of Gulf Coast brick. He was aware that Wright had already inquired as to this point, but the situation described by Senator Morton made it proper that Wright ascertain and report on the quality and price of these bricks. He was enjoined to "again carefully" examine the effect of the climate upon the bricks used by Major Chase in the Pensacola fortifications.[75]

Upon receipt of Totten's letter, Wright reassured the Department that he had not visited the New England brickyards, because he and Major Fraser had concluded that it would be more economical to first advertise in the principal northeastern newspapers. This would enable them to identify the whereabouts of interested individuals.[76]

Lieutenant Wright was soon en route to the Gulf Coast. Arriving in Mobile, he inserted advertisements in that city's and the Pensacola newspapers, inviting proposals for furnishing bricks for the government works. A number of firms responded.

After visiting the respective yards, Wright, as he had envisioned, concluded that Pensacola bricks were still superior to those made at Mobile, as to quality of material, care in manufacture, and price at which they can be furnished, either on shipboard or delivered at the Tortugas and Key West. The lowest offer received was for Pensacola bricks. The owners of two yards agreed to supply bricks at $8 per thousand, delivered aboard a vessel drawing 14 feet of water. These bricks, they guaranteed, to be hard burned and were to be subject to government inspection. The most favorable Mobile offer was $8.50 per thousand, delivered on the wharf.

Wright's inspection of Forts Pickens and McRee confirmed that the bricks used in their construction "will perfectly resist the action of the sea air, if proper care be taken to select only the hardest."[77]

b. Wright and Scarritt Recommend the Use of Pensacola Brick

Lieutenant Wright, upon reaching Key West and discussing the situation

---

75. Totten to Wright, June 14, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

76. Wright to Totten, June 15, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

77 Wright to Totten, August 3 and 10, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

with Captain Scarritt, recommended to the Department that they secure the brick needed for the "exposed faces of the Florida Reef fortifications from the Pensacola yards." He also urged that authority be given for purchase of a vessel, to be charged to the two forts, unless a contract for shipping the bricks could be made on reasonable terms. He and Scarritt believed that if it were known that the United States planned to buy a vessel and do its own freighting, it would induce shippers to lower their rates.[78]

Captain Scarritt found the cost of the Pensacola brick cheaper than any heretofore offered, even figuring the high cost of transportation. He held that the "mode of transportation should be left to the discretion" of the contracting officer. He also preferred purchase of the bricks in the open market, as was Major Chase's practice, to entering into a formal contract for the quantity required.

The Pensacola bricks averaged about 90 cubic inches, whereas northeastern bricks measured less than 60 cubic inches. Thus, their proportionate value was 1-1/2 to 1, or assigning the New England bricks a cost of $12 per thousand delivered, the Gulf Coast bricks would be worth $18 per thousand, a figure in excess of their cost.[79]

Chief Engineer Totten, after studying the correspondence, approved the proposal to employ Pensacola brick for the exposed surfaces of the Florida Reef fortifications. Purchases were to be made by contract or in the open market, as best suited public interest.

He trusted that Lieutenant Wright could arrange for delivery of the bricks without having to purchase a schooner. If this became necessary, he was to meet with Captain Scarritt and thrash out details.[80]

Wright accordingly discussed the subject with Scarritt, and they agreed to charter a vessel, if she could be had on "proper terms." As Key West was a port of call for far more shipping than the Tortugas, Scarritt was to handle this matter.[81]

c. Wright Contracts with Abercrombie and Raiford

On July 20, 1854, Lieutenant Wright mailed to the Department for review and approval the agreement he had signed with Anderson Abercrombie of Mobile and Philip H. Raiford of Baldwin County, Alabama. The contract called for

---

78. Ibid. Wright estimated the annual cost of operating a vessel, including insurance, at $6,400.

79. Ibid.

80. Totten to Wright, August 10, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

81. Wright to Totten, September 1, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

the two Alabamans to furnish 3,000,000 bricks for construction of Fort Jefferson and an equal number for Fort Taylor. The bricks were to be manufactured from Escambia clay, each one measuring at least 90 cubic inches.

As General Totten would see, Wright had made some slight alterations and additions to the original drafts. Among these was the reference to the size of the molds, because he believed it impossible "to say what must be their exact diminsions . . . to secure bricks of a given size." This, he noted, depended upon the shrinkage of the clay employed, which varied. The words "least dimensions of the brick when burned" had been substituted for those of "the moulds."

The blank for the number of bricks the contractors may furnish before they were ready to manufacture had been filled with 400,000, a number which would suffice till they had completed their preparations. Four hundred thousand had also been entered in the blank for the quantity the contractors may furnish in event of unavoidable delays. This was done, Wright explained, because it fulfilled the quantity the government was obliged to purchase under the Fiscal Year 1854 appropriation.[82]

Wright also wrote Major Chase at Pensacola, requesting him to select and forward samples, which were to regulate the inspection of the bricks to be delivered by Abercrombie and Raiford.[83]

Meanwhile, Wright had written Abercrombie and Raiford that 200,000 bricks were needed, one-half at each of the forts, within the next 90 days. An additional 100,000 would probably be required at Fort Taylor in November. They were likewise apprised that Major Chase had been requested to make jointly with them a selection of samples.[84]

General Totten, after Secretary of War Davis had sanctioned the contract, mailed it to Abercrombie and Raiford for their signatures. They were advised that clay equal in quality to Escambia could be used in manufacture of the bricks, provided Lieutenant Wright or his agent gave their assent. This had been done to silence protests of owners of the Blackwater River clay banks, who were protesting they were being discriminated against.

Major Chase was ill, so the Department alerted its superintending engineer at Mobile, Captain Danville Leadbetter, to select 24 sample bricks; 12 for Fort Jefferson and an equal number for Fort Taylor, to guide the inspections and receipts under the contract. Leadbetter was to forward these samples to Lieutenant Wright. Each sample would be marked and boxed.[85]

---

82. Wright to Totten, July 20, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

83. Ibid.

84. Wright to Abercrombie and Raiford, July 20, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

85. Totten to Wright, July 27 and August 1, 1854, and Totten to Leadbetter, August 1, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

Upon receipt of the information concerning the clay, Wright wrote the Department that he and Captain Scarritt had found that bricks manufactured from Escambia clay were far superior to "any others we could find." They had accordingly urged its use, although it added to the cost. He was satisfied that Abercrombie and Raiford must be compelled to employ Escambia clay, until such time as their bricks have been thoroughly tested.[86]

Chief Engineer Totten was agreeable. Wright's inspection was to be such that "no inferior or unsuitable bricks be passed."[87]

At the same time, Totten telegraphed M.M. Mordecai at Charleston that the bricks, unless agreed to by the United States, were to be manufactured of Escambia clay. Mordecai was to insist on this type clay.[88]

Wright, on second thought, announced that he was agreeable to so modifying the contract clause restricting Abercrombie and Raiford to Escambia clay, as to allow them use of any other than may meet the approval of the inspecting officer. He, however, did not see how such a modification could be made once signed copies of the contract had left his possession.

Would it not be proper, he inquired, to permit the contractors to present samples of brick made from other clays? If these were found to be equal or superior in quality to those from the Escambia, the contract could be amended.[89]

Captain Alexander H. Bowman, who had been an assistant to Major Chase at the Pensacola forts in 1829-34, discussed the situation with General Totten. As Bowman recalled, the best quality bricks purchased for these defenses were kilned from Blackwater clay.

Relaying this information to Lieutenant Wright, the Department announced that, as the restriction to Escambia clay had been suspended, "the whole range of choice is open." But, Totten continued, since Bowman was speaking of a situation that existed many years ago, there had probably been changes in modes of manufacture and types of clays available. Even so, he cautioned, while there may be questions as to choice within the waters of Pensacola Bay, "it would hardly be safe to go beyond those waters, unless there are evidences such as I have not heard of in favor of the durability of bricks made elsewhere." These remarks were aimed at the possibility the contractors might

---

86. Wright to Totten, August 7, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

87. Totten to Wright, August 15, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

88. Totten to Mordecai, August 15, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

89. Wright to Totten, September 6, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

decide to kiln their bricks on the marge of Mobile Bay.[90]

Meanwhile, Abercrombie and Raiford had notified Captain Leadbetter that they were ready to begin burning bricks at Pensacola.[91]

d. Abercrombie and Raiford Have Trouble Making Their Initial Deliveries

On December 8, 1854, Lieutenant Wright notified the Department that, although three months had passed, Abercrombie and Raiford had not yet landed any bricks. To make matters more embarrassing, they had not communicated with him in regard to their progress, nor had they acknowledged his letter calling on them to make their first delivery on or before November 24. Consequently, he desired to know whether he should wait longer or declare their contract null and void and take other measures for supplying the project with bricks.

If he were to adopt the latter course, he believed that bricks could be purchased in and around Pensacola at a cost not greatly exceeding the contract price, and the charter of vessels for their transportation. But, he continued, the uncertainty existing as to a speedy delivery under the contract, "together with the little weight the judgement of the officer disbursing has in securing the approval of his expenditures," served as a deterrent.[92]

When he answered Wright's letter, General Totten observed that his only knowledge of the contractors' character was through the reputation of Senator Morton, who had vouched for them. The little contact he had had with Raiford had impressed him with Raiford's desire to execute the contract in the "best manner." Under these circumstances and considering the time involved in perfecting new arrangements, it was advisable not to nullify the contract at this time, presuming that there may have been "unavoidable delays in the preparatory operations."

Meanwhile, Wright was to institute measures for securing bricks to permit him to press ahead vigorously until the bricks under contract were landed. He was to give Abercrombie and Raiford further and timely notice of his wants, sending duplicate copies of the correspondence to Captain Leadbetter at Mobile. He was to warn them that it was his duty to void the agreement, if "it fell short in any particular to the delay" of the project or injury of the public interest.[93]

---

90. Totten to Wright, September 8, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

91. Kurtz to Leadbetter, September 8, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

92. Wright to Totten, December 8, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

93. Totten to Wright, December 23, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

A kinsman of Jackson Abercrombie met with Chief Engineer Totten, in his Washington office, on behalf of the contractors, the day after Christmas. He told Totten that they were "anxious" to have their bricks inspected before they left the mainland. He also reassured the Department that every effort would be made to fulfill the contract with the "greatest promptitude."

Communicating this information to his superintending engineers, Totten noted that, if Major Chase and Lieutenant Wright could agree on an inspector, the Department would accept this arrangement. Provided, however, that this expense was absorbed by the contractors, and that proper inspections were instituted at the place of delivery to insure careful handling and provide that proper deductions be made for broken bricks.[94]

Abercrombie and Raiford soon solved their production and delivery problems. It was also agreed that the bricks could be inspected before they were embarked.[95]

e. Wright Receives Authority to Purchase Shaped Bricks from Abercrombie and Raiford

On November 29, 1854, Lieutenant Wright mailed to the Department a sketch showing the forms proposed for bricks to be used in the scarp wall facings between references (0) and (5½), and the flat arches for covering the outlets or cistern overflows. There were, he continued, three modes by which the slope of the scarp could be carried up:

(a) by inclining the bed so the plane of each course was perpendicular to the plane of the slope;

(b) by offsetting each course so as "to gain back two feet in five and a half"; and

(c) by employing bricks with one face for stretchers and an end for headers, inclined equally with the slope of the wall's face.

Upon analyzing these alternatives, Wright concluded that the first was contrary to general construction principles; the second would provide offsets thus giving an advantage to a foe attempting to surprise the garrison; while the third had no disadvantages. But, if it were to be adopted, the Department must authorize molding of bricks of the proper shape. In this respect, Wright did not foresee any difficulty with Escambia clay.

Some 108,000 bricks of this form were needed, divided equally between headers and stretchers. In addition, a comparatively small number of still different shaped bricks would be required for the salient and shoulder

---

94. Totten to Wright, December 26, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

95. Totten to Abercrombie, undated, NA, RG 77, Miscellaneous Ltrs. Sent, Chief Engineer.

angles of the bastions, embrasure tongue-holes, and perhaps for other areas.[96]

General Totten assured Wright that the Abercrombie and Raiford contract was all the authority he needed to order shaped bricks.[97]

9. Benner and Tift Contract

In mid-January 1854, Lieutenant Wright spent several weeks in and around Jacksonville, as a member of the Commission for Improvements to Navigation on the St. Johns. While awaiting departure of the mail steamer from Charleston to Key West, he rushed to Washington to lay before the Department the advantages that would accure to the United States by approval of a contract he and Captain Scarritt had signed with Benner and Tift for delivery of bricks for the Florida Reef defenses.

This trip was made at the request of Captain Scarritt, whose failure to procure bricks for Fort Taylor by modes heretofore pursued had been embarrassing. If Secretary of War Davis believed that this trip was necessary, its cost should be charged equally against the two forts.[98]

10. Boating Sand for Masonry

Most of the sand used in the concrete and brick masonry was boated over from Long Key. This was done for a two-fold purpose: (a) its superior cleanliness; and (b) because none could be spared from Garden Key.[99]

11. Gathering and Boating Coral for Aggregate from Bush Key

In the early 1850s, whenever the services of the laborers were not required at Garden Key, they were employed boating coral from Bush Key for aggregate. Several boats were thus engaged throughout much of the summer of 1851, and by early autumn a large quantity of coral had been collected and deposited near the concrete platform and within the counterscarp wall.[100]

---

96. Wright to Totten, November 29, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject drawing titled, "Plans, Sections and Elevations showing proposed forms of bricks for facing Scarp wall between references (0) and (5½) and the flat arch to cover the cistern overflow," is on file at Everglades National Park.

97. Totten to Wright, December 22, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

98. Wright to Totten, February 14, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer. Six days were required for the journey from Charleston to Washington and return.

99. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

100. Annual Report of Operations for Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

The four scows, belonging to the project and used for transporting coral from Bush Key, each handled 448 cubic feet per load. This was the maximum tonnage that the water approaches to Garden Key would permit. One load per day of coral was all that could be collected by the seven laborers detailed to this undertaking.[101]

By autumn of 1854, most of the coral had been collected from Bush Key. This caused Lieutenant Wright to lament that recourse would have to be made to "such parts of the reef as are dry at low water, or where the depth is not very considerable," for his "supply of this material."[102]

E. Corps' Experiment with a Trémie for Laying Masses of Concrete Underwater Benefit the Art

1. General Totten Calls on Lieutenant Wright to Undertake Some Important Experiments

On March 21, 1849, Chief Engineer Totten directed Superintending Engineer Dutton at Key West to ship to Lieutenant Wright at Garden Key the experimental trémie that had been built for depositing concrete underwater. Dutton had become disenchanted with it, and on its arrival at the Tortugas, Wright was to give it a trial. Although Totten did not want to controvert Dutton's tests, he did not deem them conclusive. For example, he informed Wright, Dutton had complained that the exterior surface of a mass of concrete thus deposited lost its cement and had no cohesion. But at Fort Adams, where Totten had employed a trémie, the exterior of a mass of concrete was rock-like.

Totten did not want Wright to assume any responsibility in the matter beyond carrying out carefully the Department's instructions, and applying "your own ingenity and judgment in removing or overcoming difficulties as they arise." Wright was to place in the water, near the wharf, a rough box a little larger than the base of the trémie. The box, resting on the bottom, was to have its sides rise a little above the surface. Totten would leave determination of the proportions constituting the concrete to Wright. He, however, reminded that, in underwater works, there must always be a "greater proportion of the cementing constituents in the mortar; and also a greater proportion of mortar in the concrete, than if the substance was to be exposed to air only."

In his initial experiment, Wright was to cause pieces of coral, shells, or whatever else constituted the aggregate, to be broken so that the largest pieces did not exceed 3/4 of an inch. After the trémie was lowered to the bottom, he was to fill the tub with concrete, ramming it into the tub in 2 or 3 layers, there "being so much water present in the mortar as to make the mass, when thus rammed, like a rather soft mortar." The tub, having reached the bottom, was to be upset by a pull upon the proper rope. It would be refilled and discharged again and again. When the concrete reached the surface,

---

101. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer. Coral, through the years, had been thrown up by the surf on Bush Key "in fragments so small as to render breaking generally unnecessary."

102. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

it could be rammed. Having attained a certain height above the surface, Wright was "to lift the tremie till the surface of the concrete has fallen nearly to the water." He would then refill the trunk, as before, leaving enough mortar in the tremie to fill the box when the tremie is removed, and flattening down the upper portions.

Small scale trials in the Washington office, Totten continued, had revealed that as the concrete descended into the wider parts of the frustrum, it spread laterally, so that the 1-inch stratum, which was at the top, was reduced to a thin line.

After the tremie was filled with concrete, the portion underwater being under pressure, the "surrounding water" should not trouble our mixture afterwards, provided the concrete "had such plasticity as to allow it, under pressure, to spread easily and not break up into independent and incoherent portions."[103]

2. Wright Submits His First Report

Wright agreed to receive the tremie from Captain Dutton and to perform the desired experiments as soon as possible, without interfering with day-to-day operations. He would give them his personal attention, because he was desirous of satisfying himself by careful tests as to the tremie's utility. He, however, had little expectation of success as the experiments thus far had been a failure.

To take a different approach, he asked authority to put down a line of concrete 30 feet in length and of the same width as the tremie. This would establish whether it was useful in laying foundations.[104]

By the last week of May, Wright had built a platform on the shoal at the south end of Garden Key, where the depth was about 6 feet at mean high tide. The box was of 2-inch plank, its joints close but not watertight. The materials employed were broken coral, sand from the keys, and "recently tested cement." The coral aggregate varied in size from a pea to 3/4-inch, and no cement was employed that did not "set hard underwater in three hours." The ratio was 3 parts cement, 4 parts sand, and 8 parts coral.

In mixing the concrete, it was made very soft, "so much so that it would not stand in a heap, when shoveled together, and ramming in the buckets was of no service." It was as fluid as it could be made, and still be handled with shovels.

The concrete was deposited carefully by bucket until the tremie was filled level with the surface of the water, after which it was thrown in with shovels. The tremie was pressed gradually upwards, while the frustrum was gradually filled. This upward thrust measured about 6-1/2 inches.

---

103. Totten to Wright, March 21, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

104. Wright to Totten, April 5, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

The concrete was filled into the trunk to heights varying from 2'6" to 5' above water. It was found that when this height exceeded 3-1/2 feet, the prism, notwithstanding it being wet and soft, separated from the frustrum. This documented that the pressure, due to the larger head, was not transmitted to the mass in the frustrum.

The concrete was pressed from time to time with a 6-inch rammer, and Wright saw that "till nearly the whole mass was laid, it could be forced out to the sides." This effect diminished, however, as the "central mass became hard, and towards the last this became so hard as to be immovable."

Ramming the concrete was tried, after it had been raised above the water in the trémie. This seemed to be counter-effective, because it consolidated the "center to the injury of the spreading of the subsequent deposits."

A cask, several holes bored into it, was partially filled with 2 cubic feet of concrete and deposited with the last batch.

The concrete was laid on May 15 and permitted to stand until the 29th, when the box was removed and the masonry examined.[105] The sides, Wright found, "were very smooth, no voids being perceptible, and the angles are generally well defined." The only exceptions were at two of the corners, where the box was either not filled, or the concrete had fallen out on removal of its sides. These breaks occurred at distances, from the top of the mass, of 1'5" and 1'6", each extending upwards about one foot. Below these two corners and at the others, the edges of the masonry were sound. Indeed, Wright had never seen better surfaces, even where concrete was laid above water and well rammed.

The cask-deposited specimen was not as satisfactory, but this could be explained by an accident that had occurred in lowering it. It had tripped on one of the ties and had been partially overturned.[106]

On May 31 a second block was laid, the constituents being identical, excepting the size of the aggregate. The latter varied in size from that of a pea to more than 4 inches.

Lieutenant Wright desired to test the effect of the head in compressing the mass below, so the trunk was filled to a height of from 6 to 7 feet above the frustrum, the concrete being very soft. No ramming was permitted. The concrete wedged in the trunk, because the "purchase" used would not start the trémie. By putting a heavy strain on the fall and shaking the trémie slightly, the mass was finally started, and the concrete settled gradually. The swaying was continued until the concrete had settled below the water surface.[107]

---

105. Wright to Totten, May 29, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer. The box's dimensions were 8'4½" x 7'2" x 6'.

106. Ibid.

107. Ibid.

3. Totten Commends Wright and Makes a Valuable Suggestion

General Totten was delighted to receive a copy of Wright's report, and commended him for the prompt and thoughtful manner in which he had carried out the experiments. His work would encourage the Corps to employ tremies. The wedging of the concrete in the prismatic trunk led Totten to conclude that there "might, with advantage, be a sensible difference in horizontal dimensions thereof, increasing downward."

He deemed these experiments of "great importance in hydraulic operations," and Wright was to "spare no expense that is necessary to a clear elucidation of the best process."[108]

4. Wright Continues the Program

Meanwhile, the boxing had been removed from the second block, and "the concrete . . . found more perfect than the first." It was of as good quality at the bottom and much better near the surface. The sides were smooth and hard, and the angles perfect. Lieutenant Wright found that it possessed all requisites for a superior foundation. Its greater density, he attributed to the fluidity of the concrete, the omission of ramming, and the greater "head" used.

A third experiment was scheduled to determine whether good concrete could be made from still larger size aggregate. For this test, pieces of coral, ranging in size from that of an egg to a fist, were used. A "little finer stuff was mixed" with it, and, on seeing the results, Wright noted in his journal, "My observations make me doubt whether more than partial success will be attained, for the appearance of the concrete when mixed is inferior to that used in former trials."

The mortar was deposited as in the second test, the head in the trunk being, however, 9 feet at each filling. To prevent a separation of the prism caused by a binding of the concrete, a new trunk pyramidal in form was built. Its top was 2 feet square and its height 9 feet. The slope was regulated by the size of the bucket, the top being just large enough to allow it free passage. The concrete settled favorably, no separation taking place, but it spread unsatisfactorily.

When the box was removed at the end of two weeks and the block examined, Wright pronounced this test a failure. The sides of block No. 3 "were little better than walls of loose coral and seem to have been formed by the course stones rolling down the sides of the heap after the mortar had settled and left them bare."[109]

5. Wright Formulates Five Principals

Upon evaluating the experiments, Wright filed a report noting that

---

108. Totten to Wright, June 15, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

109. Ibid.

cognizance must be taken of these principals:

(a) To employ small fragments of coral, none less than 3 inches in diameter, and these to be mixed with others from the pea-size upward.

(b) To so regulate the constituents that the mortar is "fluid enough to spread freely when shoveled together, and that . . . it shall not leave the stones bare."

(c) To fill the trunk with concrete as soon as mixed, settle it to its place as soon as filled, and raise the trémie "enough to bring the upper surface of the pile just below water."

(d) No ramming to be permitted, although the sides and corners of the heap were to be pushed outward by a long handled rammer until the frustrum was filled.

(e) To make the trunk pyramidal, to prevent the concrete from binding, and to so proportion the size of the trémie.[110]

Wright enclosed with his report a drawing of the trémie and box used in the Garden Key tests.[111]

6. Disseminating the Results

Once again, Chief Engineer Totten had kind words for Wright's latest report on depositing concrete underwater. To encourage its diffusion, he called upon Wright to "rearrange and consolidate" the data in a manner that could be published like Captain Bowman's remarks on concrete.

His article was to focus on use of the trémie, so it would require a drawing. Wright would detail the materials used, and the costs thereof. It was to be phrased to "enable a person who knows nothing about" the process, "to decide when he should use a trémie, and how he should use it."[112]

Lieutenant Wright submitted the requested manuscript, summarizing his experiments and conclusions, in mid-February 1850.[113]

---

110. Wright to Totten, October 29, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

111. Ibid. A copy of this drawing is on file at Everglades National Park.

112. Totten to Wright, November 19, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

113. Wright to Totten, February 18, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer. A check of the Library of Congress card catalogue failed to turn up any entry indicating that Wright's monograph was published.

Although Wright was the Corps' expert on the use of a tremie for laying concrete underwater, he utilized the cofferdam method for building the Garden Key's counterscarp and scarp.

7. Totten Provides Guidance on Mixing Concrete and Introduction of Lime

General Totten was satisfied that Lieutenant Wright could improve his method of mixing concrete. No amount of "manipulation would afford the result which is the fundamental one in all mortar mixtures," i.e., that every particle of sand be enclosed in a film of the cementing matter, and every void filled therewith. The aggregate, he continued, should not be added until a "good mixing" of sand and cement had resulted in an equal diffusion. Hereinafter, Wright was to mix the sand and cement (sand, cement, and lime) into a mortar, with the requisite quantity of water, before adding the aggregate.

Into all mortar, whether masonry or concrete, used above the level of the lower tier of casemate floors, lime was to be introduced in a proportion of not less than one barrel to a barrel of cement. In large masses, such as between brick arches and roof surfaces, the proportion of lime was not to be less than two barrels unslaked, to one barrel of cement. For mortar, the proportion of component parts of lime and cement to sand was to be the same ratio as cement paste to sand in pure cement mortar.

Lime that was to be mixed with cement was to be slaked with fresh water a "long time" previous to being mixed with cement. Until ready to be mixed with cement, the lime would be kept as a wet paste. In addition, it was to be free of all unbroken particles.[114]

General Totten had no doubts but that this process would result in a superior mortar, as well as being more economical, especially if Wright employed a steam mortar mill. The principle involved in such a mill was the passing of a lime paste between plates of a Bogardus eccentric mill, and then mixing it with sand in a pug mill. Cement mortar, without lime, was to pass through the pug mill.

Experience had demonstrated that it was best to omit lime from the mortar of casemate embrasures. If after careful trial, there was an efflorescence, lime was to be left out of the brick backing constituting the facings of the walls and piers.[115]

Acknowledging receipt of these instructions, Lieutenant Wright reported that a "change in the mode of mixing the ingredients of the concrete" had been made as directed.[116]

---

114. Totten to Wright, April 10, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer. One barrel of R & J Southfield lime would make from 3 to 3-1/2 barrels of paste and one barrel of Thomaston lime upwards of 2 barrels of paste.

115. Ibid.

116. Wright to Totten, April 29, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

F. A Communcations Lag Causes Problems With the Treasury

On November 3, 1855, Acting Chief Engineer Kurtz wrote Captain Wright concerning the large balance, $66,656, reportedly on hand as of October 1. This correspondence was triggered by a recent exchange between officials of the Treasury Department and General Totten. The former had sent out a circular letter, the gist of which was that all "disbursing agents were dishonest." Totten's reply was blistering.

To be on the safe side, Kurtz urged Wright to take measures to reduce his cash balance. In addition, on his October 1 statement, Wright had left blank the sum on deposit at the New York Agency.[117]

Replying, Wright informed the Department that the Treasury people could not be expected to understand the "uncertainties & difficulties attending the procurement of supplies & the disbursement of money by officers in Califa. & on the Florida reef." Otherwise, they would never have classed these officers with those superintending engineers blessed with daily mail service and the telegraph. The best that he could hope for was a semi-monthly communication with his sources of supply.

He had always sought to make his expenditures "come as nearly as possible to the proposed rate approved by the Dept." Consequently, all contracts were entered into, orders placed, and money drawn from the Treasury to meet these guidelines. All too frequently, his expectations were disappointed, because materials were not promptly forthcoming.

Since he had submitted his October 1 report, a number of vessels had reached Garden Key with materials, and by November 30 the cash balance for which he was responsible would be pared to between $10,000 and $17,000.[118]

---

117. Kurtz to Wright, undated, NA, RG 77, Ltrs. Sent, Chief Engineer.

118. Wright to Kurtz, November 22, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

V. FORT RISES ABOVE THE KEY: 1848-55

A. Fort Gets a Distinguished Name

Some 46 months after Lieutenant Wright first saw the site, the fort received a name. On October 8, 1850, Secretary of War Charles M. Conrad selected a name for the Garden Key works. Hereinafter, it would be known as Fort Jefferson in honor of Thomas Jefferson, the Nation's third President and principal architect of the Declaration of Independence.[1]

B. Planning, Funding, and Programming

1. Fiscal Year 1848 Program

When he prepared a program for Fiscal Year 1848, Lieutenant Wright recommended that priority be given to construction of the counterscarp. His estimates were predicated on two suppositions: first, that only the portion of the counterscarp in the water will be built at present; and, second, that the entire structure will be built in Fiscal Year 1849. His calculations presumed that the foundations were to be concrete; the core of the superstructure concrete faced with brick; and the coping to be granite, one foot thick, faces rough but true, and in lengths of not less than two feet.[2]

Congress did not vote any funds for the project in the subject fiscal year, so the Department did not respond to Wright's proposal.

In February 1848, peace returned to the Nation, the Treaty of Guadalupe Hidalgo having ended hostilities with Mexico. Times were again propitious for securing funds for coastal defenses.

Some four months later, on July 22, Chief Engineer Totten, who had been brevetted a brigadier general on March 29, 1847, notified Lieutenant Wright that the Fortifications Bill signed into law by President Polk, two days before, appropriated $25,000 for the Garden Key project. Wright, in accordance with procedures, was to prepare and forward for review and approval an operating program for Fiscal Year 1849. He was to include a budget listing estimated monthly expenditures, after reserving a sufficient sum to provide for security of the public property in Fiscal Year 1850, should Congress fail to appropriate additional construction funds.[3]

---

1. Totten to Wright, October 9, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

2. Annual Reports of Operations at Garden Key for the years ending September 30, 1847, and September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

3. Totten to Wright, July 22, 1848, NA, RG 77, Ltrs. Sent, Chief Engineer.

Wright replied promptly. The appropriated sum would be employed to complete the officers' quarters, and begin construction of the counterscarp, commencing at the salient angle, north of the quarters and working in either direction. His reasoning was that this section of the counterscarp would be the most liable to damage from storms, as it was exposed to the rush of waves sweeping through Northwest Channel. When built, this part of the wall would shield the quarters and kitchens better than the enrockment.

In absence of detailed instructions, regarding materials from which the counterscarp was to be built, and the kind and dimensions of the coping, Wright was unable to prepare a satisfactory "estimate of its cost, or the rapidity with which the work could be carried on." He had assumed that the counterscarp would be built in the form and dimensions "originally" called for--the foundation to be concrete and the superstructure brick and concrete. He had not included the cost of the coping.

To accomplish this work, he proposed to spend an average of $2,622 per month during the period October 1, 1848-June 30, 1849, or a total of $23,811. Six hundred dollars would be reserved from the appropriation for pay of a fort keeper, at a wage of $50 per month, in Fiscal Year 1850, should the contingency foreseen by the Department occur.[4]

2. Fiscal Year 1849 Program

Superintending Engineer Wright, upon submitting his annual report for the year ending September 30, 1848, estimated that, to fund operations in Fiscal Year 1850, an $80,000 appropriation was needed. This figure broke down:

	Nature of Workmanship, Materials, Contingencies, etc.	Days	Cost	Designation of Part of Work to Which the Expenditure is to be Applied
	Estimate for 100 running ft. CS. Wall			
	Masonry Laying Stone	25	$ 50	Coping CS. Wall
	Laying Brick	60	120	Facing of CS. Wall
	Carpentry	50	100	Cofferdam
	Labor	900	700	On CS. Wall
Workman-	Stone	600 cu ft	600	Coping CS. Wall
ship	Cement	250 bbls	500	Concrete & Mortar
	Lumber	20,000	500	Cofferdam
	Provisions	1,035 rations	250	Mechanics & Laborers
	Add		180	
		Total	$3,000	

4. Wright to Totten, September 18 and November 25, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

	For 2,000 ft. of CS. Wall in the water at above measurement	$60,000
	For 530 ft. of CS. Wall above high water mark of $2,000 per 100 running feet	$10,600
	Expenses of Activa	1,800
	Machinery of various kinds	3,000
	Clerk & physician 365 days	1,095
	Overseer 365 days	1,095
Services	Master Carpenter 300 days	900
	Master blacksmith 300 days	900
	Total	$79,390
	Add for unforeseen expenses	610
		$80,000[5]

In March 1849, the 2d Session of the 30th Congress enacted a Fortifications Bill appropriating $50,000 for the Garden Key works in Fiscal Year 1850. This was $30,000 less than the sum called for in the estimates. When General Totten relayed this information to Lieutenant Wright, he called on him to submit for review and approval a program for expenditure of these monies.[6]

Wright proposed to employ this money to construct about 2,531 running feet of counterscarp, to include that funded under the appropriation for Fiscal Year 1849. This estimate rested on the supposition that the wall was to be everywhere 8 feet thick. He, however, believed that the width of the counterscarp on front B and that part of front C, "beyond the high water line," as they were less exposed to surf could be reduced to 6 feet, and "still be as secure as the other portions."

After reserving $600 for hire of a fort keeper in Fiscal Year 1851, should Congress fail to make an appropriation, Wright proposed to hold his average monthly expenditure during the period July 1, 1849, to June 30, 1850 at $4,100.[7]

He would budget the $50,000:

Nature of Workmanship, Materials & Contingencies	Extent	Cost	General Designation of the Parts of the Construction to which it was to be Applied
Masonry, laying bricks	days 1,500	$3,000	Superstructure of CS.
Carpentry	days 1,000	2,000	Cofferdam, machinery, tools

5. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

6. Totten to Wright, March 15, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

7. Wright to Totten, April 23, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

	Labor of Men	days	15,000		Boating materials for concrete, excavating for foundations, laying concrete, and assisting
	Cement	bbls.	8,000	$13,000	Foundations & superstructure of CS.
Lumber	Timber 8 x 8s M. ft. 50			1,000	
	Timber 6 x 8s M. ft. 15			300	Cofferdam for CS. and general use
	Plank 2-inch M. ft. 100			2,000	
	Boards 1-1/2 in. M. ft. 25			500	
	Boards 1-inch M. ft. 20			400	
	Steam pump & other machinery			2,500	Draining foundations
	Repair of Activa			750	General Service
	Clerk & Physician	days	365	1,180	
	Overseer	days	365	1,180	General Service
	Master & crew of Activa	days	2,190	1,180	
	Engineer (steam)	days	300	600	Charge of steam pump
	Provisions			5,000	
				$49,400	
	Fort Keeper for 1 yr. to June 1, 1851			600	
	Grand Total			$50,000[8]	

3. Wright Campaigns for Larger Annual Appropriations

When he filed his annual report for 1849, Lieutenant Wright urged that, in the interest of economy, the Department seek from Congress larger appropriations for the Tortugas fort. This he justified by its isolated situation which made it impossible to increase and decrease the labor force at pleasure according to the exigencies of the work. A considerable part of the labor force were slaves, whose masters could not afford to hire them to the United States at reasonable wages, unless they were regularly employed. Nearly the same situation prevailed with free labor. The services of first class mechanics and laborers could not be obtained unless steady employment was guaranteed.[9]

4. Fiscal Year 1851 Program

Wright's plea carried no weight. The Fortifications Bill enacted by the 1st Session of the 31st Congress, and signed into law by President Millard

---

8. Ibid.
9. Annual Report of Operations at Garden Key for the year ending September 30, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer.

Fillmore, merely appropriated $50,000 for the Garden Key fort in Fiscal Year 1851. In accordance with procedures, Wright was called upon by the Department to prepare and submit for approval a program for expenditure of this sum. He was to include a proposed monthly rate of disbursements.[10]

Lieutenant Wright was in New York City, in early October 1850, overseeing repair of Activa. Replying, he informed Chief Engineer Totten that, with this money, he proposed to continue the counterscarp on front No. 2 and that portion of front No. 3 situated on the shoal. Funds remaining would be applied to the scarp and cistern floors of fronts Nos. 1 and 6, commencing at bastion A and working in both directions, and raising the scarp, as the work progressed, to reference (0). The piers were to be left till operations on these fronts were resumed after the foundations of the entire fort were laid.

To justify his program, Wright wrote, it would be uneconomical to attempt to carry up any "one of the fronts to a much greater height than above mentioned, till the entire work is raised to that level." By following this scheme, the means employed in draining the cofferdam could be dispensed with in ensuing operations, because the amount of pumping necessary in carrying on construction above low tide mark was limited, and could be accomplished by hand pumps.

The foundations of all scarp fronts, he explained, would be laid with the aid of a cofferdam, constructed in a manner similar to that in use for the counterscarp, from which water was to be drained by steam powered pumps.

Wright proposed to hold his average monthly expenditure to about $5,000 during the period September 1, 1850-June 30, 1851. One thousand dollars would be retained to underwrite the salary of a fort keeper should Congress fail to enact a Fortifications Bill to fund the Fiscal Year 1852 construction program.[11]

The Department approved Wright's program as outlined.

5. Wright Estimates That to Complete the Fort Will Cost More Than $1,210,000

On October 1, 1851, Lieutenant Wright mailed to the Department an annual drawing showing the construction accomplished to date. As funds were nearly exhausted, the situation was favorable either for continuing work, or for a suspension of operations, "when the money on hand was exhausted." Nothing had been left undone which might preserve the work already executed, or the property on hand from injury or vandalism should the project be stopped.[12]

---

10. Totten to Wright, September 28, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

11. Wright to Totten, October 5, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

12. Annual Report of Operations for Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject drawing is on file at Everglades National Park.

About this time, Wright, in response to a circular letter, prepared a report on the cost of completing Fort Jefferson. He estimated that another $1,210,036 and 11 years would be required to see the project through. This figure, he noted, was a general one for the work itself and such portions of the interior buildings as have been constructed, but did not include the remaining structures within the parade wall, for which plans had been prepared.[13]

6. Congress Fails to Appropriate any Monies to Underwrite the Program in Fiscal Year 1852

There would be no program for Fiscal Year 1852. In late February 1851, the House of Representatives rejected the Fortifications Bill for the subject 12 months. Upon notifying Wright of this, General Totten called on him to "make such arrangement of your plan of operations, as will restrict your expenditures, engagements, and contracts, within the amount" still applicable to the project from former appropriations. The fabric and equipment were to be placed in a condition calculated to secure them from the elements and vandalism during the suspension. Wright was to reserve a sufficient sum to maintain a fort keeper on-site from the time work stopped until April 1, 1853.

Care was to be taken to leave no unpaid debts or claims against the United States.[14]

7. Closing Down Operations

By curtailing expenditures, Lieutenant Wright was able to continue construction on a reduced scale until the spring of 1852. Money, however, finally ran out. Before laying off the last of the hands and closing down the project on May 13, Wright saw that all movable parts of the steam engine, pumps, and other machinery were greased and stored. A shed was erected over the boiler of the steam engine, after it was first painted and filled with water. Activa was moored in the inner harbor, and stripped of her running rigging and sails, which were sent ashore and stored. The fort keeper was directed to keep her awnings spread, when necessary to protect her from the sun. He would also see that her decks were wet down daily.[15]

8. Fiscal Year 1854 Program

Some eleven months later, on April 13, 1853, Chief Engineer Totten notified Lieutenant Wright, then on temporary duty at St. Augustine, that President Fillmore had approved the Fortifications Bill enacted by the 2d Session of the 32d Congress, appropriating $100,000 for continuing construction of the defenses of Fort Jefferson in Fiscal Year 1854. Wright was to hold himself ready to

---

13. Wright to Totten, October 20, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

14. Totten to Wright, February 25, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer.

15. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1852, NA, RG 77, Ltrs. Recd., Chief Engineer.

return to Garden Key, after first turning over responsibility for the harbor improvement projects to Lieutenant John Newton, who had been ordered to Florida from Augusta, Maine. Wright was to contact Newton and establish a mutually agreeable place and time for making the necessary transfer of funds and papers.[16]

Wright and Newton met in Washington at the Chief Engineer's office to complete the necessary paperwork. While there, Wright discussed with General Totten and received the Department's verbal approval of his program for expenditure of the $100,000.[17]

9. Fiscal Year 1855 Program

On August 3, 1854, President Franklin Pierce signed into law the Fortifications Bill passed by the 1st Session of the 33d Congress, appropriating $50,000 for construction at Fort Jefferson in Fiscal Year 1855. Apprising Lieutenant Wright of this, General Totten called on him to submit for approval a program and budget for expenditure of this sum. He was to reserve sufficient money to maintain proper control over the public property from June 30, 1855, for 12 months, on the assumption that Congress might fail to make an appropriation for Fiscal Year 1856.[18]

Answering, Wright announced that he proposed to apply all available money in raising the remainder of the scarp wall to reference (0'); to laying grillages under casemate piers; to raising these piers to reference (4'); and to devote the balance, after completion of the foregoing, to laying-up the scarp above reference (0'). A small sum might be required for repair of the wharf.

Monthly expenditures between October 1 and June 30, 1855, would average about $10,500.[19]

On October 28 General Totten, having returned to Washington from a tour of inspection of the Nation's northeastern defenses, reviewed and approved Wright's program as outlined.[20]

---

16. Totten to Wright, April 13, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

17. Newton to Totten, April 19 and 23, 1853, and Kurtz to Wright and Newton, April 26, 1853, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

18. Totten to Wright, August 10, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

19. Wright to Totten, August 24, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

20. Totten to Wright, October 28, 1854, NA, RG 77, Ltrs. Sent, Chief Egnineer.

10. Fiscal Year 1856 Program

On March 8, 1855, General Totten wrote Wright that President Pierce had signed into law the Fortifications Bill enacted by the 2d Session of the 33d Congress, appropriating $150,000 for construction of Fort Jefferson in Fiscal Year 1856. In accordance with procedures he was to submit for review by the Department a program for expenditure of this sum.[21]

After studying his cash returns, Wright concluded that, with the funds available, his workmen should be able to raise the casemate piers to reference (4'), and the entire scarp to at least flood tide level.

This would enable him to program the $150,000 to: (a) completing the cistern floors; (b) constructing the wall closing the "rear ends" of the cisterns; (c) raising the scarp to the height of the floor of the second tier casemate (reference 19'); (d) turning the cistern arches; (e) levelling the cistern tops to form the floor of the lower tier of casemates, and to laying the traverse circles of the same; (f) carrying up the casemate piers of the first tier; and (g) construction of wharves for landing materials.

If it were deemed necessary to mount the first tier guns as soon as the work was ready to receive them, it would probably be necessary to prepare the magazines in the bastions and long curtains for reception of ammunition.

Provided this schedule was adhered to, Wright saw no reason why 122 heavy guns and 36 flanking howitzers could not be mounted by July 1, 1856.

He proposed to spend $10,000 in each of these months (July, August, September, October, and May); $15,000 during each month from November through April; and $9,000 in June. This would leave $1,000 for hire of a fort keeper in Fiscal Year 1857, if Congress failed to make an appropriation.[22]

Chief Engineer Totten approved the program and budget as outlined.[23]

C. Wharves are Built to Facilitate Construction

By September 30, 1847, lumber and piles for construction of a wharf had been received.[24] A pile driver was then assembled.

No construction funds being available in Fiscal Year 1848, work on the wharf was deferred until the ensuing year. This was fortunate because changes to the configuration of the key, wrought by the hurricane of 1846, had

---

21. Totten to Wright, March 8, 1855, NA, RG 77, Ltrs. Sent, Chie Engineer.

22. Wright to Totten, March 26, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

23. Totten to Wright, May 28, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

24. Annual Report of Operations at Garden Key for the year ending September 30, 1847, NA, RG 77, Ltrs. Recd., Chief Engineer.

rendered the proposed site unsatisfactory. When finally built, the wharf was merely a simple 34-by 28-foot pierhead.[25]

The near approach of the channel to Garden Key and depth of water close inshore made extensive wharves for landing materials superfluous. The simple 34-by 28-foot pierhead proved sufficient until construction was resumed in August 1853. An inspection at this time divulged that teredos had seriously weakened the pilings. These were replaced, and the wharf continued to render satisfactory service through the 1854-55 construction season.[26]

In April 1855 Lieutenant Wright, taking cognizance of the impending receipt of large quantities of materials needed to expedite construction, submitted plans and estimates for building an additional wharf. To justify this expenditure, he noted that the present landing would accommodate only one vessel, while there were often two or more craft laying in the harbor waiting to discharge cargo. The site for the new structure would be near the works, while affording a secure berth to vessels from where they could readily put to sea in an emergency. The bridge providing access to the wharf from the parade would pass through a casemate at a sufficient height above the floor to allow a plank roadway to be laid.

A crane, suitable for landing huge columbiads and other heavy items, would be erected on the pier.[27]

On May 28 the Department approved the project.[28]

The new 40-by 30-foot pierhead, with 12-foot approach, was completed during the summer, and the old wharf rebuilt.[29]

D. Completion and Maintenance of the Section of Officers' Quarters Used as Engineers' Offices

Workmen, when not employed on the counterscarp, were turned to completing the officers' quarters. By September 30, 1849, everything about the structure

---

25. Wright to Totten, January 17, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

26. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

27. Wright to Totten, April 21, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer. Wright estimated the cost of the wharf for materials and labor at $790. A copy of a "Sketch of a proposed Wharf at Fort Jefferson" is on file at Everglades National Park.

28. Totten to Wright, May 28, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

29. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

had been finished, except construction of the rear piazza, painting the third-story woodwork and that of the central hall, and bringing the yard walls in the rear to their proper height.

A permanent 19,000-gallon cistern for the quarters was built. Its walls and bottom were concrete plastered on the inside and stuccoed on the exterior.[30]

During the 12 months ending September 30, 1850, workmen completed the officers' quarters.[31]

By September 30, 1851, Lieutenant Wright had concluded that outside blinds were needed for the officers' quarters to prevent subtropical downpours from beating in under the jib doors and around the window frames. Efforts to remedy this situation locally failed, and the rooms on the windward sides were continually being drenched by water during storms, and the ceiling plaster had been damaged.[32]

During the 14-month (May 1852-August 1853) suspension of construction the fort keeper found time to paint a "portion of the quarters, some parts of which stood much in need of protection from the weather, and the remainder [which] had never received the full number of coats designed."

General Totten's sanction having been secured, carpenters, when work was resumed, were turned to building and hanging venetian blinds.[33]

Lieutenant Wright, in Fiscal Year 1854, was dismayed to observe that the Hudson River bricks used in construction of the quarters were rapidly deteriorating. The number of defective bricks had materially increased during the past 14 months.[34]

During the year ending September 30, 1855, workmen repainted the structure

---

30. Annual Report of Operations at Garden Key for the year ending September 30, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer. Copies of "Plans and Sections of Officers' Quarters and Kitchens"; "Plans of windows of Officers' Quarters"; and "Plan of Windows, etc., Officers' Quarters" are on file at Everglades National Park. These drawings were prepared by Lieutenant J.G. Foster.

31. Wright to Totten, October 17, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

32. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

33. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853 and September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

34. Ibid.

and replaced the decayed bricks. They also erected walls enclosing two of the three yards.[35]

E. Counterscarp Takes Shape

1. Wright Outlines His Goals and Alternatives

On July 27, 1848, Lieutenant Wright addressed a lengthy letter to General Totten focusing on the counterscarp and its mode of construction. Enclosed with this correspondence was a sketch detailing the results of recent borings made by his people. These documented that the rock strata peculiar to the Florida Reef did not show itself anywhere on the bank upon which Garden Key was located. This led to the conclusion that the subject key was "formed" on heads or "collections of distinct stones of coral formation, and not on a regular rock strata." Consequently, the existence or non-existence of a solid rock foundation would have no importance as far as prosecution of the project was concerned.

Wright had inferred from the memoir and plans that the Department had not presumed that rock could be found, sufficiently near the surface, for foundations, and that they were to rest on sand. The sand, if confined, he had discovered in building the officers' quarters would constitute a good foundation. The only danger to be apprehended was from spreading of the sand laterally, or from the foundations being undermined by water. Greater precaution in this respect, he noted, would be required here because of the lightness and shifting character of the Tortugas sands. The principal work could probably be shielded from this danger by the proposed counterscarp, and the depth at which its foundations were to be laid.

Having familiarized himself with the area, Wright felt justified, though he was a junior officer, as to the problem. It seemed to him that the counterscarp had a twofold purpose:

(a) To constitute one side of a ditch, in which "a depth of water too great for fording is obtained, and by preventing boats from reaching the scarp, thus strengthening the work against assault."

(b) And as a protection to the foundations of the scarp against the sea's battering.

To attain the first object, the area between the counterscarp and scarp walls could be excavated to a depth of 6 feet below high tide mark. This would enable the ditch to retain about 6 feet of water, whenever an attack threatened. From the character of the sand, this depth could only be achieved by paving the ditch, because the water would ebb and flow with the tides by percolating through the sand.[36]

---

35. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

36. Wright to Totten, July 27, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer. To illustrate his point, Wright called attention to the "readiness with which the water makes its way thro the sands of the Keys [as] . . . shown by the rise and fall of the water in the low ground in the middle of (continued)

Turning to the second goal, Lieutenant Wright forecast that similar results could be attained at less expense. This could be accomplished by forming an embankment "about the same distance from the work and following the same direction as the C.S. wall." It would protect the scarp wall against the surf, as well as prevent the approach of landing barges crowded with enemy soldiers and marines.

Wright championed the feasibility of substituting "something for the projected C.S. wall which will be much less expensive and which will effect the same object, viz., to protect the scarp foundations" from being battered by the sea.[37]

Should the Department determine to build the counterscarp as planned, Lieutenant Wright had prepared a project for a cofferdam to facilitate its construction. He proposed to drive three lines of piles (either square timbers or logs) at a distance of 8 feet from centre to centre and parallel to the direction of the counterscarp, and separated respectively in the perpendicular direction by 11'2" and 9'4". The sheeting, designed "to keep out the sand, and make smooth water in the interior," was to be 3-inch plank, while the floor of the platform was to be 2-inch plank.

Wright did not believe it necessary to drive the piles or sheeting much below the "bed of the foundation." After a section of counterscarp had been built, the cofferdam materials could be salvaged and reused at another point.[38]

If the counterscarp were to be faced with brick, Wright inquired of the Department, "Will it be possible to lay them at so great a depth in reference to low water?" According to a section of the wall, the superstructure was to commence at reference (-5'), zero being extreme low water, which occurred only at the new or full moon. Moreover, the maximum flood and minimum ebb tides occurred only once in a 24-hour period.

If it were deemed inadvisable to make the ditch watertight, there seemed to be no need to excavate the sand therein. Consequently, the concrete of the foundation might be carried up to reference (0), or 6 inches below it, as detailed on the enclosed sketch.[39]

To excavate for the counterscarp foundation, Wright suggested a "spoon," which was formed much like a shovel and was worked by a windlass. It should be about 2'6" or 3' inside and 3'6" long, having a long handle to guide it. He did not believe a steam shovel would be economically viable.[40]

---

36. (continued) the Key where the water takes nearly the same level as on the shore."

37. Ibid.

38. Ibid. A copy of Wright's cofferdam plan is found in the files, Everglades National Park. It is filed with the Report of Operations for the year ending September 30, 1848.

39. Ibid.

40. Ibid.

2. Totten Provides Guidelines

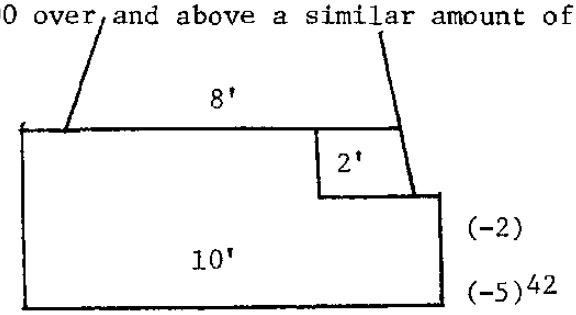
General Totten, as was his habit, answered Wright in great detail. He could not accept Wright's theory that underlaying Garden Key were a "collection of separate stones of the Coral formation, and not a regular rock strata." In any event, Wright's borings had demonstrated that it was "below our reach, unless we rest upon it by means of piles." But, he continued:

> if we can prevent motion in the overlaying sand, there can be no better intermedium than the sand itself, as a mode of preventing motion in this substance, and thereby securing perfectly the main walls of our fort.

It was impossible to overemphasize the advantage of the proposed counterscarp wall, Totten asserted, unless the surge of the sea is much less violent than reported. The form it took was to be conditioned by these factors: (a) The action of the sea could be so slight, even during hurricanes, that a ridge of rubble stones, placed along the line of the counterscarp, would not only prevent undermining of the sand foundations of the scarp, but would also be secure from such injury. (b) That sea tides generated by hurricanes be so violent as to mandate a counterscarp wall deeply founded, with riprap deposited against its exterior slope, reaching from the sand to the top of the wall. (c) That certain parts of Garden Key be subject to the first and others to the second condition. (d) Another situation could be foreseen where "the counterscarp crosses the island, and where probably, a thin wall, as originally designed, will afford all required security, while it serves to limit the outside of the ditch."

Wright was to satisfy himself from his own observations and from the experiences of others familiar with the Tortugas of the extent of danger from beach erosion.[41]

Turning next to Wright's proposal to begin the foundation of the counterscarp at reference (-5) and to raise the concrete to (0), and there begin the masonry, General Totten had one objection, but it was not insurmountable. It was that the upper exterior edge of this concrete foundation would be above water. There will be, he reminded Wright, about 1-foot of water at ebbtide. A remedy was to place the outside offset of 1-foot at reference (-2); to lay thereon a 2-foot course of granite, alternating headers 5 feet long and stretchers of 8 to 10 feet. Such an expense, for an extent of half the length of the counterscarp, would be less than the cost of an equal quantity of brickwork, and about $1,000 over and above a similar amount of concrete.



[42]

41. Totten to Wright, September 11, 1848, NA, RG 77, Ltrs. Sent, Chief Engineer.

42. Ibid.

Whether the remainder of the facing should be granite or brick, depended on something besides cost. Totten believed that a facing of very hard bricks, laid in quality cement mortar, in successive courses of 2-1/2 bricks, backed by concrete, coped by blocks of similar brickwork (the blocks divided by, and laid in joints of mastic) would better resist the shock of waves, than a wall faced with granite backed by concrete. This was because the "whole wall will act like a single stone, which will not be the case with any workmanship that we could afford to bestow upon the bond of granite blocks." To increase the resisting mass, and present a smoother surface, both faces of the wall should be vertical.

Chief Engineer Totten pronounced Wright's drawing of the cofferdam "very judicious." He, however, would drive the outside sheet pilings and cut them off at reference (0) and cover them with sand. The others should be either "drawn or cut off" as low as possible.

Totten held that a small dredge mounted on a carriage would be more satisfactory than one on a boat.[43]

3. Wright Looks to Captain Dutton for Assistance

On September 30, before receipt of Totten's letter, Lieutenant Wright notified the Department that he would avail himself of Captain Dutton's Key West experiences in laying concrete for the counterscarp's foundation. During the course of these operations, Dutton had experimented to ascertain "the proper proportions of materials, and the best manner of laying in water to prevent the mortar from being washed out, and to secure a homogeneous mass."[44]

4. Wright Refines His Plan for the Foundations

Upon acknowledging receipt of General Totten's mid-September correspondence, Wright devoted considerable thought to the costs and corresponding advantage that might occur by positioning a course of stone on top of the outside face of the foundation. He, however, saw no advantage.

In his drawing depicting proposed modifications in the profile of the counterscarp and its foundations, he had represented the "natural" surface of the terrain. This left the upper portion of the foundation exposed to battering by the surf. His intention, he reassured the Department, was to cover this area with sand, either through wave action or currents. Wherever this filling did not result from a natural phenomenon, it was to be secured by short coral piers, perpendicular to the counterscarp, because where sand did not embank, it tended to erode.

He would, he reiterated, commence the foundation at reference (-5) and carry it up to reference (0), where the wall was to begin and be laid-up with vertical faces of brick. The counterscarp was to be completed as

---

43. Ibid.

44. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

construction of the scarp continued, and the cofferdam and staging removed as soon as the masonry had solidly set. By observing the action of the surf on the sand, they could promptly determine the number and position of the piers needed to trap migrating sand.

Wright recommended that the foundation and superstructure be laid in a sand and cement mortar, with no admixture of lime. In fact, he continued, no lime should be employed as an ingredient for mortar in any part of the work. It had been his experience that where it was used, after apparently setting hard, it softened and fell out when exposed to water or weather.

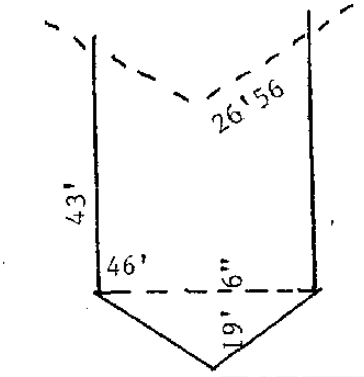
To expedite staking out the line of the counterscarp, he must have the dimensions of the bastions.[45]

5. Totten Gives Wright Authority to Proceed

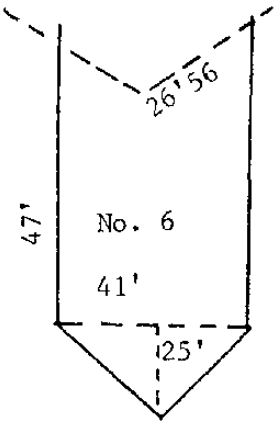
After reviewing the points raised by Lieutenant Wright, Chief Engineer Totten approved the proposal to begin construction of the counterscarp opposite the north bastion, and to proceed in both directions. He would rely on Wright's view that a course of granite was unnecessary. Wright, however, would not wait for the sand "to embank itself against the top of the outside of the foundations." He was to cover them as soon as finished with a deposit of sand. As heretofore the counterscarp foundation was to be commenced at reference (-5) and carried up to reference (0).

Totten denied directing Wright to mix lime with the mortar for the counterscarp wall. He likewise questioned whether his superintending engineer was correct in ascribing to the presence of lime the disintegration of mortar joints. This was not always the cause, because many joints of stucco, of cement, and sand had suffered in a similar manner. It was an established practice to employ lime as a "preventive of this very effect."

Enclosed for his guidance Wright would find a sketch of bastion No. 6, with an outline of the desired magistral. The other five bastions differed but were themselves identical[46]



Bastions 1, 2, 3, 4, & 5



45. Wright to Totten, November 25, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

46. Totten to Wright, December 15, 1848, NA, RG 77, Ltrs. Sent, Chief Engineer.

6. Wright Introduces an Approved Manner of Cofferdamming

As work began and progressed, during the winter of 1848-49, Lieutenant Wright became satisfied that the foundations for the counterscarp could be laid by cofferdamming and pumping out the water. He was led to this conclusion by watching the excavation of a channel for scows. When embanked this sand packed hard, and was found to contain an "almost impalpable powder which is entirely washed out from the sand thrown up on the shore."

He, as an experiment, had watched as the sheet piling for 112 feet of cofferdam on front A were driven. The piles were 2-inch plank, 5 feet in length, and were driven on each side of the interior framing. The area bounded by the pilings was then filled with sand, the space left for the foundation bailed, the earth excavated, and some of the concrete poured.

The high cost incident to laying concrete under water, Wright explained to the Department, had induced him to undertake this investigation. In view of its success, he apprehended no difficulty in carrying out this scheme for the entire extent of the counterscarp, as well as the scarp.

But, to secure maximum advantage, he had written Captain Fraser (who had recently replaced Lieutenant Leadbetter as officer in charge of the New York Agency) to secure data on the cost of a locomotive engine and wheel to facilitate pumping water from the area sealed off by the cofferdam.

In asking the Department to sanction this plan in preference to the one approved in mid-December, Wright noted that it was much cheaper, because it required considerably less lumber and much less time in driving. Two men, with heavy mauls, were able to drive about 100 running feet of outer sheeting per day. Moreover, the quality of the masonry would be improved.[47]

General Totten enthusiastically endorsed the use of embankment on either side of the sheet piling to keep water out of the trunk.[48]

Major Richard Delafield, the superintending engineer for the Boston Harbor defenses, reassured Wright that he found a locomotive engine and wheel effective, convenient, and economical in pumping water.[49]

Common sucking pumps were employed for pumping out the cofferdam. The yellow pine pumps, 2 in number, were positioned side-by-side. They had a square section of 1'3-1/2" and no difficulty was encountered from their becoming choked by the sand, which they handled, along with fragments of coral carried down into the pumps by "the current in the dam during the excavation.

---

47. Wright to Totten, March 3, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer. Enclosed with Wright's letter, a copy of which is on file at Everglades National Park, is a drawing of a "Section of Coffer dam for counterscarp wall of Fort at Garden Key"

48. Totten to Wright, March 22, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

49. Ibid.

Wear and tear on the pumps caused by sand getting between the boxes and sides was prevented by lining their sides with boiler plate within the "limits of the play of the boxes."[50]

7. Progress in the Year Ending September 30, 1849

By the first week of April 1849, the foundation for 100 feet of counterscarp had been laid, and the wall brickwork commenced. Most of the pumping had been done by a windmill and a cheap pump. Whenever there was a breeze, this was sufficient to keep the trunk free of water. But, whenever finances permitted an increase in the workforce, Lieutenant Wright believed efficiency would mandate use of a steam-powered pump.

Wright was impressed by the quality of the concrete laid but not the progress. One reason had been the need to shut down operations for ten days in March, when most of the workmen were called to Key West by the Admiralty Court as witnesses to the January 20 wreck of William Hitchcock.[51]

By mid-April the cofferdam on fronts A and B was completed. Although Wright beefed up his force, the task of pouring concrete dragged until the anxiously awaited steam engine and rotary pump were received. But by then it was late summer, and it was early October before they were assembled and operating. Consequently, when he submitted his report for the year ending September 30, 1849, Wright only listed the length of the counterscarp finished, except for the coping, at 510 running feet; length of foundation laid 518 feet; distance of cofferdam constructed and of large piles driven 1,010 feet.[52]

The concrete foundation was composed of 1 part cement, 2 of sand, and 4 of coral. The quantity of concrete, when laid, exceeded the volume of coral by 13 percent. Ocean water was used for mixing the concrete, "which has been made very wet, to make it pack densely, and fill closely against the surface of the sheet piling." Frequent examinations by Lieutenant Wright documented that the concrete set well, and presented the appearance of great compactness when cut into.

The counterscarp had been carried up on this foundation with brick facings, averaging 1'4" in thickness, the 5'4" core between being concrete. The subject

---

50. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1852, NA, RG 77, Ltrs. Recd., Chief Engineer.

51. Wright to Totten, April 5, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer. William Hitchcock had gone ashore on Garden Key. On January 22 the wreckers began stripping the craft. Her hull was refloated and towed to Key West.

52. Annual Report of Operations at Garden Key for the year ending September 30, 1849, NA, RG 77, Ltrs. Recd., Chief Engineer. Excavation for the foundations totalled 973 cubic yards, concrete laid in the foundations 959 cubic yards, concrete poured in superstructure 571 cubic yards, and brick masonry in faces of superstructure 285 cubic yards.

facings were laid in bonds of "three courses of bricks high, and 2-1/2, 2, and 1-1/2 bricks thick respectively." The mortar between them was mixed in the same ratio as that constituting the foundation.

The superior slope was "smoothly plastered over with cement ready for receiving the brick coping in asphalt," and was shielded from the weather by a layer of sand.[53]

8. Progress in the Year Ending September 30, 1850

During the 12 months ending September 30, 1850, the cofferdam for the shoal sections of the counterscarp, not previously constructed, totalling 1,759 running feet, was finished. A portion of the foundation and superstructure of the counterscarp, 1,307 running feet in length, comprising 4,356 cubic yards of brick and concrete masonry, had been completed, excepting the coping. Excavation for the foundation amounted to 2,080 cubic yards, and had been made to a depth of 6-1/2 feet below mean ebbtide.

Square pilings had been driven, and plates secured for the outer side of the scarp cofferdam at three bastions and the two connecting curtains.[54]

9. Progress in the Year Ending September 30, 1851

Workmen, in the year ending September 30, 1851, pushed construction of the counterscarp on the shoal (front No. 2) and that part of front No. 3 "beyond the shore."

By the time Lieutenant Wright filed his annual report that part of the counterscarp wall "in the water" had been carried up to the coping, excepting two spaces "left down two feet for the convenience of transporting materials over it," and openings left for two sluiceways. The top had been covered with sand, which constituted an excellent safeguard against weathering, and placed in condition to stand unharmed until such time as the coping could be positioned.[55]

10. One of the Two Caps Is Closed

By May 1, 1855, only one of the two gaps left in the counterscarp, the one on front No. 2, remained. It was being used to facilitate landing and storing lumber on the parade.[56]

---

53. Ibid.

54. Annual Report of Operations at Garden Key for the year ending September 30, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer.

55. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

56. Wright to Totten, May 1, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

11. Locating and Detailing the Sluceways and Gates

On May 25, 1850, Lieutenant Wright called upon the Department to provide him with a plan for a sluiceway through the counterscarp, and to fix the point at which it shall be placed, or if there were to be two, their whereabouts. To prevent the water in the ditch from stagnating, he recommended that the moat be flushed often by the tide. This could be accomplished by letting the water in at one point and discharging it at another.

The positions of the sluiceways would be important, because they must be protected from the surf, as well as from the shots of an enemy. The fronts most exposed to the sea, Wright explained, were Nos. 1, 5 and 6, which likewise were the least shielded from bombardment. To illustrate what he meant, he included a sketch. The only objection to sluiceways at these points was the possibility that they might become sand-choked, but all areas were liable to this difficulty.

An early decision on this question was needed, Wright added, because the counterscarp foundation was already extended to "the shore on the S.W. side, and the superstructure will soon reach the same point."[57]

General Totten, after studying the drawing, sanctioned the location of the sluices as proposed. But, he continued, if he were the superintending engineer, he would construct them so that at low water, the sluice sill would be above ground on the outside. There should be two sluiceways nearly opposite. The wider they were, consistent with strength, the better.

The sluice gate was to rotate on a horizontal timber axle, turning on composition gudgeons in metallic boxes embedded atop the upper granite course. Sides of the sluices, as well as the floors, were to be faced with large granite blocks. At the bottom of the sluiceway, there was to be a rebate for the foot of the gate, and two stones in the sides were to project about 6 inches within the sluiceway to afford support to the edges of the gate. The normal position of the gate would be at 3 o'clock, allowing the tide to flow in and out of the ditch without interruption, emptying the moat to reference (0) at every ebbtide, and admitting freshwater at every flood. In this position, the gate became a bridge across the sluiceway.

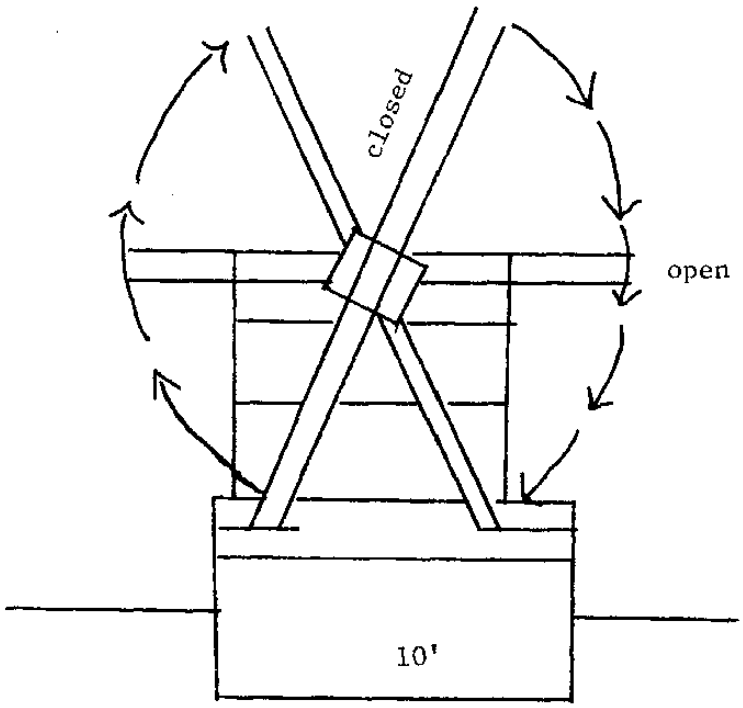
If it were desirable to forestall a "great rush" of water through the sluices, such as accompanied hurricanes, a wing of boards could be secured to be acted upon as soon as the surging tide reached the lower edge. This would cause the gate to revolve into its third position at 7 o'clock.

A cast iron stand, fastened to the top stones on one side of the sluiceway, would support a crank and pinion, gearing into "a semicircular of cogs fastened to the gate."[58]

---

57. Wright to Totten, May 26, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject sketch titled, ". . . proposal for sluices through the counterscarp wall," is on file at Everglades National Park.

58. Totten to Wright, September 12, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.



12. Enrockment is Positioned to Forestall Erosion on Fronts Nos. 5 and 6

Upon returning to Garden Key in August 1853, after a 14-month absence, Lieutenant Wright saw that the 1852 hurricane had "washed the sand bottom" considerably along the counterscarp on front No. 5. Tests revealed that another 2 feet of sand must be swept away before the foundation bottom was exposed. Fearful lest a gale, during the present season, might erode sufficient sand to endanger the counterscarp stability in this area, he determined to guard against this eventuality by an enrockment along the face of the foundation.

Workmen were turned to, and a bed about 8 feet wide and rising to zero level on top of the foundation was laid along the entire extent of front No 5, and for a short distance on front No. 6.[59]

13. Wright Identifies Some Structural Failures

During a September 1853 inspection of the project, Wright pinpointed some cracks in the counterscarp. He was uncertain of their cause, though he believed most were due to "unequal expansion between the brick facings and the concrete filling." A few, he believed, could be attributed to unequal subsidence in the wall, although its weight was insufficient to cause "so great a settlement."[60]

---

59. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

60. Ibid.

Some two years later, in October 1855, Superintending Engineer Wright reported that the cracks had increased in number, but their width was so insignificant that there were no fears for the structure's stability. He now attributed the factures, in part, to a "slacking" of the lime.[61]

F. To Combat Subsidence Pier Grillages are Decided Upon

1. To Determine the Degree of Subsidence to Anticipate a Brick-Laden Table is Positioned

The first evidence of a possible subsidence problem was reported by Lieutenant Wright in the winter of 1850-51. Chief Engineer Totten was understandably disturbed by the "slight subsidence" observed in the wall of the officers' quarters. He concluded that they must ascertain whether coral, when recently embanked, would "submit to compression under such heavy weights," as the fort's piers and scarp. To determine this, Wright was to have a table, 12 feet square, made of heavy planks. It was to rest on four short posts, supported by a plank platform. Wright was to pile on this table bricks to the height of 6 feet, which would exert a pressure equal to the scarp.[62]

Upon receipt of these instructions, Wright had the table built and positioned on the site of bastion A. It was then loaded with bricks to a weight of 51 cubic feet to the square foot of the base.

By April 29, 1851, the subsidence slightly exceeded 3/8 of an inch. Upon writing the Department of this, Wright noted that the "real pressure of the scarp on its foundation (supposing it to be equally distributed over . . .) will not exceed 33-1/3 cub. ft. per sq. ft." The table was loaded with a weight 50 percent greater than the sand would be called on to bare when the scarp is finished. The four legs, he continued, had settled equally or within 1/16-inch of each other.

This settlement was so insignificant that he had no hestitation in proceeding with the scarp foundations.[63]

Totten, though delighted by the preliminary results, believed they were inconclusive. To insure a "satisfactory test," Wright was to permit the bricks to rest on the table for at least six months. The load should also be increased at periodic intervals, and Wright was to make frequent measurements of and to record the subsidence. If at the end of six months, the subsidence had ceased or been reduced to a "minute quantity," he was to add about fifty percent to the load, and continue his observations as long as there was any motion.[64]

---

61. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

62. Totten to Wright, April 10, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer.

63. Wright to Totten, April 29, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

64. Totten to Wright, August 19, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer.

On December 3, 1851, Lieutenant Wright notified the Department that the table had been in position for more than six months, without any farther subsidence. During this period the embankment earth, on which it stood, had been subjected to heavy rains and autumn storm tides.

Because the table was "directly" over the intersection of the curtains abutting on bastion A, it obstructed the laying out of front No. 2. Consequently, it must be relocated to the area adjacent to bastion E. This was dictated by discovery that the character of the ground on front No. 5 and near bastion B differed considerably from that heretofore encountered, and made it necessary to test its "compressibility."[65]

2. Table Warns the Corps to Expect Considerable Subsidence

On September 5, 1853, soon after his return to Garden Key following a 14-month absence, Wright checked the table he had positioned near Bastion B. He recorded what he saw:

Date of Loading	Cubic feet of pressure and square foot of bearing	Date of taking levels	Settlement of table South leg	East leg	North leg	West leg
Jan. 29, 1852	38! cubic feet					
	38! cubic feet	Feb. 4, 1852	1	1.0625	1.3125	1.375
	38! cubic feet	Feb. 9, 1852	1	1.0625	1.3125	1.375
Feb. 9, 1852	64 cubic feet					
	64 cubic feet	March 1, 1852	2.1875	2.025	2.67	2.97
	64 cubic feet	March 15, 1852	2.1875	2.025	2.67	2.97
	64 cubic feet	April 27, 1852	2.1875	2.0625	2.8125	3.0625
	64 cubic feet	Sept. 5, 1853	2.53	2.70	3.98	3.90 [66]

When he transmitted these figures to the Department, Wright called attention to the subsidence registered between April 27, 1852, and September 1853. During these 16 months, the settlement had increased rapidly and in varying degrees for the four legs. Consequently, he was unable to state whether the subsidence had ceased until further observations were made.

Both scarp and piers could be expected to settle, he explained, but unfortunately the subsidence would not be uniform. Nor could he forecast whether this difference would be sufficient to endanger the masonry's stability. Wright did not believe this would cause problems insofar as the scarp was concerned, but any material differences in subsidence of "adjacent piers might cause cracks and consequent leakage in the arches of the casemate."

---

65. Wright to Totten, December 3, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer. Before positioning the table, the earth was excavated to reference (-2), i.e., the bottom of the foundations of the casemate piers.

66. Wright to Totten, September 5, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer. For some unexplained reason, Wright had relocated the table at bastion B rather than bastion E.

To obviate this danger, in such parts of the fort as seemed to require it, he recommended either a timber grillage, projecting several feet beyond the pier foundations, or compacting the "bed by ramming into it, hard & smooth fragments of coral."[67]

3. Totten Calls for Cheap Grillages

A review of the subsidence tables and correspondence satisfied Chief Engineer Totten that, to prevent damage to the masonry by unequal settlement of the foundations, they must resort to a cheap grillage.

The type he proposed was to consist of a layer of 3-inch planks, each plank bedded on compacted sand. These planks were to run longitudinally or transversely, as may be most advantageous, or even obliquely, if the length of the planks required. There would be no disadvantage in leaving the joints between the planks more or less open. Upon the first layer of planks, and at right angles, there were to be laid on edge and 8 inches apart, in the clear, 6- by 8-inch timbers. The space between these timbers to be filled with well rammed concrete. Before these upper timbers were laid, all joints below were to be carefully filled with sand, and, after they were down, wedges were to be driven wherever there was room, so that they would bear, before being loaded, upon every plank they crossed.

This grillage was to spread, with "full effect," about 1-foot beyond the concrete base of the scarp and piers, and more, if this base were given a batter.

No part of the grillage was to be higher than flood tide mark. If buried in sand, General Totten believed, it would be secure at that height.

He was unready to state whether the grillage should extend under every part of the scarp and piers, but questioned whether "any part of the ground will be entirely safe without the grillage."

In deeper excavations, the floor of the grillage would be at the reference heretofore assigned the bottom of the concrete.

Grillages of this type were to be positioned under the "several parts of the work that are not already too much advanced to admit it." These grillages, Totten reminded, would lessen the "tendency to subsidence; and also prevent wholly in some cases, and lessen in all, the tendency to settle into weak holes and patches." There might be some "patches of weak ground" that could be improved by first ramming in masses of coral, and Wright might find others so "tender" as to mandate a second grillage upon the first.[68]

4. Wright Submits His Recommendations

On November 4 Lieutenant Wright, having studied General Totten's letter,

---

67. Ibid.

68. Totten to Wright, September 29, 1853, NA, RG 77, Ltrs. Sent, Chief Engineer.

mailed to the Department a plan he had prepared of the casemate piers and a supporting grillage. The grillage had been adapted to "the form of foundations approved by the Dept." on October 31, 1851. The planks, he explained, ran under the entire length of the foundation, but the timbers stopped at the superstructure of the piers.[69]

To secure "as much bearing surface as possible," Wright suggested a change order. He called for building the piers solid up to the floor of the first tier of casemates, instead of leaving a 12'6" opening, as shown in the original sections. This change was depicted in the endorsed section marked B. Such an alteration would result in an increase of 82-1/2 square feet of bearing surface, by addition of about 4-1/2 cubic yards of masonry for each pier. Because it was proposed to close this opening by a 2-foot thick brick wall, there would be no increase in the piers' brick masonry.[70]

He, however, was unprepared to recommend any grillage under the scarp, because the "pressure without one is about the same per square foot as it is for the piers when the grillage shown in section (B) is used." Indeed, the scarp cofferdam had progressed to such a point that a grillage could be employed for only a part of two fronts.

In addition, Wright suggested that none of the foundations be commenced much above zero reference, to guard against undermining by rats and land crabs. It should be noted, he continued, that with a scarp founded at reference (-5'), the water level in the ditch would change but little with the tides. This was documented by the counterscarp, which before the sluiceways were opened, caused the impounded water to stagnate and limited the ebb and flow to about one foot. This, he believed, would be farther diminished on the inside of the scarp, because of the obstructions offered by the sand to the "free motion of the water after it has found its way under the foundation."

Wright held that, when the scarp was completed to above flood tide level, the water under the parade would not vary more than 3 inches from reference (1'), the highest level at which the foundation should be commenced.

In closing, Wright recommended that the grillage shown in Section B be constructed for all piers, but that none be built for the foundations of the "scarp wall, on which the pressure will not exceed that of the piers with grillage."[71]

5. Totten Drafts a Change Order

Chief Engineer Totten, in view of the importance of the subject, prepared a lengthy memorandum, supplemented by two drawings. As he recalled,

---

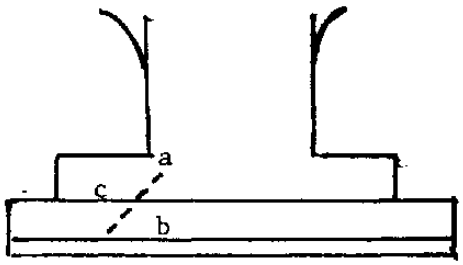
69. Wright to Totten, November 4, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the drawing titled, "Plan and Sections of proposed grillage, Fort Jefferson," is on file at Everglades National Park.

70. Ibid.

71. Ibid.

all first tier casemates were to have cisterns, except those in the bastions. In regard to the water level, he deemed it prudent to direct that "the lower side of the grillages under the bastion piers, stairways, etc., i.e., under all piers not immediately connected with the cisterns, be fixed at reference (0)."

To profit from the use of grillages, they must change the casemate piers, because those called for were not well adapted. The pressure, as Wright would see from the enclosed drawing, was conveyed along line a-b, and would leave a useless mass of concrete (c) behind and not bearing on the grillage.



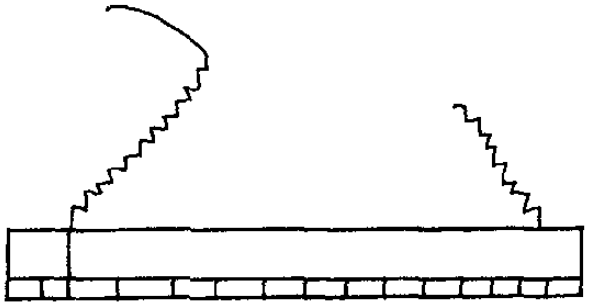
This situation could be improved upon by adopting the section of pier determined upon for Fort Taylor. To accomplish this, planks were to be laid longitudinally, for a width of 11 feet under the piers, in a reference identical to that of the superimposed timbers. On these planks, Wright was to lay transverse timbers 8 inches apart. These 8 by 6s were to be at least 11 feet long. Any excess in length beyond the planking was to rest on and be well bedded upon sand. In the space between the piers, the timbers were to be secured and covered with planks thus constituting a bottom for the cisterns.

The timbers being laid and made to bear by "wedges fairly upon every plank," the interstices between, to the width of the planking (11 feet), were to be filled with concrete. Then, leaving a 1-foot offset on each side, the brick casings of the pier foundations would be commenced on a width of 9 feet. Each succeeding course of brick was to "set back just enough to give a thickness of five feet to the foundation at reference (4)." The thickness of the brick casing was to be: first course, 2 bricks; second course, 1-1/2 bricks; third course, 1 brick; fourth course, 2 bricks; and so on. The beds of concrete backing were to be levelled and rammed even with the top of every third course.

The foundation was to be carried up the entire length of the pier without interruption under the communication arches. Toward the parade, it was to have the same spread, beyond the inner end of the casemate, as it had toward the side, i.e., 2-1/2 feet of masonry and 3-1/2 feet of grillage.

Wright was to begin the pier superstructure at reference (4), with a thickness of 4 feet, leaving a 6-inch offset on each side, from which to spring the arch over the cistern.

The enclosed drawing illustrated what was intended:



The spaces between the timbers, under the cistern floor, were to be filled with compacted sand, and a flooring of jointed 3-inch planks laid thereon. Some caulking might be necessary around the edges of the flooring.

General Totten was agreeable to omitting a grillage under the scarp, provided that the excavation did not uncover any "weak spots." Should any be pinpointed, they were to be covered by a stiff grillage.[72]

The decisions made regarding the grillages and piers caused Wright to seek a review of a verbal order by Totten not to lay the plank cistern flooring or to turn these arches.[73]

Totten, when approached on the subject, directed Wright to complete the floors and turn the cistern arches.[74]

6. Wright Attributes Much of the Unequal Subsidence to Boring by Shrimp and Worms

When Wright next checked the brick-laden test table in late October, 50 days after the September 5 inspection, he found that two of the legs had settled another 1/4 inch, while the others had been pressed downward only 2/100 of an inch. At first glance, he attributed the continued subsidence to the downward thrust of the load. This, he concluded, was not necessarily true.

As he explained to the Department, the shoal was honeycombed by holes mades by shrimp and boring worms. The latter had "thrown up . . . little hillocks literally covering the surface in certain spots." They had been especially active in the area where the table stood. Because the worms were bringing up sand from a depth of several feet, Wright theorized that their holes must extend below the bearing surface of the table legs, thus partially undermining them and causing a settlement. Since this "action is in constant

---

72. Totten to Wright, December 9, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

73. Wright to Totten, December 8, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

74. Totten to Wright, December 23, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

progress," he continued, "the subsidence will continually occur till these bearing surfaces have gone down below the point to which the worms, etc., carry their holes."

The shrimp and worms were seemingly killed by the stagnant water impounded by the cofferdams. Moreover, the piers were to be surrounded by earth, and the foundations of the scarp were below the depth to which they bored. Consequently, Wright had no reason to fear any subsidence from "their action after the masonry for these parts" was laid.[75]

7. Positioning the Grillages and Laying the Piers is Expedited

The vital question of grillages resolved, workmen concentrated their attention on the piers. By December 30, 1854, grillages had been positioned under six casemates, and they had commenced the foundations of an equal number of piers. Measures had been taken to bolster the labor force, and if there were no unexpected developments during the next 90 days, Wright reported, the project would be in condition to employ a very large force.[76]

Wright's expectations were fulfilled. By the end of May 1855, the grillages of the curtains had been laid and all casemate piers raised to reference (4').[77]

When he filed his annual report for the year ending September 30, 1855, Wright proudly announced that all grillages were positioned, except those designed to support bastions A and F and the bastion E stair tower.[78]

G. Scarp Takes Shape

1. Wright Seeks a Change Order

Early in October 1849, Lieutenant Wright submitted a program of work he proposed to accomplish during the next 12 months, provided there was adequate funding. His workmen would begin the foundations of the main defense at bastion A, progressing in both directions and carrying the masonry up to reference (7'), the level of the lower casemate floors. His best cost estimate for raising bastion No. A and the curtains on fronts 1 and 6 to this height was $75,000. This was made on supposition that the masonry to this level was to be concrete, except for the 16-inch brick exterior facing of the scarp wall. He also proposed that the "bottom" of the short front casemates be raised to the same level as those on the four long fronts.

---

75. Wright to Totten, November 4, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

76. Wright to Totten, December 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

77. Wright to Totten, May 31, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

78. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

This change was recommended because it would eliminate much of the difficulty and expense associated with laying concrete in water, and "tend" to insure watertight cisterns.

To replace part of the cistern capacity thus lost, Wright suggested that the space under the quarters and barracks kitchens be outfitted as cisterns for receiving water from the roofs of these structures.

A plan was prepared and enclosed detailing for Chief Engineer Totten's benefit how this could be accomplished. Extra money, to fund this change, over and above what was necessary for the foundations, would not greatly exceed the cost of filling them to reference (5') with sand. Moreover, the popularity of this type of cistern was documented by widespread usage in Key West.[79]

Some eight months later, not having heard anything from the Department on this subject, Wright mailed to Chief Engineer Totten a sketch of the scarp on which he had indicated certain modifications. These included: (a) carrying up the offset of the foundation in rear of the scarp to reference (-2') instead of (-3'); and (b) to found the cisterns on the short fronts at the same level as on the long fronts, i.e., at reference (-2') instead of (-5').

The latter change, which had been previously recommended, would result in the loss of about 267,000 gallons in cistern capacity. This, however, would be more than compensated for by fitting up the spaces under the floors of the kitchens for holding water. Wright did not believe that "tight cisterns" could be established, if their bottoms were founded at reference (-5'). Coincidentally, all danger of seepage (other than from settling) would be avoided, if the cisterns were raised so as to leave 3 feet less water to contend against. In addition, preparatory operations "may be much slighter if the proposed modification be adopted," while cost of laying concrete would be much diminished.

By raising the offset in rear of the scarp to the bottom of the cistern floors, a watertight joint would be secured along the line of the scarp, he added.

If the Department approved these changes, the foundation for the scarp wall could be laid first, and the masonry of the structure carried up to any desired level throughout its extent.

To facilitate this, Wright would employ the "temporary works" shown in figures 3 and 4 of the subject drawing. This cofferdam would be similar to those being employed in construction of the counterscarp. It would facilitate laying of the cistern bottoms, because the scarp would form one side of the cofferdam and 1-1/2-inch sheet piles the others. He anticipated no difficulty in keeping the spaces to be occupied by the cisterns free of water. The bottoms could then be laid with as much care and as good quality concrete as if on dry land.[80]

---

79. Annual Report of Operations at Garden Key for the year ending September 30, 1849, NA, RG 77, Ltrs. Sent, Chief Engineer.

80. Wright to Totten, May 25, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer. (continued)

The Department approved Wright's proposal to found the cisterns on the two short fronts on the same levels as those on the four long fronts.[81]

2. Work on the Cofferdam, Foundations, and Superstructure Begins

During the 12 months ending September 30, 1851, carpenters and laborers positioned the cofferdam for the scarp on fronts Nos. 1 and 6 and the adjacent bastions. Next, masons and laborers excavated and laid the foundations (2' thick and 12'3" wide) for these sections of the scarp. On these were laid a part of the superstructure to reference (-1). The construction area included bastions A and B, the connecting curtain, and 227 feet of front No. 6.

The cofferdam for the remainder of front No. 6 and bastion F was completed, excepting the embankment, the material for which was secured from the foundation excavation. No difficulty was encountered in expelling water from the cofferdam, until the final section was reached. The latter leaked badly, and required all the force of both pumps to keep the water low enough to permit laying of concrete. The counterscarp opposite this section had presented a similar problem--no bottom being found. After it was passed, Lieutenant Wright apprehended no further difficulties of this character.[82]

3. Foundations and Superstructure of Bastions A, B and F, and Fronts Nos. 1 and 6 are Raised to Reference (0)

Between October 1, 1851, and May 13, 1852, when the project was shutdown, the remainder of the foundations of front No. 6 and bastion F were put down, and the superstructure raised 3 feet to reference (0), on all foundations put down. This included bastions A, B and F, and curtains Nos. 1 and 6. The superstructure was faced with a "very superior quality of hard burned, pressed bricks," from North Danvers, Massachusetts.

Driving square piles and putting on plates for the cofferdam had been pushed till all the timber stockpiled for this purpose was exhausted. This readied for future operations all the cofferdam square piling and plates on the west side of Garden Key to the shore, and all to the shore on the east side. Sheet piling on each side of the cofferdam, for a length of more than 100 feet on curtain No. 5, was also driven.

As the foundations for the piers of the casemate arches were to be commenced at reference (-2'), an average of nearly 4 feet of water would be removed from their beds before they were laid. To accomplish this in an economical mode, Wright saw that cuts 1 foot wide and 2 feet deep were left

---

80. (continued) A copy of this sketch titled, "Plans & Sections of Scarp wall and cisterns, shewing proposed plan for constructing the same," is on file at Everglades National Park.

81. Totten to Wright, September 12, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.

82. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

through the scarp at points where the piers were to come against it. This would enable workmen to drain the beds of these foundations into the space between the scarp wall and outer face of the cofferdam. These interstices would permit pumps being placed in the middle of the curtain, from where water could be drawn from all the pier cofferdams of that particular front simultaneously.[83]

4. Material Shortages Slow Progress

In August 1853, pile driving was resumed on fronts Nos. 2 and 5. Two drivers were employed, and by September 30, 744 sheet piles, 13 feet long and from 10 to 13 inches wide, had been driven. Lieutenant Wright trusted that his people would complete their pile driving under the current appropriation, though "the amount still to be done, and the slow rate of progress" made this questionable.

The curtain piers, numbering 116, still must be enclosed by sheet piling, before any excavations could be undertaken and the grillages and foundations laid. About 8,500 piles were required for this purpose.

Concrete platforms for two fronts were built or repaired, and were ready for use in mixing concrete for the scarp and pier foundations.[84]

During the 12 months ending September 30, 1854, progress was "less than anticipated in view of the large amount of funds available." Wright attributed this to the great difficulty encountered in

> procuring supplies of certain materials, principally bricks and lumber, neither of which could be obtained in sufficient quantities to supply the wants of a more vigorous prosecution of operations, owing to the great scarcity of vessels of the class employed in such freighting and high rates of freight demanded.

Work had continued on all remaining fronts of the scarp. Progress had been recorded on the enclosed annual drawing. Masonry positioned included 2,622 cubic yards of concrete in the wall and foundation and 141 cubic yards of brick facing in the scarp.

The scarp cofferdam had been extended as far as available lumber would permit, and it could have been finished but for the want of that material. Nevertheless, all the square piles had been driven, the plates framed on, and a large number of sheet piling positioned, leaving only 700 more sheet piles to drive. During the 12 months, 233 square piles and 2,383 sheet piles had been hammered into position.[85]

---

83. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1852, NA, RG 77, Ltrs. Recd., Chief Engineer.

84. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

85. Annual Report of Operations at Fort Jefferson for the year ending (continued)

5. Work is Accelerated and the Scarp Rises

By December 30, 1854, there were a large number of masons on the job and materials were no longer a problem. This had enabled the workforce, by the end of the year, to raise the "circuit of the scarp" to reference (0).[86]

Meanwhile, it was decided that a "single width" of brick laid in flemish bond would suffice for the facings of the concrete masonry.[87]

During the 12 months ending September 30, 1855, workmen, Captain Wright reported, had accomplished these projects:

Front No. 1--The curtain scarp was raised to reference (8'.55), except where left open to receive the pintle stones and tongue-hole lintels. Casemate piers had been carried up to reference (5'). Eight cistern arches were turned, and the brick facings of the walls at the parade end of these cisterns raised 9" above the floor.

Front No. 2--The brickwork of the curtain was laid-up to reference (9½') and the concrete backing to (9'), except where "left down" for pintle stones, etc., and a gap where the new wharf crossed the work. Casemate piers were raised to reference (5'); cistern arches turned, except the semicircular ones at the "end of the magazines and one of the extreme ones"; and the wall at the rear of the cisterns carried up 2 feet above the floor.

Front No. 3--The curtain was raised to reference (5½'), except for a length of 57 feet about the sally port, where it had been laid-up to reference (1'). The piers were carried up to reference (5'); arches of cisterns turned, except the one at the gateway, the oblique one at the west end, and two small ones at the end of the magazine. The end walls of the cisterns had been raised about 2 feet above the floors, and the cross walls, separating the guardrooms and prison, carried up through the arches. A manhole was left in each for communication between the cistern compartments.

Front No. 4--The curtain was laid-up to reference (5½'); the cistern end walls raised 1'3" above the floor; and all arches turned, except the oblique ones at the extremities.

Front No. 5--The piers were carried up to reference (5'), except those at the rear of five of them, where masonry was "left down" to allow cistern

---

85. (continued) September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject annual drawing titled, "Plan of Fort Jefferson, Garden Key, exhibiting the condition of the work on 30th Sept. 1854," is on file at Everglades National Park.

86. Wright to Totten, December 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

87. Wright to Totten, November 29, 1854, and Totten to Wright, December 23, 1854, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

pipes to be positioned on their receipt. The arch skewbacks had been laid to a height of 1-foot. On this front the scarp was at reference (0).

Front No. 6--The scarp brickwork was raised to reference (2'), and the concrete backing to reference (1'6"). Skewbacks for the arches were laid, and the brick facings of the walls at the rear of 8 of the cisterns raised 9' above the floors.

At bastion A the scarp was at reference (0) and the bed for the grillage levelled. The brickwork of bastion B was at reference (5½'); the concrete backing at reference (5'); and the pier foundations at reference (4'), except the one under the stair tower, which stood at reference (2'). The scarp wall of bastion C was at reference (5½'); the pier foundations at reference (4'), except those for the stair tower, which had not been commenced. Bastion D's scarp wall had been laid-up to 1-foot and bastion E's to 2 feet, but no progress had been made on the pier masonry. The scarp of bastion F was at reference (0).

One hundred of the 110 cast iron pipes leading into the cisterns had been positioned as had 87 of the composition waste pipes running through the scarp wall.

The cofferdamming on the scarp side of the parade, except at bastion F, had been removed to make way for the casemate masonry.[88]

H. Perfecting Plans and Details for the Fort's Drainage

1. Totten Provides Guidelines for Constructing and Positioning the Outlet Drains

By mid-April 1851, construction of the scarp had reached a point where Lieutenant Wright needed answers to several questions. Writing the Department he complained that he had been provided no plans giving the "number, or positions of the outlets into the ditch, of the culverts for carrying off the water from the privies, kitchens, etc."

Workmen, he explained, had laid the foundation of the scarp for bastion B and about one-half the curtain on front No. 1, and a portion of the superstructure had been carried up to the position depicted on the enclosed sketch. Nothing further, however, could be accomplished until receipt of a shipment of Massachusetts bricks for the exterior facings, and determination of the positions for the drain outlets.

Wright had indicated on a second sketch, likewise enclosed, the positions to be occupied by the interior buildings, to which he had added the proposed locations of the outlets. These drains, he explained, could be easily connected to a system of surface drainage for the parade.[89]

---

88. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

89. Wright to Totten, April 15, 1851, NA, RG 77, Ltrs. Recd., Chief (continued)

General Totten, upon reviewing the sketch, approved the sites selected by Lieutenant Wright for the outlet culverts, i.e., in the scarp of the curtains, near the flank angles. This would carry the drains under the flooring of the oblique casemates nearest the bastions. By giving to the sewers of the two contiguous fronts a common outlet, three outlets would answer for the fort, even on the assumption that a sewer would ultimately be placed on front (d), as well as each of the others.

The outlet through the scarp was to be cylindrical, its diameter in the clear 2 feet. The cylinder was to be formed of burned brick, laid in cement, as half brick voussous, the portion next the outside being "run in horizontally" one foot. At that distance within the scarp, there was to be inserted a copper or composition grating, composed of 3/4-inch rods. The ends of these rods were to be deeply embedded. From this point, the bottom of the outlet was to rise, so that within one foot of the inside face of the scarp wall, it will have attained the level of low water (0), which level it will continue through the remainder of the scarp.

Against the inside face of the scarp, there must be a gate to be lifted from the casemate above. As its object was to hold in a flood tide until "dead low water, and then, by a quick lifting of the gate, to cause the water to rush out with violence, it was to be accurately fitted and strongly made."

The culvert for "general drainage" was to be 3 feet high by 2-1/2 feet wide. This would allow a crawl space. Its bottom would be at zero level. All sinks from the buildings, all surplus rainwater, and all privies were to discharge into the culverts. To provide access to them, there were to be manholes, covered, when not in use, by granite slabs.[90]

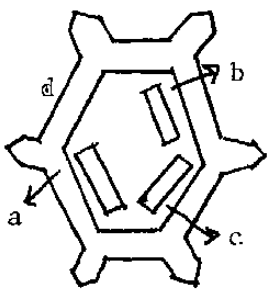
2. Wright Submits Drawings for Sewers, Privy Vaults, Drains, and Outlets

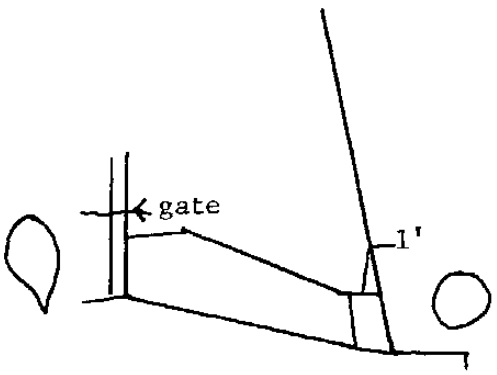
This information sufficed to answer any questions Wright had on this subject until October 21, 1854. On that date he mailed to the Department two drawings. The first was titled, "Sketch Showing Sewers, privy vaults & drains,"

---

89. (continued) Engineer. A copy of the subject sketch titled, "Fort Jefferson, Sketch shewing proposed location and form of the main drains for the work," is on file at Everglades National Park.

90. Totten to Wright, May 6, 1851, NA, RG 77, Ltrs. Sent, Chief Engineer.





and the other "Sections and Elevations of main drains and outlet thro' scarp wall." In a covering letter, Wright, referring to these, asked Chief Engineer Totten for guidance on these problems:

(a) the position, form, and manner of constructing the conduits for leading water from the casemate roofs into the cisterns;

(b) the size, form, and general arrangement of the privy vaults;

(c) the outlets of the main drains and the kind of gate for retaining high water in these drains till ebbtide; and

(d) the manner of carrying off rainwater from the bastion casemate arches.

For conduits, he proposed to use 6-inch cast iron pipe. These pipes were to be continued down to the spring of the cistern arches, where a square elbow was to turn them into the cistern. No provision was planned for filtering the water, nor had a site been indicated for the pumps.

The outlets for the principal drains, Lieutenant Wright continued, and the proposed gates were shown on sheet No. 2. The gate was to be of 3/10-inch copper plate, square at the top and upper one-half of the sides, and rounded on the lower portion. Its diameter to be 1/2-inch greater than the circular arch of the outlet. The gate was to be raised and lowered in a copper groove, and to be opened by hand. As its weight would not exceed 50 pounds, one man could easily handle it. The well could be covered with a flat stone, whose upper surface would be flush with the casemate floor.

Rainwater from the bastions could be either turned into the drains as depicted, or carried into the nearest cistern by continuing the culvert to and through the cistern arch. As drainage would not be very rapid, the small, cheap culvert purposed should suffice.[91]

3. Totten Gives His Comments

After reviewing the drawings and correspondence, General Totten referred Wright to the Fort Taylor plans exhibiting the manner of leading water from the casemate arches into the cisterns. By studying them, he could provide the same system for the Fort Jefferson curtain casemates, which were to lead down a 6-inch cast iron pipe in the middle of the centre pier. This pier was to discharge water vertically into a small recess fitted as a filter. In other areas, i.e., the bastions and oblique adjoining casemates, positions of the pipes would depend on the drainages of the roofs. The Key West drawing had been arranged with the idea that earthenware pipes might in most situations be relied upon, but now this was doubted. As from pipes were "a sure reliance," they were to be substituted. It might be a good idea to swell out the vertical pipe, where it was to take water from the roof slopes.

---

91. Wright to Totten, October 21, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer. Copies of the subject drawings are on file at Everglades National Park.

Water collected from the bastions was to be carried into the nearest cistern through nearly horizontal iron pipes.

Wright, in constructing the piers and centre arches, was to provide for a syphon-like connection from one cistern to the next. These would be voids in the masonry. But, to insure that they functioned in the best manner, there was to be a small air vent in the top of each.

It was vital, Totten continued, that there be inserted through the base of the scarp wall at the bottom of every cistern a "thin composition pipe" of 2-inch diameter. It was to be provided at the outer end with a cap of the same metal. By removing the cap, the cistern could be drained. To prevent leakage on the outside of this pipe, several copper plates were to be brazed to it.[92]

The "form and general arrangement" of the privy vaults, shown on Wright's drawing, were acceptable, except for one point--the outlet into the main drains from the vaults was not large enough. At its narrowest, Totten noted, it must not be less than 9" or 12" by 18". Manholes should not be less than 16 inches in diameter, or 14 by 16 inches if elliptical.

It seemed that three outlets for the principal sewer through the scarp were sufficient. Totten agreed that the "egg shape" was proper.

He approved Wright's proposition for a flushing gate at each outlet to the main sewer, provided that both gate and groove be composition (tin and copper) rather than copper.[93]

In closing, Totten called on his superintending engineer to prepare and forward for comment a drawing of the fort's drainage system.[94]

4. Agreement is Reached on the Details

Lieutenant Wright believed that with the assistance of the Fort Taylor drawings, which could be adapted to conditions at Fort Jefferson, he could "get along very well for some time without troubling" the Department for further details.

Writing General Totten, on December 20, Wright noted that a want of iron pipe to which the cistern pumps were to be attached compelled him "to leave down the end of each alternate pier, till they were received."

He also needed to know if the 110 composition pipes to be led through the scarp, at the level of the cistern floors, were necessary, because they were expensive. Inasmuch as he could determine, their only purpose was for draining the cisterns, and this would only occur in event of leakage or

---

92. Totten to Wright, Nov. 25, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

93. Ibid.

94. Ibid.

cleaning. We, however, enclosed a sketch of the piping for use by the Agency to guide a manufacturer.[95]

The Department was unwilling to dispense with the subject pipes, and Captain Dutton at the Agency was directed to secure them. Their purpose, General Totten reminded, was to dewater the cisterns without pumping, "for as long as the water continued to be alkalized from the salts in the cement."[96]

Meanwhile, Wright had informed the Department that, for the time being, they would construct no more than "mere outlets" for two of the drains and just enough of the third to serve the needs of the officers' quarters.[97]

5. Wright Prepares a Drawing

Early in July 1855, the Department called on Superintending Engineer Wright to provide it with sketches to enable its draftsmen to update the drawings depicting the drains leading water from the bastions and the sewers passing nearby.[98]

Wright accordingly prepared a drawing on which he located the sewers and privy vaults. Only so much of the drains had been built as necessary for existing buildings and to run under the stair piers on front No. 6. The sewer had been carried beyond kitchen No. 3, and the vaults for three sets of privies built. At the other two outlets, not yet built, the sewers were to be carried past the curve on one branch and through the foundation of the stair piers on the other.

Drainage from the bastions was to be carried to the filtering closets of the nearest cisterns on the right and left by 6-inch iron pipes. The lower extremity of the longer branch was to be placed at reference (5') and the other at reference (6'3") giving a descent of 1'3".

The shape and dimensions of the filtering closets were given on the drawing, and corresponded with those at Fort Taylor, except where they had to be adapted to suit circumstances at Fort Jefferson.[99]

---

95. Wright to Totten, December 20, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

96. Totten to Wright, January 17, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

97. Wright to Totten, December 20, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

98. Totten to Wright, July 9, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

99. Wright to Totten, August 15, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject drawing is on file at Everglades National Park and is labelled Drawer 74, Sheet 46.

6. Work Accomplished in the 12 Months Ending September 30, 1855

Three outlets of the main sewer, and enough of each branch had been constructed to clear the masonry of the work, and the branch in rear of the quarters extended past kitchen No. 3. Two composition flushing gates had been hung; five privy vaults (two double and one single) had been built; and brick privies, with slate roofs, constructed over the single vault and one of the double.[100]

I. Coping With a Shortage of Potable Water

1. Vennard Cisterns Cause Problems

Water for drinking soon became a serious problem to the construction people. At first, the 22 wooden Vennard cisterns were more than adequate, but during the summer of 1848 the subtropical sun caused them to leak. This seepage was corrected in part by tightening the hoops, as shrinkage was unequal, being greater in the parts above water level. Thereafter, no difficulty was encountered in keeping the cisterns tight, so long as they were full of water.

When he relayed this information to the Department, Lieutenant Wright noted that these cisterns, which cost about $85 each, would soon require extensive repairs. Moreover, the men had complained that water drawn from these cisterns for drinking and cooking had a woody taste. In view of these problems, he recommended against future use of wooden cisterns at Gulf Frontier fortifications.[101]

2. Plans are Prepared and Approved for Incorporating Cisterns in the Chapel-Offices' Foundations

Some two years later, in May 1850, Superintending Engineer Wright warned the Department that it would soon be necessary to increase the capacity of the cisterns. The wooden cisterns had continued to deteriorate. Many were now empty and being repaired, the bottoms being more or less rotten. In some cases, decay had penetrated nearly two-thirds of the way through the bottoms. It was hoped that a heavy coat of pitch might arrest the rot.

To provide a more secure source of water, Wright called for authority to build a permanent concrete cistern of sufficient capacity to meet all their needs. Such a structure, for which he was enclosing plans, would cost an estimated $1,500, and have a draining surface of 13,162 square feet.[102]

---

100. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

101. Annual Report of Operations at Garden Key for the year ending September 30, 1848, NA, RG 77, Ltrs. Recd., Chief Engineer.

102. Wright to Totten, May 25, 1850, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject drawing titled, "Sketch Showing Plan, Section and position of a Proposed Cistern" is on file at Everglades National Park.

General Totten was cognizant of the arguments advanced for providing, at an early date, a permanent cistern to replace the temporary wooden structures. He, however, questioned the recommended site because, if located there, it would eventually have to be removed. Nor did he like the idea of erecting a building solely for that purpose. The site of the building intended as offices and chapel would be satisfactory for this object, and Totten saw no objection to making a cistern under it. This structure was to be 66 by 53 feet on the exterior, allowing 1'6" for the thickness of the exterior walls and the walls on each side of the passageway running longitudinally, and of the two partition walls laying in the opposite direction. This would permit six offices, each 20 by 19 feet, and a 63-by-9-foot passageway.

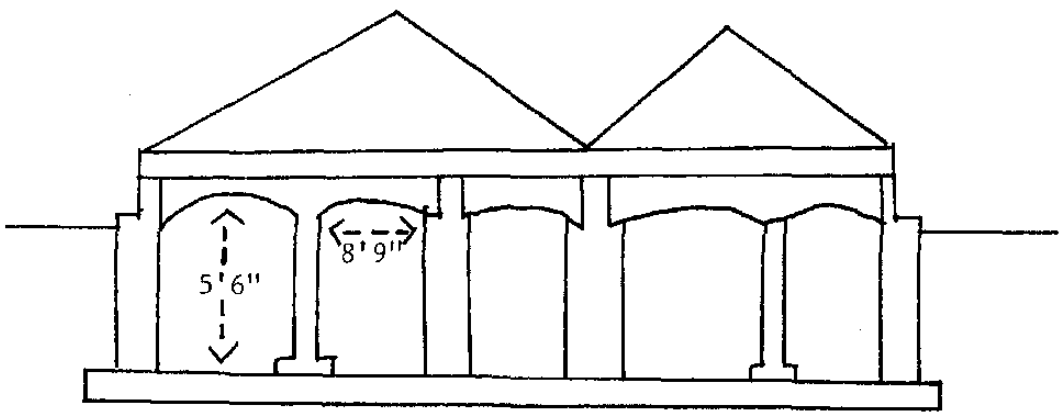
There was to be laid, as a foundation for walls and cisterns, a stratum of concrete 12 inches thick, extending over the interior space, and projecting 1 foot beyond the outside walls. It was to be placed as low as possible "with convenience and certainty." On this mass would be laid the foundation of the exterior superstructure walls and the building's partition walls. If there were any doubt as to stability, these foundation walls were to be faced with "good sound bricks." Two other longitudinal walls, 1-1/2 bricks thick, spreading out at the base, were to be laid under the middle of the rooms. If the walls of the building could be first completed to the roof, the lower strata of concrete was to be laid under the walls above, and not under the cisterns, until all settlement was over.

The lower floor of the building was to be brick pavement resting on brick arches. As these arches would be difficult to build once the cisterns were in use, Lieutenant Wright should have them turned before putting on a light, cheap roof.

All partition walls were to be 2 feet and the arches would terminate against them. These walls would divide the area into 15 cisterns, to have no communication with each other lower than the imposts of the arches. Consequently, a leak in one cistern would not draw water off from those adjoining.[103]

---

103. Totten to Wright, September 12, 1850, NA, RG 77, Ltrs. Sent, Chief Engineer.



3. Wright Introduces Several Changes

Construction began immediately, and by September 30, 1851, workmen had nearly finished the cistern. Yet to be completed were about one-fourth the arching, the backing of the arches, and plastering of several of the compartments.

As the subtropical rains were usually accompanied by strong winds, which blew much of the water off the roofs and out of the gutters, Wright had deemed it best to finish off the arches with slight slopes. These were similar to casemate arches, and were covered by course sand, thus saving all the water which fell on the roofs, except the little absorbed by the sand. The gutters, formed by the arches, could be filled with concrete whenever it became necessary to lay the flooring of the offices.

Nearly the entire cost of the roof would be saved by this mode of covering, because the price of shoveling on sand would be slight, and it would sustain no deterioration from exposure to weather.[104]

4. Reservoir is Completed and Partially Filled

By the time work was secured on May 13, 1852, the cistern was completed and nearly full of water. Concurrently, deterioration of the wooden cisterns had accelerated, and all of them would soon be worthless. Several of them had been broken up by the end of Fiscal Year 1852, while others had been "patched up, with the hope they might be of service a little longer."[105]

5. Construction of Two Concrete Cisterns

Upon Lieutenant Wright's return to Garden Key in August 1853, following a 14-month absence, he saw that few of the Vennard cisterns were serviceable, and those that were leaked badly. It would be necessary to build frame replacements, particularly at the south end of the officers' quarters and at the workmen's barracks and messhall.[106]

By mid-June 1854, the last of the wooden cisterns had been condemned. No steps having been taken to replace the Vennard cisterns, Wright now advised the Department that he proposed to build two large concrete cisterns.

The first of these (40 feet long, 6 feet wide in the clear, and 6 feet deep) was to be positioned outside the fort, between the temporary barracks

---

104. Annual Report of Operations for Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of "Plan & Section of Cistern under Offices & Chapel, Garden Key, Fla.," is on file at Everglades National Park.

105. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1852, NA, RG 77, Ltrs. Recd., Chief Engineer.

106. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1853, NA, RG 77, Ltrs. Recd., Chief Engineer.

and kitchen. It was to be separated by a 2-foot thick cross wall. The second cistern was to be sited at the officers' quarters, its rear wall

> on the line of the back face of the qrs., the south on that of the 2nd partition wall of the 2nd set of qrs., the front on that of the partition between the front & back rooms next to the present building, and the remaining wall 57!" from the present building.

Three of the walls would thus serve as foundations, as far as they go, for the next set of quarters. The cistern bottom was to be 1 foot thick and the walls 2 feet through, except in the lower parts of the rear and south walls, which would correspond in form and dimensions to the quarters foundations.

The cisterns' bottoms were to be positioned at a level at which water was found. This was to place as much as possible of them underground, and secure them against being undermined by rats. The roofs were to be nearly flat and covered with 1-inch boards, their joints battened.[107]

On July 3, the Department approved construction of the two cisterns. Hereinafter, Lieutenant Wright, when proposing projects, was to include estimates.[108]

The subject cisterns were completed by September 30, and increased the aggregate capacity of the four masonry cisterns to 170,000 gallons.[109]

6. Flooring the Casemate Cisterns

During the year ending September 30, 1855, carpenters made considerable progress on the casemate cisterns. A flooring of 3-inch yellow pine plank was laid in "two lengths, with edges carefully joined, and secured to the grillage timbers by 1-1/4 inch treenails." Although great care had been exercised in securing the jointing, most of these floors leaked. They would require "considerable wedging" to make them watertight.

Of the 110 casemate cisterns, 83 had been floored.[110]

---

107. Wright to Totten, June 16, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer. Wright enclosed with his letter a sketch of the proposed officers' quarters cistern. A copy of the subject sketch is on file at Everglades National Park.

108. Totten to Wright, July 3, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

109. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

110. Wright to Totten, October 5, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

J. Building-up and Levelling the Parade

Fill in large quantities was required for forming the parade. All sand removed from the counterscarp cofferdam was hauled to within the line of the parade wall.[111]

Since four of the six fronts were to be founded on the shoal and the other two partly thereon, the parade, during the year ending September 30, 1854, was embanked to reference (3'). The depression, formerly a pond, in the middle of Garden Key was filled to the same level. This height insured that the parade would never be flooded, either by normal flood tides or torrential rains. Although this was lower by 2 feet than the level proposed, Lieutenant Wright believed it was satisfactory in all respects. If the Department agreed, which it did, a large expenditure would be saved.

More fill, however, was needed than removed from the foundation excavations. To supply the deficiency, sand was boated over from Long Key.[112]

---

111. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1851, NA, RG 77, Ltrs. Recd., Chief Engineer.

112. Annual Report of Operations at Fort Jefferson for the year ending September 30, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

VI. MAJOR CHANGES IN THE STRUCTURE ARE MANDATED

A. International Tensions Focus Attention on Coastal Fortifications

The crisis in the Nation's relations with Spain, sparked by the Ostend Manifesto of October 1854, brought the threat of war to the Gulf Frontier. On November 24, General Totten wrote a "confidential letter" to Major Chase, his superintending engineer at Fort Taylor. Chase was informed that "it is . . . possible that the day of trial may be nearer than is now supposed; and reliable intelligence may reach you of the necessity for instant preparation" for war.[1]

The next day Totten called to Lieutenant Wright's attention the "great importance of bringing at the earliest day practicable your fort to a condition of efficiency." To accomplish this, the project must be modified to introduce embrasures into the lower tier of the casemates of the long, as well as short fronts, and also into the flanks of the lower tier of bastions. These modifications would not prevent their use as storerooms, whenever they can be spared for that purpose.

Consequently, Wright must carry up "the scarp all around to about the height of the tops of the cheeks" of the lower tier embrasures. This accomplished, the masons would raise the scarp still higher to the level of the second tier. Because the necessity for constructing pier foundations and turning centre arches was so pressing, Totten believed, they must increase the labor force to insure that the arches were turned by the time the scarp was prepared for its guns. They would not, until more important details were completed, raise the piers above the floors of the lower casemates.

General Totten could not at present provide Wright with embrasure details, because important tests leading to a new type were underway and had not been evaluated.[2]

Lieutenant Wright was at Key West when these letters arrived. Replying, on December 8, he promised to carry out these instructions to the best of his ability, although little could be accomplished in the way of masonry until Abercrombie and Raiford began delivering bricks.[3]

Difficulties with Great Britain caused by covert United States support for William Walker's filibustering activities in Nicaragua, continuation of the Crimean War, and southern expansionists' interests in Cuba, in March 1855, led General Totten to issue a confidential circular. He called upon

---

1. Totten to Chase, November 24, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer. Chase was directed to show this letter to Lieutenant Wright, so he would know of "the wishes and anxieties of the Department."

2. Totten to Wright, November 25, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

3. Wright to Totten, December 8, 1854, NA, RG 77, Ltrs. Recd., Chief Engineer.

the superintending engineers to focus their attention upon the importance of bringing and keeping the forts for which they were responsible in "the best state of efficiency for use and service at any moment." A sneak attack would be no excuse if it found them unprepared.

To the extent of available means, they were to see that, so far as the forts and batteries were concerned, they were in condition for defense. In their operations, this goal was to be kept continuously in view. "Distant ultimate advantages" should not be the object, if their attainment required an "intermediate stage of unpreparedness and want of readiness" for war.

Appropriate funds for Fiscal Year 1856 could be drawn upon at this time, if needed, to meet this challenge.[4]

Lieutenant Wright, at this time, was employing 121 men. Such a force he deemed sufficient to enable him to meet his obligations under the Fiscal Year 1855 program, and to have "a reasonable crew" on hand for the summer's operations under the 1856 appropriation.

Now, in view of the emergency, he proposed to reinforce his workforce to about 200, and keep it at that number until November, when it could be again increased. He, however, questioned whether it would be practicable to maintain so large a crew during the summer, because of the difficulty of inducing workmen from the North to remain in the tropics during the sickly season.[5]

B. Technological Improvements in Weaponry Result in a Revised Armament Schedule

Technological advances made by European naval powers resulting in the introduction and construction of large numbers of steam-powered warships, mounting powerful hard-hitting shellguns, caused the United States military to look toward strengthening the armament of its seacoast fortifications. A board chaired by Secretary of War Jefferson Davis met in March 1855. After reviewing the armament emplaced or to be mounted in the Nation's coastal defenses, the Davis Board extensively revised this schedule.

Under the Davis program Fort Jefferson would mount:

Area	Caliber of Guns	No.	Type of Carriage
Lower Tier, N & S fronts	42-pounder smoothbores	30	Casemate
Lower Tier, four long fronts	42-pounder smoothbores	85	Casemate
Second tier, four long fronts	42-pounder smoothbores	92	Casemate
Second tier, two short fronts	8-inch columbiads	30	Casemate
Second tier, flanks	24-pounder howitzers	36	Casemate

4. Totten to Superintendent Engineers, March 22, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

5. Wright to Totten, April 16, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

Barbette Tier

Tower bastions	10-inch columbiads	6	Barbette
Curtains	10-inch columbiads	6	Barbette
Curtains	8-inch columbiads	110	Barbette

Assigned to the fort would be a siege battery of four 10-inch siege howitzers.

The "exact positions" to be occupied by the barbette tier 8-inch columbiads had not been determined. When they were, Wright would be apprised.

The 42-pounder smoothbores had been included because the columbiads, according to the Ordnance officers, were not adapted to the use of hot shot.[6]

C. Wright Calls for Structural Details Necessary in Implementing Major Changes

By mid-April 1855, construction had reached the stage where Lieutenant Wright needed guidance to implement vital structural changes mandated by General Totten in his November 25, 1854 letter. Stone sills for the first tier embrasures, both flanking and curtain; traverse circles for the same; and cistern manholes must be ordered through the New York Agency. But, before he could act, he must be provided with sketches of these features. Also required were drawings of the sallyport and adjacent guardrooms and the new type of embrasures.

Instructions were likewise needed on these points:

(a) Will there be a gun embrasure in the salient of the lower tier bastions?

(b) Is it indispensable to use traverse irons on the stone circles? It had occurred to Wright that the rapid oxidation of wrought iron in this latitude would have an adverse effect on iron circles.

(c) Shall the stone stairs adjacent to the magazines be laid out according to the plans or modified? He had noticed that those at Fort Taylor differed from the plan provided him.

(d) Is any change planned in the central casemates of the long fronts that will affect the masonry below the cistern arches?

(e) Can concrete be used for flooring in the casemates? If so, it would be more economical than bricks or flagging.

---

6. Totten to Wright, April 9, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

To assist in preparation of drawings and to free his time and energy for more important tasks, Wright urged that he be permitted to hire a draftsman.[7]

D. Department Transmits Several Drawings

General Totten was absent from the city, and his assistant, Lieutenant John D. Kurtz, sought to answer several of the requests. Wright was alerted that a drawing detailing the mode of leaving an opening in the scarp for "inserting" an embrasure would be prepared and mailed. Details of the new Totten iron embrasures, he noted, had not been finalized.[8]

Some ten days later, Kurtz mailed to Wright a plan of the "manner of leaving openings in a scarp for embrasure blocks." The embrasure openings, he observed, were to be large but not more so than required. Neither were they to be as large as the finished embrasures of the most formidable of the Russian defenses at Kronstadt.

Also enclosed was a sketch, prepared for Fort Delaware, of the mode of laying casemate traverse circles, which applied to both guns and columbiads.[9]

E. General Totten Gives Directions

1. About the Embrasures

Upon his return to Washington from a tour of inspection of the Southern forts, General Totten, after reviewing Lieutenant Wright's April 17 letter, answered Wright's questions. Turning to the embrasure problem, he noted that, unless the international situation caused by the Crimean War deteriorated, they should not carry the masonry of the embrasures higher than the top of the tongue-hole lintle, i.e., 2 feet above the level of the casemate floor. If, however, there were sufficient reason to raise the work higher than 2 feet, Wright was to "rack back" the masonry to better tie the embrasure, when built, into the scarp. If the recess arch must be turned, he was to build no more of it than will cover the recess, leaving the embrasure space open to the top of the wall.[10]

There would be no first tier embrasures in the salients of the tower bastions. A truncation designed to afford space for a gun in the second tier of each salient would be made just below the second floor. To accomplish this, the brickwork at the salient must not, for the present, rise higher than within 3 feet of the second floor level.

---

7. Wright to Totten, April 17, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

8. Kurtz to Wright, May 1, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

9. Kurtz to Wright, May 11, 1855, and Totten to Chase, November 25, 1854, NA, RG 77, Ltrs. Sent, Chief Engineer.

10. Totten to Wright, June 1, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

Totten deemed the advantage of iron traverse circles as more than justifying the trouble and expense involved.[11]

2. About Structural Changes to Lower and Second Tier Piers and Arches

Enclosed Lieutenant Wright would find a sketch to guide him in arranging the foundations. Black lines indicated the design as projected. Lower tier walls and piers to be modified were delineated in red. The foundations of "the new portions when they are independent of those of the project" were to have a proportionate spread. The arch (bbbb), like those marked (b'), were to be built with imposts and keys below those of the floor arches of the casemates. The reference of the second tier was to be raised 1 foot (to reference 20) at the expense of the second tier casemates. The imposts and keys of the second tier arches were to be raised 6 inches, an additional thickness of 6 inches being given to the masonry floor.

Cannon firings, recently witnessed by General Totten, had mandated a desire to avoid weak points existing at the junction of the communication groin with the casemate arch in the floor arch. Although there had been no breaking or cracking during the firings, there had been too much elasticity. Totten also thought it wise not to groin into the communication arch, and instead to make both these arches thicker. He had likewise made the centre arch a full brick and one-half at the key and thicker at the spring.[12]

The pier foundations of the magazines in the central casemates of the long fronts were to be prepared in the same mode as for the other piers and cisterns. Lieutenant Wright was to lay on the grillage, the foundations of a 4-foot thick wall, "connecting and according with the 4 foot piers next the parade." He would next position on the grillage, the foundation of another 4-foot wall, the outside of which will be on the plane of the inside of the 4-foot passage pier, and the inside within 4'3" of the nearest face of the main communication passage. The scarp fronting the magazines would be built without a recess.

The "clear length" of the magazine and the principal portion of the cistern below would be 18'6". The walls of the communication passages, separating these two magazines from the gunrooms on either side, were to be 3 feet thick. Several small passages on the level of the floor of the cistern were to convey the cistern water into adjoining cisterns. There being no such passage through the pier between the two magazine cisterns, each magazine cistern was to serve as an enlargement of the adjoining gunroom cistern.[13]

---

11. Ibid.

12. Ibid. A copy of the subject sketch titled, "Plan of Bastion Magazines & Adjoining Casemates--With Sections" is on file at Everglades National Park.

13. Ibid.

3. About the Advantages of Flagging the Casemate Floors

General Totten vetoed Wright's suggestion to substitute concrete for brick or flagging for the casemate floors. He had never known a concrete floor that could resist the hard usage sustained by casemate floors. Bricks had proved to be so defective that very hard flagging, laid carefully on concrete and in mortar, was the only answer. Enclosed Wright would find a sketch of a 15-foot casemate floor. The flagging should be 6 inches thick, and in the lower tier the middle stone, under the larger traverse circle, must be cut out a little on the underside to "lie fairly upon the extrados of the cistern arch without any diminution in the thickness of the latter." Flagging stone, not required to support the traverse circles, could be from 3- to 6-inches thick.[14]

4. About Cistern Manholes, etc.

It was proposed to line the cistern manholes with cast iron, Totten continued. On the cast iron cover would be "laid a suitably shaped flagging stone, to be lifted by a ring."

Provision must be made for introducing pumps into the cisterns and also filtering closets. For details, Wright was referred to the Fort Taylor plans.

Conduit pipes were to lead down the middle of the second and third of the three (4-by 4-foot) square piers, while "another was to go down each of the piers behind the angle of the flanks."[15]

5. About the Sally Port Pit and Guardroom Cisterns

Construction details of the sally port were to accord with the project, except as modified by the rest of the work in its foundations, and in these features:

(a) the pit into which the bridge dropped was to be filled with concrete to reference (1'6");

(b) the stone sill of the outer gateway was to be omitted, along with the stone sill of the gateway inside the pit; and

(c) the jambs of the opening through scarp were not to be carried up.

The cisterns under the adjoining casemates were to be similar to the others, except that a brick transverse partition wall (1-1/2 bricks thick) was to rise up from the grillage and pass through the arch to support the prison walls. One was to be 8 feet and the other 14' 10" from the inner face of the scarp. The scarp was to be loopholed. The partition wall between the "two dark prisons" need not be carried below the floor of the casemate. The cistern next west of the sally port could communicate at the

---

14. Ibid. A copy of the subject sketch, labelled 74-38, is on file at Everglades National Park.

15. Ibid. A copy of a drawing titled, "Details of Manhole," is on file at Everglades National Park.

bottom with the adjoining magazine cistern, and the cistern under the gateway could communicate with the one on the east. Two composition outlet pipes would suffice to discharge these cisterns. There would be a similar pipe through the scarp from the bottom of the pit at reference (1'6").[16]

F. Progress Precludes One of Totten's Changes

After studying Totten's letter and the drawings, Wright informed the Department that it was too late to implement the instructions relating to the communications between the cisterns under the long front curtains and the adjoining ones because all piers had been laid-up to reference (4'). It would serve the desired purpose, he presumed, to leave an opening through the cross walls of the subject cisterns "on a level with the floor." This would permit water in the part next the scarp to flow into the cistern adjoining the parade, to which the pump pipe will connect. Sally port cisterns would be treated in a similar manner.[17]

G. Pintle-Blocks and Tongue-Hole Lintels are Determined Upon and Ordered

Lieutenant Wright found that the sketch of the pintle stones posted by Acting Chief Engineer Kurtz were designed for Fort Taylor, where the scarp headers constituted the lower stone. They must be modified, but he did not know how small they could be cut without hazarding the safety margin. He believed that a granite block, 2 feet square on top and 1 foot deep, would suffice especially as it would be backed by the masonry of the scarp and the casemate floor.

After studying the Key West stone, Wright was satisfied that it was unsatisfactory for embrasure lintels. He accordingly wished to place an order with the New York Agency for granite lintels and 110 lower pintle-blocks for the lower tier.

He, however, hesitated to order stones for the flanking casemates because he could not adapt the general plan forwarded to Fort Jefferson.

To illustrate what was required, Wright enclosed a "Sketch of pintle stones for embrasured guns."[18]

When he reviewed and approved the requisition for the pintle stones and tongue-hole lintels, General Totten called on Captain Dutton at the Agency to ship 20 sets to Garden Key as soon as feasible. They were to be of granite, of the designated dimensions, with the top and one long edge cut rather fine, and at right angles. The bottoms were to be rough cut "parallel with the top

---

16. Ibid.

17. Wright to Totten, June 18, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

18. Wright to Totten, June 18, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject sketch is on file at Everglades National Park.

affording an unwarped bed, and the three remaining edges merely broken straight to full dimensions."[19]

Relaying this information to Wright, Totten advised that a sketch of the flanking howitzer pintle stones (6'6" x 3' x 1') would be transmitted to Captain Dutton. The pintle holes, as great precision was demanded, were to be drilled on-site before the stones were laid.

The embrasures, Wright was informed, were to be made as small as possible, so there would be no margin for error. The diameter of the pintle hole was to be 3 inches, and, to prevent spalling, the hole was to be drilled from opposite sides of the stone, the drills meeting several inches from the bottom of the block. After the stone had been shaped, it was to be laid out, and the embrasure constructed with particular reference to the pintle hole.[20]

H. Department Forwards Plans and Sections of the First and Second Tiers of Five of the Six Bastions

On July 9, 1855, the Department mailed to Captain Wright plan No. 40 of the 1st and 2d tiers of the North, Northeast, Southeast, South, and Southwest Bastions, and plan No. 41 sections of the same bastions. As soon as finalized drawings would be transmitted of the subject bastions' roof surfaces, details of the Northwest Bastion, and sally port.

General Totten, in a covering letter, called Wright's attention to certain details. Sections Nos. 1 and 2 had been prepared on assumption that the base of the curtain scarp had been constructed for a superstructure 6 feet thick in the recesses, which was the design when all lower casemates of the long curtains were to be storerooms and magazines. If Wright had built these casemates with gun recesses, he was to enter the change on the plans.

In preparing the flanks of the 1st tier bastions for howitzers, the Department had shown the scarp fronting the recesses as 5 feet and had given the recesses an oblique form. If Wright had built the base of these flanks with recesses, as shown in his sketch of October 21, 1854, he was to erect from reference (O) "additional portions" to sustain the sides of the recesses. He was to detail the best mode of executing this, so the Department could complete its plans in that particular.[21]

I. Wright Submits an Important Drawing

Captain Wright accordingly prepared and submitted the desired drawing. As the Department could see, he explained, the cisterns and casemates on the curtains of all fronts, both long and short, had been laid-up in the same manner

---

19. Totten to Dutton, July 9, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

20. Totten to Wright, July 9, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

21. Totten to Wright, July 9, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer. Copies of drawings "No. 40, Fort Jefferson, Plans of 1st & 2d Tiers of N, NE, S, & SW Bastions" and "No. 41, Fort Jefferson, Sections of N, NE, SE, S, & SE Bastions" are on file at Everglades National Park.

and with identical dimensions. The part of the cistern projecting into the scarp wall was 10 feet wide with vertical rather than sloping sides. This particular manner of carrying up the recess had been adopted because it simplified laying the cistern floors and gave greater stiffness to the covering arch.

The magazines at the center of the four long fronts had been carried up as detailed in his drawing.

He did not "appreciate" the dimensions of the scarp ventilators because he feared they were too wide to afford "perfect security" against shells. He feared an 8-inch shell striking against the 3-inch opening might penetrate far enough through the oblique side to communicate the blast of its explosion into the magazine. To nullify this danger, he suggested a 3-inch opening with vertical sides.

Wright was also concerned about carrying the filtering closets up into these piers.

The two bastions, as General Totten would observe, commenced before receipt of the Department's letter of November 25, 1854, had been so modified as to correspond in all essential details except the parts about the salient recess, where no grillage was laid, and no spread given the foundation.[22]

J. Department Transmits Drawings of the Roof Surfaces of Five of the Six Bastions and Plans and Sections of the NW Bastion

Then, on August 6, the Department mailed to Wright drawings Nos. 42 and 43. The former detailed roof surfaces of the "N, NE, SE, S, and SW Bastions, and adjoining Casemates," and the latter "Plans and Sections of the NW Bastion containing the Bakery." Calling attention to the second drawing, General Totten presumed that the foundations of the piers and flanks, so far as they agreed with the other bastions, had been commenced at the same reference and carried up in a similar manner. If so, the remarks found in his July 9 letter were applicable. It was also assumed that the interior line of the foundation of the faces of the northwest bastion (bastion F), as commenced, corresponded with the line d, e, and f found on the plan of the first tier, in which case additions to the foundations would be necessary near the interior angles of the shoulders.

Wright was to make such additions to the foundations as would allow the superstructure of this area of the bastion to accord with the enclosed plan.[23]

The bakery ovens were to be built independent of the fort's walls. The 2'3" walls in front of both ovens and at one side of the larger oven were to be commenced at a convenient depth below the floor and carried up at the same thickness to reference (9'9"). Between these walls, the scarp and piers of

---

22. Wright to Totten, August 15, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of Wright's drawing, identified by the notation, "Engr. Department, Aug. 27th 1855 Received with Capt. Wright's letter, dated Aug. 1855," and labelled Drawer 75, Sheet 46, is on file at Everglades National Park.

23. Totten to Wright, August 6, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer. Copies of the subject drawings are on file at Everglades National Park.

the bastion, and the walls of the furnace and flues, earth was to be thrown in, rammed, and levelled off at reference (7'6"). From this level, a brick wall (without mortar) 18 inches thick, to support in part the side walls of the oven's was to be built. It was to rise to a height of 9'9", and conform to the shape of the side walls of the oven. The remaining space was to be filled to the same reference with large pieces of coral, laid without mortar.

Upon this foundation would be positioned a layer of fine coral or shells, and upon it a bed of clay in which the fire bricks of the hearth were to be laid. The hearth was to have a plane surface, descending to the oven's mouth. Inner surfaces of the furnaces, flues, and ovens were to be fire brick.

The oven arches were to be laid on centres or forms of well rammed earth, and were to be 1/2-brick thick. Over these arches would be turned a concentric arch, 1-brick thick, of common bricks. This was to be separated by 1-inch from the arch below, by placing under each brick of the second arch a cubical piece of wood. Occasionally, there was to arise from the lower arch a header, the upper end of which would be embedded in the bond of the upper arch. The space between the two arches was to remain a void, except for the pieces of wood which would be gradually reduced to charcoal.

Oven fire bricks were to be laid in a clay and sand mortar. Ironwork about the oven mouths was to be embedded in a similar mortar. The vertical 1/2-brick walls at the oven mouths were to be fire bricks in clay mortar.

The recess introduced into the scarp wall to receive the rear of the larger oven was to be laid off and begin at reference 9'9".[24]

K. Department Provides Drawings and Instructions for Building the Gateway

It was September 22, 1855, before the Department transmitted drawing No. 44, "Plans, Sections, & Elevations of Gateway and Adjoining Casemates," and No. 45, "Details of Drawbridge." Wright, having called for these documents in mid-June, was anxiously awaiting their receipt.[25]

General Totten, in a covering letter, noted that the cistern under the sally port had been dispensed with, and that space was to be packed with earth. Also eliminated were the embrasure in the casemate over the sally port, and its scarp recess.

The pier filtering closets, overflow pipes, manholes, and recesses in the scarp wall of the cisterns had been altered to conform to the work as built. The pumps at the ends of the piers were not depicted in the drawings because it was not known to which pier they were attached. Wright was to add this detail to the plans.

---

24. Ibid.

25. Wright to Totten, June 18, 1855, and Totten to Wright, September 22, 1855, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Copies of the subject drawings are on file at Everglades National Park.

The arrangement of magazine doors and windows, the arching of the corridor in front, and the roof arches of the gun casemates above differed from the project as approved. The ventilators through the scarp had been modified.

It was assumed in Washington that granite, cut with "some finess," would be introduced as a facing to the exterior and interior entrance of the gateway passage, and that portions of the piers, etc., immediately connected with the drawbridge. In Totten's opinion, the jambs of the narrow passages at the several gates could hardly be safe without it, and the solid embedding of the machinery required it. A simple flat tablet could be substituted for the exterior pediment, if "fine cut" granite were deemed too expensive. The drawbridge gudgeon had to be sustained by granite blocks large enough to be thoroughly bedded in the walls. All things considered, Totten was satisfied that the granite facings depicted could be introduced without running into an unjustified expenditure.

Composition hooks or sockets must be employed to sustain the gate hinges.[26]

Although it would be some time before the "suspended portion" of the bridge was needed, Totten provided advise on its construction. It was to be of yellow pine plank, 6 inches broad and 3 inches thick, and of "full length of the bridge. They were to be well seasoned by being piled under cover in free access of air." They were to be "laid flat on edge on a perfectly flat floor, so that the upper and lower surfaces may be true planes, the sides of all should be smeared with pure asphaltic tar, and then drawn together as tight as possible," through use of bolts and nuts. The 6 by 3s, including the outside pieces (6 by 6s), after being connected, were to be covered with well seasoned 1-1/2-inch oak planks, likewise coated with a thin sheet of asphaltic tar. Care would be exercised to see that the tar filled the thin joints between the oak planks.

The gudgeon sockets were to be precision positioned, as the bridge's ease of motion depended on this, and the adjustment of the gudgeons in their appropriate beds.

In ordinary situations, the frame that supported the inner end of the drawbridge would be in the position depicted on drawing No. 45, the chains drawn tight, and the latches engaged in the ratchets. When the bridge was to be maneuvered, a soldier would climb through the trap door, and throw the frame back from under the bridge into the recess, under the gate sill. The bridge on that end would then be dependent on the chains.[27]

Totten was not infallible. Some two weeks later, upon reviewing drawing No. 45, he found an error in the position and dimensions of the catch designed to retain the latch, when the draw was elevated. A sketch, showing the necessary corrections, was prepared and forwarded to Garden Key.[28]

---

26. Ibid.

27. Ibid.

28. Totten to Wright, October 5, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

L. Wright Provides Data on Pump Pipes, Manholes, etc.

On October 17, 1855, Wright mailed to Washington a drawing to enable the Department to update its files. Shown and identified were the cistern pump pipes. On front No. 1, the first square pier and each alternate pier had two pipes and the last square pier, one. On fronts Nos. 2 and 3, the pipes were positioned in a similar manner; while on fronts Nos. 4-6, the first square pier had but one, the second, two, and each alternate pier also two.

In addition, the cistern manholes differed slightly. The divisions of the guard and prison rooms should be reversed.[29]

29. Wright to Totten, October 17, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject drawing, labelled Drawer 74, Sheet 49, is on file at Everglades National Park.

VII. THE WOODBURY YEARS: 1856-60

A. Woodbury as a Manager

1. Woodbury Becomes Superintending Engineer

In mid-December 1855, Chief Engineer Totten, having decided that Captain Woodbury would replace Captain Wright as superintending engineer at Garden Key, notified the former that, as soon as relieved by Captain George W. Cullum, he was to take leave of his present Wilmington, North Carolina, duty station and proceed to the Dry Tortugas.[1]

Captain Cullum would continue to be responsible for the Charleston fortifications. While wearing two hats, he was to see that work on the North Carolina projects was pushed, pending the arrival in Wilmington from California of Lieutenant William H.C. Whiting, Woodbury's designated successor.[2]

But, on Christmas Eve, the Department revised its personnel assignments. Captain Woodbury was to travel to the Florida Reef by way of Charleston, where he would be joined by Lieutenant W.P. Craighill. After relieving Captain Wright, Woodbury was to leave Craighill at Fort Jefferson and return to Wilmington. Then, on Lieutenant Whiting's arrival from the West, Woodbury would hasten to Fort Jefferson, and send Craighill back to Charleston. This arrangement negated the necessity of calling Captain Cullum to Wilmington.[3]

The new Fort Jefferson superintending engineer had been born in New London, New Hampshire, on December 16, 1816, and had graduated from the U.S. Military Academy as No. 5 in the Class of 1836. Commissioned a 2d lieutenant, he was assigned to the 3d U.S. Artillery. His first assignment was assistant engineer for construction of the National Road in Ohio. Woodbury was transferred to the Corps of Engineers on July 1, 1837, and was promoted 1st lieutenant in July 1838. He continued on his National Road assignment until 1840, when he was ordered to Boston Harbor to be assistant engineer for building Fort Warren. Woodbury was assistant engineer in 1842 overseeing repair of the defenses of Portsmouth Harbor, and from 1842-44 he was on duty in Washington as assistant to Chief Engineer Totten.

In 1844 Lieutenant Woodbury was ordered to the North Carolina coast as superintending engineer for repair of Forts Macon and Caswell. He spent three

---

1. Totten to Woodbury, December 17, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

2. Totten to Cullum, December 17, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer.

3. Totten to Woodbury, Craighill, and Cullum, December 24, 1855, NA, RG 77, Ltrs. Sent, Chief Engineer. Craighill was Cullum's assistant at Charleston.

years (1847-50) in the trans-Mississippi as superintending engineer for construction of Forts Kearny and Laramie and for protection of the Oregon Trail. In 1851 he returned to the North Carolina coast as superintending engineer for repair of Forts Macon and Caswell and for improvement of navigation on the Cape Fear River. Woodbury was promoted captain on March 3, 1853.[4]

Woodbury was recognized as the Corps' authority on "sustaining wall and arch construction," which was a factor in dictating his assignment to Fort Jefferson as this stage of its construction. The urbane Woodbury little appreciated the honor. A "gregarious individual who set a premium upon culture and education," possessing a love of "sparking company and the effervescence of society," he had little "stomach for the drab isolation of Tortugas."[5]

Acknowledging receipt of the Department's orders, Woodbury reported that he planned to sail from Wilmington for Key West aboard the first southbound packet.[6] Wright beside himself with anticipation and hoped to complete the necessary transfers in time to be at Key West to take passage North on the January 25 mail packet.[7]

This schedule was adhered to. Captain Woodbury and Lieutenant Craighill reached Fort Jefferson on January 8. By the 25th they had effected the prerequisite paperwork. Craighill remained on Garden Key, and Wright and Woodbury sailed aboard the Charleston packet.

Captain Woodbury remained at Wilmington until mid-March. Upon Lieutenant Whiting's arrival from the Pacific coast, Woodbury turned over to him responsibility for the North Carolina projects and sailed from Charleston for Key West on the 19th.[8]

Landing at Garden Key on the 22d, Woodbury relieved Lieutenant Craighill. The latter officer would not be returning to Charleston. Instead, he proceeded to Washington for duty as an assistant in the Chief Engineer's office.[9]

2. Woodbury Vainly Seeks to Transfer from Fort Jefferson to Fort Taylor

Lieutenant Craighill was glad that his Tortugas tour of duty had been brief.

---

4. Cullum, Biographical Register, Vol. I, pp. 496-97; Warner, Generals In Blue, pp. 570-71.

5. Manucy, "Construction History of Fort Jefferson," p. 40.

6. Woodbury to Totten, December 29, 1855, NA, RG 77, Ltrs. Recd., Chief Engineer.

7. Wright to Totten, January 8, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

8. Totten to Woodbury and Whiting, March 1, 1856; Woodbury to Totten, March 16, 1856, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Whiting had reached Washington on March 1.

9. Totten to Craighill, March 5, 1856, NA, RG 77, Ltrs Sent, Chief Engineer.

Several months after reaching Washington, he condoled Woodbury:

> I hope that you are better satisfied at Fort Jefferson than I was, for if not, you must be having a miserable time of it. I offer you very sincere sympathy.[10]

Yellow fever claimed several lives at Key West in August 1856. Among the victims was Major Fraser, who had replaced Major Chase as superintending engineer at Fort Taylor on February 15, 1856.

Notifying the Department of Fraser's death, Captain Woodbury requested that he be reassigned to Fort Taylor, and the officer who would otherwise replace the deceased be ordered to Garden Key.[11]

Dan Woodbury evidently believed that life would be less monotonous at Key West, a growing community of some 3,000 people. The Department, however, determined to continue to employ his talents on Fort Jefferson. His application was rebuffed, and Brevet Major John Sanders drew the Fort Taylor assignment.[12]

Then, early in October, following receipt of the specie which enabled Woodbury to pay the workmen and slaveowners, he secured a four-week furlough and hastened to Wilmington. On his return to Key West, he was accompanied by his family.[13]

About this time, Woodbury was notified that his responsibilities had been increased. He was to take charge of a Lighthouse Board project and supervise construction of a 150-foot lighthouse tower to be built on Loggerhead Key.

To enable him to meet this added workload, he inquired into the possibility of being provided an assistant engineer. Because of heavy nationwide commitments, this would be impossible, the Department replied.[14]

Denied the services of a junior member of the Corps, Woodbury next called for and received authority to employ a draftsman and assistant at wages of $4 per day.[15]

---

10. Craighill to Woodbury, July 30, 1856, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

11. Woodbury to Totten, August 9, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

12. Wright to Woodbury, October 1, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

13. Woodbury to Totten, September 23, 1856, and Totten to Woodbury, October 16, 1856, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

14. Totten to Woodbury, October 27 and December 2, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

15. Woodbury to Totten, April 8 and Totten to Woodbury, April 16, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

On May 23, 1857, Captain Woodbury received a copy of orders, dated some two weeks before, relieveing Major Sanders as superintending engineer at Fort Taylor and designating Woodbury as his temporary replacement. These increased duties, Woodbury complained, underscored the need for an assistant engineer. He trusted that the Department could detail a 2d lieutenant from the West Point Class of 1857 no later than July 10.

It was unlikely, General Totten replied, that the Department would be in position to detail an assistant engineer before autumn. Until then, Woodbury would be compelled to make the best arrangements possible for prosecution of operations during his occasional absences.[16]

In view of the decision making him also responsible for Fort Taylor, Woodbury decided that J.C. Clapp, the draftsman at the Key West fort, could also handle the newly authorized Garden Key position. But, if this were done, Clapp's salary should be boosted.

The Department was agreeable and sanctioned an increase in the pay Clapp received for his services at Fort Taylor by $1 per day, including Sundays. This was to be restricted to the period that Woodbury remained in charge of both works.[17]

Some two months later, on August 8, Woodbury returned to a subject he had broached at the time of Major Fraser's death. He suggested to General Totten that, if the officer sent to the Florida Reef as Sanders' replacement were his junior, he (Woodbury) be given his choice of the two forts. If given this opportunity, he would opt for Fort Taylor. This, he believed, was his right by precedent.[18]

Fort Jefferson, Chief Engineer Totten countered, was a much larger work than Fort Taylor, and much less advanced. It was a project demanding as high degree as any of an officer's administrative talent and engineering experience. It was in respect to importance and difficulty that the rank of the superintendent was considered, and such must be kept subordinate to the demands of the service, he reminded Woodbury.

Totten's philosophy was that no engineer officer should be ordered from a project unless his service elsewhere was indispensable. This was demanded by the public interest, although this principle had been shunted aside on several occasions over his protests.

Woodbury had been placed in charge of Fort Taylor, in addition to his

---

16. Woodbury to Totten, May 23 and Totten to Woodbury, May 30, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

17. Woodbury to Totten, June 9 and Totten to Woodbury, June 16, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

18. Woodbury to Totten, August 8, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

Fort Jefferson and Loggerhead Key responsibilities, without Totten's knowledge and consent. If he had had the opportunity he would have opposed it because Woodbury's attention was already engrossed by Fort Jefferson. He had seen no reason for releasing Major Sanders from that responsibility and putting it on Woodbury's shoulders.

There was nothing at Fort Taylor now, Totten continued, that places it in comparison with Fort Jefferson, "as a work of importance demanding high administrative competance and constant personal supervision." He could not agree to Woodbury's request for reassignment to Key West, and replacing him at Garden Key with an officer necessarily inferior in all such qualifications.[19]

Consequently, Lieutenant Edward S. Hunt was ordered from Fort Adams, Rhode Island, to Key West. He reached the Florida Reef on December 10, 1857, and relieved Dan Woodbury of his Fort Taylor responsibilities.

3. Woodbury's Final Three Years on the Project

Once again, Woodbury, during the late autumn of 1857, called on the Department to detail him an assistant from the Corps of Engineers. To add to an air of urgency, his draftsman, hired only several months before, was in miserable health and on the verge of resigning.

If an assistant engineer were assigned to the project, Woodbury desired to be given a four-month leave of absence to begin in July or August 1858.[20]

No reply was forthcoming to this letter, probably because General Totten had secured a lengthy leave of absence to travel. During his absence, Colonel Thayer served as Acting Chief Engineer.

In February 1858, General Totten stopped off in the Tortugas and inspected the fort. Writing Lieutenant Hunt of the visit, Woodbury confided, "Tell Mrs. Totten that she brot the Genl & her aides down here only to make us all feel badly at their early departure."

Soon after Totten's departure, Woodbury adopted a different tact in his campaign to secure an assistant. Writing Colonel Thayer, he noted by mid-April the $300,000 appropriated by Congress on March 3, 1857, will be nearly expended. As soon as practicable after that date, he hoped to be ordered to Washington for duty in the Chief Engineer's Office.

Following his departure, there would be retained on the payroll: 1 physician-clerk, 1 overseer, 1 assistant clerk, 1 receiver and issuer of materials, 2 suboverseers, 1 foreman of masons, 8 masons, 8 white laborers, 56 slave-laborers, 1 carpenter, and 1 blacksmith. During the summers, he

---

19. Totten to Woodbury, August 26, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

20. Woodbury to Totten, December 8, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

explained, the laborers were usually employed gathering coral and preparing for the next construction season. He therefore deemed it to be good policy to contin operations until they learned the fate of the "Fortifications Bill" for Fiscal Year 1859.

The Tortugas, he reminded Colonel Thayer, were only one degree north of the Tropic of Cancer, and he had already spent two summers there. Like most "northern men under the same circumstances," his health had failed, and he needed a summer's tour of duty in northern latitudes.[21]

He again urged the Department to send a young lieutenant to Fort Jefferson, because no officer in the Corps could be more in need of an assistant. While he did not dislike the Florida Reef, he needed "a change of scene more than I can explain." If no officer could be sent, he might leave the project in charge of Dr. Whitehurst, a man in whom he had great confidence.[22]

Taking cognizance of the limited funds remaining in the Fort Jefferson account, which would soon necessitate a reduction in force to the proposed summer standard, the Department looked with favor on Woodbury's request for a four-month furlough. As operations could be undertaken on a limited scale without presence of an officer, Woodbury, after taking necessary precautions and perfecting arrangements for prosecution of the work during his absence, could proceed to Washington.

Because of limited personnel, it would be impossible to assign another officer to the Dry Tortugas. Consequently, it was understood that Woodbury was to retain management of the project during his absence.[23]

His furlough approved, Captain Woodbury placed Dr. Whitehurst in charge and sailed on May 10 from Key West for Charleston. After spending several days in Wilmington, visiting friends and relatives, he traveled to Washington. Arriving at the War Department, he was told to remain there several days, with a view to performance of special duties. On June 8 he was ordered to New York City to contract for publication of his monograph on "The Arch," to be one in the series of Papers on Practical Engineering by the U.S. Corps of Engineers.[24]

---

21. Woodbury to Thayer, February 18 and 23, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer; Woodbury to Hunt, February 19, 1858, FRC, East Point, GA., Ltrs. Sent, Fort Jefferson.

22. Woodbury to Wright, February 23, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

23. Thayer to Woodbury, March 27, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

24. Woodbury to Thayer, April 23, 1858 and Thayer to Woodbury, June 3 and 8, 1858, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Woodbury was in such a hurry to leave that he forgot to leave instructions for Dr. Whitehurst.

While in Washington, Woodbury wrote Lieutenant Hunt, who with work closed down at Fort Taylor had been ordered to Boston, that a special fortification bill had been pigeonholed in the House, but that money for the Florida Reef forts probably would be made available through some other source. The waters of Washington politics, he confided to Hunt, were no longer complicated by the Anglo-American controversy over Central America. With sly humor, he professed a "half fear" that he would be rushed back to defend Fort Jefferson from the British much in the way President Polk had wanted to hurry Lieutenant General Winfield Scott to Mexico in advance of his army to fight the Mexicans.[25]

Before returning to the Florida Reef in November, Woodbury was informed that plans were afoot to assign one of the Corps' lieutenants to duty as his assistant.[26]

There were no follow-ups, and no 2d lieutenant received orders billeting him to the Tortugas.

On January 11, 1859, less than two months after resuming active supervision of operations at Fort Jefferson, Woodbury applied to the Department for and received authority to take seven days leave to enable him to visit La Habana.[27]

Accompanied by his wife and three children, Woodbury boarded the schooner Tortugas and spent the second week of March in the Cuban city. While there, he reconnoitered La Cabana and the Morro Castle, and submitted a report, supplemented by plans and a map, to the Department describing their strengths and weaknesses on his return to Fort Jefferson.[28]

The Department acknowledged his report with thanks.[29]

Some 13 months later, on April 13, 1860, Acting Chief Engineer René De Russy called Woodbury to Washington to serve on a Board for modifying the plans for the fort at Sandy Hook. Before leaving Garden Key, he was to make necessary arrangements for preservation of the project and security of the public property during his absence.[30]

---

25. Woodbury to Hunt, May 29, 1858, FRC, East Point, Fort Jefferson Letter Book, 1858-64.

26. Woodbury to Thayer, September 29, 1858 and Thayer to Woodbury, October 2, 1858, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

27. Woodbury to De Russy, January 11 and De Russy to Woodbury, January 27, 1859, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Lieutenant Colonel René De Russy had relieved Colonel Thayer as Acting Chief Engineer.

28. Woodbury to De Russy, March 16, 1859, NA, RG 77, Ltrs. Recd., Chief Engineer.

29. Craighill to Woodbury, March 31, 1859, NA, RG 77, Ltrs. Sent, Chief Engineer.

30. De Russy to Woodbury, April 13, 1860, NA, RG 77, Ltrs. Sent, Chief Engineer.

Acknowledging receipt of his orders, Woodbury announced that he would travel as far as Wilmington in Tortugas, where he wished to spend two weeks before continuing on to Washington.[31]

Woodbury, leaving faithful overseer George Phillips in charge, sailed from Key West with his family on April 27. Although a fearful storm was encountered, they reached Wilmington in six days. Tortugas would return, as soon as new sails could be made to replace those shredded in a gale encountered on the passage up from the Florida Reef.[32]

After spending two weeks with friends and relatives, Woodbury caught a train from Wilmington to the Nation's capital.

B. Planning, Funding, and Programming

1. Department Seeks Data to Enable it to Establish Long-Range Priorities

To provide the Department with back-up data to be used by the Secretary of War in justifying requests by Congress to fund construction and completion of the Nation's Third Coastal Defense System, the Chief Engineer on February 28, 1856, called on his superintending engineers for the following information:

(a) The gross sum required to bring the defense "to a state of complete efficiency of its batteries in the shortest time; and how much time will this require after you are advised of such an appropriation?" This situation presumed the employment of as many workmen as could be efficiently employed, not to include round-the-clock gangs.

(b) How much time and money, in addition to the foregoing, were needed to complete the defense "in what relates to security (against attack, etc.), accommodation and preservation?"

(c) In case of annual grants, how much could they spend yearly, without materially increasing the prices of materials or labor, by pushing the work at a rate "at which early efficiency will be the controlling" factor, and a minimum cost secondary to it? In answering this question, they were to indicate how long it would take to complete the fort, and the number of guns that would be ready at the close of each construction season.

(d) They were to indicate the annual appropriation necessary to combine the greatest economy with the "requisite strength and durability of workmanship and what will be the results of each season's work (in number of guns, etc.), and the time and cost."[33]

---

31. Woodbury to De Russy, April 23, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

32. Woodbury to Wright, May 10, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

33. Circular Letter, February 28, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

Captain Woodbury, understanding that question (a) applied to the 1st tier, premised his answer on assumption that its efficiency required completion of the casemate arches. The cost of accomplishing this would be $200,000, and involve one year's work.

It would mandate, he noted, another $550,000 and two additional years to meet the conditions called for in question (b).

In reference to "annual grants," the desired sum was $250,000 per fiscal year, and the time 36 months. Such a program would add one-third of the total armament each year.

Replying to the fourth inquiry, Woodbury suggested that an annual appropriation of $200,000 was the answer. This sum would be disbursed over 3-1/2 years, and result in increasing the armament by one-fourth the total allowed every 12 months.[34]

2. Fiscal Year 1857 Program

a. Carrying on in Anticipation of an Appropriation

Eighteen hundred and fifty-six was a presidential election year, and Congress found its time and energy engrossed by the slavery and other sectional issues. As the weeks passed and the national legislative body failed to enact the annual "Fortifications Bill," funds became increasingly tight. In late April, the owners of slaves employed on the project, fearing that Captain Woodbury would soon be compelled to close it down, met with him. They announced that they were agreeable[35] to employment of their blacks without pay, subject to the next appropriation.

Upon transmitting this proposal to the Department, Woodbury urged its acceptance. He also requested authority to retain 12 to 15 selected whites on the payroll. They, like the blacks, were to be paid under the new appropriation.

While he would be operating without funds, he would not be doing so without means because, as of March 31, there were on hand materials valued at more than $35,000. Since then, 368,000 bricks valued at $6,000 had been landed.

Should no appropriation be made by the 1st Session of the 34th Congress, enough of these materials could be sold to meet all outstanding debts.[36]

The Department sympathized with Woodbury, and agreed that, because of the delay and great expense in recruiting a new force, it was to the interest of the United States to accept the slaveholders' proposition.[37]

---

34. Woodbury to Totten, March 3, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

35. Slave owners to Woodbury, April 25, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

36. Woodbury to Totten, May 1, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

37. Wright to Davis, May 17, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

Secretary of War Davis accordingly went along with the scheme, on the understanding that no obligations would be incurred that could not be met, should the "Fortifications Bill" fail to pass the 1st Session of the 34th Congress.[38]

b. Congress Votes $150,000 for Fort Jefferson

The situation Secretary Davis had cautioned about did not come to pass. On August 18 President Pierce signed into law the "Fortifications Bill" passed by Congress appropriating $150,000 for construction at Fort Jefferson in Fiscal Year 1857. Captain Wright, upon advising Woodbury of this, called on him to prepare a program for expenditure of this money. In accordance with procedures, Woodbury was to reserve sufficient monies to provide for security of the public property in Fiscal Year 1858, if Congress failed to fund operations during that period.[39]

3. Wrestling with a Program

Because of the communications lag, Woodbury, as late as September 6, did not know of this action. But on supposition that Congress had acted favorably, he had called on Captain Dutton at the New York Agency to contract for 111 sets of embrasure irons. The balance of any appropriation would be employed to: (a) raise the scarp wall to the level of the upper casemate floors reference (20'); (b) complete the lower casemate piers; and (c) finish the powder magazines at the middle of the long fronts.

A little additional work, he forecast, would make the magazines bombproof.[40]

Upon being notified of Congress' action, Woodbury sought to hedge on one project. Since he had not been apprised of the cost of the embrasure irons, he recommended that no more than 90 sets be ordered.

Among lesser projects, he proposed to implement during Fiscal Year 1857, was paving the cisterns with one layer of bricks laid "in flat concrete mortar." Several months before, he explained, 14 cisterns, a number of them under the powder magazines, had been caulked and paved with bricks laid flat in cement and sand, and since then there had been no seepage into them.[41]

General Totten questioned whether casemate cisterns could be made "permanently tight by paving the floors." In any event it would be improper to adopt this mode until other means had been tested.

---

38. Davis to Totten, May 23, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

39. Wright to Woodbury, August 20, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

40. Woodbury to Totten, September 6, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

41. Woodbury to Totten, September 18 and October 21, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

Their first step should be to ascertain whether the floors could be made watertight by wedging. If this failed, Woodbury was to floor several of the cisterns having the worst leaks with 1-1/2-inch white pine boards, closely jointed, laid in the same direction as the present flooring.

Totten reminded Woodbury that no portion of the second tier casemate piers or arches could be constructed at the expense of the scarp wall till the latter had been carried up to the level of the second floor. The flagging in the lower tier casemates was to be laid upon completion of the embrasures.

Except for these remarks, Woodbury's program was approved.[42]

Woodbury accordingly revised his program to coincide with the Department's guidelines. He would spend during the nine remaining months of Fiscal Year 1857, the $141,000 available: (a) putting up 90 sets of embrasure irons in the lower tier curtain casemates; (b) building up the adjacent parts of the scarp; (c) raising the bastion scarps to reference (9.50'); (d) laying-up the bastion piers and foundations of stairway towers to reference (7'); (e) building the powder magazines at the centers of the long fronts; and (f) "carrying up the scarp of the several curtains toward the level of the upper casemate floors."[43]

4. Fiscal Year 1858 Program

On March 3, 1857, President Pierce signed into law the "Fortifications Bill" enacted by the 3d Session of the 34th Congress, appropriating $300,000 for construction of Fort Jefferson in Fiscal Year 1858. In accordance with procedures, Captain Woodbury, after reserving sufficient money to provide for security of the property in the 12 months ending June 30, 1859, was to submit a program for expenditure of this sum.[44]

Woodbury proposed to use these monies to "continue the work up to the reference (20') the floor of the upper tier of casemates and, with trifling exceptions, to complete the work below that level." So far as practicable his construction priorities would be: the scarp, piers and stair towers, and communication and casemate arches.

He would pave the gunrooms of the curtains from the scarp as far back as the inner jambs of the communication arches, i.e., 14'3", with 3-1/2-inch flagging. Concrete to a depth of 6 inches would be used for the bastion floors.

There would be left open for the present, one "embrasure space" in each long front as a roadway for receipt of materials.[45]

---

42. Totten to Woodbury, October 16, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

43. Woodbury to Totten, October 23, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

44. Totten to Woodbury, March 10, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

45. Woodbury to Totten, March 26, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

Chief Engineer Totten, upon reviewing the program, took several exceptions. He held that the entire casemate floor should be flagged.

In laying flagging, care must be taken to solidly support every part, otherwise it would be fractured by falling objects. Every stone, after being laid and levelled, was to be lifted by one edge, so as to reveal all areas not in contact with mortar, and then relaid. Each stone was to be settled in position by several blows from a wooden rammer.

Totten could not approve use of concrete 6 inches deep for the bastion floors. It was "well known" that concrete did not make a durable floor where exposed to hard usage or even frequent passage of troops. The bastion floors were to be flagged.

Subject to these comments, Totten approved the program.[46]

5. Fiscal Year 1859 Program

To fund construction in Fiscal Year 1859, Woodbury recommended a $350,000 appropriation. This sum would be applied to prosecution of construction of the 2d tier casemates, piers, embrasures, arches, etc., and any monies remaining were to be applied to erection of several of the proposed permanent buildings.[47]

Congress, however, halfed his request.

On June 14, 1858, President Buchanan signed into law the "Fortifications Bill" enacted by the 1st Session of the 35th Congress, which included $150,000 for Fort Jefferson. In accordance with procedures, the Department called on Captain Woodbury to formulate a program for expenditure of this sum. Sufficient funds were to be reserved to provide for security of the public property in the year ending June 30, 1860.[48]

Woodbury, upon submitting his program, advised the Department that, with slight exceptions, the scarp stood at 19.50 feet above low water and 6 inches beneath the elevation of the floor of the upper casemate gunrooms. Employing the new appropriation, he proposed to "continue the scarp and piers, already begun, above that level, and to turn the arches of the 2d tier."

Because of "settlement" of the structure, in places as much as 9 inches, he would postpone for the present "formation of the iron embrasures of the 2d tier, and the stone work connected therewith." Positioning of the 2d tier gun traverses and pavements would also be deferred.

---

46. Totten to Woodbury, April 20, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

47. Woodbury to Totten, October 5, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

48. Wright to Woodbury, July 1, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

The recess arches, like at Forts Sumter and Taylor, would be built in advance. But, to provide a margin for final adjustment, he would lay-up the subject arches, "both at the key and the spring, 4 inches higher above the keys of the several casemate arches of the lower tier, at the ends adjacent to the scarp," than depicted in the drawings.[49]

On August 5 the Department reviewed and approved Woodbury's program as transmitted.[50]

6. Fiscal Year 1860 Program

Early in February 1859, Captain Woodbury urged the Department to seek a large appropriation for continuing the project. Although the fort was now defensible and the 146 guns of the 1st tier could be mounted, whenever they became available, it was in no condition to withstand a serious attack.

The arches covering the lower tier were only 18 inches at the key, and accordingly not bombproof. By employing the $150,000 appropriated in June 1858, they could carry up the masonry to the spring line of the upper casemate arches, but could accomplish little toward forming these arches. A $200,000 appropriation for Fiscal Year 1860 would suffice to complete the 2d tier arches and make the casemates bombproof.

Such an expenditure, Woodbury argued, was justified by these conditions:

(a) Because Fort Jefferson was 100 miles from the Florida mainland, it was calculated to promote the national welfare rather than any particular section, North or South.

(b) The Tortugas were so remote from population centers that, should a war break out, few, if any, improvements could be effected.

(c) In event of a conflict with a naval power, Fort Jefferson would be a high priority target. Without it, the United States would be unable to maintain a squadron in the Gulf of Mexico.

(d) Sound public policy dictated that construction be continuous because, if work were suspended, an experienced and capable force would be difficult to reassemble.[51]

Woodbury's recommendations failed to sway a Congress engrossed by sectional animosities and concerned about the Nation's economic ills that had reduced

---

49. Woodbury to Thayer, July 23, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

50. Wright to Woodbury, August 5, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

51. Woodbury to De Russy, February 4, 1859, NA, RG 77, Ltrs. Recd., Chief Engineer.

Treasury receipts. Consequently, the Fortifications Bill enacted by the 2d Session of the 35th Congress and signed into law by President Buchanan on March 3, 1859, only appropriated $95,000 for Fort Jefferson in Fiscal Year 1860.[52]

Woodbury, in compliance with regulations, informed the Department that he planned to use the subject appropriation "to continue the erection of the upper casemate arches as far as the means will go."

The upper covering arches of the bastion magazines having been formed, and the steps and landings for the circular tower stairways on hand, the latter would be laid.

Flagging had been received from the New York Agency for the lower tier bastions and the gunrooms as far back as 16 feet from the scarp. Although much of this flagging had been laid, some remained to be put down.[53]

Acting Chief Engineer De Russy reviewed and approved the Fort Jefferson program as submitted.[54]

7. Woodbury's July 1, 1859, Estimate for Completing the Fort

On April 25, 1860, Captain Woodbury, in response to a circular letter, forwarded a detailed estimate of the cost of completing Fort Jefferson as of July 1, 1859. He placed these costs at:

the fort proper, counterscarp, ditch & wharf	$700,000.00
naval storehouse (160' x 58')	73,000.00
two powder magazines (71' x 52'), each $32,500	65,000.00
three powder magazines (53' x 52'), each $25,300	75,900.00
officers' quarters (286'8" x 44'), one block & three-fourths	212,601.88
barracks (338'5" x 35'6")	90,000.00
commanding officer's quarters	20,000.00
chapel & offices	20,000.00
hospital	20,000.00
contingencies	2,409.33
Total	$1,278,911.21

Value of materials on hand, July 1, 1859,	$53,911.21	
Appropriation for Fiscal Year 1860	95,000.00	
		$ 148,911.21
Appropriations required to complete project		1,130,000.00
Amount already appropriated		1,205,000.00
Estimated cost of fort		$2,335,000.00

52. De Russy to Woodbury, March 18, 1859, NA, RG 77, Ltrs. Sent, Chief Engineer.

53. Woodbury to De Russy, April 30, 1859, NA, RG 77, Ltrs. Recd., Chief Engineer.

54. De Russy to Woodbury, May 17, 1859, NA, RG 77, Ltrs. Sent, Chief Engineer.

Woodbury brokedown the cost of completing the "fort proper, seawall, ditch & wharf":

Brick Masonry Above (30')	Cubic Yards	Cost Per Cubic Yd	Amount
Casemate arches of the 2d tier from (30') to (35'333) curtains	5,291	$16	$84,656
Casemate arches of the 2d tier from (30') to (35'333) bastions	794	16	12,704
Piers near bastion gorge from (30') soffit of C.M. arch	24	16	384
Parade wall from (30') to (37'375)	424	16	6,784
Piers from (30') to (32')	80	16	1,280
Corbel under parade coping	14	16	224
6 bastion stairway towers from (38'3") to (48'3")	64	16	1,024
6 bastion stairway towers from (35'3") to (38'3")	80	16	1,280
Scarp wall from (30') to (33')	794	16	12,704
Scarp wall from (33') to (43')	2,650	16	42,400
Skewbacks of the 6 long arches near parade	69	16	1,104
Scarp corbel and dental courses	60	16	960
4 unfinished gun embrasures, 1st tier	53	16	848
126 gun embrasures, 2d tier	1,667	16	26,672
36 howitzer embrasures, 2d tier	286	16	4,576
Breast-height wall	2,275	16	36,400
Roof surfaces, drains, watertight courses, etc.	1,923	16	30,768
Total, requiring 6,255,147 bricks	16,548		$264,768
Main drain, about 2,000 ft. in length, brickwork	500	$16	$8,000
Counterscarp wall, 620 ft., brickwork	460	16	7,360
Concrete Masonry			
Over casemate arches, above (30')	3,297	$ 6	$19,782
Scarp wall from (30') to (33')	6,000	6	36,000
Closing rear ends of cisterns from (4') to (7')	211	6	1,266
Main drain	520	6	3,120
Counterscarp wall	600	6	3,600
Embankment of parapet	8,000	.60	4,800
Embankment of curtain terrepleins	6,000	.70	4,200
Embankment of bastion terrepleins	700	.70	490
Excavation of the ditch to mean level of (-5'), material to be transferred to parade	30,000	$ 1	$30,000
Excavation for main drain & reembankment	3,330	.30	999
Excavation for counterscarp wall & expense of sheet piling	1,860	1.50	2,790

	Superficial Ft.	Cost	Amount
Flagging, 3½ to 4 inches thick			
Gunrooms & communication ways, 1st tier	35,160	.60¢	$21,096
Gunrooms & communication ways, 2d tier	60,856	.60	36,513
Belt course of granite 2'6" x 6" x length between (19.50') and (20')	3,912	1.10	4,303
126 sets of traverse stones, 2d tier	12,600	1.25	15,750

Embrasure Stones	Cubic Ft.	Cost	Amount
126 gun pintle-blocks, each (18" x 18" x 12")	283.50	$2	$ 567
126 tongue-hole covers (5'3" x 11-1/8" x 6")	637.38	2	1,274
126 sole stones (8' x 2'2" x 1'3")	2,730	1.50	4,095
36 howitzer sole stones (2'6" x 6' x 4")		12	432
36 howitzer pintle-blocks		20	720
Caps of bastion flues			2,725
6 door sills, stairway towers			21
6 lintels, stairway towers			18
18 window sills, stairway towers			54
18 window lintels, stairway towers			54
Belt course around towers			100
Cordon between (34'3") & (35'3") 3119.50 x 2" x 1'	6,239	1.50	9,358
Parade coping 2.200' x 3' x 10½"	5,775	1.60	9,240
Tower coping			982
Scarp coping, 3.100' x 3' x 1'	9,300	1.60	14,880
Stone covering manholes			2,680

Iron Embrasures With Lead Concrete	
126 gun, 36 howitzers (162) at $600	$97,200

Iron Traverse Circles	
1st tier (111) upper tier (126) = 237 guns at $20	$4,740
1st tier (35) upper tier (36) = 71 howitzers at $13	923
Barbette tier, 122 at $65	7,930
Cast iron drainage pipe, 27,000 pounds	1,080
Cast iron cistern curbs & covers, 110	1,200
Cast iron manhole covers	463
Cast iron dowels for scarp coping	194
Lead flashing course	2,662
Lead gutters	786
Slate laid in gutters	375
Asphalt surfaces	16,736
122 columbiad platforms at $200	24,400

Furring, flooring, fitting with doors, ventilators, etc., 9 bastion magazines at $500 each	$4,500
Furring, flooring, fitting with doors, ventilators, etc., 4 double curtain magazines at $1,000 each	4,000
Permanent wharf	10,000
Drawbridge, machinery, etc.	10,770 [55]

8. Fiscal Year 1861 Program

On June 21, 1860, President Buchanan signed into law the "Fortifications Bill" passed by the 1st Session of the 36th Congress. Included was a line item of $75,000 for Fort Jefferson in Fiscal Year 1861. Woodbury was to prepare a program for expenditure of this sum, reserving enough money to provide for a watch over the public property during the 12 months ending June 30, 1861.[56]

Woodbury proposed, subject to the Department's approval, to shift emphasis because time had come to ready the fort for its garrison, and many years would slip by before the project was completed. He planned to employ the subject monies to: (a) build the most northern section of the barracks; (b) complete the casemate arches and cover them sufficiently for drainage; (c) to finish fitting up the six bastion magazines of the 1st tier; and (d) to expend the balance on the continuation of the scarp wall.[57]

On August 20 Acting Chief Engineer De Russy approved the program as submitted.[58]

C. Construction Progress Under Captain Woodbury's Superintendence

1. In the 12 Months Ending September 30, 1856

During the 12 months ending September 30, 1856, workmen laid the last of the grillages and the 27 remaining cistern floors. Arches over these cisterns, along with the other 51, were turned and covered. The last of the 23 composition waste pipes were positioned in the scarp wall.

One hundred and eleven pintle stones and tongue-hole lintels were received and laid, while 111 sets of traverse stones were obtained but not positioned.

The scarp wall of the curtains, except at the sally port and on fronts Nos. 1 and 2, had been raised to reference (9.50). The former stood at reference (5.50) and the latter at (10'.92).

---

55. Woodbury to De Russy, April 25, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

56. De Russy to Woodbury, June 28, 1860, NA, RG 77, Ltrs. Sent, Chief Engineer.

57. Woodbury to De Russy, August 16, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

58. De Russy to Woodbury, August 20, 1860, NA, RG 77, Ltrs. Sent, Chief Engineer.

Throughout the work, cistern piers had been backed up with concrete to reference (7'). The casemate piers of the curtains had been raised to reference (10'50), except those piers connected with the gateway, guard- and prison-rooms, and magazines.

The bastion scarps had been laid-up to reference (7'.50) and the subject piers to reference (4'). Foundations of the stairway towers and the magazines connected thereto had been raised to reference (4').[59]

2. In the 12 Months Ending September 30, 1857

During the year ending September 30, 1857, attention was focused on the scarp walls, piers and communication arches, iron embrasures, and traverse circles of the lower tier of guns. The casemate piers of the six curtains, along with the communication arches, had been carried up and prepared to receive the lower casemate arches.

All casemate arches of the southeast front (No. 3) had been turned, except three at the sally port, and most of them backed with concrete.

One hundred and ten embrasure sole-stones had been set in the curtains, and 35 in the bastions for the flanking howitzers. Ninety-seven sets of traverse stones had been positioned; 59 sets of gun embrasure irons and 12 sets of howitzer irons installed.

The scarp wall had been laid-up to heights varying from 10'6" to 16'8" above low water; the walls of the bastion magazines and stairway towers had been carried up to elevations varying from 8' to 16', and the bastion piers to heights of from 8' to 16' feet.

Underground bastion drainage pipes had been laid and several sections of vertical pipe connected therewith.[60]

Fourteen casemate cisterns had been paved and made watertight.[61]

3. In the 9 Months Ending June 30, 1858

In 1858 the Department changed the period to be covered by the annual report of operations. Hereinafter, the time interval was to coincide with the fiscal year. Accordingly, the annual report for 1858 focused on the nine months between October 1, 1857, and June 30, 1858.

During this period, work had been concentrated on the lower tier of casemates, their covering arches, and adjacent scarp. The latter had been carried up from the level of the lower embrasures to the platform of the

---

59. Woodbury to Totten, October 21, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

60. Woodbury to Totten, October 5, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

61. Ibid.

2d tier of guns. Casemate arches and all other parts of the work had been raised up nearly to the same level.

Excepting the gateway, which would be constructed in the near future, the 1st tier was now enclosed, covered, and defensible. All its armament could be mounted, if on hand, "although the requisite facilities" were not complete.[62]

4. In the 12 Months Ending June 30, 1859

During Fiscal Year 1859 priority was given to construction of the piers, communication arches, stairway towers, bastion magazines, and scarp wall between references 19'6" and 30', i.e., "from a plane 6" below the proper platform of the 2d tier of guns to the springing line of the upper casemate arches." There was one exception, however. At the gateway, the three casemate arches of the lower tier and the stone fronts still had not been formed.

On July 1, 1858, with few exceptions, the masonry had stood at reference 19'6" and by June 30, 1859, it had been carried to reference 30', while the bastion towers had been laid-up a little higher, and the magazine arches adjacent to the towers had been formed.

No upper tier embrasures had been laid, and "a hiatus" had been left in the scarp under the recess arches.

Four of the lower tier bastion magazines had been floored and partly furred.[63]

5. In the 12 Months Ending June 30, 1860

In Fiscal Year 1860 the masons raised the scarp throughout from 30 feet to 32 feet 6 inches; the concrete backing of the scarp wall from 31 feet to 32 feet 6 inches, except for one-half the northwest bastion, where it remained at 30 feet, and the southwest short front, where it had been raised about 7 inches. The stairway towers had been carried up to the upper landings; all 24 bastion casemate arches had been formed, as had 86 of the 122 curtain arches.

To provide additional details concerning the subject upper tier arches, Woodbury submitted a table:

Length of arches	30'6"		24'6"		6'		Remarks
	formed	not formed	formed	not formed	formed	not formed	
Front 1			4	11	4	11	The 4 oblique arches formed
Front 2	2		21	0	4	17	
Front 3	2		21	0	12	9	

62. Woodbury to Thayer, September 23, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

63. Woodbury to De Russy, October 20, 1859, NA, RG 77, Ltrs. Recd., Chief Engineer.

Front 4			15	0	12	3	
Front 5		2	4	17	4	17	The 4 oblique arches formed
Front 6	2		21	0	21	0	
Total formed	6		86		57		
Not formed		2		28		57	

The lower tier magazines in bastions C and D has been "completely fitted up, and work enough has been done upon the other two to complete one of them."

All lower tier arches had been pointed, while the upper bastion and curtain arches on fronts Nos. 2 and 6 had been pointed, excepting 17 of the 6-foot arches on fronts No. 2 and 5 of the same length on front No. 6.[64]

D. Change Orders: Both Those Approved and Those Vetoed

1. Involving Elimination of Certain Manholes and Enlarging Communications Under Certain Passageways

After reviewing drawing No. 44, Captain Woodbury called for a change order to eliminate the manholes in the magazines at the mid-points of the long fronts and to enlarge the manholes in the passageways. He also asked authority to enlarge the communications under the passageways with the cisterns beneath the magazines by an arch 2 feet wide and 2 feet high, beginning at reference (4'). This arrangement, he noted, would provide necessary access to the cisterns without interferring with the magazine storerooms.[65]

In mid-June 1856, this charge order was reviewed and approved by the Department.[66]

2. Totten Vetoes a Proposal to Relocate Certain Long Front Manholes

On the last day of January 1857, Woodbury recommended another change order. He called for relocating the entrance into the manhole of the filtering closet in the piers between the long front double magazines.

General Totten rejected the proposal because it would weaken the pier. Any danger from dampness in the magazines, he reminded Woodbury, could be alleviated by "tightly caulking around the door."[67]

---

64. Woodbury to De Russy, August 23, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

65. Woodbury to Totten, May 19, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

66. Wright to Woodbury, June 18, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

67. Woodbury to Totten, January 31, 1856 and Totten to Woodbury, February 19, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

3. Totten Turns Down a Proposal to Introduce Ventilators into the Lower Tier Casemates

On May 23, 1857, Dan Woodbury suggested introduction of ventilators for facilitating escape of smoke from the lower tier casemates. Needed horizontal ventilators could be located immediately above the recess arch, "the height extending from that arch to the soffit of the casemate arch, or a little higher." Its outlet to be midway between the embrasure openings of the 1st and 2d tiers.[68]

General Totten rejected this change. On doing so, he reminded his superintending engineer that experience had demonstrated that, when casemates were open toward the parade, smoke occasioned so little inconvenience that no special provision for ventilators were necessary. The small amount of smoke from the gun vent was rapidly dispersed through the embrasure or rear of the casemate.[69]

4. Making the Casemate Cisterns Watertight

In accordance with Totten's instructions, Woodbury caused three casemate cisterns to be paved with 1-1/2-inch pine boards. On doing so, he found that the average cost of paving a cistern with boards was $77.90, opposed to the average cost for those paved in brick of $55.26. These costs broken-down:

Cisterns Paved With Brick

1,200 bricks at $21	$25.20
4 barrels of cement at $1.75	7.00
3 days' labor of mason at $2.30	6.90
3 days' labor of carpenter at $2.30	6.90
6½ days' work by laborer at $1.42½	9.26
Average Cost	$55.26

Cisterns Paved With Boards

558 feet 1½-inch pine boards at .05¢	$27.90
120 bricks at $21	2.52
3/4 barrel of cement at $1.75	1.31
1/3 day's labor of carpenter at $3	1.00
9½ days' labor of carpenter at $2.30	21.85
1 day's labor of mason at $2.30	2.30
14-3/4 days' work by laborers at $1.42½	21.02
Average Cost	$77.90

In all cases, the "original plank paving" had been made as tight as possible, but in no instance was it possible to prevent seepage. There was

68. Woodbury to Totten, May 23, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

69. Totten to Woodbury, May 30, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

no difficulty with the joints, but all the treenails leaked, while water seeped through cracks in the planking.

Woodbury was of the opinion that, if any leaks developed in the 34 paved cisterns, they would occur either near the junction of the pavement and scarp wall or under wide communication arches. If so, they could be stopped by a single line of bricks laid in mortar lengthwise along the opening.

Woodbury, provided the Department was agreeable, would not pave all the cisterns at present. Almost one-half would not be paved until the work was in a more advanced stage.[70]

General Totten approved Woodbury's actions. Better yet, Totten urged him to limit "still more" the number to be paved now, confining them to such as may be needed to supply water for the project.[71]

Upon receipt of Totten's letter, Woodbury reported that no more cisterns had been paved, nor did he think it necessary to pave any more at present.[72]

5. Authority is Sought and Given for Introduction of Stairway Tower Loopholes

On April 29, 1859, Woodbury sought and received permission to "introduce a narrow light in the rear wall of each stairway tower," between references (26') and (31').[73]

E. Laying-up the Totten Embrasures

1. Craighill Calls for Guidance

Lieutenant Craighill, in the weeks he was in charge during Captain Woodbury's absence, searched the files but was unable to locate a drawing depicting the mode of supporting "the feet of pintles" for the flanking casemates. If these were to be of granite, he wrote the Chief Engineer, considerable time would be saved if they were ordered by the Department.[74]

---

70. Woodbury to Totten, October 28, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

71. Totten to Woodbury, November 30, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

72. Woodbury to Totten, December 8, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

73. Woodbury to De Russy, April 29, 1859, and De Russy to Woodbury, May 17, 1859, NA, RG 77, Ltrs. Recd., Chief Engineer. Attached to Woodbury's letter is a drawing, "Fort Jefferson, Loop Holes proposed for Rear Wall of Tower Stairways."

74. Craighill to Totten, January 30, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

As soon as plans for the new Totten casemate embrasures were prepared, the Department answered, copies would be transmitted. It was desirable that the embrasures be built in conjunction with adjacent portions of the scarp, so Craighill would not carry up any portion of the scarp higher than the level of the upper surface of the tongue-hole lintels, until directed.

Because the new flank embrasure required a slightly different position for the pintle stone than those recently furnished, Craighill was to delay setting them or drilling the pintle-holes until he had been provided with the modifications.

After the "entire scarp" had been raised to the height of the upper surface of the tongue-hole lintel, he was to limit operations to construction of casemate piers and portions of the masonry below the level of the first tier floors.[75]

Upon receiving a copy of the Department's letter, Craighill checked and found that 17 of the flank howitzer pintle stones had been drilled as depicted on sheet No. 40, leaving 18 to be drilled. In accordance with instructions, the latter would be set aside for the present.[76]

2. Totten Sends Plans and Gives Detailed Instructions for Construction of 1st Tier Curtain Embrasures

a. Ironwork and its Function

In view of the decision to introduce the recently developed Totten iron and brick embrasures into Third System forts then under construction, the Department mailed to Captain Woodbury sheet No. 46, "Plans, Sections & Elevations of Gun Embrasures in the Lower Tier." On April 24, 1856, in a covering letter, General Totten noted that these embrasures were to be formed chiefly of bricks and wrought iron. The principal pieces of wrought iron were: No. 1 R and No. 1 L, the right and left jambs; No. 2 and No. 3, the right and left auxiliary jamb pieces; No. 4, sill throat iron; No. 5, lintel throat iron; No. 6 R and No. 6 L, right and left shutters; and No. 7, tongue-hole iron.

The manner in which No. 1 R to No. 6 L were to be combined in forming the embrasure throat was detailed on a detached portion of sheet No. 46. These irons would be provided by contract with R.P. Parrott Foundry, and shipped to Garden Key, with the holes drilled, and ready to be mounted.

The hinges and bolts were to be supplied by Woodbury. These included a hinge bolt (a) of gun metal, cut to allow passage of a copper bolt (b), which would permit the hinge bolt to be lifted sufficiently to position the strutter. A second hinge bolt (a') would be kept from dropping too low by a second copper

---

75. Totten to Woodbury, February 6, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

76. Craighill to Totten, March 1, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

bolt (b'), until it was necessary to dismount the shutter. Both copper bolts were to be riveted in place, so that by cutting off the riveted heads, with a cold chisel, they could be driven out.

The washer (c), upon which the heel of the shutter turned, would be of gun metal. The bolt for fastening the shutter would also be gun metal, and its handle was to be screwed in place, after the bolt had been introduced into the socket. A composition catch (d) was to hold the lower end of this bolt. The catch was to be embedded in the embrasure sole.

It was necessary that the axes of motion of the shutter be fixed in the embrasure with "absolute precision," and some special means might have to be contrived to secure it. Recent West Point tests made it almost certain that, "if truly centered, the shutter will close spontaneously at each discharge of the gun."

Though the jamb pieces, Nos. 2 and 3, there were 1-inch diameter holes corresponding to the cavities in Nos. 1 R and 1 L. Into these were to be driven, when everything was positioned, composition bolts, 5 inches long. These would keep the subject iron plates from slipping upon each other.

Tests at West Point had demonstrated that the arrangement of wrought iron about the throat, supported by the masonry as depicted, would resist an 8-inch solid projectile fired from a columbiad at a range of 200 yards. The shutters had resisted, without being dismounted or rendered unserviceable, the largest grape shot from the same piece fired at a similar distance. But to do so, it was mandatory that the ironwork be supported by "solid and well bonded masonry."

In relation thereto, it had been shown by the tests that the power of grape and canister was such upon the exterior facings of the embrasures, even though they were of the hardest granite, that a "protection of iron" was mandated for the margin. It was to consist of plates of boiler iron 3/8- or 1/2-inch thick, and about 9 inches wide. Woodbury's attention was directed to the plan depicting the edge of the iron plate on the side of the embrasure, and to note that it did not reach by 1/2-inch the edge of the brickwork. This was because of fear that otherwise the side plates might be loosened by muzzle blasts.

The embrasure sole and the lintel, outside the throat, were to be faced with 3/8-inch boiler iron, each having a 1-inch camber. The ends of these plates were to extend into the brickwork of the cheeks, while their outer edges overlapped the upper and lower embrasure plates.

A plate of boiler iron, 8 inches wide, bent in the proper form was to be suspended over the embrasure throat from the upper end of the throat jambs. It in turn sustained the brickwork immediately above.

There was likewise a plate of boiler iron, 8 feet long and 1-foot broad, positioned on edge behind the aforementioned brickwork, and the upper ends of the throat jambs.

Woodbury was to provide the boiler iron plates.[77]

b. Introduction of a Sole Stone

"One stone" would be introduced into the embrasure beyond those already laid. Called a sole stone, it would be 8' long, 1'3" wide, and 1' high. Its bottom was to rest atop the tongue hole lintel; its upper side to constitute part of the sole of the embrasure; its front to be notched to receive the pintle and pintle head; and its upper and outer edges to have a rebate cut to receive the lower ends of the throat jambs. This rebate was to extend from one jamb to the other.

Unless large pieces of hard Key West stone could be procured, granite, correctly cut, should be secured through the New York Agency. The portions of the stone to receive the pintle and rebate and the exposed surfaces were to be accurately cut, while the other surfaces were to be rough hammered.

All bricks laid around the embrasure must be hard-burned, and, like the stones, be laid in the strongest cement mortar, i.e, 1 barrel of dry cement mortar to 1 barrel of sand. The bricks were to be taken out of water, and laid as soon as they ceased to drip.[78]

c. General Instructions as to Mode of Construction

General Totten next detailed the mode of constructing the embrasures. Upon the lintel of the tongue-hole would be laid the sole stone, and the brickwork behind. Included would be the paving of the inner sole of the embrasure with bricks on end. Upon the brickwork in front of the sole stone would be laid an inverted arch, one brick in length along the key. The slightly curved soffit was to receive the iron plate slated to form the surface of the embrasure. The fall of the arch to be 1-inch in a 3'4" span.

Bricks were to be laid between this arch and the sole stone, and on either side. Space would be left for lead concrete between the stone and arch. This space was to be 1'11" wide next the stone, and 9 inches wide next the arch.[79]

d. Guidelines as to Use of Lead Concrete

The brickwork having been advanced sufficiently, lead concrete would be introduced. To accomplish this, Captain Woodbury was to first position a substitute for the pintle, and make the joints below tight. The void space to a height of 2'6" above the floor of the casemate was to be filled with small pieces of hard brick, free from dust, and "quite hot." Enough molten lead

---

77. Totten to Woodbury, April 24, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer. A sopy of the subject plan is on file at Everglades National Park.

78. Ibid.

79. Ibid.

would then be poured in to fill the voids. The height attained to be that of the bottom of the rebate in the sole stone. The irons forming the jambs and sills would then be positioned, along with the catch (d) for the shutter bolt. Masons would then build-up the brickwork around this portion of the embrasure. They were to insert in front and around the head of the pintle proper quantities of brick fragments. Melted lead would then be poured to fill the voids, and give "the true form of this part of the bottom of the embrasure."

To make certain that the lead filled the interstices in front and next to the throat irons, it was wise to leave a hole in the sole plate in front of the shutter catch, so lead could be poured in there, at the same time that it was floated in between the bottom of the throat irons.[80]

e. Instructions on Arch Construction

In building the reverse arch under the exterior sole of the embrasure, the marginal plate of boiler iron was to be secured by introducing, in their proper places, a sufficient number of anchors. These wrought iron anchors (2" x 1/4") were to be fastened at one end by a rivet to the outside plate and "lying in joints of the brickwork," and have the other end turned at right angles. All exterior plates were to be secured on this principle.

The cheeks, both inside and outside, were to carried up with the brickwork, in accordance with the drawings. At the proper height, the boiler plate, forming the exterior lintel and bent to a curve of 1-inch verse sine, was to be laid in the exterior cheeks, and a single-brick arch turned thereon, being anchored by its marginal plate.

The bent lintel plate (u) would then be positioned between the tops of the throat jambs, and built upon. A long plate of boiler iron (8' x 1' x 1/2") would likewise be positioned. The inside cheeks were to be built-up to the soffit of the 2 arches that were to be turned over them. These arches were to spring from reference (13'4"), but, though contiguous, were not to be bonded together. One arch was to have a span of 5'4" and a rise of 6", and the other a span of 3'8" with a 3-inch rise. Both arches were to be 1-1/2 bricks thick.

Upon this masonry, horizontal brickwork would be laid-up to the soffit of the recess arch and continued through to within one-brick length of the face of the scarp. This arch was to be cylindrical, with horizontal imposts at reference 13'6" and at right angles to the scarp. The 15-foot span was to rise 2 feet. The oblique faces of the recess were to be carried up till they attained the soffit of this recess arch.[81]

f. Use of a False Pintle and Forms to Facilitate Good Workmanship and to Secure Precision

As the position of the gun in the embrasure was dependent on the care with

---

80. Ibid.

81. Ibid.

which the pintle was placed, General Totten urged that a substitute for the pintle be provided, having the exact dimensions of the pintle hole, and to rise some distance above the sole. It should be of iron or composition. Two or three of these would suffice for building all the embrasures. If surrounded by a single thickness of cartridge paper, they could be readily withdrawn when necessary.

Utmost precision was required in adjusting the several parts of the embrasure, especially the ironwork about the throat. This could be accomplished by providing a form, which should embrace the elongated substitute for the pintle.

In fitting the throat irons into place, "particular pains" were to be given to securing firm bearings. After the lower ends of the throat jambs were sealed in the sole stone rebate, if they did not bear throughout against the stone, strips of sheet iron were to be driven in wherever possible. When building brickwork against the throat irons, very little mortar was to be used, so that, except in the hollows of the bricks, the bricks and iron would be in contact. To accomplish this, every brick was to be set-up against the iron-work by several hard taps.

Care was to be taken to reduce the number of oblique angles in the brick-work, particularly those that showed two faces. Brick cutting being costly, there were to be no cut bricks in the voussoirs.

Upon their receipt, the embrasure irons were to be carefully inspected, piece by piece, to insure that they were of the proper form and dimensions. Before being positioned, they were to be cleaned and lacquered. Also they were to be liberally smeared with asphaltum just before being laid. The iron boiler plates attached to the sole, lintel, and outside of the embrasure would also have a layer of asphaltum interposed to make the joint watertight.[82]

g. Woodbury is Directed to Order 111 Sets of Irons

Woodbury was to write Captain Dutton at the New York Agency in regard to securing 111 sets of embrasure irons for the lower tier. While awaiting the irons, sole stones might be procured and laid, and the brickwork of the sole, inside and outside, and lead concrete up to the bottom of the sole stone rebate positioned. Boiler plate for the sole and lintel, exterior facings, etc., could likewise be prepared. It would be unsafe, General Totten cautioned, to turn down the hinge and fastening bolts, until the exact size of the sockets had been ascertained by inspection of the shutters.

Because the embrasures were too far advanced for the No. 3 piece (the tongue-hole iron) to be introduced, it was to be eliminated.[83]

---

82. Ibid.

83. Ibid.

3. Department Forwards Drawings of the 1st Tier Flanking Embrasures

Then, on October 14, 1856, the Department mailed to Captain Woodbury drawing No. 47, "Plans, Sections & Elevations of Howitzer Embrasures in the Flanks of the Bastions, Lower Tier." General Totten pronounced the drawing self explanatory. He, however, reminded Woodbury that the cast iron cylinder forming the bottom of the pintle-hole had been "introduced because of the want of sufficient width in the stones already on hand to allow of the hole drilled entirely within the outer edge."[84]

4. Fabricating the Embrasure Irons

To hold down costs, the Department determined to place a consolidated order for the embrasure irons. Consequently, Captain Dutton at the New York Agency was directed to contract with Robert P. Parrott for Totten embrasure irons for these defenses:

Name of Fort	Guns			Howitzers with Gun Irons		
	1st tier	2d	3d	1st tier	2d	3d
Knox	19	X	X	8	X	X
Richmond	27	29	X	6	6	X
Delaware	33	38	X	10	10	X
Sumter	X	41	X	X	X	X
Taylor	42	44	X	6	6	X
Jefferson	111	127	X	35	36	X
Proctor's Landing	X	X	X	X	X	4
Fort Point	28	30	30	X	X	X[85]

On October 13, 1857, General Totten wrote Woodbury that Parrott would have to reduce his workforce unless the Department could take and pay for more sets of embrasure irons. Totten noted that 163 sets were required for the fort's second tier. Not knowing the state of Woodbury's funds and contracts, Totten had declined to commit the Department to placing further orders.

He had told Parrott that, although 163 additional sets were required for Fort Jefferson, they must be paid for out of current appropriations, and he did not know the status of Woodbury's commitments.

The subject was to be left to Woodbury's discretion, with the understanding that the Department would seek a liberal appropriation for the Garden Key fort in Fiscal Year 1859. But, Totten cautioned, there was no guarantee that Congress would fund the program in view of the Nation's present depressed economic condition.[86]

---

84. Totten to Woodbury, October 14, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer. A copy of the subject drawing is on file at Everglades National Park.

85. Totten to Dutton, October 28, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

86. Totten to Woodbury, October 13, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

Meanwhile, Totten had advised Parrott that 163 sets of irons would be required for the Fort Jefferson 2d tier. As they must be paid for out of the appropriation for that work, it was impossible for the Washington office to say whether the contracts already entered into by Captain Woodbury would allow him to order any 2d tier embrasures.[87]

5. Most of the 1st Tier Embrasures are Completed

By mid-February 1858, embrasure irons had been received and positioned in all the 1st tier curtain casemates, except in the four left open for roadways. They had also been set in five of the six bastions.[88] On September 23, 1858, Captain Woodbury notified the Department that all the 1st tier embrasures, except the four aforementioned--107 gun and 35 howitzer were now positioned.[89]

6. Department Provides Plans for the 2d Tier Embrasures

During Woodbury's June 1858 visit to Washington, the Department provided him with "Plans, Sections & Elevations of Gun Embrasures in 2nd Tier."[90]

Some five months later, on November 30, 1858, Woodbury, on his return to the Florida Reef, called on the Department to furnish a "drawing of the Bastion (howitzer) embrasures of the 2d tier . . . including all iron & stone work."[91]

Acting Chief Engineer De Russy responded to this request. In a covering letter, he informed Woodbury that the portion above that represented was similar in form and dimensions to the corresponding first tier howitzer embrasures.[92]

F. Department Provides Plans of Barbette Tier Details

While in Washington in September 1858, Captain Woodbury was provided with a drawing, "Details of Pan Coupe" for the Fort Jefferson bastions.[93]

---

87. Totten to Parrott, October 13, 1857, NA, RG 77, Misc. Ltrs. Sent.

88. Woodbury to Thayer, February 18, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

89. Woodbury to Thayer, September 23, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

90. A copy of the subject drawing is on file at Everglades National Park.

91. Woodbury to Wright, November 30, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

92. De Russy to Woodbury, December 22, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

93. A copy of the subject drawing is on file at Everglades National Park.

Then, on June 10, 1859, the Department mailed to Woodbury two sheets of drawings. The first was a lithograph of the details of barbette platforms; and the other a tracing from Fort Delaware, giving plans and sections for covering roof surfaces, founding breast-height walls, etc. The latter detailed the principles upon which these features were to be arranged. It was understood, however, that the "important dimensions," such as the thickness of parapets, etc., previously established were not to be changed.[94]

These plans were needed to guide work on the barbette tier. Missing, however, because of Chief Engineer Totten's long absence from his office, were the minute instructions that usually accompanied such transmittals.

G. Subsidence Becomes a Serious Problem

On February 18, 1858, Captain Woodbury notified the Department that, "after turning the lower casemate arches . . . and carrying up the scarp wall to elevations varying from 18 to 20 feet above low water," settlements had been observed in nearly all parts of the fort. At the 1st tier embrasures, they varied from 1 to 8 inches.

The scarp had not in any case separated from the adjacent casemate piers and arches, "but all have gone down together, though unequally." Only two cracks had been pinpointed in the scarp wall.

All the curtain traverse stones, except 12, had been placed. The outer and inner traverse circles of these casemates showed slight differences in level. Seldom was it more than 1/4-inch, generally not more than 1/8-inch, but in two instances it measured an inch.

Despite the "unexpected settlement of the masonry," Woodbury was satisfied that "no mistake was made in preparing the lower tier for its armament, especially as years may elaspse before the completing of another tier."

To make a systematic and more accurate study of the subsidence, Woodbury called for and received authority to purchase a level.[95]

The fort continued to settle and it was necessary, when the second tier scarp was raised to postpone construction of the embrasures. When he checked the structure in May 1859, Woodbury found that at several points it had subsided as much as 11 inches.[96]

On May 31, 1860, while at the Department, Woodbury turned over to Acting Chief Engineer De Russy a record of the subsidence as determined by observations

---

94. De Russy to Woodbury, June 10, 1859, NA, RG 77, Ltrs. Sent, Chief Engineer.

95. Woodbury to Thayer, February 18, 1858, and Thayer to Woodbury, March 5, 1858, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

96. Woodbury to De Russy, October 20, 1859, NA, RG 77, Ltrs. Recd., Chief Engineer.

made on five different occasions beginning in May 1858 and ending in December 1859.[97]

H. August 1856 Hurricane and the Loss of "Activa"

A hurricane, the most violent since 1846, swept the Florida Reef on August 27 and 28, 1856. Activa was en route to Key West when the storm struck. The crew anchored her in the lee of the Marquesas and sought to ride out the blow. At 5 p.m., on the 27th, she parted her anchor and, putting to sea, Captain Ellis sought to reach the Tortugas. At 3 a.m. the sailors, through the gloom, made out Garden Key light. Soon thereafter, her last sail shredded, and she struck the reef and stranded south of the Engineer office. About noon on the 28th, Captain Ellis, the four-man crew, and a passenger succeeded in reaching Fort Jefferson in the schooner's small boat.

In addition to the disaster to Activa, one flatboat used for hauling sand was wrecked on Long Key, several squares of slate were torn from the officers' quarters, and a number of barrels of cement stored in the lower tier of the cement house were damaged.

About one-half of Long Key was washed away. Several hundred feet disappeared from its western end, and a cut some 600 or 700 feet in length was opened near the key's mid-point.[98]

After the storm abated, workmen salvaged from the battered schooner's hulk ballast, cables, etc., valued at $1,000. When he advised the Department of Activa's loss, Woodbury asked permission to purchase a replacement.[99]

Woodbury was directed by the Chief Engineer to make temporary arrangements for keeping open communications between the Tortugas and Key West, until a suitable vessel could be acquired.[100]

While on leave in mid-November 1856, Woodbury, having secured the Department's sanction, contracted with the Messrs. Thatcher of Wilmington, Delaware, for a schooner to replace Activa.[101]

---

97. Woodbury to De Russy, May 31, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of this table is on file at Everglades National Park.

98. Woodbury to Totten, August 30, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

99. Woodbury to Totten, September 6, 1856, NA, RG 77, Ltrs. Recd., Chief Engineer.

100. Wright to Woodbury, September 16, 1856, NA, RG 77, Ltrs. Sent, Chief Engineer.

101. Woodbury to Totten, November 13, 1856, and Wright to Woodbury, December 16, 1856, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

The Thatchers promised to complete the craft by mid-March. Since it was inconvenient for Woodbury to absent himself from Fort Jefferson, Captain Wright traveled up from Washington to examine and accept the schooner, which was christened Tortugas.[102]

Before he laid eyes on the craft, Woodbury requested permission to travel to La Habana in her, being absent about 4 days.[103]

The Deparment responded that such an extraordinary arrangement would be difficult to implement. Secretary of War John B. Floyd's consent was essential, and General Totten was not disposed to "bother" the Secretary with such a trivial matter. Consequently, Woodbury was advised to make the trip by steamer at his own expense, as that was the customary habit among officers posted in that area.[104]

I. Storehouses and Protecting the Materials

1. May 15, 1857, Fire Costs the Project a Storehouse

Shortly after midnight on May 15, 1857, the lighthouse keeper saw that the large storehouse was afire. He raised the alarm, and the workmen turned out on the double. Fire and dense smoke prevented them from saving much beyond the surveying instruments. Their attention was engrossed in preventing the spread of the conflagration to other structures. The roof of the lumber house smoldered but a bucket brigade saved the structure.

Loss to the project because of the fire was considerable, especially as a large shipment of provisions, tools, and materials had been recently received and stored within. Speculating as to the cause of the fire, Woodbury attributed it to spontaneous combustion because tar, rosin, oil, and tow had been stored promiscuously in the lower story.

Reporting the disaster, Woodbury requested authority to replace the fire-gutted structure by building the west one-half of the Navy storehouse.[105]

Chief Engineer Totten sanctioned the proposal. Woodbury would, before beginning construction, forward for approval the modified plans of the structure.

---

102. Woodbury to Totten, February 19, 1857, and Totten to Woodbury, March 10, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Tortugas cost about $6,700 and displaced 110 tons.

103. Woodbury to Totten, April 23, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

104. Wright to Woodbury, April 16, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

105. Woodbury to Totten, May 19, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

Meanwhile, he was to have a labor force proceed with the excavation and secure lumber for the grillage.[106]

Upon taking inventory, Woodbury placed the value of the stores destroyed at $7,000.

Pending construction of a new storehouse, the inner ends of five casemates on front No. 3 were enclosed with wood. These rooms, each 15' x 16'3", were ideal for storage of articles not subject to injury by dampness. The arches over these particular casemates were laid in cement and sand mortar and were waterproof.[107]

For some unexplained reason, Woodbury concluded not to take advantage of his authority to erect one-half the Navy storehouse. For storage purposes, he would rely on the five casemates, several old frame structures, and a new frame building being erected by George Phillips.

2. Overseer Phillips Builds and Operates a Small Store

During the weeks following the fire, Woodbury permitted Overseer Phillips to begin erecting, at his own expense and for his personal use, a frame one-story building near the messhall. Woodbury then had second thoughts and concluded to have this "temporary storehouse" erected at public expense.

Upon the structure's completion, he allowed Phillips to use the building as a place of storage for clothing, shoes, etc., kept for sale to the employees. For this use, Woodbury proposed to charge Phillips an annual rent of $40.

Phillips replied that it would be better if he retained ownership.

When Woodbury referred the subject to the Department, he noted that the store performed an essential service. Otherwise, it would be impossible to supply the 200 to 300 workmen's clothing needs.[108]

Woodbury, General Totten replied, had acted correctly because authority for construction of a private structure on a government reservation must be obtained from the Department. Such permission was seldom given.

Moreover, Totten cautioned, overseers should not be allowed to "traffic" with workmen, unless there were extenuating circumstances. This could be

---

106. Totten to Woodbury, May 30, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

107. Woodbury to Totten, October 5, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

108. Woodbury to Totten, October 30, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

the situation at Garden Key, where the laborers might find it impossible to secure certain necessities.

The question of renting the building to Phillips was dependent upon Woodbury's decision as to the need of a continuation of the agency. Woodbury would likewise be responsible for establishing the rent.[109]

Woodbury found it impracticable to withdraw at this time Phillips' agency because there were presently more than 200 white workmen on Garden Key that looked to the store for clothing and other necessities.[110]

J. Bacon and Abercrombie Provide Millions of Bricks at $21 per Thousand

During the Woodbury years, quality bricks continued to be supplied by Abercrombie and Raiford. In the spring of 1857, the firm became Bacon & Abercrombie, when Raiford sold his interest to Colonel Bacon of Columbus, Georgia.[111]

Early in March 1858, Bacon & Abercrombie notified Captain Woodbury that, at considerable expense, they had made extensive improvements to their kilns. Desirous of avoiding the expense and trouble of stacking bricks at the yard, and then rehandling them for shipment, they proposed to continue transporting them to Garden Key in their two vessels until such time as Woodbury deemed it necessary to increase the number. In absence of an appropriation, Bacon & Abercrombie would continue to ship without pay, either for the bricks or freight, until Congress made additional monies available.[112]

On suggesting approval of this proposition, Woodbury informed the Department that the contractors were now delivering about 200,000 quality bricks per month.[113] Acting Chief Engineer Thayer, in turn, recommended to Secretary of War John B. Floyd that, if not controlled by the Act of May 1, 1821, Captain Woodbury be authorized to permit the contractors to land 1,000,000 bricks at Fort Jefferson. This was to be done with the understanding that they were not to be purchased unless a further appropriation was made for the project. No bricks were to be landed after the adjournment of the current session of Congress, unless additional funds were voted for prosecution of the work.[114]

---

109. Totten to Woodbury, November 30, 1857, NA, RG 77, Ltrs. Sent, Chief Engineer.

110. Woodbury to Totten, December 8, 1857, NA, RG 77, Ltrs. Recd., Chief Engineer.

111. Bacon & Abercrombie to Woodbury, April 13, 1857, FRC, East Point, Ga., Fort Jefferson, Ltrs. Recd. Book.

112. Bacon & Abercrombie to Woodbury, March 6, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

113. Woodbury to Thayer, March 10, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer.

114. Wright to Floyd, March 26, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

Secretary Floyd approved the Department's recommendation. Moreover, he authorized Woodbury to permit the landing of another 2,000,000 bricks, on the same condition, in addition to the million, provided it was of public interest.[115]

Some 20 months later, in January 1860, Bacon & Abercrombie, upon learning that the Fiscal Year 1860 appropriation had been nearly expended, again proposed that they be permitted to continue to ship and deliver bricks as they had under similar circumstances in 1858.[116]

When recommending acceptance of the proposal, Captain Woodbury suggested that Bacon & Abercombie be limited to landing between now and the adjournment of the 1st Session of the 36th Congress, not more than 100,000 bricks per month.[117] Secretary of War Floyd sanctioned the proposal as circumscribed by Woodbury.[118]

Bacon & Abercrombie prospered with the contract, and in 1859 sought to introduce a machine-made brick to replace the handmade product. The time was not propitious and the experiment was a failure.[119]

K. Labor Force and Working Conditions

1. Establishing Comparable Wages

Soon after taking charge of the project, Captain Woodbury sought and received approval for increasing the monthly pay of Dr. Whitehurst from $100 to $125 and the daily wage of suboverseer of laborers James Leghorn from $1.50 to $1.75.[120]

Some 14 months later, on May 30, 1857, Woodbury urged that Receiver of Materials Phillips' salary be increased from $60 to $75 per month and Overseer Leghorn's from $1.75 to $2 per diem. Since the volume of paperwork had been increased by the "New Regulations," Dr. Whitehurst had been snowed under preparing returns, and Phillips had been called on to assist him.

---

115. Floyd to Wright, April 1, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

116. Bacon & Abercrombie to Woodbury, January 10, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

117. Woodbury to De Russy, February 9, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

118. De Russy to Floyd, February 29, 1860, and Floyd to De Russy, March 30, 1860, NA, RG 77, Ltrs. Sent, Chief Engineer.

119. Bacon & Abercrombie to Woodbury, April 15, 1859, FRC, East Point, Ga., Fort Jefferson, Ltrs. Recd. Book.

120. Woodbury to Totten, March 31, 1856, and Totten to Woodbury, April 16, 1856, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Dr. Whitehurst doubled as physician and clerk.

The Department approved these pay raises to be retroactive to April 1.[121]

On September 30 Woodbury asked for and received authority to increase the workforce during the forthcoming season by two foremen of masons at $2.50 per day, one suboverseer at $2 and another at $1.80 per day, and an assistant receiver of materials at $2 per diem. These men, excepting the assistant receiver, were also allowed their rations.[122]

Dr. Whitehurst resigned in the autumn of 1859 to take employment under Captain Hunt at Fort Taylor. Woodbury's hopes of replacing Whitehurst with a person, who was both a physician and engineer, were disappointed. He accordingly sought and received permission from the Department to hire a physician for $125 per month and to increase George Phillips' pay from $75 to $100 per month. This was to compensate Phillips for shouldering Whitehurst's duties as clerk.[123]

Rates of pay were comparable with those paid elsewhere. Most of the whites, however, continued to be laid off during the sickly season, and there was no monetary incentive for workmen to exile themselves to the isolated subtropical Florida Reef. During the hot months, they were beset by swarms of insects, and the fear of fevers and dysentery were always with them. Inefficient personnel were an ever present problem. Good men were hard to find for work in the Tortugas.[124]

2. Rations and Recreation

The surrounding waters abounded in fish, turtles, and shrimp, and it required little effort to row over to Bird Key and gather eggs in season. But red meat seldom graced the table, and the barrels of salt beef and pork were not always of superior quality. In addition to salt meat, the usual rations included flour, beans, rice, molasses, sugar, potatoes, onions, grits, coffee, tea, turtles, and fish.[125]

Fresh vegetables were at a premium, and tiring of a fish diet, the workmen ate rancid meat, dessicated vegetables, and good and poor bread according to the ability of the incumbent baker. It was small wonder that Dr. Whitehurst called for arrow-root:

---

121. Woodbury to Totten, May 30, 1857, and Totten to Woodbury, June 16, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

122. Woodbury to Totten, September 30, 1857, and Totten to Woodbury, October 16, 1857, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

123. Woodbury to De Russy, November 9, and De Russy to Woodbury, November 15, 1859, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer. Dr. J.B. Holder was hired as surgeon to replace Whitehurst.

124. Mauncy, "Construction History of Fort Jefferson," pp. 70-1.

125. Fort Jefferson Materials Book (J-M92), 4th quarter, 1847, FRC, East Point, Ga., Fort Jefferson.

> To meet the character of those ailments, which have particularly occured sic among the laborers. Almost all of them, have their orgin in gastric derangement, and a light and nutritious diet, would more permanently ensure their return to health, than by suddenly placing the feeble and invalid on food of a more Solid Character. . . .[126]

White mechanics and laborers found recreation after work without difficulty. They played games; they cooled off by wading or swimming; and they fished from the wharves. The slaves needed little for amusement. Many of them, after the ten-hour day that prevailed six days a week, worked extra time on the project itself or fished, and with the extra money earned, bought confections. For an occasional frolic, slaveowners sent "delicacies," probably tobacco and rotgut liquor, and in lieu of vacations, occasional visits to Key West were permitted. The "boys" were usually allowed to have their wives, who did double duty as laundresses.[127]

3. Senator Mallory Pressures the Department to Make Full Use of Slave Labor

As work on the fort progressed, many Key Westers purchased slaves to realize income from their labor on the government projects. The reduction of the workforce, during the sickly seasons, threw a number of blacks out of employment and resulted in a loss to the slaveowners.

Consequently, during the winter of 1857-58, Senator Stephen R. Mallory of Florida protested to the Secretary of War about hiring practices at Fort Jefferson, which gave preference to Yankee artisans. When asked to comment on this, Captain Woodbury concurred with the Senator's views, as to the relative superiority of blacks over white laborers, when employed on projects in the subtropics. But, he cautioned, Mallory was mistaken as to the construction history of Fort Jefferson in the years since January 1856.

At the time Woodbury took charge, there were 40 slaves employed on Garden Key. Since then, he had gradually increased the number to 56. He had kept the slaves employed year around. None had been discharged without permitting the owners to replace them.

Where a project in the South consisted principally of masonry, it had to be carried on in the cooler months. His masons came from the North and, while they were delighted to work during the winter and spring, they were insistent on leaving the area before advent of the sickly season.

Woodbury was satisfied it would be poor policy to "keep any great number of Mechanics here during the Summer."

As long as appropriations were made annually, the slaves now employed

---

126. Whitehurst to Wright, September 7, 1847, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

127. Mauncy, "Construction History of Fort Jefferson," p. 67.

could be retained throughout the year. If the number of slaves were increased during the winter, it would be mandatory to pare the number during the summer. To this, the owners would object.[128]

Replying to Senator Mallory, the Department assured him that, in the hire of workmen, preference was to be given to those residing locally over those from another state. The annual program, hereinafter, was to be so structured as to neither compel a suspension of work during any part of the fiscal year for which the appropriation is made, nor to create a necessity for the discharge of the local force during that time.[129]

On January 16, 1860, the Department reminded Captain Woodbury of its commitment to Senator Mallory. He was to so arrange his operations as to enable the government to employ all the local labor force that may apply. He was to continue working these men to the end of Fiscal Year 1860, and, if possible, until a new appropriation became available.[130]

During the years before 1860, Key Westers were glad to have their blacks isolated at Fort Jefferson and removed from contact with northern visitors to Key West. For the same reason, they opposed black education--even reading and writing. As the decade of the 1850s drew to a close, the owners lived in fear of losing their chattels. The climax came in January 1860, with rumors of a mass escape from Fort Jefferson to Nassau. At the fort, itself, the whites were apprehensive. The black assistant to the smith was said to be making spearheads during his leisure hours. Nothing, however, came of these scares.[131]

---

128. Woodbury to Thayer, February 22, 1858, NA, RG 77, Ltrs. Recd., Chief Engineer; Joseph T. Durkin, Stephen R. Mallory: Confederate Navy Chief (Chapel Hill, 1954), pp. 95-6.

129. Wright to Woodbury, February 13, 1858, NA, RG 77, Ltrs. Sent, Chief Engineer.

130. Wright to Woodbury, January 16, 1860, NA, RG 77, Ltrs. Sent, Chief Engineer.

131. Manucy, "Construction History of Fort Jefferson," p. 73.

VIII. THE CIVIL WAR COMES TO THE FLORIDA REEF

A. Captain Meigs' Thirteen Exciting Weeks

1. New Superintending Engineer is Ordered to Fort Jefferson

A bitter feud between Secretary of War Floyd and Captain Montgomery C. Meigs was to benefit Captain Woodbury in his long struggle to secure a new duty station. On September 18, 1860, the Secretary issued orders removing Meigs as superintending engineer for construction of the Washington Aqueduct and repair of Fort Madison, and directing him to proceed as soon as possible to the Tortugas, and there assume charge of construction of Fort Jefferson. This order was delivered to Meigs on the morning of the 20th.[1]

Woodbury sympathized with Meigs. At Garden Key he had "enlivened the dignity of his leisure in scientific study, and improved the time by putting his theories of construction into black and white." In the months after Professor Jean L.R. Agassiz's 1858 visit, Woodbury had immersed himself in a study of the area's natural wonders. In 1859 he had sent a valuable collection of specimens to the Smithsonian Institution. He now wrote Meigs:

> Let me advise you to carry to Fort Jefferson all necessary microscopes & other instruments for investigating marine specimens. In that way only can you make your time pass pleasantly. You see I write as if you were to remain at Fort Jefferson some time. It would be a very pleasant service if you could manage like Captain Hunt to spend the summer north. . . .[2]

The new superintending engineer had been born in May 1816, in Augusta, Georgia. The family moved to Philadelphia, his mother's home, during Montgomery's childhood. He attended the University of Pennsylvania before securing an appointment to West Point from where he graduated as No. 5 in the Class of 1836. Commissioned a 2d lieutenant in the 1st Artillery, he was ordered to Fort Mifflin, Pennsylvania, as assistant engineer. He was engaged in surveying the upper Mississippi in 1837, when he was transferred to the Corps of Engineers. Meigs was posted at Fort Delaware as assistant engineer for construction of that fort, improvement of harbors in the Delaware River and Bay, and the Delaware Breakwater from 1837-39. He was on detail to the Board of Engineers for Atlantic Coast Defenses, 1839-41; and was superintending engineer for building of Fort Delaware in 1841 and of Fort Wayne, Michigan, 1841-49.

---

1. Russell F. Weigley, Quartermaster General of the Union Army: A Biography of M.C. Meigs (New York, 1959), pp. 102-08.

2. Woodbury to Meigs, September 28, 1860, FRC, East Point, Ga., Ltrs. Sent Book, Fort Jefferson.

During the next 11 years, he held these assignments: 1849-50, on special duty in the Engineer Bureau; 1850-52, superintending engineer for construction of Fort Montgomery, New York; 1852, superintending engineer for harbor improvements along the New Jersey shore and in Delaware Bay; and 1852-60 of devising and construction of the Washington Aqueduct, of the U.S. Capitol extension and dome, of the U.S. General Post Office extension, and of the repair of Fort Madison, Maryland.[3]

2. Meigs Reaches the Tortugas at a Critical Time

Captain Meigs, learning that most materials and supplies for the project were procured at Pensacola, was concerned because he had no acquaintance with the business community there. It would be helpful, he informed the Department for Captain Woodbury to accompany him on his initial trip to that city. After making necessary contracts, they would travel to Garden Key, where Woodbury could turn over to him responsibility for the public property and provide such technical data as necessary to enable Meigs to enter upon his new duties.[4]

Acting Chief Engineer De Russy, recognizing the merit in Meigs' proposal, gave it his blessing. Upon completion of this mission, Woodbury was to return to Washington and report to the Department for further orders.[5]

Meigs left Washington on October 22 and traveled southwestward by way of Lynchburg, Knoxville, Atlanta, Columbus, and Montgomery. After transacting their business at Pensacola, Meigs and Woodbury embarked in a mail steamer, which made stops at Apalachicola, St. Marks, Cedar Keys, and Tampa before arriving at Key West on November 7. The next day they reached Garden Key aboard Tortugus.

As the trip was made coincident with the momentious 1860 election, Meigs was distressed to encounter strong feelings of hostility toward the Union as far north as Lynchburg, Virginia, and his foreboding deepened on observing that the spirit of rebellion and disloyalty increased as the train chugged into the deep south. At Montgomery, resistance to the inauguration of the black Republican Abraham Lincoln, as President, was openly discussed. Becoming apprehensive, Meigs wrote General-in-Chief Winfield Scott, warning, "the temper of the South is excited--is dangerous." At every stop, he was told that the southern senators intended to resign "if Mr. Lincoln is elected."[6]

Upon disembarking at Key West, Meigs' anxiety increased, on hearing citizens contemplating the effect of a demand by Governor Madison Perry of Florida for the possession of the United States public works within the state.

---

3. Biographical Register, Vol. 1, pp. 495-96; Warner, Generals in Blue, pp. 318-19.

4. Meigs to De Russy, October 6, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

5. De Russy to Woodbury and Meigs, October 11, 1860, NA, RA 77, Ltrs. Sent, Chief Engineer.

6. The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies (70 vols. in 128 parts, Washington, 1882-1900), Series I, Vol. LII, part 1, pp. 3-4; Weigley, Quartermaster General, pp. 118-122.

His apprehension increased upon arriving at Fort Jefferson and finding the post with

> not a single gun, and I doubt whether among the seventy or eighty persons, white and black, employed or permitted on the island half a dozen fowling pieces could be found. The embrasures of the lower tier are ready for their guns. Magazines exist for ammunition. The walls are thirty feet in height, and the armament of the flanks by a few howitzers and the placing of one or two big guns on each curtain, with a proper supply of ammunition and small-arms, would enable a single company of artillery, with the aid of volunteers . . . to hold this extensive and important work.[7]

Concerned that Southern fire-eaters might carry out their threats, Meigs, in mid-November, warned Captain Thomas A. Craven, the officer in charge of the Key West Naval Station, that precautions must be taken to prevent seizure of Forts Jefferson and Taylor by people threatening secession. The latter was said to contain "considerable ammunition & guns," while the former was without armament.

If an attack came, Meigs believed it would be by a "small party of men anxious to embroil the different sections of the Union who might find a tempting bait in either of these important fortresses."[8]

Craven was cooperative, and Mohawk took station off Fort Jefferson and Wyandotte near Fort Taylor. Meigs expected the Buchanan administration to fume. So pusillanimous was the cabinet that with treason abroad in the land, it had not sent any instructions to its officers on the Gulf Frontier alerting them to measures to take to guard the public property.

At Key West, pro-secessionists had organized the "Island Guard" a militia force, some 100-strong. It drilled under the eyes of United States officers with ammunition borrowed from United States stores.

Captain Craven, in early December, received a message from Secretary of the Navy Isaac Toucey. The Secretary chided that he knew nothing to warrant Craven's presence at the Tortugas. He was to return forthwith to Key West.

Meanwhile, Meigs was anxiously awaiting an answer to his letter to General Scott. When none was forthcoming, he concluded that the War Department had rendered the general-in-chief helpless. But, he noted, his own and Craven's records were clean. "Personally," he wrote, "I think that the President ought to be impeached and convicted of treasonable weakness in leaving such temptations in the way of the excited and desperate of the South."[9]

---

7. Official Records, Series I, Vol. L11, Part 1, p. 4.

8. Meigs to Craven, November 15, 1860, NA, RG 77, Ltrs. Recd., Chief Engineer.

9. Weigley, Quartermaster General, pp. 122-23.

3. Meigs is a Man of Action

General Scott had been only too aware of the exposed condition of the Southern forts, and he had urged their reinforcement before receipt of Meigs' letter of November 10. But, until the end of December, the Buchanan administration hesitated to take any measures which might precipitate hostilities. The situation now changed decisively. Secretary of the Treasury Howell Cobb of Georgia resigned from the cabinet on the 9th, to be followed on the 29th by Secretary of War Floyd. The latter's departure swung the balance of power in the cabinet to the side of the strong Northern anti-secessionists whom Buchanan was bringing in to replace the departing Southerners. Joseph Holt replaced Floyd as Secretary of War. Between them, Secretary Holt and General Scott determined to reinforce selected Southern forts.

Florida having seceded on January 10, 1861, Captain Meigs had not been apprised of these developments. At the end of the second week of the new year, Meigs spent a day in Key West. While there, he learned from the crew of the steamer Crusader and newspapers that secessionist forces had seized the unoccupied coastal fortifications at New Orleans, Mobile, Pensacola, Savannah, and Charleston from the ordnance-sergeants. It was rumored by Key Westers that expeditions were being fitted out for the capture of the Florida Reef defenses.

To guard against this threat, Meigs had his workmen close up with brick and timber nearly 200 openings in the scarp wall (the first tier embrasures and the openings left for them on the second tier), take up several bridges giving easy access to the fort, put up a drawbridge and gate at the sally port, and bring "the work into a condition which would enable a small force with guns and supplies to hold it." Priority would next be given to making a number of the second tier arches bombproof, with bricks and other materials, to afford protection for the magazines and to shelter a garrison.[10]

If the War Department, in view of the Southerners' provocation, changed its policy, Meigs informed Acting Chief Engineer De Russy, a strong army and naval force based on Tortugas Harbor could "effectively close" the Gulf Coast ports of the rebellious states. But, unless Fort Jefferson was soon occupied by the United States in "proper force," he feared it would be "seized by the parties who have shown so much more energy and promptness than those who have controlled the Army and Navy of the United States."[11]

On January 17 the Monroe County Fishery Commission and sheriff visited the Dry Tortugas to collect from the fishing smacks license fees. Meigs deemed this to be an invasion of federal jurisdiction, and as commanding officer he considered it his duty to protect these craft from seizure or molestation. But, without men and guns, he was powerless. He accordingly called on Captain John M. Brannan, the Fort Taylor commander, for loan of six flanking

---

10. Meigs to De Russy, January 15, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. One opening, in addition to the sally port, was left in the scarp. This was on No. 2 front.

11. Ibid.

howitzers, an equal number of heavy casemate guns, and ammunition.[12]

4. Major Arnold and a Garrison Occupy the Fort

The next morning, the 18th, a large steamer was sighted approaching the Tortugas from the west and displaying no colors. There was much anxiety ashore, when she hove to off the reef and lowered a boat.

Captain Meigs was relieved to discover that the ship was the Joseph Whitney. Aboard were 66 officers and men of Company C, 2d U.S. Artillery, Brevet Major Lewis G. Arnold commanding. The artillerists had sailed from Boston on the 7th, and were under orders to occupy and garrison Fort Jefferson. Upon landing, Major Arnold assumed command of the fort. The small amount of ammunition brought along was stored in the recently bombproofed magazine, and the troops were housed in the frame structures erected on the parade as storehouses and quarters.[13]

Major Arnold agreed with Captain Meigs that, until guns were mounted in the bastions, the fort could not be held against a concerted attack. At the latter's suggestion, Arnold sent the steamer to Key West to secure from Captain Brannan the armament Meigs had previously called for. Meigs took passage on the vessel.[14]

5. The Fort Receives Its First Big Guns

Joseph Whitney docked at Key West on the 20th. Upon disembarking, Meigs was told that 500 men were said to have taken passage aboard the U.S. mail steamer Galveston at New Orleans. If these people planned to seize the Florida Reef forts, Meigs wrote Chief Engineer Totten, who had returned to duty on January 2, they will be "warmly welcomed if their appearance and conduct deserve it."[15]

When Galveston arrived on the 23d, Meigs was at the dock. Contrary to the stories, she had only a few passengers. The captain told Meigs that Governor Thomas O. Moore of Louisiana had offered to send 10,000 men to assist

---

12. Meigs to Brannan, January 17, 1861, found in O.R., Series I, Vol. Lll, Part 1, p. 6. Soon thereafter, Meigs discovered, to his embarassment, that the United States did not enjoy exclusive jurisdiction in the Tortugas, the state having reserved the right to serve judicial processes in certain instances. Meigs to Sheriff of Monroe County, January 21, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

13. Meigs to Totten, January 19, 1861, found in ibid., pp. 1-3. Arnold's troops brought with them from Boston two field guns.

14. Arnold to Adjutant General, January 23, 1861, found in O.R., Series I, Vol. I, p. 346.

15. Meigs to Totten, January 20, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

Florida State Troops to take possession of Forts Jefferson and Taylor, but when his ship sailed from New Orleans only a few made their appearance.

Upon relaying this news to the Department, Meigs requested that cannon and provisions be rushed to Fort Jefferson. There were, in addition to Major Arnold and his redlegs, about 75 workmen on Garden Key. Sufficient cannon and howitzers were needed to arm the lower tier.[16]

By nightfall on the 22d, a gang of blacks had embarked six 8-inch columbiads, their casemate carriages, two 6- and two 12-pounder field guns, 700 empty 8-inch shells, a large number of fixed projectiles for the 6-pounders, and a sling cart aboard Horace Beale. Next morning, Joseph Whitney took the brig in tow and, convoyed by the gunboat Crusader, stood out to sea. Dusk found the vessels safely anchored in Tortugas Harbor. Nearby the gunboat Mohawk rode at anchor.

Reporting to Major Arnold, Meigs recommended that one 8-inch columbiad be placed in "the first right-curtain on the right and left of bastions A, C, and E; and one flanking gun in the casemate next the curtains in each bastion." Arnold told him to proceed.[17]

The ordnance was landed and, assisted by the engineer employees, sailors from Mohawk, and two mules, the artillerists had mounted the six columbiads by the morning of the 25th. To emplace the big guns, it was necessary to cut holes through certain of the first tier casemate arches.[18]

On the 26th the artillerists fired one of the columbiads. The black powder, transferred from the Fort Taylor magazines, was caked, and a dozen friction primers were expended in getting off two rounds.

To guard against this situation, Captain Meigs recommended that all powder, friction primers, etc., intended for use on the Florida Reef forts be stored in naval metallic airtight containers.[19]

Meigs' letter was referred by the Department to Chief of Ordnance James W. Ripley.[20]

---

16. Meigs to Totten, January 23, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

17. Meigs to Totten and Meigs to Arnold, January 23, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer; O. R., Series I, Vol. 1, p. 346. At Meigs' request, Mohawk had sailed from Key West on the 20th. She had dropped anchor in Tortugas Harbor and was standing by to guard against an attempt by secessionists to seize the fort.

18. Meigs to Totten, January 25, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. As soon as the columbiads were mounted, the sailors were recalled and Mohawk returned to Key West.

19. Meigs to Totten, January 26, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

20. Totten to Meigs, February 11, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

In addition, the guns did not have locks. For accurate firing at a ship, Meigs reminded Chief Engineer Totten, port fires were as ridiculous as flintlocks in quail shooting.[21]

6. Department Commends Meigs' Zeal

Secretary Holt, General Scott, and Chief Engineer Totten were enthused to learn of Meigs' actions, and commended his "zeal, activity, intelligence and prudent forecast" that marked his actions during the crisis. Knowing how "totally unprovided" he was with arms and ammunition, they had been deeply concerned, even after Major Arnold's departure from Boston, that the secessionists might strike first. They had speculated on what measures Meigs would take for the work's security. They had been agreeably surprised by his enterprise in moving the columbiads from Fort Taylor and mounting them in the Fort Jefferson casemates.[22]

7. Meigs Recommends Several Structural Improvements

Apprising the Department of his activities, Meigs called for a first-class blacksmith, whose services were necessary in readying the first tier for receipt of the armament.

There were at present on the key, 168 persons, including women and children, and "850 days' supply of pure water at the Navy rates" were impounded in the parade cisterns. In addition, there was a large amount of water in the casemate cisterns. A number of the latter had never been made watertight, and the contents were brackish.

Upon surveying the 110 casemate cisterns, Meigs found that 52 had been finished, but none of these were "perfectly tight." Although all had been overflowing during the September rains, the "surface of the tightest had fallen 1½ ft. since by leakage." Moreover, the water in them was neither fit to drink nor cook with. Consequently, except for washing, it was of no use.

He accordingly recommended that the casemate cisterns be made independent of the fort's foundations. This could be accomplished by excavating the parade to a grade of 18 inches below low water mark, backfilling with clay puddle to low water, then filling up to within 1 foot of the parade level "with silicious sand from a freshwater region, with proper drains and pipes to lead the water to pumps."

This would provide a stratum of sand saturated with freshwater not liable to leakage. All water falling within the fort's magistral could then be collected in the casemate cisterns.[23]

---

21. Meigs to Totten, February 1, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

22. Totten to Meigs, January 31, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

23. Meigs to Totten, January 25 and 29, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

If the Ordnance Department shipped the 10-inch columbiads for the bastions' barbette tier, the Engineer Agency should send the traverse stones with them. They could, Meigs confided, be promptly positioned.

Consideration should also be given to covering the second tier arches with sand brought from the banks of one of the Everglades' navigable freshwater streams. Otherwise, precipitation reaching the cisterns would be rendered brackish by percolation through a fill of porous coral sand.[24]

Should he secure necessary pilings, Meigs proposed to commence construction of a concrete wharf upon which to position the iron crane acquired by Captain Wright for the project many years before. This would facilitate the landing of big guns and other heavy items.[25]

8. Meigs Further Strengthens the Fort's Armament

On February 2 the sloop-of-war Brooklyn hove to off Garden Key to land four mountain howitzers before proceeding to Fort Pickens with 85 men of the 1st U.S. Artillery under Captain Israel Vogdes. If the secessionists attempted to seize the three United States Florida forts still in the government's hands, there would be bloodshed.

Early in February the sloop-of-war Macedonian anchored in Tortugas Harbor, and Meigs asked the captain to loan the Army his ship's two 10-inch pivot guns to mount en barbette on two of the bastions. The naval officer, though sympathetic, replied that he could not spare such important elements of his sloop's armament.[26]

Rebuffed by the Navy, Meigs again turned to Captain Brannan, who agreed to release seven 8-inch columbiads mounted on Fort Taylor's waterfronts. To transport the guns, their carriages, and equipment, Meigs chartered the brig Alpine. A gale on February 4 delayed the departure of Meigs and his working party from the Tortugas until the 5th.

Writing the Department of his good fortune, Meigs reported that they needed more ammunition at Fort Jefferson, because the men were "new to their guns," and the ranges unknown to them. He hoped that they could be provided with sufficient shells, canister, and powder to permit "liberal practice to fix ranges & show the men the use & effect of their arms both in the Harbor and ditch."

---

24. Meigs to Totten, January 25, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

25. Ibid.

26. Meigs to Glynn and Meigs to Totten, January 30 and February 1, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. To facilitate communicating with ships, such as Macedonian, Meigs requisitioned from the New York Agency one of Captain Joseph Francis' metallic surf boats.

The addition of these guns; although "insignificant with needs," would enable the garrison, when properly schooled, to provide protection to the fleet, instead of looking to the Navy for its security.

All lower tier casemates, Meigs reminded Chief Engineer Totten, were ready for their armament, while one second tier embrasure had been completed, and embrasure irons for 19 more were on hand. Large caliber pivot guns could be promptly mounted on the barbette tier, provided they were supplied with timbers for platform and traverse irons.[27]

On the 9th Meigs returned to Garden Key with the cannon borrowed from Fort Taylor. Addition of these guns increased the heavy weaponry available for defense of Fort Jefferson to:

13	8-inch columbiads on casemate carriages; and
12	light flanking guns, viz., 3 6-pounder brass guns,
5	12-pounder brass howitzers, and
4	mountain howitzers.

Six of the light guns were mounted as flanking howitzers on crude casemate carriages. The remainder would soon be mounted in similar fashion.[28]

The Department, after studying Meigs' reports, advised him that Chief of Ordnance Ripley had been asked to ship to Garden Key a minimum of 36 8-inch columbiads, 36 24-pounder howitzers, and a corresponding number of casemate carriages. The Ordnance people were agreeable to sending these guns and carriages, along with a bonus--six 10-inch columbiads and their wooden platforms. The latter guns were to be mounted en barbette on the bastions.

Notifying Meigs of this, Chief Engineer Totten directed him, in anticipation of their delivery, to ready the parapets and terrepleins. A drawing of a wooden platform that would suffice for 8-and 10-inch columbiads was enclosed.

The howitzers, Totten continued, were to be mounted on ordinary flanking chassis, the traverse circles of which had a 12-foot radius, measuring from the centre of the pintle to the centre of the circle.

If Captain Meigs, in his requisitions on the New York Agency, had not specified the number of sets of circles for casemate guns, Totten believed 50 would be sufficient, because the number of guns of this type ordered to Garden Key would not exceed that total.[29]

---

27. Meigs to Totten, February 5, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

28. Meigs to Totten and Meigs to Arnold, February 9, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

29. Totten to Meigs, January 31 and February 11, 1861, and Totten to Gillmore, February 19, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

Totten, however, vetoed the proposal to complete the second tier embrasures, because it would be "injudicious" to do so while there was a continuation in the subsidence.[30]

9. Meigs Proposes Additional Defenses to Protect the Fleet Anchorage

Early in February, Meigs recommended that, to provide additional security for the anchorage, a small battery be established on Sand Key; a martello tower on the 16-foot shoal; and a battery on the point of the reef one and one-half miles west of Garden Key.[31]

10. Meigs Ends His Exile

On February 13, Meigs' four-month exile came to an abrupt end. The schooner Tortugas reached Garden Key bearing orders from the War Department for him to turn over his engineering responsibilities to Lieutenant Chauncey B. Reese, who had arrived from New Orleans the day before, and return to Washington at once to resume charge of the Aqueduct.

Two hours after receipt of these orders, Meigs was en route to La Habana, where he landed on the 14th. From Cuba, he sailed on the 15th for New York City aboard Quaker City.[32]

B. Morton's 12 Months on the Florida Reef

1. Morton Becomes Superintending Engineer

On February 21, 1861, Secretary of War Holt selected Lieutenant John St. C. Morton to replace Captain Meigs as superintending engineer at Fort Jefferson. Morton was born in Philadelphia in September 1826. A brilliant student, he entered the University of Pennsylvania at the age of 14, and, after four years there, was appointed to the U.S. Military Academy. He graduated from West Point as No. 2 in the Class of 1851.

Commissioned a 2d lieutenant in the Corps of Engineers, Morton was ordered to Charleston, as assistant engineer to Lieutenant Kurtz. In 1852 he was sent North to become assistant engineer for construction of Fort Delaware. He returned to West Point in September 1855 as assistant professor of engineering. The next year found him Lighthouse Engineer for the 3d District. In 1860 Morton served as engineer for the Chiriqui Expedition. Upon his November return from Central America, he was placed in charge of construction of the Washington Aqueduct.[33]

---

30. Totten to Meigs, February 14, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

31. Meigs to Totten, February 5, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

32. Meigs to Totten, February 14, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer; Weigley, Quartermaster General, pp. 128-29.

33. Cullum, Biographical Register, Vol. II, p. 279; Warner, Generals In Blu p. 336.

Morton, on reaching Garden Key, was to receive from Lieutenant Reese custody of the funds and public property. Operations at the fort were to be "carried on in strict conformity to plans and instructions heretofore communicated" to the engineer in charge. Lieutenant Reese was to remain as Morton's assistant.[34]

Morton experienced difficulty in securing the services of a competent clerk to accompany him to the Tortugas because of the low salary, $100 per month. To assist in recruiting a good man for this position, Morton asked for and received authority to boost the compensation to $125 per month. He also made arrangements to dispense with the draughtsman. This resulted in a $75 per month savings to the public.[35]

Because of the "peculiar circumstances" under which the project was being continued, Morton urged that Artificer J.A. Miller, a "competent and worthy" member of the Engineer Company, be detailed to accompany him. This request was sanctioned by the Adjutant General.[36]

These personnel problems solved, Morton and Miller booked passage on a packet. They landed at Key West at the beginning of the fourth week of March, 1861, but it was the 25th before they secured passage on a Tortugas-bound vessel.[37]

Six days later, on April 1, Morton relieved Lieutenant Reese of responsibility for the project. On doing so, he learned from Reese that the "appropriation owes money on bills and payrolls for as far back as least October, amounting to nearly the aggregate of the balance" turned over to him. Morton accordingly asked that the balance (about $21,400) be deposited to his credit.[38]

2. Secretary Cameron Rules Against the Engineers

On April 3 Post Commander Arnold, the garrison having been tripled by arrival of Companies L and M, 1st U.S. Artillery, from Texas, on March 24, called on Lieutenant Morton to erect temporary quarters for his troops and laundresses. He justified this request by citing General Order No. 4, March 1, 1860, to the effect that "all quarters for officers and soldiers at permanent fortifications will be estimated for and built by the Engineers Department."

---

34. Totten to Meigs and Morton, February 21, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

35. Morton to Totten, March 5, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

36. Morton to Totten, March 6, 1861, NA, RG 77, Ltrs. Recd., Chief Eningeer. Artificer Miller was on duty at the Washington Aqueduct.

37. Morton To Totten, March 25, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

38. Morton to Totten, April 1, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

These instructions, however, contravened the orders from the Department to disburse the appropriation "in strict conformity with the plans." Morton accordingly called on Chief Engineer Totten to "either authorize me to decline obeying orders that conflict with my duty . . . or relieve me of pecuniary responsibility incurred by obeying such orders."[39]

While awaiting a reply resolving this question, it was agreed that Morton would comply with Arnold's request, employing Quartermaster funds to defray all expenses incurred.

There would be, Morton feared, numerous trying jobs mandated by arrival of large numbers of troops, which would occupy the time of at least three mechanics. In view of the small balance remaining in the Fiscal Year 1861 appropriation, he did not deem it expedient to charge against it any expenses that did not belong to it. In addition, the post quartermaster was known to have about $8,000 available against which these expenditures could be debited.[40]

General Totten reassured Morton that he must apply appropriated funds to construction of the fort, being guided in such "application soley by the plans and instructions which have been, or may hereafter be communicated" from the Chief Engineer's office.

Should Post Commander Arnold order Morton to report to him, it would be Morton's duty to obey only inasmuch as he could without conflicting with the special duties to which he had been assigned. He would neither neglect nor exceed the Department's instructions, nor hazard his accountability to the Treasury Department for his disbursements.

If Major Arnold desired additional accommodations for his troops, not contemplated in the plans or instructions, the appropriation for fortifications could not pay for them. If Arnold provided funds for such purposes out of other appropriations and called for Morton's aid, Morton was to render all assistance in his power, consistent to the special nature of his assignment. Any temporary structures erected must not interfere with plans for the defense in any particular relating to its efficiency.[41]

Major Arnold did not agree with this interpretation. He reiterated that materials and labor for construction of batteries on adjacent keys and for erection of temporary quarters were to be charged against the Fort Jefferson appropriation.[42]

---

39. Morton to Totten, April 3, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

40. Ibid.

41. Totten to Morton, April 12, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

42. Blunt to Morton, April 29, 1861, and Morton to Totten, May 5, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. M.M. Blunt was post adjutant.

The dispute was referred to Secretary of War Simon Cameron by Major Arnold, and he ruled against the Corps of Engineers. Morton would employ funds appropriated for Fort Jefferson to provide temporary quarters for the troops.

When he relayed this information to Superintending Engineer Morton, General Totten was unable to provide guidelines on the extent this can be done "consistently with operations, indispensable to the efficiency and defences of the fort." The degree was to be left to Morton's judgment, after conferring with Major Arnold. Totten was certain that Arnold could see that the safety of the post "may depend on getting up, as soon as possible, the upper tier of guns, and on securing an abundance of good water." Temporary barbette platforms, in Totten's opinion, were indispensable.[43]

To centralized authority, it was now decided by the War Department that hereinafter Major Arnold would give Morton no instructions involving disbursements. Such orders were to emanate from Colonel Harvey Brown, the officer commanding the Department of Florida.[44]

3. Thomas Jekyll is Hired as a Draftsman

Lieutenant Reese's April 16 transfer to Fort Pickens left Morton without an assistant. Neither did he have a draftsman. Satisfied that there would be much work for a draftsman in the months ahead, Morton, in late July, suggested that the Department employ Thomas Jekyll of the District of Columbia in this capacity and send him to Fort Jefferson.[45]

General Totten was sympathetic with Morton's needs, and authorized Jekyll's hire for the position at a salary of $125 per month.[46]

4. Morton Secures a 90-Day Leave

Meanwhile, the Confederates had bombarded Fort Sumter into surrender, and President Lincoln, on April 15, had called for 75,000 volunteers. The time for compromise had passed, and the North and South rushed to resolve their long-standing differences on the battlefield.

Eleven months in the subtropics, aggravated by wartime stresses, took their toll on Captain Morton's constitution. Consequently, on March 5, 1862, he submitted to the Department a surgeon's certificate attesting to his ill-health, brought on by several attacks of Charges fever, and requested a

---

43. Totten to Morton, May 2, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

44. Morton to Totten, May 24, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. Colonel Brown was headquartered at Fort Pickens.

45. Morton to Totten, July 30, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. Jekyll had served with Morton on the Chiriqui Expedition.

46. Morton to Kurtz, September 19, 1861, and Totten to Morton, September 2 and 7, October 1, 1861, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

three-month leave to visit the northern states. While he was absent, his clerk, Francis Pearsall, could manage the project. Or if the Department preferred, it could be overseen by Lieutenant Walter McFarland, the superintending engineer at Fort Taylor.[47]

The Department approved a 90-day leave for Morton. Before departing from the Florida Reef on March 22, Morton transferred responsibility for the papers, funds, and public property belonging to the project to Lieutenant McFarland. Until Morton's return, McFarland was to wear two hats.[48]

Morton reached his home in Germantown, Pennsylvania, on April 2. Soon thereafter, he learned that he would not be returning to Garden Key, because, on the 22d, the Department issued orders designating him superintending engineer at Fort Mifflin.[49]

C. Planning, Funding, and Programming

1. Fiscal Year 1862 Program

Although seven states, including Florida, had seceded, the 2d Session of the 36th Congress, by an act signed into law by President Buchanan on March 2, 1861, appropriated $75,000 for construction at Fort Jefferson in Fiscal Year 1862. Lieutenant Morton was called upon by the Department to submit for approval a program for expenditure of this sum. As heretofore, sufficient monies were to be reserved to provide for security of the public property in the year ending June 30, 1863.[50]

Morton wisely pocketed this correspondence until after he had reached Garden Key and had discussed the situation with Major Arnold. On doing so, he informed the Department that the new appropriation would be employed on the parapets and terreplein, the permanent barracks, and to make the cisterns watertight. Major Arnold had concurred in these priorities, which were "calculated to put the Fort promptly in a highly defensive and sanitary condition."[51]

Morton also asked to have these funds made available for immediate expenditure. By doing so, two months' time would be gained, during a season favorable to hard labor.[52]

---

47. Morton to Totten, March 5, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer. Morton had been promoted to captain on August 16, 1861. On March 10, 1862, McFarland had relieved Captain Hunt as superintending engineer at Fort Taylor.

48. Totten to Morton and McFarland, March 27, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

49. Morton to Totten, April 2, and Totten to Morton, April 22, 1862, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

50. Totten to Morton, March 9, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

51. Morton to Totten, April 6, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

52. Ibid.

Chief Engineer Totten cautioned that Morton was to apply the appropriation to construction of the fort.[53] Morton accordingly modified his program. He, subject to the Department's approval, would employ the $75,000 on construction of the parapets and terreplein and to begin work on the barracks and quarters.[54]

General Totten, upon reviewing the program, held that priority should be given to the features heretofore specified. When Morton wrote of beginning construction of permanent barracks and quarters, Totten presumed he meant those for which plans had been forwarded to Captain Wright many years before. Should any modifications be contemplated, Morton was to transmit them to Washington for approval. Totten would consider changes aimed at providing better accommodations for the troops, as long as they did not increase costs. One alteration could be made, however, which would add to the expense. This involved substitution of iron for wooden floor joists. These were to support floors of 1-1/4 inch pine upon 1-1/4 inch battens, positioned on arches and levelling concrete.

All stairways in the barracks and quarters were to be iron.

It would be advantageous to make the interior walls hollow. Brick furring would not suffice. At subtropical posts, Totten noted, "even the inner walls and those next the chimney flues, reek with water," where plaster is upon brick. Vertical furring strips of 1/2 inch were thick enough to receive the lathes, but there must be free circulation between the plaster and wall. There must also be free communication between the battens of the floor below the vertical strips, up the sides of the rooms and out to the exterior or into the ceiling, as circumstances warranted. The only exceptions as to wooden furrings would be in the kitchens and on the intradoes of the ceiling arches. On the latter, plaster was to be spread upon the brick voussoirs.

Wooden floors laid on battens must be put down independent of the side furrings, so they could be taken up without disturbing the latter.[55]

2. $100,000 Windfall

Construction funds for Fort Jefferson received a windfall in June, when Secretary of War Cameron reprogrammed $100,000 appropriated for work on coastal forts seized by secessionist forces to the defenses of Garden Key. This boosted monies on hand in the Treasury earmarked for Fort Jefferson to $165,000. Of this sum, $20,000 had been deposited to Morton's credit with the Assistant Treasurer in New York City.[56]

---

53. Totten to Morton, April 12, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

54. Morton to Totten, April 17, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

55. Totten to Morton, May 24, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

56. Totten to Morton, June 18, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

3. 1st Session of the 37th Congress Appropriates $100,000 for Fort Jefferson

The 1st Session of the 37th Congress, which convened in Washington on June 23, enacted legislation "making additional Appropriations for Support of the Army" for Fiscal Year 1862, and "Appropriations of Arrearages" for the year ending June 30, 1861. To be included in this bill, signed into law by President Lincoln on July 17, was $100,000 for Fort Jefferson.[57]

4. Bleak Financial Outlook Threatens to Shut Down the Project

On December 7, 1861, General Totten wrote Superintending Engineer Morton that spending was to be continued at the present rate for as long as current funding permitted.

The Department had asked Congress for a $200,000 appropriation for Fort Jefferson in Fiscal Year 1863, and there was every expectation that it would be granted. Once Congress had acted and President Lincoln had signed the measure into law, the Secretary of War would ask for authority to obligate the money immediately, so there would be no interruption in the project.

Captain Morton was to advise the Department as to how long existing appropriations would enable him to push ahead without reducing his force. Also desired was information on what he hoped to accomplish with these means beyond completion of the terreplein, parapets, and magazines. Morton would inform the Department of the monies, beyond those already available, necessary to complete the fort. He was to list separately the gross amounts for quarters, barracks, parade magazines, storehouses, and completion of the second tier.[58]

Reviewing his files, Morton reported that:

to complete the terreplein and parapets, in all respects, beyond the current monies	$100,000.00
to complete officers' quarters No. 1	114,101.91
to build officers' quarters No. 2	154,500.00
to build barracks	116,141,50
to complete 2d tier	258,615.00
to build Navy storehouse	66,760.00
to build 4 parade magazines ($24,831.34 each)	99,325.00
total	$809,743.41
to construct permanent wharf, and railway	$1,000,000.00[59]

57. George P. Sanger (editor), The Statutes at Large, Treaties, and Proclamations, of the United States of America from December 5, 1859, to March 3, 1863. . . (Boston, 1863), Vol. XII, pp. 261-64.

58. Totten to Morton, December 7, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

59. Morton to Totten, January 4, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

At the time of receipt of Totten's letter, Morton continued, no permanent barbette tier platforms had been built, the cutstone for their construction having only recently been received. The curtain and barbette magazines were unfinished, and construction of the parade magazines and shot furnaces had not been started. The sally port gates had no bolts, while the 42-pounders, listed as mounted, were en barbette, because there were no casemate carriages.

Now, to add to the danger, the Trent Affair had pushed the North to the brink of war with Great Britain.[60]

Until recently, Morton wrote, he had predicated his program and expenditures on an assumed budget of $267,275, a figure which included the $100,000 appropriated by Congress for Fort Jefferson on July 17. This comprehended an expenditure of about $25,000 per month and would fund the project through mid-March. Now, he had heard that the $100,000 had been withdrawn. If true, Fort Jefferson was in debt about $60,000.

If he were to suspend construction until Congress made an appropriation, he would lose at least 60 working days, because his hands could not go home and return in less time. Moreover, these two months were critical, for work was now at a stage where nearly every day would see completion of another barbette tier platform. To shut down the project, Morton warned, was to imperil Fort Jefferson, "when its prosecution would speedily render it impregnable."[61]

The Department, General Totten reassured Morton, "fully appreciates the delicacy and responsibility of your position in reference to the insufficiency of existing means necessary for the energetic and continued prosecution of your work." Considering the circumstances by which Morton was surrounded, Totten approved his determination to push ahead until instructed otherwise.

In view of the "great importance" of Fort Jefferson being placed in a "condition of strong defence at the earliest practicable time," Totten urged Morton to continue his current rate of expenditures, even if it meant a delay in meeting contractural obligations. No probable inconvenience to citizens could be allowed to "weigh against the heavy national disaster which might occur if we were now to pause in our labors there."[62]

Acknowledging the Chief Engineer's letter, Morton announced that his workmen were employed on the terreplein, and the foundations of the barracks and one of the parade magazines.

Although he could get along without funds for several months, the public interest would be furthered by providing money with which to pay the hands

---

60. Morton to Totten, December 31, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

61. Ibid.

62. Totten to Morton, January 29, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

regularly. Their last payday had been for December, and his balance was nearly exhausted. If the Department could fill a $30,000 requisition to cover the rolls for January through March, it would be good for the men's morale.[63]

5. Eleventh Hour Reprieve

The "Fortifications Bill," funding construction in Fiscal Year 1863, although passed by the House, encountered a legislative logjam in the Senate. As the end of the first week of February approached, General Totten began to fret. He feared that action would be so delayed that it would be impossible for Captain Morton to continue operations beyond those already authorized. To make matters more embarrassing, there was reason to apprehend that, even if it passed, the Treasury would be in no condition to meet any requisitions until further ways and means were provided by Congress.

The Treasury Note Bill, pending in the House's Committee of the Whole, would, the Department hoped, provide ample means to meet its obligations during the remainder of Fiscal Year 1862. But progress was snail-like, and Totten feared there would be no relief from this source before March 1.[64]

Although he sat on this bleak news, Morton would have to release it on the 28th. He, however, felt confident of retaining about 200 of the 275 employees, on the understanding that they must wait for their pay till it is "convenient . . . for the Treasury to afford it." Materials had been stockpiled for completion of the terreplein and parapets.[65]

Unknown to Morton, the Senate completed work on the "Fortifications Bill" on the third of February, and President Lincoln signed it into law on the 20th. Notifying Captain Morton of this, General Totten reported that it appropriated $100,000 for Fort Jefferson in Fiscal Year 1862 and $200,000 in Fiscal Year 1863. The former sum would cover the monies appropriated in July 1861 and then withdrawn. In accordance with procedures, Morton was to prepare and submit for approval a program for expenditure of this money.[66]

Before receipt of this communication, Captain Morton went North on sick leave. Although he continued to receive instructions from the Department pertaining to Fort Jefferson until he reported to Major General Don C. Buell at Corinth, Mississippi, on June 7, Morton neglected to prepare and submit for review the called for program. Neither did his successor, Lieutenant

---

63. Morton to Totten, February 16, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

64. Totten to Morton, February 6, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

65. Morton to Totten, February 25, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

66. Totten to Morton, February 22, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

William McFarland. Since the meticulous General Totten did not repeat his request, this is an indication that old age and infirmities were beginning to take their toll.[67]

D. Totten's New Instructions for "Arranging" the Barbette Tier

1. Generalizations

On May 24, 1861, General Totten mailed to Lieutenant Morton drawings and instructions for arranging the barbette tier. He called attention to several changes in the "principal dimensions and references."

The general profile had been altered by raising the cover line 6 inches, and giving the superior slope a fall of but 18 inches on all parapets, the thickness being left as heretofore. Gun recesses and positions of centres of horizontal motion were adapted to the modern wrought iron gun carriages. Most of the pieces would traverse about pintle centres at the front transome. Only those guns in the bastion salients were to traverse around pintles fixed to the middle of the transome.

It was understood in Washington that several 10-inch columbiads may have been mounted on wooden platforms. If so, they were to remain until the other barbette platforms were finished, and then the permanent centres and circles were to be laid on the bastions.[68]

2. Changes in Details of the Curtain Platforms

Totten called attention to drawing No. 50, and the details of the curtain platforms, traverse circles, and banquettes for barbette guns. The pintle stones were to be footed in the concrete of the arch cap. Their surrounding mass of concrete was "to rise out of the surface," as detailed on sheet No. 42, but not disturb those surfaces, except for the space actually covered.

The vertical pintle stone and horizontal backing stone were to be of the form and dimensions heretofore employed under similar circumstances. Specifics were found in Details of Barbette and Columbiad Platforms. All platforms, except the six on the bastions, were to be identical.[69]

3. Changes in Details of Bastion Breast-Height Walls

Lack of time had precluded including on sheet No. 50 details of the 10-inch columbiad platforms in the bastion salient angles. Construction of temporary platforms in these areas had momentarily solved this problem.

---

67. Register of Letters Recd., January 1, 1862-August 31, 1863, NA, RG 77.

68. Totten to Morton, May 24, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

69. Ibid. Copies of these plans are on file at Everglades National Park.

But it would be necessary for Morton to know the horizontal trace of the breast-height wall, which was given on this sheet. This wall was to have a polygonal form at the salient, not circular as previously depicted. The centre of motion of the gun was to be 8'3" from the breast-height wall of the salient pan coupe, measured on the capital, and be 9 feet from the breast-height walls on the flanks of the bastion.[70]

4. Substituting Brick for Stone in the Cordon and Coping

If cordon stone had not been ordered, a brick cordon was to be substituted. Totten also trusted that the "higher projecting coping stone . . . . surmounting the exterior crest of the parapet" had not been called for, or if it had the requisition could be countermanded. This would enable Morton to substitute the detailed brick arrangement, which must be laid without any cutting of bricks, and would be much cheaper.[71]

5. Traverse Magazines

Drawing No. 50, detailing positions of the barbette guns on one bastion and the adjoining curtains, would answer for all corresponding parts of the fort. Morton's attention was called to the positions of the permanent traverses, which were to double as service magazines for the barbette tier. The two short fronts were to have two of these on each curtain, and the four long fronts were to have three on each curtain. The middle traverse was to be above the middle casemate of the curtain. Such an arrangement gave 16 traverses, each containing a small magazine and a bombproof passage. Sheet No. 49 detailed these magazines.

In front of these magazines, the scarp retained its full thickness up to the crest. The arches, 2 bricks thick, over the magazine and gallery were to be covered with a thick mass of concrete, and be surmounted by a layer of "marly earth" from the ditches. Upon the former would be placed a "light slate or galvanized iron roof." This roof would negate necessity of covering the casemate area below with mastic, except in the narrow portion under the traverse passage.[72]

6. Outlets Through the Breast-Height Wall

The enclosed drawings and those to be sent would explain how the casemate roof surfaces were to be formed, to secure a "free discharge of rain water." Sheet No. 50 detailed the trace of the breast-height wall, which was to rise from the roof surface. Between this wall and the scarp, no mastic was to be applied. An outlet would be perforated through the breast-

---

70. Ibid.

71. Ibid.

72. Ibid. A copy of sheet No. 49, "Plan, Sections, etc., Barbette Magazine-Traverse" is on file at Everglades National Park.

height wall along the gutter to permit water to escape, if any seeped through the layer of mastic to be placed below the superior slope.[73]

7. Keeping the Cisterns Watertight in View of the Increased Overburden

The "most necessary work," Totten observed, was completing the scarp and parapet, including the breast-height wall. This would throw a heavy weight on the scarp foundations, which were without a grillage. Any subsidence of these foundations must affect the cisterns.[74]

Morton was to give attention to making watertight such of the cisterns as were leaking. How far the increased load, necessary to put upon the scarp, might disturb repairs of this nature was a subject that must be considered. Chief Engineer Totten, however, trusted that Morton could handle both operations simultaneously with slight risk of having to repeat repair of the cisterns.[75]

8. Revetting the Breast-Height Wall

General Totten next described the mode to be followed in revetting the breast-height wall. After the subject wall had been raised to within 18 inches of its crest, and the top sloped away in a plane passing under the upper member of the scarp, i.e., about 1-foot below the exterior crest, a sheet of mastic laid in the best manner would be applied. It was to cover the entire surface, including the top of the breast-height wall and scarp. The earth between, to prevent any shrinkage of the mass, was to be rammed in successive horizontal 6-inch layers.

A course of brick headers would be laid on the breast-height wall, with their ends projecting inward 1-1/2-inches. Each brick, as it was about to be laid, would have its bed smeared with pure bitumen. The vertical joints intervening were to be well filled and pointed with cement mortar. Upon this course of brick would be placed on edge, pieces of flagstone, 2 to 2-1/2-inches thick, 15-inches wide, and as long as the "particular face of the wall they were to surmount." These slates were to either stand vertically, or perferrably be so inclined as to be at right angles to the parapet's superior slope.

To retain them in place, a clasp was to be placed at each angle, several rods passed through the clasp, and hooked over a 12" by 5-3/4" plate, standing nearly vertically and kept in position by well-rammed earth between it and the flagging stones. The rods and cast iron plates were to be identical for all parts of the parapet. The cast iron clasps were to be either concave or convex, and except for a few were to have a common pattern. Some exceptional clasps were to be cast "to suit certain salient and re-entering angles of the bastions." These pieces of iron, whether cast or wrought, were to be

---

73. Ibid.

74. Ibid.

75. Ibid.

galvanized. Just before being positioned, they were to be heated and smeared with hot bitumen.[76]

The joint between the flagging, "while close above, must, below the upper hole of the clasp, be as wide as the diameter of the rods (3/4") so that any flagging stone may be lifted vertically out of place, without disturbing the clasps."

If the flagging did not reach the Tortugas in time, the slopes must be faced with boards, employing the aforementioned irons.[77]

9. Forming the Surmounting Blocks

The "surmounting member of the scarp," about a foot high and one brick thick, was to be laid in separate blocks, not to exceed 3 or 4 feet in length. A block being laid, "a sheet of the proper shape and size, consisting of the thickness of cotton bagging, thoroughly saturated (but not dripping) with hot pure bitumen will be placed against the ends of the block, the adjoining bricks of the next block, as laid, being pressed against it, without any intervening mortar." This would provide a tight joint between blocks, while permitting contraction and expansion dictated by changes in temperature. The lower course of bricks in each unit would be headers, without mortar in the vertical joints, permitting water to pass through. Upon these bricks, the other courses would be laid in high-grade cement mortar.[78]

10. Providing for Drainage and Unequal Subsidence

Reviewing a tracing giving details of the manner of preparing roof surfaces for the free discharge of water mailed by Colonel De Russy to Captain Woodbury in June 1859, during his absence, General Totten found several features which must be changed. Writing Lieutenant Morton, he noted that the foundations of the breast-height wall were to be concrete, not brick, except on the side toward the parade. Where brick, they were to be about 6 courses in height, the courses laid parallel to the roof surfaces, to secure good joints for insertion of mastic and lead flashings. Similarly, there were to be some brick facing courses in the foundations of the gun centers, so that the flashing could be carried around the concrete masses. The inside of the parade wall, "being faced generally with concrete, instead of bricks, must have a few courses of bricks at the bottom for the same purpose."

A small addition of concrete was necessary in the bottom of the valleys that formed the roof surface. This was to raise the small conduit, which

---

76. Ibid. For details of the "Iron Clasps, Rods and Plates for Breast-High Slopes," a sketch on file at Everglades National Park should be consulted.

77. Ibid.

78. Ibid.

passed through the foundation of the breast-height wall, enough for the discharge to pass above the small 6-or 12-inch slope.[79]

Because it was probable there would be a difference of settlement in the upper concrete and brickwork, whether it rested on arches or piers, Totten believed safety would be enhanced by separating the mass of the breast-height wall and platform foundations by vertical joints, from the foundations of the breast-height wall to the right and left. The latter was deemed to be resting entirely on the piers. Without this precaution, there would be an irregular break, difficult to close. Morton was to build the central mass first, and then the others resting against it.[80]

11. Banquettes and Traverse Circles

The principle of dividing the range of brickwork that was to serve as coping would be applied to the "small brick revetment walls" of the banquette, and the mass surrounding the pintle centres.

To keep rain water from flowing against the inner (concave) side of the traverse circles, a gentle plane was to rise from the surface of the terreplein up against these circles. There was to be a plane on each side of the directrix.

The iron traverse circles of the curtain guns were to have their ends turned up about 3 inches, to keep the chassis from running off the circle.[81]

12. Changes to Coping of Circular Stairway Tower Walls and Addition of a "Drip"

General Totten was obliged to alter the coping of the circular stairway walls, on the side next the terreplein. This change was detailed on Section 3-4, Drawing No. 50.

Although the drawings did not provide details, there was to be a "drip on the under side of projecting" stone copings.[82]

13. Composition of Terreplein Surface

The terreplein surface, Chief Engineer Totten noted, was to be earth, screened to a depth of 2 feet of all "lumps of rock or coral."[83]

---

79. Totten to Morton, May 24, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

80. Ibid.

81. Ibid.

82. Ibid.

83. Ibid.

14. Details of Bastion Roof Surfaces and Drainage

On June 10, 1861, the Department mailed Lieutenant Morton sheet No. 51, depicting "Plans & Sections Giving Details of Roof-Drainage, Barbette Platform, etc., of the Bastions." These were to supercede drawings heretofore sent focusing on these features. A copy of the subject drawing is on file at Everglades National Park.

The roof surfaces, as Morton would see, were generally unaltered. One change involved a decision not to place the layer of mastic "immediately on the roof surface," but near the top of the parapet. A considerable modification of the roof had been made under the columbiad platform and its breast-height walls.

Some joints of the roof discharge required "castings of a peculiar form." The adjustment and protection of these required special attention, because they would be difficult of access, and liable to "disarrangement by irregularity of settlement."

The bastion manholes were to be cylindrical, the one next the platform of the columbiad in four of the six bastions being brought up to the terreplein by the side of the breast-height foundation.

Although not detailed, it was understood that, in the small arches turned over the main roof gutters, the 2 lower courses of brick on each side were to be laid without mortar. Other bricks in the arch were to be positioned with mortar only on their beds. Side joints were to be without mortar, to allow water to pass freely. The bricks were to touch each other.

The mode of holding up the flagging used on the revetment of the breast-height slope would, in part, be similar to that employed elsewhere, i.e., by iron clamps. Where the slates abutted against chimney tops, Morton was to build into the bricks of the chimneys pieces of galvanized iron of appropriate form, to keep the revetting stone in place, and at the same time permit them to be withdrawn.

For greater security in areas liable to unequal settlement, Morton, after adjusting the surface at and around the upper mouth of the iron conduit pipes, would mould thereon a large piece of heavy sheet lead, spreading it upward for 18 inches and making its lip overhang, loosely by 3 or 4 inches, the top of the pipe. The mastic covering was to be "fitted down" on this piece of lead, as it would be upon concrete, provided the lead was not present.

In some cases, an additional vertical pipe was to be placed over the upper mouth at the roof surface of the main conduit, and be carried up nearly to the superior slope of the parapet. It was to be covered there tightly by a piece of flagging. The broad bottom flange of these "higher pipes," resting on a corresponding top flange of the lower pipe, would be traversed by numerous radial gutters about 1-inch high, to permit water to pass freely between the flanges from the roof surfaces.

As lead was "destroyed by contact with lime in mortar, the concrete surface, where the lead was to be, should first be paved with bitumen."[84]

15. Blind Embrasures

Blind embrasures would be built in the bastions, one over each flank embrasure and another over each pan-coupe embrasure at the salient. Bastion F, not being truncated at the salient, would have blind embrasures only on the flanks.[85]

16. Details of Columbiad Platforms

Drawing No. 51 also detailed the columbiad platforms. The elevation of the larger iron circles was 4' 1" below the plane of the crest of the parapet, while the plane of the lower step was 5' 6" below. The surrounding terreplein surface lay in an inclined plane that, at the breast-height wall of the pan-coupe, was 6' 3" below the plane of the crest, and on a line tangent to the lower step at the inner end of a diameter that corresponded with the capital of the bastion and was 6' 6" below the same plane. The surrounding terreplein surface was to be concrete brought up with the mass of the platform from reference (38' 3"). It would be covered with mastic, as would the concrete surfaces of the platform above.

All vertical joints in the platform, between blocks, whether of brick-work or stone, were to be filled with sheets (2 or 3 thicknesses) of coarse bagging supersaturated with bitumen.[86]

Certain errors had been introduced into sheet No. 50, because of the hurry to get it in the mail. Calling these to Lieutenant Morton's attention, General Totten noted that the pintle stone and traverse circle should be 62 inches, not 61 inches, below the plane of the crest.[87]

17. Loading Recesses

Since the "general introduction" of shellguns into the seacoast batteries, it had become mandatory for inclusion of a "place of safety," near barbette cannon, for loaded shells. Featured on sheet No. 51 were details of small recesses to be formed in the parapet for that purpose. One of these was to be sited between the 1st and 2d guns on the curtain, counting from an angle of the flank, and others between each ensuing pair.

At each, a cut 2' 6" in the clear was to be made through the banquette; descending by 3 steps of 9 inches each to the floor of a recess at reference (36).

---

84. Totten to Morton, June 10, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

85. Ibid.

86. Ibid.

87. Ibid.

A plate of cast iron, inserted in the breast-height wall, was to cover part of this doorway, while the part over the steps would be closed by a wooden doorway, in two leaves, hinged to stone jambs. A piece of stone flagging was to close the passage on the side next the traverse circles. A cast iron lintel would project slightly beyond the face of the breast-height wall to sustain the upper edge of the wooden shutters.

The recess proper, faced within by bricks, would be 5' long, 2' 6" wide, 3' 9" high to the impost of the covering arch, and 4' 9" to the key. The walls of the recess, including the thin brick facing, were to be 2' 6" thick and the concrete roof 2' 6" thick at the top, including the arch. The recess was to be floored with flagging, sloping slightly downward to the middle, to carry off any condensation through a narrow opening into the drainpipe beneath. The steps were to be formed of flagging resting on bricks.

Similar recesses were to be formed behind each angle of the flank in each bastion.[88]

18. Peculiarities Found in the Roof Surfaces of Bastion F

Bastion F's barbette tier had several peculiarities--the roof drainage near the salient was different, while the manhole was behind the platform.[89]

19. Changes Mandated by the Ordnance People

A recent change by the Ordnance Department in the columbiad barbette carriages mandated that the platform plate be raised 2-1/2 inches and the traverse circle be depressed 6 inches. No change was programmed for the chassis' horizontal projection. Consequently, no platform stones were to be ordered from the New York Agency, until such time as Lieutenant Morton was supplied by the Department with a sketch delineating the modifications.[90]

This information reached Morton too late, because he had already mailed to the Agency drawings and specifications for the bastions' center-pintle platforms.[91]

The Department accordingly mailed to the New York Agency a tracing showing the arrangement and dimensions of the front-pintle traverse stones of the barbette tier. The number of positions was 106, of which 62 were to have traverse stones like C (guns adjacent); 16 were to have traverse stones like B (a traverse on the right); 16 were to have traverse stones like B but reversed

---

88. Ibid.

89. Ibid.

90. Totten to Morton, July 6, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

91. Morton to Totten, July 30, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

(a traverse on the left); 6 were to have traverse stones like A (a bastion on the left); and 6 were to have traverse stones like A but reversed (a bastion on the right).

These 106 centres were for the curtains because the six bastions were to mount centre-pintle guns.[92]

E. Plans and Instructions for Building Detached Parade Magazines

1. Grillages and Foundations (General)

Early in December 1861, Chief Engineer Totten notified Captain Morton that among the most important structures remaining to be erected were the large parade magazines. Work on one of these should be commenced immediately. Drawings of these magazines and their grillages would be forthcoming.[93]

Some four weeks later, on January 6, the Department transmitted to Morton plans of the grillage to be positioned under one of the parade magazines, along with a site plan of their location. As he would see, the walls and piers were to be founded on a "wide-spread grillage."

Lumber recently ordered for the barracks floors was to be diverted to the grillage. If the joists were smaller than the 12 by 6s, shown on the sketch, they must be positioned closer together. The underlying planking could be as thin as 2 inches.

Morton was cautioned that particular attention must be given to levelling the ground for reception of the layer of planks. Sand was to be used, if necessary, to even the surface. No less pains were to be given to securing the bearings of the timbers upon every plank they crossed.

The top of the grillage was to be at reference (o). On this and between the timbers was to be poured concrete, rising with sloping sides, to reference (3). The foundations of the piers and porch walls were to be laid thereon, and carried up, still sloping with the general masses, to reference (6). These masses would constitute a strip of flagging (2' 6" long by 1' 6" wide) lying under the superstructure. Special attention would be given to embedding the flagging, so it would not crack for want of support.

Several ventilators were to be formed in the masses, as well as two thin interior partition wall foundations. The latter were to be raised to reference (3) before receiving a 1-1/2-brick wall.

After the foundations were finished, sand would be returned to the interior space till it reached reference (2' 9"). This sand would be capped with 3 inches of well rammed concrete. The top of the latter would be the bottom of the cellar.

---

92. Totten to Gillmore, September 24, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

93. Totten to Morton, Dec. 7, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

The thin interior foundation wall of 1-1/2 bricks would be surmounted by a layer of flagging 12" by 3" by 4", its top being at reference (6). This flagging would underlay the exterior and interior of the magazine walls.

All flagging edges were to be broken straight.

The reference (3) had been taken as the bottom of the cellar, on supposition that tidal waters would not reach that height. If otherwise, the cellar must have less depth.[94]

General Totten was satisfied that, because of subsidence, all Garden Key structures must be founded on grillages. Although the section of the officers' quarters had "settled very little," he, in view of the subsidence elsewhere, ascribed this to good fortune as to the substrata at that site.

Captain Morton, being on site, might have "conclusive reasons" against the additional expense of a grillage. If so, Totten would not press the issue.[95]

2. Grillages and Foundations (Specific)

On February 4, 1862, Chief Engineer Totten mailed Morton a sheet of drawings titled, "Plans, Sections and Elevations of a Detached Magazine." In a covering letter, he explained, the foundations were to be of well rammed concrete, in successive thin horizontal layers. These foundation walls, from the top of the grillage, were to have a pronounced batter for their entire height. Economy would dictate whether this batter was a continuous slope, or to rise in several steps, each of about 9 inches. The lower one-half of the space between the piers of the alcoves was to be filled with concrete. But, if Captain Morton deemed otherwise, the side slope of these piers could begin at the grillage.

After the magazine had been completed and subsidence had ceased, they might remove the sand from the cellar, position a grillage in the space not covered by that of the walls, and lay thereon the bottom of a cistern for collecting water from the roof.[96]

3. Anteroom

A 1-1/2 brick wall was to run along the centre line of the magazine to receive the lower floor joists, and to sustain wooden posts upon which upper platform girders were to rest. A similar wall was to cross the cellar, rising to the same height, to receive the bottom of the studs, which were to extend upward to the upper floor joists. Boarded over on both sides, they were to form a partition, setting off an anteroom, about 13 feet wide next the entrance to the magazine. A "considerable space" in the anteroom would be set off to

---

94. Totten to Morton, Jan. 6, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer. A copy of the subject drawings titled "Sketches showing positions and details of grillages of large Magazines, with Sections thro' foundations of Soldiers Barracks" is on file at Everglades NP.

95. Ibid.

96. Totten to Morton, Feb. 4, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer. A copy of this plan is on file at Everglades NP.

the right of the entrance as a filling room, by a similar partition of studs boarded on both sides, and having an open woodwork door. The partition boarding was to rise no higher than the bottom of the upper floor joists. The remainder of the anteroom would be occupied by a flight of stairs of low risers and broad heads, the kind to be easily passed by men "bearing barrels of powder on hand barrows."

Above the entrance to the lower room, there was to be a 4-by 4-foot trap, closed by a door in two leaves, through which a small platform bearing barrels of powder or boxes of ammunition could be lifted by block and tackle suspended from a strong composition hook sealed in the arch above.[97]

4. Shot-and-Shell Proof Porch

The principal entrance into the structure was to be protected by a shot-and-shell proof porch, into which there were to be two doorways. A grated wooden door would be hung at each entrance onto the porch on the outside wall. There was to be another grated door, on the inside of the wall, at the entrance to the magazine, and another in the cross partition wall. The latter was to be of two leaves, providing a 5-foot opening. A fourth doorway was to open through the filling room partition. A strong, solid double-leaf door was to be hung in the face of the magazine wall next the porch.

All hooks and hinges were to be gun metal; the locks were to be brass.[98]

5. Walls and Piers

Walls and piers, above the foundations, were to be faced with brick, laid in this bond--2 bricks thick and 3 courses high; then 1-1/2 bricks thick for 3 courses; then 1 brick for 3 courses; then again 2 bricks thick for 3 courses; and so on. The mass behind the brick facing was to be well rammed concrete, laid in layers corresponding to the height of the several courses of brick. Pier alcoves, being built of well-burned brick, would be an exception. They were to have a "mitten" dimension of 9' by 3' 4". While preserving this length, the breadth might vary slightly, depending on the size of the bricks.[99]

All arches were to be laid in "independent rings," each having a thickness of 1-1/2 bricks. Those over the alcoves were to consist of 2 rings; the principal magazine vault of 4; and the small porch arches of 1. There would also be some very small 1-brick arches.

---

97. Ibid.

98. Ibid.

99. Ibid.

All brick facings, exposed to either weather or sight, were to be laid in lime mortar, without any admixture of cement. This would also apply to the soffits of visible arches. The reasoning was because

> the admixture of any of our known cements, causes, in brick work, such efflorescence of pointing, and such scaling of the surface of the brick itself, that the injury far exceeds any advantages derived from the hardening properties of cement.

When used as mortar, with sand alone, the lime was to be slaked "with the least quantity of water," and to be applied as soon as possible, "after very faithful mixture with the sand."[100]

6. Ventilating the Structure

The numerous ventilators that passed through the arches were to be formed by leaving a certain number of bricks out of the arch, when it was built. Four ventilators were to pass out from each side of the great arch, at its spring, into a horizontal channel running the length of the piers. Five others were to rise through the key courses into another horizontal ventilator at the crown of the arch. Several courses were to be omitted next the "main side walls" of the alcove arches, to give passage to air coming in through these side walls. The small arch over the porch was to have openings for the same object.[101]

A buttress had been added to the end wall opposite the magazine porch. Its object was to open and protect air passages deemed important in this area of the structure.[102]

Copper gratings were to be introduced some 18 inches within the face of the wall. On the face, itself, there was to be a rectangular recess 1/2-brick deep. One-half brick within the latter, there was to be a similar recess, "less by half a brick all around than the outer." Within the interior recess, there was to be secured a wooden frame, housing a copper screen of 9 meshes to a square inch.

On the interior, there would be fastened over and against each ventilator opening, a wooden frame, carrying the same type of wire grating.

The horizontal branches of the wider ventilators were to be coursed by thin flagging.[103]

7. Roofing and Bombproofing the Structure

After the great arch had been formed of 4 successive brick arches, concrete was to be superimposed, forming the roof slopes, and giving "an entire radial thickness in the thinnest place of 5 feet." A concrete ridge would be raised over this thin place, making the radial thickness about 8 feet. At the top

---

100. Ibid.

101. Ibid.

102. Ibid.

103. Ibid.

angle of the roof, a 2-foot wall of concrete would be raised to a height of 4 feet. The side walls of the structure were to be raised correspondingly, so there could be positioned upon the concrete surface, a vertical 4-foot covering of earth, deposited and rammed in horizontal layers. At no point would the vertical roof covering (brick, concrete, and earth) be less than 10 feet.

After the concrete of the roof was finished, to include forming the gutters, the sloping planes, to carry water into the gutters, were to be covered with mastic.

The slated roof was to be supported by light rafters, roughly boarded, covered with high quality slates, laid in the best manner. To secure the rafters 1" or 3/4" iron bolts were to be embedded in the concrete, pass up through the rafters, and receive screw-nuts.

General Totten questioned whether the copper eave gutters, depicted in the drawing, were practicable. A good substitute would be a mastic gutter, supported by large moulded bricks.[104]

8. Door Jambs and Lightning Rods

In all brick door jambs, which were to be recessed 1/2 brick, there was to be inserted a block of granite "to receive each hinge hook, and another to catch the bolt of the door lock."

There were to be four lightning rods, one near each corner. They were to be of bar copper, 3/4-inch in diameter, attached to a spar erected near the wall, and rising above the roof. The rod was to extend 6 or 8 feet above the top of the spar.[105]

F. Laying-up Concrete in the Masonry Masses

1. Totten Provides Guidelines

Chief Engineer Totten was disappointed to learn that Superintending Engineer Morton was considering dispensing with the use of hydraulic lime as an ingredient in his mortar. Writing Morton, Totten reminded him that a decade earlier Captain Wright had also questioned the economy of mixing lime and cement. But, he continued, experiments at Forts Jefferson and Adams had demonstrated that hydraulic energy could be imparted by "cement to a large dose of lime." To secure a bulk of lime and avoid subsequent slaking, Totten wrote, the lime must be slaked with sufficient water to leave it in a paste for a considerable time. A boarded pit or pits should receive the lime and be covered from the rain.

Lime from the pits, after it was in condition to be cut like soft cheese, was to be removed by shovel and spread upon the mortar platform. It would then be covered with a "due proportion" of powdered cement, and the two mixed before addition of sand. After the sand was incorporated, the mortar was ready to receive its aggregate.

---

104. Ibid.

105. Ibid.

Recommended proportions of concrete without lime were: 4 barrels of aggregate, 2 barrels of sand, and 1 barrel of cement.

When lime was to be employed, Totten continued, Morton must adhere to these proportions, substituting lime for cement in the same ratio. If one barrel of cement were combined with one barrel of lime, the former in powder and the latter unslaked, the resulting mortar would be excellent, and could be used in the parts of the fort above the watertable. In lesser important sections of the fort, the proportion of lime could be increased to 1-1/2 barrels, and in "certain great masses but little exposed to the weather," the lime might be increased to two barrels.

General Totten believed that a mixture of 14 barrels of fragments, 7 barrels of sand, 1 barrel of unslaked lime, and 1 barrel of cement would yield a concrete that provided great structural strength at a reasonable cost.[106]

The proportions, Totten cautioned, must never be left to the judgment of the concrete-makers. They must be regulated by measures of convenient size, i.e., the barrel.

A savings could be effected by reducing "the measure of void space in the fragments." To ensure that the concrete have a "certain degree of plasticity, so that it may be turned easily, shovelled, etc.," the greater part of the aggregate was to be of moderate size, 4 to 5 cubic inches each, or less. After the mix had been positioned, a considerable savings could be made by dropping into it, still larger fragments, leaving room between for use of a rammer.[107]

2. Morton's Method of Mixing and Laying Concrete

After studying the correspondence and undertaking several experiments, Morton ascertained that the cost per yard of concrete masonry as laid in the roof surfaces of the arches, barbette piers, and barbette magazines was:

33 bbls. cement at $1.25.	$ 67.50
260 cubic feet coral boated at $2.87	21.51
380 cubic feet sand boated at .01 1/2	5.70
260 cubic feet coral broken at .01 1/2	11.40
32 days making and laying at $1.50	48.00
2 days making curbings at $1.50	3.00
2 days machinist hoisting with engine at $2.30 . .	4.60
2 days assistant machinist at $1.50	3.00
TOTAL	$160.21

Measurement when laid, 798 cubic feet, cost $5.42 per yard.[108]

---

106. Totten to Morton, July 1, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

107. Ibid.

108. Morton to Totten, July 18, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

During the autumn Morton continued his experiments with concrete on an increasing scale. One of these was aimed at determining "how great a batch of concrete could be raised from the ground to the terreplain" by a good draft animal without being overworked. It was found that, in a six-day week, about 83,000 pounds of concrete could be handled. For convenience in working, the mortar was hoisted in wheelbarrows.

Workmen measured

> the cement by the barrel, each barrel yielding 3 1/3 cubic feet of paste; the lime by the barrel, each barrel making 6 cubic feet of paste; and the coral and sand in "an apparatus consisting of four planks, whose ends are mortised and tenoned so as to receive each other and readily keyed together with wedges."[109]

Coral for aggregate was boated to Garden Key in scows manned by seven men. It was collected at low tide, on the outlying reefs, and each scow had a capacity of 375 cubic feet. Sand was brought from Sand Key in a scow manned by three men, and three loads were landed daily.

The concrete gang included a foreman, 19 men to mix, wheel and lag, and one to drive the horse or run the hoisting engine. Morton employed two or three concrete gangs. Four men were employed in advance of them, constructing plank "curbings" to receive the concrete, and a mason stretching guidelines for "limiting warped and other complicated surfaces to which the concrete must conform."

The coral was wheeled in barrows from the water's edge to the concrete platform and dumped into an adjustable box. An adjustable sand box was then positioned atop the coral, and the sand wheeled and dumped into the box until it was full. The sand box was then taken apart, and "the sand hoed evenly over the coral surface." Twenty-six barrels of cement were next wheeled to the platform from the cement shed and rolled on top of the sand. The cement barrels were then broken open, and the contents spread with hoes and shovels evenly over the sand surface. The coral box was then taken apart, and a trench made on one side of the 20-by 20-foot mass. Water was then pumped into it by means of a hose. The mixing was done

> progressively from one side of the mass to the other, the trench being continuously cut out of the mass on the one side; and its bank on the other, after being turned over three times, and thoroughly wet and incorporated by that time, being then hoisted and rammed into its place in the curbings.

---

109. Morton to Totten, Nov. 19, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

Morton found that the cost of this cement concrete was:

96 cubic feet of cement paste requiring 26 barrels at 85¢ per barrel	$22.10
freight on 26 barrels, 50¢ per barrel	13.00
receiving and storage at 4¢ per barrel	1.04
225 cubic feet of sand at 77/100¢ per cu. ft.	1.73
500 cubic feet of coral at 2¢ per cu. ft.	10.00
wages of concrete gang	21.50
wages of preparatory gang	2.77
rations of men and forage of one horse	6.16
total cost of laying up one batch (625 cu. ft.)	$77.80[110]

3. Morton's Method of Mixing and Laying Lime-Concrete

Lime concrete, Morton noted, was used "throughout the terreplein and parapets"; indeed everywhere, except in areas exposed to dampness and the weather. He had determined that one barrel of Cool's Lump Lime, or Glens Full Lime, after slaking, made 6 cubic feet of lime paste. Eight barrels of it, made into paste, would replace 13 barrels of cement.

To slake the lime, an adjustable sand box was employed. The subject box consisted of four planks tenoned and mortised at the ends. When positioned, the box 26 feet long, 10 feet broad, and 13 1/2 inches deep, would hold 225 cubic feet.[111]

Sand was then wheeled up and dumped into the box till it was full. The box was then taken apart, set on its side, and the sand hoed into a dish shape. Eight barrels of lime were then broken into the "dish, and a full allowance of water pumped into the dish." Sand was next thrown over the slaking mass, and workmen slaked another batch alongside. Each of the six concrete platforms had half a dozen such batches to be supplied from. The batch of slaked lime and sand was always taken from the oldest available. None was used until it had laid at least a week and the lime was completely slaked. Three men were kept busy slaking lime.

Morton placed the cost of lime concrete at:

48 cubic feet of cement paste, 13 barrels at 85¢ per barrel	$11.05
freight on the 13 barrels of cement at 50¢ per barrel	6.50
receiving and storage on 13 barrels of cement at .04¢ per barrel	1.52
48 cubic feet of lime paste, 8 barrels of lime at 65¢ per barrel	5.20
freight on 8 barrels of lime at 50¢ per barrel	4.00

110. Ibid.

111. Morton to Totten, Feb. 22, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of a drawing detailing the operation of the concrete plant is found with Morton's February 22, 1862, report.

receiving and storage on 8 barrels of lime at 40¢ per barrel.	.20
500 cubic feet of coral at 2¢ per foot	10.00
225 cubic feet of sand at 77/100¢ per foot	1.73
wages and rations as for cement concrete	29.93
additional wages and rations for labor of slaking . . .	1.26
Total cost of a batch of lime concrete (626 cu. ft.) .	$70.39[112]

4. Totten's Comments

As to be expected, Chief Engineer Totten read with interest Morton's report. He found the economic effects encouraging, and was satisfied that further gains in this direction, as well as quality of workmanship, were possible.

It appeared that 450 cubic feet of coral aggregate made, with the mortar, 625 cubic feet of concrete, less 50 cubic feet of coral added while ramming, or 575 cubic feet.

The theory of concrete, however, postulated that the mortar should equal the voids in the coarse fragments, not increase the bulk thereof.

The quantity of mortar, Totten continued, should be very little greater than the measure of the voids. This must be carefully ascertained by making a box of known capacity and convenient size, but not less than one cubic yard. Morton was to have it filled with coral aggregate and water. It was to stand long enough for the coral to absorb as much water as possible. The remaining water would then be drawn off, the box refilled with water, and a record made of the quantity poured in to fill the voids. This figure represented the mortar needed.

Morton would next ascertain the voids in the sand by employing the same method. This would represent the minimum quantity of "paste of lime, or of cement, or both needed for the mortar."

Proper proportions thus established, Morton was to follow the process he had outlined for making concrete, except that the lime or cement, or both, "must be intimately mixed into a mortar with the sand and water by a distinct process, before they are added" to the aggregate.

Totten pronounced the addition of large pieces of coral to the concrete as it was deposited and rammed in layers, as "an important and clear gain."[113]

G. Work Accomplished in Fiscal Year 1861

During Fiscal Year 1861 the Fort Jefferson scarp was built-up from 35 to 42 feet; much of the breast-height and parade walls completed; 60 casemate arches asphalted; the first and second tier gunrooms paved; three tower magazines constructed; 79 cisterns tightened; the barbette platforms and magazines commenced; temporary buildings for storerooms and shops constructed; and casemates and wooden buildings outfitted as barracks and quarters.

---

112. Ibid.

113. Totten to Morton, Dec. 4, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

These operations involved 3,150 cubic yards of brick masonry, 2,790 cubic yards of concrete masonry, 8,300 square feet of pavement laid, 1,130 surface yards of asphaltum spread, 8,400 surface yards of plastering, and 41,100 running feet of pointing.

Work on the cisterns involved paving the floors with one course of brick and two coats of cement mortar; and building up their outer heads with a brick wall, covering the joint between the scarp and piers.

The openings left for the second tier embrasures were bricked up to convert the gunrooms into quarters for the garrison and workforce.[114]

H. Two Shot Furnaces are Located and One Commenced

On December 7, 1861, General Totten called on the New York Agency to furnish Captain Morton with irons for two 30-foot shot furnaces, and the prerequisite fire bricks.[115]

Before construction began, Morton needed to know where they were to be located.[116] Early in March, the Department provided the desired information. One of the furnaces was to be sited in the north angle of the parade, between the proposed hospital and officers' quarters; and the other at the south angle, near the magazine, and between the proposed commanding officer's quarters and Navy Store.[117]

Chief Clerk Pearsall, during the first week of April, began construction of the furnace at the north angle of the parade. Before doing so, he changed the sites slightly, because he deemed the area recommended for the second too close to the magazine. To illustrate his point, he forwarded sketches locating the furnaces. These were reviewed and approved by the Department.[118]

---

114. Morton to Totten, Oct. 15, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer; Executive Documents of the Senate of the United States for the 2d Session of the 37th Congress, 1861-62 (Washington, 1862), Serial 1118, pp. 102-03.

115. Totten to Morton, Dec. 7, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

116. Morton to Totten, Feb. 16, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

117. Totten to Morton, March 8, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

118. Pearsall to Totten, April 5 & Totten to Pearsall, April 19, 1862, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. A copy of "Sketch Showing the location of No. 1 Shot Furnace Opposite Bastion D," is on file at Everglades NP.

I. Documenting the Rate and Degree of Subsidence

On March 12, 1862, the Department reminded Captain Morton that no subsidence tables had been received from Fort Jefferson since the spring of 1860, when Captain Woodbury had forwarded data for the period May 1858-December 1859.[119]

Morton responded promptly to the Department's request. He mailed a box containing levels taken at the fort during 1861, and a "graphical table exhibiting those levels in connection with nearly all the anticedent ones" made by his predecessors.

In explanation of the three enclosed profiles, Morton noted that "Profile A" embraced the embrasure curves for the four years, 1858 to 1861. Because records of the elevations for May and July 1858 were incomplete, the earliest curve plotted was for October 1858.

"Profile B" included the curves of the inner and outer traverses for December 1859 and 1861, and the outer traverses for 1860. Elevations of the six tower door sills were plotted for the purpose of connecting the traverse curves of the various curtains, the traverses and subject sills having the same base line.

"Profile C" presented a greater variety of data than the others, but was in no way as accurate, there being a want of data for several check points, as well as by the introduction of some errors. On this document were plotted the curves of the scarp and parade walls for October 1858 and December 1859, and of the scarp wall only for December 1860 and 61. There was no data for curves of the parade wall and soffits for these years. Levels could only be taken at infrequent intervals, because the parade fronts of a large number of casemates were obstructed by building materials or temporarily closed in for other purposes.

A glance at "Profile A" revealed that the elevations for October 1858 through part of curtains Nos. 1, 2, and 4, and bastions B and E established a greater subsidence at that remote period than succeeding levels documented.

The 1859, 1860, and 1861 curves demonstrated a conformity and regularity of subsidence that reassured Morton of their accuracy.[120]

J. Increasing the Fort's Armament

1. Situation in October 1861

On April 14, 1861, Colonel Brown, while en route to reinforce Fort Pickens, spent the day at Garden Key. He found mounted in the first tier casemates the thirteen 8-inch columbiads borrowed by Captain Meigs from Fort Taylor and six 6-and 12-pounders. Tied-up at the wharf was a vessel unloading thirty 8-inch columbiads, twenty-four 24-pounder howitzers with carriages, implements, 400 8-inch shells, 600 round shot, and a proportionate quantity of ammunition.

---

119. Totten to Morton, March 12, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

120. Morton to Totten, April 12, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. Copies of the subject "Profiles" and the 90-page report bearing on the levels is on file at Everglades NP.

When he sailed for Santa Rosa Island, Brown took from Fort Jefferson a field battery and the four mountain howitzers.[121]

By early June six 10-inch columbiads had been landed and receipted for by Major Arnold. On the 6th, Lieutenant Morton advised the Department that, if rumors of the Anglo-French intervention were true, he would have the 10-inch columbiads mounted on the barbette tier over the tower magazines. These guns could then be sheltered by sandbag parapets.

While providing for the fort's immediate defense, these big guns would not interfere with construction of the bastion parapets and terrepleins. When the latter were completed, the columbiads could be moved forward onto them, and the permanent terreplein over the magazine arch laid-up.[122]

There was no substance to the stories of Anglo-French intervention on behalf of the Confederacy, and Morton dropped his scheme for temporary emplacements for the big columbiads.

On October 26, Captain Morton submitted the required annual armament report. As of September 30 there were emplaced in the fort:

Position	24-pdr. iron howitzers	12-pdr. brass howitzers	8-inch Columbiads (old pattern)	8-inch Columbiad (new pattern)
Bastion A	4			
Front No. 1			7	1
Bastion B	4	1		
Front No. 2			4	1
Bastion C	4	2		
Front No. 3				3
Bastion D	4	1		
Front No. 4				3
Bastion E	4			
Front No. 5			7	2
Bastion F	4			
Front No. 6			9	
Total	24	4	27	10

The 12-pounder brass howitzers were mounted on rude temporary carriages; their chassis traveling upon the pavement without traverse irons. All other pieces traveled on their "permanently laid traverse irons."[123]

There were on hand at Garden Key, but not mounted, these guns and carriages: five 10-inch columbiads, nine 42-pounder smoothbores, twelve 24-pounder smoothbores, four 8-inch mortars, and two coehorm mortars. Also stored in the fort were nine guns without carriages: one 10-inch columbiad, six 18-pounder smoothbores, and two 24-pounder flank howitzers.

---

121. Manucy, "Construction History at Fort Jefferson," pp. 85-6.

122. Morton to Totten, June 6, 1861, & Totten to Morton, June 24, 1861, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

123. Morton to Totten, Oct. 19, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

In addition, there were a number of carriages for which there were no guns:

	Barbette		Casemate	
Type	No. of carriages	No. of chassis	No. of carriages	No. of chassis
42-pdr.	11	9		
32-pdr.	9	14	15	14
24-pdr.	6	6		
18-pdr.		1		
12-pdr.	1			
8-inch Sea Coast Howitzer	5	5[124]		

2. "Trent Affair" Results in a Crash Program

The "Trent Affair" threatened to bring Great Britain into the Civil War on the side of the Confederacy. Fearful of a British attack on Fort Jefferson, the Department directed Morton to expedite positioning those lower tier pintles and traverse circles then on hand. No pains were to be spared to be ready to mount the armament on its arrival at the Tortugas. Besides preparing the first tier for all its guns, he was to provide for mounting one or more cannon on each curtain of the barbette tier as soon as feasible. Equal importance, would be given to readying the magazines for storage of powder and explosive shells.[125]

According to the latest information supplied by the Ordnance people, unchambered columbiads were to be substituted for the 207 42-pounder smooth-bores recommended by the Davis Board in 1855 for the armament of the fort's casemated tiers.[126]

Captain Morton responded to the crisis with alacrity in an effort to place the fort "in a posture of defense." At his request, Post Commander Horace Brooke detailed large fatigue parties to rise the columbiads and wheel "sand into the terreplein, thereby materially assisting the Corps."

An agent was rushed to La Habana to recruit more hands. Consul Robert W. Shufeldt agreed, if necessary, to transact business in the Cuban metropolis for Morton. He would purchase provisions and seek to forward them should the British seek to blockade the Straits of Florida.[127]

---

124. Ibid. In addition, there were eighteen IX-inch Dahlgren tubes belonging to the Navy on Long Key.

125. Totten to Morton, Nov. 25, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

126. Ibid.

127. Morton to Totten, Dec. 19, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. Bvt. Lt. Col. Horace Brooke had relieved Major Arnold as commander at Fort Jefferson on September 9. The garrison in November included Company M, 1st U.S. Artillery; Company H, 1st U.S. Infantry; and Companies B and F, 6th New York Infantry. Post Returns, Fort Jefferson, July-Dec. 1861, NA, Microcopy M-617.

To expediate this work, Colonel Brooke requisitioned two scows, 50 wheelbarrows, and 50 shovels from the Quartermaster Department.[128]

By early January 1862 two 10-inch columbiads had been emplaced on the terrepleins of bastions B and F. Work was progressing rapidly on mounting a third big columbiad on bastion D.

Fatigue parties detailed by Colonel Brooke would soon finish these bastions' parapets. Captain Morton proposed to try "as a finish, above the layer of asphaltum and between the flagging or plank revetment on the inside and the brick on the outside a layer of sand bags well filled and jammed compactly together." He believed Bermuda would grow through the bags, and by the time they were rotten there would be a sod which would resist Gulf of Mexico winds.[129]

Coincident with the crisis, Chief of Ordnance Ripley notified the Chief Engineer's Office that, in compliance with requisitions, the Watervliet Arsenal had been directed to ship to Fort Jefferson pintles for 106 front-pintle barbette guns, 6 centre-pintles for barbette guns, 36 front-pintles for casemate guns, and 36 pintles for flanking howitzers.[130]

The threat of war with Britain evaporated in early January upon release by the United States of Confederate Commissioners James M. Mason and John Slidell, whose capture while aboard the British packet Trent had precipitated the crisis.

3. 15-inch Rodmans are Slated to Replace the Six 10-inch Columbiads

Meanwhile, the Armament Board had determined to substitute 50,000-pound 15-inch Rodmans for the 10-inch columbiads scheduled to be mounted en barbette on the bastions. Morton would accordingly do nothing toward building permanent platforms for these positions until receipt of further instructions.[131]

K. Engineers and the Line Officers Cooperate for the Area's Defense

1. Major Arnold Gives Morton a Number of Projects

On April 15, 1861, Major Arnold directed Lieutenant Morton to undertake a number of additional projects:

(a) He was to finish, as soon as practicable, the bastion magazines, cisterns, and barbette platforms for mounting 10-inch columbiads.

---

128. Brooke to Meigs, Dec. 18, 1861, NA, RG 92, Consolidated Correspondence File.

129. Morton to Totten, Jan. 11, 1862, NA, RG, Ltrs. Recd., Chief Engineer.

130. Kurtz to Morton, Dec. 5, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

131. totten to Morton, Jan. 6, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

(b) He was to build, without delay, the concrete wharf designed by Captain Meigs before his departure, erecting upon it an iron crane for disembarking big guns. If timber for this wharf had not been received, Morton was to purchase it in Key West or elsewhere.

(c) He was to make arrangements for acquisition of a water distilling apparatus to be charged to the Quartermaster Department.

(d) He was to purchase necessary lumber and enclose a sufficient number of upper tier casemates to serve the garrison as commissary storerooms, the cost to be defrayed by the Quartermaster General.

(e) He was to prepare a scheme of defense for batteries to be erected on the several keys for defense of Tortugus Harbor.

(f) He was to make arrangements for purchase of necessary materials and hire of mechanics and laborers for a prompt execution of these undertakings.[132]

2. Labor Shortage Plagues Morton

To implement these instructions, Morton traveled to Key West on the 17th, where he purchased a schooner-load of materials. Not knowing that Fort Sumter had been fired upon, he sent a vessel to Cedar Keys to embark lumber for the commissary storerooms. The latter was lost, when the schooner Atwater and her cargo were seized by Confederates and taken to St. Marks.

Fifteen free laborers and two slaves were hired to replace men who had accompanied the Fort Pickens expedition. To further reinforce his workforce, Morton wrote the United States consul at La Habana to recruit such white mechanics and laborers as might be seeking work elsewhere to escape the sickly season.

The difficulty in boosting his workforce was aggravated by a Florida law, which the Lincoln administration was determined to enforce, prohibiting introduction of free black labor from the Bahamas. Experience had demonstrated that white workmen employed on Florida Reef projects during the summers had an excessive incidence of sickness.[133]

The Department, upon being apprised of the labor shortage, directed Lt. Quincy C. Gillmore at the New York Agency to recruit and send to the Florida Reef 50 "good railroad laborers." They were to be paid $1.50 per day and given their board.[134]

The vessel, on which the workmen were embarked, anchored in Tortugas Harbor on June 5. Also aboard were the asphaltum, drainage pipes for piers, kitchen furniture, and coal ordered from the agency in early April.[135]

---

132. Arnold to Morton, April 15, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

133. Morton to Totten, April 17 & June 6, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. Totten questioned the wisdom of employing large numbers of Bahamans, because of the limited available funds.

134. Totten to Morton, May 4, 1861, NA, RG 77, Ltrs., Sent, Chief Engineer.

135. Morton to Totten, June 6, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

3. Colonel Brown and Morton Reach Agreement

In late May, to resolve his problems with Major Arnold, Lieutenant Morton traveled to Fort Pickens and met with Colonel Brown. They were able to solve a number of differences.

Brown announced that he was agreeable to abandoning his direction of Engineer operations designed to afford additional protection to Tortugas Harbor. In regard to quarters for the troops, he was agreeable to biding his time until the permanent barracks were erected. The soldiers seemed to be comfortable and contented with their present arrangements.

Brown also did not insist on a concrete wharf being commenced. Morton would accordingly submit a proposal to the Department "relative to the location of a wharf to accommodate the wants of shipping during the operations in the Gulf, and to provide for the approaching decay of the present wharves."[136]

4. Proposal to Build a Causeway and Wharf is Shelved

On July 16 the Department agreed to construction of two frame sheds for storage of cement and lumber. The structures formerly employed for these purposes were to be turned over to the garrison as barracks.[137]

Some two weeks later, Morton transmitted to the Department a sketch of Garden Key, locating the various temporary structures. Also shown was the site of the proposed wharf. The latter, as General Totten could see, was some distance from the gateway, but plans called for the access causeway to be coral and rubbish, low cost materials.

The wharf itself was to consist of a rectangular area "enclosed by a concrete wall," to be "laid along and around a row of piles, and strengthened by the walls." The space between the walls was to be filled with rubbish, and the face of the wharf sheathed with 4-inch yellow pine down to low water. It was to be guarded by fender beams.

Unless ordered otherwise, Morton did not plan to begin construction of the permanent wharf for at least 12 months.[138]

---

136. Morton to Totten, June 6, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

137. Morton to Totten, July 15 & Totten to Morton, July 27, 1861, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. The structures to be given up were on the parade. The new lumber shed, likewise on the parade, was parallel to and adjacent to front No. 6, and the other shed was outside the fort.

138. Morton to Totten, July 27, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of a drawing, "Suggested Plan and Section of Proposed Wharf of Concrete and Piling, at Fort Jefferson," is on file at Everglades NP.

General Totten called for more details before sanctioning construction of the wharf. He needed to know: Why the great length? How were the concrete walls to be formed? How were the sides of the causeway to be made?[139]

Since he was in no hurry to begin work on the wharf and causeway, Morton failed to provide the desired data, and the proposal was dropped.

5. Department Agrees to Construction of a Horse Railway

Then, in mid-December 1861, Captain Morton urged construction of a horse railway to facilitate transportation of cannon, stone, embrasure irons, etc., from the wharf onto the parade. The rails were to be secured to longitudinal concrete sleepers, and the carts were to be "small four wheel trucks, two of them to adjust together to form the running part." For moving guns, a strong frame would be adjusted upon the pair of trucks; to carry tubes a lighter crate-like frame; and for slop, refuse, etc., airtight iron tanks.[140]

The Department approved construction of the railway. The sleepers were to be of wood to facilitate their relocation as construction dictated.[141]

6. Water Distilling Machines Supplement the Cisterns

Even before he reached Garden Key, Lieutenant Morton had begun to fret about the problem of supplying a large garrison during a drought with freshwater. To supplement the rain collected in cisterns, he suggested that the Tortugas be provided with an "apparatus" for distilling saltwater, such as were used on steamships. As best he could remember, these units could distill a pound of water for each quarter pound of coal burned.[142]

Upon being apprised of this situation, the Department called on Lieutenant Gillmore at the New York Agency to take measures for providing Fort Jefferson with an apparatus for distilling ocean water.[143] Gillmore moved promptly to supply this need. The Ship Island schooner Union sailed from New York City for the Tortugas. Aboard, along with provisions and materials consigned to Lieutenant Morton, were four of Dr. Normandy's water distilling machines.[144]

---

139. Totten to Morton, Aug. 14, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

140. Morton to Totten, Dec. 19, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. To illustrate his proposal and its utility, Morton provided the Department with a drawing, "Sketch Showing proposed arrangement for receiving and distributing Ordnance, Commissary and Quartermaster stores, and building materials; and for collecting and discharging the kitchen and other refuse of the place." A copy of this drawing is on file at Everglades NP.

141. Totten to Morton, Jan. 11, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

142. Morton to Totten, March 25, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

143. Wright to Gillmore, April 3, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

144. Totten to Gillmore, April 10, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

Union reached Tortugas Harbor in the second week of May. One of the Normandy machines was sent ashore, assembled, and placed in operation.

Within three weeks, the post quartermaster had submitted a requisition for a second condenser. The one just received and in use was nearly "worn out and liable to fail daily." There were 1,300 men on the key, and they were consuming 2,500 gallons of water daily. The condenser now in use, he warned Quartermaster General Montgomery C. Meigs, would not "more than supply us from day to day."[145]

General Meigs approved the request, and a second distilling machine was soon en route to Garden Key.

Then, in mid-December 1861, Post Quartermaster Joseph A. Mower transmitted a requisition to Washington, calling for one evaporating machine of 5,000 gallons daily capacity. There were at the post two machines, each of which would yield 500 gallons in 24 hours, an amount inadequate to the post's needs. To complicate the situation, vessels were constantly arriving and landing building materials. These craft always seemed to need water. Consequently, water stored in the cisterns was in short supply, and should the two-month drought continue, there would be great suffering among the troops.[146]

Mower's request was approved and the New York depot was directed to ship a third condenser to Garden Key.[147]

7. Union is Transferred and Tortugas Armed

In mid-April 1861, the Quartermaster General inquired into the possibility of employing Tortugas to help transport subsistence supplies to the Fort Jefferson garrison. If it were impossible for Tortugas to accomplish a dual mission, Chief Engineer Totten directed Lieutenant Morton to place Union, on her arrival from New York City, at the disposal of Post Commander Arnold for quartermaster service.[148]

Union docked at Garden Key early in the second week of May. She was found to be in good condition, except that her seams required caulking, a common complaint in new vessels. As soon as she had discharged her cargo, Morton, in accordance with instructions, turned her over to Post Quartermaster Henry Benson.[149]

---

145. F.G. Comestock to Meigs, June 4, 1861, NA, RG 92, Consolidated Correspondance File. Meigs has been named Quartermaster General on May 15, 1861.

146. Mower to Meigs, Dec. 15, 1861, NA, RG 92, Consolidated Correspondence File.

147. Meigs to Tompkins, Jan. 2, 1862, NA, RG 92, Consolidated Correspondence File.

148. Totten to Morton, April 17, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

149. Morton to Arnold, May 10; Special Order No. 17, May 11; and Morton to Totten, May 14, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

Before the month was history, Morton armed Tortugas with two heavy 12-pounder Dahlgren brass boat howitzers. The crew was issued rifle-muskets, Colt's revolvers, and small-arms ammunition. After being drilled in the use of these, the captain and crew took the oath of allegiance. These precautions somewhat relieved fears that the schooner, on one of her trips, might become an inviting prize for a prowling privateer.[150]

8. Quartering the Garrison

In June 1861, Post Quartermaster Benson submitted estimates asking for $1,000 to repair and extend the old building (the 1847 stables) being used as a temporary hospital and $2,000 for erecting temporary quarters to house one company and to repair the old frame buildings occupied by two companies.

To justify the $1,000 allotment, Surg. E. F. Hammond noted that the structure currently employed as a hospital had room for only 17 beds. The three-company garrison, exclusive of officers and dependents, numbered 198, and in May there had been 95 men on sick call. In addition, the hospital was charged with care of the 250 Engineer Department employees.[151]

Major Arnold, to support the request for the $2,000, reminded Washington that permanent barracks had not been built, and it was necessary to provide the troops rushed to the Tortugas with emergency quarters. Captain Meigs, while superintendening engineer, had turned over to the Quartermaster Department two frame structures (the lime and lumber sheds) which sufficed as temporary quarters for two companies. Work had been commenced on quarters for a third company by the Engineers. But, before it was completed, orders were received by Lieutenant Morton from Chief Engineer Totten that the Department could not allow expenditure of funds for a structure not estimated for. Consequently, the expense of erecting this structure must be defrayed by the Quartermaster Department.[152]

Quartermaster General Meigs, being familiar with the situation, promptly approved the $3,000 expenditure. The new frame barracks was sited on the parade east of and parallel to front No. 5. Before it was completed in early August, there was a change in the garrison. On July 4 a vessel reached Tortugas Harbor from Fort Pickens and Companies B and E, 6th New York Infantry, came ashore. The New Yorkers were assigned quarters in the casemates of front No. 2, the parade arches having been boarded in. The next day, the 5th, the officers and men of Company L, 1st U.S. Artillery, said goodbye to Garden Key and took passage on a vessel bound for Fort Pickens.[153]

---

150. Morton to Totten, May 24, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

151. Hammond to Arnold, undated, NA, RG 92, Consolidated Correspondence File. Between March 24 and July 4, 1861, the garrison consisted of Companies L and M, 1st U.S. Artillery, and Company C, 2d U.S. Artillery.

152. Arnold to Benson, undated, NA, RG 92, Consolidated Correspondence File.

153. "Fort Jefferson, Sketch Showing the Locations of the Permanent and Temporary Barracks, Storehouses. . .;" Post Returns, Fort Jefferson, March-Sept. 1861, NA, Microcopy M-617.

The garrisoning of the fort caused the Engineers and their employees several unexpected problems. The soldiers took possession of the two privies in fronts Nos. 2 and 6 to which access was gained from the counterscarp. This compelled the Engineers to construct a new one for their employees at the southern extremity of Garden Key. Next, a boathouse was erected "to lock up Engr. boats in and prevent soldiers from staving them" in.[154]

9. Bird Key Fortifications

In mid-April 1861, Department Commander Brown directed Major Arnold to:

> Take measures for occupation by sea coast earthen batteries of all points in the harbor of Tortugas necessary to secure a complete command of the anchorage and of the channels of entrance thereto.

These earthern batteries were to be designed to resist any projectile then in use in the world's various navies. Each was to contain not less than three big guns, to be enclosed, and capable of offering resistance to an amphibious assault, and to house bombproof magazines.

Arnold's attention was called to the need to occupy one or more of these keys--Bird, Sand, Loggerhead, East, Middle, and Bush. Construction was to begin immediately, so the works would be ready to receive the guns when they arrived. The garrison was to be employed on their construction and Lieutenant Morton was to provide professional advice. Plans were to be transmitted to Colonel Brown at Fort Pickens for approval. Arnold would, without awaiting official sanction, began work on the Bird Key battery.[155]

By May 24, Lieutenant Morton was able to transmit to the Department a drawing of the sand battery being built under his supervision on Bird Key. A lunette-shaped work, its principal face was nearly parallel to the northeast front of Fort Jefferson.[156]

Morton, at the time Colonel Brown abandoned his responsibility for directing Engineer operations in the Department of Florida, recommended that the Bird Key lunette be completed, because a vast amount of labor had already been expended. The soldiers, at first, had been told by Major Arnold that they were to receive extra pay and had worked very hard. When informed that they would not, "they still worked fairly [hard] being under the impression that the safety of the Post and good of the service required it." Now, if they had cause to suspect that their labor had been in vain, "it would be difficult in future. . . emergencies to get them to work with spirit."[157]

---

154. "Fort Jefferson, Sketch Showing the Locations of the Permanent and Temporary Barracks, Storehouses, etc.," NA, RG 77.

155. Brown to Arnold, April 11, 1861, found in Official Records, Series I, Vol. 1, p. 37.

156. Morton to Totten, May 25, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

157. Morton to Totten, June 6, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer

Chief Engineer Totten, recognizing the logic in Morton's argument, agreed to fund the lunette's completion.

A more important role for Bird Key in the defense of the anchorage was envisioned. The Fortifications Bill signed into law by President Lincoln in February 1862 included a $200,000 appropriation for a fort on Bird Key. Before finalizing plans for this defense, the Department needed certain data. General Totten accordingly called on Captain Morton to let him know: (a) the degree to which the Fort Jefferson piers had settled, resting as they did on a wide grillage; (b) the depth of rock beneath the sand on the "broad part" of the key; (c) the general length of the required piling; and (d) was there anything materially different in the character of the strata of Garden and Bird Keys regarding the stability of foundations.[158]

Morton had gone North on sick leave, so Chief Clerk Pearsall replied. For data on the subsidence of the Fort Jefferson piers, he referred the Department to the profiles which Morton had taken with him. The Bird Key soil, he noted, was similar to that of the other keys, consisting of sand "mixed with lumps of coral varying in size from 5 lbs. to 5 tons." Although he was satisfied that there was no underlying stratum of rock, he had been unable to test his hypothesis by borings. This was because Bird Key was currently serving as a hospital for 40 soldiers quarantined with smallpox.[159]

The frame isolation hospital and its cistern had been erected late the previous summer in accordance to a recommendation by Morton.[160]

Although plans were developed, no ground was broken for construction of a permanent fort on Bird Key.

10. Providing Facilities for Storage of Naval Ordnance Stores

The Navy regarded the Tortugas anchorage as a vital base for its Gulf Blockading Squadron. Consequently, in early December 1861, Secretary of the Navy Gideon Welles called on the Army to reserve sufficient space for ordnance stores in the Fort Jefferson casemates and magazines for his Department.[161]

Chief Engineer Totten relayed this information to Captain Morton. In accommodating this request, Morton was to bear in mind that nothing must be done to compromise the service of the guns of the first and barbette tiers.[162]

---

158. Totten to Morton, March 6, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

159. Pearsall to Morton, April 5, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

160. Morton to Totten, July 12, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

161. Welles to McClellan, Dec. 5, 1861, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

162. Totten to Morton, Dec. 11, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

The space allotted to the Navy was sufficient to house 2,000 barrels of powder, 5,000 shells, and 1,000,000 rounds of small-arms ammunition.

L. Supplying the Project with Materials

1. Bacon & Abercrombie Abrogate Their Contracts

The difficulty in getting materials for Garden Key became more pronounced upon the secession of Florida. As early as January 5, 1861, Bacon & Albercrombie intimated that their association with the project must cease if Florida withdrew from the Union.[163] Then, on February 28, Bacon & Albercrombie sent word of their refusal to supply anymore brick and lumber because of organization of the Confederate States of America.[164] Hereinafter, the superintending engineer must look to the New York Agency or its contacts for all construction materials.

2. Coping With Financial and Labor Shortages

Lieutenant Morton was distressed to discover, upon his arrival, that the balance in the Treasury from the 1860 Fort Jefferson appropriation was some $6,400 less than shown by the returns turned over to him by Lieutenant Reese.[165] Then, to compound his problems, he learned that the $75,000 appropriated by Congress on March 2 could not be drawn upon before July 1.[166]

To cope with this situation, Morton was compelled to countermand several orders made upon the New York Agency for materials and to cancel the proposal to raise the wage of the workforce. The latter measure did not cause the feared consequences. Only a few men left, and they were more than compensated for by the 41 laborers recruited and sent from La Habana by Acting Consul Savage.

In regard to materials, the need for iron pipes and asphaltum was critical, and Morton hoped they could be purchased on credit.[167]

The Department, upon being apprised of this situation, sanctioned the purchase of materials, provided the vendor was agreeable to deferral of payment until after July 1.[168]

---

163. Bacon & Abercrombie to Meigs, Jan. 5, 1861, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

164. Bacon & Abercrombie to Meigs, Feb. 28, 1861, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

165. This descrepancy had been caused when Louisiana authorities sequestered the funds belonging to the Fort Jefferson appropriation on deposit with the former United States Assistant Treasurer in New Orleans. Guiros to Morton, April 24, 1861, and Morton to Totten, May 18, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

166. Totten to Morton, May 2, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

167. Morton to Totten, May 6, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

168. Totten to Morton, May 2, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

3. New York Agency Scrounges for Bricks

During the six weeks ending June 19, Chief Engineer Totten coordinated through Lieutenant Gillmore of the New York Agency arrangements for supplying Morton with needed materials. On May 1, Gillmore was informed that there was required at Fort Jefferson a large number of small irons to be employed in revetting the breast-height slope of the parapet. These irons were to be supplied in sets consisting of a cast iron clasp, two wrought iron rods, and a cast iron plate. The clasps were to be of two kinds, one concave and the other convex. There would be 106 sets, divided equally between the two types.[169]

A decision having been made to employ brick instead of granite for the cordon and coping, Gillmore was directed to procure and ship to the Tortugas 600,000 superior quality Danvers, Massachusetts, bricks. These were deemed to be the best northern brick for durability in a southern climate. They did not have to be pressed, as a quality hard-burned common brick would answer the Department's purpose.[170]

Gillmore was unable to secure Danvers bricks and, with the Department's approval, he contracted with a Brewer, Maine, firm for them. Extreme care was to be exercised in their selection.[171]

On June 6, Gillmore was ordered to the Washington County, New York slate quarries to select and make arrangements for shipment of 100,000 slates.[172] Two weeks later, he returned to New England to purchase more brick.[173] Upon doing so, he found that stacks of bricks on hand at the Brewer and Danvers yards were so low that new kilns would have to be built to meet demands. Subsequent delays in shipment of materials from these two companies resulted in a brick shortage on Garden Key.[174]

On August 16, Gillmore notified Morton that he was marking ten representative bricks of the next two shipments. These bricks had been purchased as "front bricks."[175] Some three months later, a letter from the Agency notified Morton that the Danvers bricks did not measure up to standards.[176]

---

169. Totten to Gillmore, May 1, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

170. Totten to Gillmore, May 7, & Totten to Morton, May 24, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

171. Totten to Gillmore, May 16, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

172. Totten to Gillmore, June 6, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

173. Totten to Gillmore, June 19, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

174. Morton to Hunt, June 14 & Hunt to Morton, June 20, 1861, FRC, East Point, Ga., Ltrs. Recd. & Sent, Fort Jefferson.

175. Gillmore to Morton, Aug. 16, 1861, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

176. Towbridge to Morton, Nov. 26, 1861, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

4. Agency is Directed to Ship Cutstone for Stair Towers

In mid-July, Morton mailed to the Department a bill and sketch of cutstone for coping the parade wall and six circular stair towers.[177] After reviewing the documents, General Totten forwarded them to the New York Agency, along with a request that six sets of tower stones be shipped to Garden Key. The cornice of the adjacent curtains was to be "crossed with brick."[178]

5. Morton Seeks to Maintain an Equilibrium

Early in August, Morton informed the Department that he had requested the New York Agency to ship 21,000 barrels of cement and 2,000,000 bricks to the Tortugas. These bricks were in addition to the 900,000 purchased in April and May. Although this order was immense, he was satisfied that it was neither extravagant nor ill calculated. He had, however, preservered in his arrangements, and "an equilibrium between the materials already ordered, those of the new order, and their cost, with the amount of workmanship and labour" required was his goal.

The 300-man workforce, "with complete facilities of scows, runs, hoistings, mule power, etc.," were maintaining a schedule that insured the materials on hand would hold out until the first cargos of the new order arrived. If these schedules were maintained, the parapets, terrepleins, and platforms would be finished by May 10, 1862.

The carpenters would then make some headway on the barracks woodwork, but no masonry in this structure would be laid until the barbette tier was completed.[179]

Chief Engineer Totten approved the subject requisitions.[180]

6. W.P. Trowbridge Takes Charge of the New York Agency

Late in October 1861, Captain Gillmore was relieved as officer in charge of the New York Agency, and reported for duty to Brig. Gen. T.W. Sherman as chief engineer of the Port Royal Expedition. His replacement was Capt. John G. Foster, who occupied this position for some four weeks. Foster was succeeded by a civilian, W.P. Trowbridge.

Soom after assuming his new responsibilities, Trowbridge was directed to provide Fort Jefferson with traverse irons for the barbette tier.[181]

---

177. Morton to Totten, July 15, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

178. Totten to Gillmore & Morton, July 27, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

179. Morton to Totten, Aug. 10, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

180. Totten to Morton, Sept. 7, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

181. Gillmore had been promoted captain on August 6, 1861.

About this time, the brig B.K. Eaton, en route from New York Harbor to Fort Jefferson, was captured and burned by a Confederate privateer, along with 1,046 barrels of cement and 1,047 casks of lime. Hearing of the disaster, General Totten contacted Trowbridge. To ensure against a work stoppage, because of lack of these materials, Trowbridge was to see that an equal quantity was loaded on the first vessel sailing from New York City to the Florida Reef.[182]

Early in January 1862, the Department directed Trowbridge to ship to Garden Key all the items listed on Morton's recent requisition, i.e., lintels, manhole covers, asphaltum, etc., and provisions. In regard to the latter, General Totten noted, "If the corned meat and other anti-scorbutics are for the workmen," Trowbridge was to ship them, unless he found some reason not to.[183]

7. Trowbridge Ships 111 Sets of Casemate Traverse Irons

On March 14, 1862, the Department directed Trowbridge to procure and ship to Fort Jefferson 111 sets of casemate traverse irons. They were to be 6 inches wide by 1/2-inch thick. Those for the larger circles were to be in segments.

The radius of the middle line of the inner circle would be 5' 9-1/2" instead of 5' 1/2" as heretofore, and the radius of the middle line of the outer circle would be 16' 9-1/2" rather than 16' 2-1/2". The chord of the half arc for the inner circle would be 4' 8". The outer circles were to meet in the middle of the communication between the casemates, which dictated that the chord of the arc be 19 feet, and the ends of the irons, at the extremities of the arc, be parallel.[184]

M. Mobilizing and Maintaining a Large Labor Force

1. Wage Scales

Within three weeks of Lieutenant Morton's arrival on Garden Key, his work-force began to melt away. To reverse this situation and to encourage those walking off the job at Fort Taylor to come to Garden Key, Morton on April 22 raised the daily wages to: mechanics from $2 and a ration to $2.50 and a ration; and laborers from $1.12½ and a ration to $1.50 and a ration.[185]

---

182. Totten to Morton, Dec. 4, 1861, NA, RG 77, Ltrs. Sent, Chief Engineer.

183. Totten to Morton, Jan. 11, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

184. Totten to Morton, March 14, 1862, NA, RG 77, Ltrs. Sent, Chief Engineer.

185. Morton to Totten, April 22, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

A tight financial situation soon compelled Morton to suspend the pay raise, but his manpower situation had stabilized. In the ensuing weeks the workforce was recruited by arrival of a large number of mechanics and laborers from Cuba and New York City.

By late summer the monthly payroll had zoomed to $9,640.37. It brokedown:

1 physician at $125 per mo.	$125,00
1 mate at $30 per mo.	30.00
1 clerk at $125 per mo.	125.00
4 sailors at $20 per mo.	80.00
1 principal overseer at $125 per mo.	125.00
1 cook at $28.50 per mo.	28.50
1 master carpenter at $75 per mo.	75.00
1 U.S. Engineer at $12 per mo.	12.00
1 master mason at $67.50	67.50
5 labors, general service at $1.50 per day	187.50
2 suboverseers at $45 per mo.	90.00
1 captain of Tortugas at $65 per mo.	65.00
21 laborers boating coral from Bush Key 3 laborers boating sand from Long Key at $1.1/8 per day 71 laborers, mixing, hoisting, and laying concrete	2,671.87
1 blacksmith at $2.70 per day	67.50
1 blacksmith at $2.50 per day	62.50
2 helpers at $1.1/8 per day.	56.25
1 applicateur at $61 per mo.	61.00
2 helpers at $56.15 per mo.	112.50
19 laborers, cooking, baking, fishing, etc.	520.13
12 laborers, laying runs, setting curbing for concrete, etc.	237.50

5 laborers, sweeping masonry, breaking cement bbls, etc. . .	140.65
12 laborers, wheeling sand onto terreplein	337.50
40 masons at $2 per day	2,000.00
40 masons' helpers at $1.1/8 per day	1,125.00
16 carpenters at $2 per day	800.00
4 carpenter helpers at $1.1/8 per day	112.50
10 laborers, unloading and storing materials	281.25
TOTAL . . .	$9,640.37[186]

On October 1, the end of the sickly season at hand, Morton reduced his mechanics' wages from $2.50 to $2 per day and the laborers' from $1.12½ to $1 per diem.[187]

2. Fatigue Parties and Prisoners Augment the Workforce

Fatigue parties of soldiers detailed by the post commander also were turned out. Artificer Miller supervised these troops. In a successful effort to secure Miller a promotion to sergeant, Lieutenant Morton wrote the Department that Miller was at present commanding a daily detail of 52 soldiers, including a sergeant and a corporal. On occasions, he had been in charge of more than 100 rank and file. Equally important, he secured their cheerful obedience, while pushing them vigorously.[188]

The number of military personnel available for work on the fort was increased on September 4, when the bark W.H. Wall landed 53 soldiers from the 13th and 79th New York Infantry Regiments. These men, charged with mutinous conduct, were placed at Morton's disposal. They were put to work unloading vessels, wheeling materials, etc., and an equal number of paid laborers laid off. This was beneficial, because the government was able to save wages and rid itself of marginal workmen.

The mutineers were supervised by Sergeant Miller who pushed them hard. Two armed guards were on hand to enforce discipline.[189]

---

186. Morton to Totten, Aug. 10, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

187. Morton to Totten, Nov. 5, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

188. Morton to Totten, May 23, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

189. Morton to Totten, Sept. 10, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer; Post Returns, Fort Jefferson, Sept. 1861, NA, Microcopy M-617.

3. Fort Jefferson Volunteer Sappers and Miners

The employees, to be prepared for an emergency, organized themselves into a militia company, designated the Fort Jefferson Volunteer Sappers and Miners. Lacking arms and accoutrements, the officers called on Lieutenant Morton to bring their plight to the attention of the Department.[190]

Morton, on forwarding the communication, reported the company, numbering 80-strong, drilled in the evenings. Recommending that favorable consideration be given their request, he pointed out that the men's trades rendered "them competent without instruction for the mechanical parts of the duties of an Engineer Company."[191]

N. Stranding of J.C. Chambers

On the evening of February 14, 1862, a gale was blowing out of the southeast, and the U.S. gunboat J.C. Chambers grounded on a shoal near Southwest Key. Notified that a vessel was in distress, Captain Morton turned out the crew of Tortugas. Taking a scow in tow, the schooner reached the gunboat. The scow was employed to put out anchors and cables, which kept the warship from being driven higher onto the shoal.

After the storm abated, J.C. Chambers was partially unloaded and refloated at high tide on the 15th.[192]

---

190. Miller to Morton, Aug. 27, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer. Company officers were: John A. Miller, captain; H. Herron, 1st lieutenant; and John Montgomery and Moses Paul Gibson, 2d lieutenants.

191. Morton to Totten, Sept. 5, 1861, NA, RG 77, Ltrs. Recd., Chief Engineer.

192. Morton to Totten, Feb. 16, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

IX. THE MCFARLAND SUPERINTENDENCY

A. McFarland Manages the Project Through Assistants

1. McFarland is Felled by Yellow Fever and Goes on Leave

Captain Morton's replacement as superintending engineer was Walter McFarland. A New Yorker, McFarland had graduated from the U.S. Military Academy as No. 1 in the Class of 1860. Commissioned a 2d lieutenant in the Corps of Engineers, he was ordered to Louisiana as assistant engineer for construction of the defenses of New Orleans. On February 15, 1861, Louisiana forces having seized the forts, McFarland was sent to Key West to be assistant engineer for defense of that area. Then, in April, he joined the United States forces at Fort Pickens, as assistant engineer. While on Santa Rosa Island, he was promoted to 1st lieutenant. On March 5, 1862, McFarland was named superintending engineer for the defenses of the Florida Reef.[1]

McFarland, as he wore two hats, decided to continue residing at Key West. Day-to-day supervision at Fort Jefferson would be the responsibility of Chief Clerk Pearsall. On May 17, some six weeks after he had assumed responsibility for the Garden Key project, McFarland wrote the Department that construction seemed to be progressing favorably under Pearsall's supervision. The principal difficulty was failure by the government to pay the workforce. The United States now owed four months' wages, aggregating more than $30,600, and this caused considerable dissatisfaction. Notice had been received by McFarland of the deposit of $50,000 to Captain Morton's credit in New York City. McFarland asked that this sum be speedily transferred to his credit.[2]

The Department promptly implemented this request, and the men soon were given their back pay.

During the last days of July 1862 yellow fever broke out at Key West. Two of the Department employees died on the 28th, and Lieutenant McFarland was felled on the 30th. For the next 12 days, he was confined to his bed, and it was September 11 before he again attended to his duties.

Writing General Totten to explain what had occurred, McFarland reported that 26 of his men had died of the fever, and another seven or eight were still hospitalized. "Nothing but the extreme kindness of almost perfect strangers" had saved him from sharing the fate of Captain Scaritt and Major Fraser, who had died from yellow jack while supervising construction of Fort Taylor in the 1850s.[3]

---

1. Cullum, Biographical Register, Vol. II, p. 494.

2. McFarland to Totten, May 17, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

3. McFarland to Totten, Sept. 11, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

Some four weeks later, McFarland notified the Department that, on advice of Dr. Whitehurst, he was preparing to travel to Port Royal, South Carolina, to see if Department Commander Ormsby M. Mitchel would grant him a sick leave to visit his home in Brooklyn, New York. To oversee construction at Fort Taylor and of the Key West seawall, during his absence, McFarland had recalled Civil Engineer Jekyll from Fort Jefferson. George Phillips, a 17-year veteran, would be in charge of the Garden Key project. [4]

General Mitchel approved McFarland's request for 20 days' leave, and he reached Brooklyn on October 18. Two weeks slipped by much too fast, and McFarland asked for and received a 30-day extension.[5]

Writing McFarland, General Totten thanked "the heavens" that the deadly scourge had not "wrested from the Corps another of its zealous and able officers." He congratulated McFarland on his narrow escape.[6]

Upon expiration of his leave, McFarland would take passage on the first Key West-bound military transport. Notifying the Department of his plans, he asked permission to be accompanied by his family. This should not present a problem because Key West was as much removed from the war zone as any northern city.[7]

Permission was forthcoming but, because of problems in securing transportation, McFarland decided not to take his family with him.[8]

McFarland was still in New York City on January 9, 1863, having been unable to secure satisfactory transportation. So far his only opportunity had been aboard merchant vessels. Twice he had been promised passage by the Quartermaster Department--first on the steamer Cahawba and then on the propeller S.R. Spaulding. Both times his plans had been frustrated, owing to the sudden diversion of these vessels to Chesapeake Bay.

Finally, after six weeks, passage was arranged aboard the steamer McClellan, scheduled to sail on the 23d.[9]

2. Jekyll is Fired and Frost Hired

Before returning to Florida, McFarland called on the Department to provide him with names of engineers who knew the art of fortifications, and possessed the necessary energy and sobriety to be placed in charge at Fort Jefferson. From what he had heard, he feared that he must discharge Mr. Jekyll.[10]

---

5. McFarland to Totten, Oct. 27 & 31, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

6. Totten to McFarland, Sept. 29, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

7. McFarland to Totten, Nov. 22, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

8. McFarland to Totten, Aug. 24, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

9. McFarland to Totten, Jan. 9, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

10. McFarland to Totten, Jan. 10, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

McClellan sailed as scheduled. She reached Key West on Friday, January 30, and McFarland disembarked and reoccupied his office after an absence of 15 weeks. He found that the stories regarding Jekyll's drunkenness and gross misconduct were true. After firing Jekyll, McFarland, not having heard anything from the Department concerning a possible successor, wrote Trowbridge at the New York Agency to see if he had any candidates for the position. Trowbridge recommended Edward Frost, and he was hired and assigned as civil engineer at Fort Jefferson.[11]

In the later winter of 1863-64, Frost, as a result of a personality clash with Captain McFarland, quit. On accepting Frost's resignation to take effect on the day he left Fort Jefferson, McFarland noted that "the little fault I have had to find with your administration is not. . . sufficient to render necessary or advisable your resignation." Although they had had their differences as to "ideas," McFarland cited Frost "for energy & ability. . . exhibited during your connextion with the" project.[12]

Frost next sought to secure employment with the Quartermaster Department. Writing General Meigs, he explained that since reaching Garden Key, more than a year before, he had had responsibility for overseeing expenditure of $350,000. He was now resigning because of a disagreement over policy with Captain McFarland. The captain, he explained, had resolutely maintained his office at Fort Taylor, seldom visiting the Tortugas, and had failed to give personal supervision to the project.[13]

Captain McFarland and Frost soon buried the hatchet, and by mid-summer Frost was back on the job.

3. Hilton Head Interlude

McFarland's return to the Florida Key was brief. On the last day of February, 1863, he received an order, dated the 31st, directing him to report for duty at Hilton Head. There he was to serve on the staff of Headquarters, Department of the South. Before boarding a Port Royal-bound vessel, he wrote Chief Engineer Totten. He complained that his reassignment, though temporary, must delay and disturb operation for which he was responsible. While absent, his brother, James McFarland, would attend to all official correspondence. Overseer Phillips would supervise construction at Fort Jefferson and a Mr. Rand at Key West.[14]

---

11. McFarland to Totten, May 19, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

12. McFarland to Frost, Feb. 22, 1864, NA, RG 92, Consolidated Correspondence File.

13. Frost to Meigs, March 8, 1864, NA, RG 92, Consolidated Correspondence File.

14. Seymour to McFarland, Feb. 21, 1862, & McFarland to Totten, Feb. 28, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

Chief Engineer Totten agreed with McFarland, and recommended to Adjutant General Lorenzo Thomas that Lt. Charles R. Suter, currently on duty with the Army of the Potomac, be ordered to Hilton Head to replace McFarland. Upon Suter's arrival, McFarland was to return to Key West.[15]

The War Department was agreeable. On April 24, 1863, following Suter's arrival at Headquarters, Department of the South, McFarland was detached and ordered to return to the Florida Reef. Meantime, he had been promoted to captain.[16]

There not being any direct communications between Hilton Head and Key West, McFarland returned by way of New York City. Consequently, it was May 18 before he reached Key West aboard the steamer Arago.[17]

As the final weeks of the sickly season approached, McFarland reminded the Department that the previous autumn permission had been granted for his family to travel to Key West aboard an army transport. He, however, had not taken advantage of this situation. He was now renewing his request.[18]

Chief Engineer Totten recommended that McFarland be allowed to have his dependents transported from New York City to Key West by a public vessel.[19] Secretary of War Edwin M. Stanton, however, rejected the request.

4. Lieutenant Holgate Assists James McFarland

On June 26, 1863, one week before the surrender of Vicksburg, the Department notified Captain McFarland that Lt. Asa. H. Holgate, a recent graduate of the U.S. Military Academy, had been ordered to report to Key West as his assistant. Concurrently, it was decided by Washington that McFarland would have general responsibility for Fort Clinch, upon which construction was about to be resumed. The addition of Holgate to his staff would enable McFarland to make periodic visits to Fort Clinch to check on the progress of work there under Capt. A.F. Sears' supervision. While at Fernandina, he would pay particular attention to the system of administration and accountability.[20]

---

15. Totten to Thomas, March 14, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

16. Halpine to McFarland, April 14, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

17. McFarland to Totten, May 19, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

18. McFarland to Totten, Aug. 24, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

19. Woodruff to Stanton, Sept. 3, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

20. Totten to McFarland, June 4 & 26, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

Upon his August arrival at Key West, Lieutenant Holgate was assigned to Fort Jefferson. Within several months a situation arose that compelled the young lieutenant to request a 30-day leave to visit his home in Ohio to attend to pressing family business.

Captain McFarland, on recommending approval of a furlough, noted that Civil Engineer Frost would have supervision of the Garden Key project during Holgate's absence.

In mid-September, McFarland had sailed from Key West for Fernandina aboard Tortugas. While there, he inspected Fort Clinch and reviewed procedures with Captain Sears.[21]

5. Flying Visit to New Orleans

On February 17, 1864, Captain McFarland received orders from Maj. Gen. Nathaniel P. Banks, directing him to proceed to New Orleans for duty with Headquarters, Department of the Gulf. Before leaving Key West for Louisiana, he fired off letters to Chief Engineer Totten and General Banks, protesting a policy that found him whisked off into the field, while charged with his Florida Reef and Fort Clinch responsibilities. So there would be no misunderstanding, he assured them that he did not object to this duty. He was willing "either to go into the field," or to oversee construction of the forts, but it was too much to expect him to undertake both missions.[22]

McFarland reached New Orleans on March 5. General Banks, recognizing the merit in McFarland's position, suspended the orders for him to report to his headquarters. Returning to his duty station, McFarland landed at Key West on St. Patrick's Day.[23]

Soon after McFarland's arrival, there was a yellow fever scare at Key West, when several men employed at the naval base were stricken.

6. McFarland Seeks Field Service

On April 22, 1864, General Totten, who had held the position of Chief Engineer since December 1838, died of pneumonia. His replacement was Richard Delafield, the Corps' next senior officer.

---

21. Holgate to McFarland, Sept. 17, & McFarland to Totten, Sept. 17, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

22. McFarland to Totten & McFarland to Drake, Feb. 17, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

23. McFarland to Totten, March 18, 1864, NA, Ltrs. Recd., Chief Engineer.

About this time, Lieutenant Holgate was ordered to report to Maj. Gen. Edward R. S. Canby, commander of the newly constituted Military Division of West Mississippi. The loss of his young assistant increased McFarland's workload, and he called this situation to the Department's attention.[24]

Replying, Chief Engineer Delafield gave McFarland his sympathy. He agreed that all superintending engineers, engaged in major projects, should have an assistant, but this was now impossible. "We are engaged in a mighty struggle with a determined and powerful enemy," Delafield continued, which called for the "best exertions of every officer whose services can be commanded, while we have also to look to the probable interference of Europeans." Such a situation called for "the zealous and overtasked labors of yourself and other officers of the Corps."

Under these circumstances Delafield could not promise much, because General Canby could not dispense with Lieutenant Holgate's services, nor could the Department, with propriety, substitute an experienced West Point graduate for him on Canby's staff.[25]

Becoming disenchanted with his situation, McFarland now informed General Delafield that, in October 1862, he had verbally discussed with Chief Engineer Totten an assignment with one of the Union field armies. He was still interested in securing such a transfer.[26]

Once again, Delafield had no solace for his superintending engineer. At present, he could not be spared from his Florida Reef duties.[27]

Meanwhile, McFarland had sailed from Key West for La Habana on June 29. There he received from the United States Consul a packet containing confidential instructions for delivery to General Canby. McFarland departed the Cuban city on July 1, reaching New Orleans on the 7th. He delivered the packet, took passage on a Key West-bound vessel on the 12th, and was back at Fort Taylor on July 16.[28]

---

24. McFarland to Delafield, May 26, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

25. Delafield to McFarland, June 8, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

26. McFarland to Delafield, July 20, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

27. Woodruff to McFarland, Aug. 16, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

28. McFarland to Delafield, July 20, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

Capt. Franklin Harwood, commanding the Army of the Potomac's Battalion of Sappers and Miners, apprised of McFarland's plea for field service, wrote the Chief Engineer that he was desireous of changing duty stations with McFarland.[29] General Delafield was unable to do anything about this proposal, because officers assigned to duty in the field could not be reassigned by the Chief Engineer.[30]

On February 27, 1865, General Canby, preparatory to undertaking his campaign aimed at the capture of Mobile, issued orders directing Captain McFarland to report to his headquarters for temporary duty.[31]

More than five weeks passed before a copy of this order reached McFarland. After drafting a protest, he left Key West by the first available transportation for Pensacola, where he arrived after the occupation of Mobile by Canby's army.[32]

Upon being apprised of what had happened, Chief Engineer Delafield, in view of the surrender of Gen. Robert E. Lee's Army of Northern Virginia at Appomattox Court House and the impending collapse of the Confederacy, called on General Canby to relieve McFarland as soon as practicable and return him to his duty station.[33]

This Canby did on May 27, and on June 7, McFarland was back at Key West.[34]

7. McFarland's Orders to Join the XIII Corps in Texas are Canceled and He Spends Four Months in the North

Soon after returning to his duty station, McFarland requested authority to travel to New York City. While there he would, in cooperation with the Engineer Agency, make necessary preparations, insofar as procurement of materials and hire of workmen were involved, to expedite construction when it was resumed early in November.[35]

---

29. McFarland to Delafield, Feb. 14, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

30. Delafield to McFarland, March 14, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

31. Special Order No. 58, Feb. 17, 1865, Military Division of West Mississippi, NA, RG 77, Ltrs. Recd., Chief Engineer.

32. McFarland to Delafield, April 9, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

33. Delafield to McFarland, April 22, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

34. McFarland to Delafield, June 7, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

35. McFarland to Delafield, June 10, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

Before he received an answer, orders reached McFarland to report for duty with the XIII Corps. He would be its assistant adjutant general, with the rank and pay of lieutenant colonel of volunteers. Upon advising the Department of this, he asked instructions as to what disposition he was to "make of my Engineer trust." Since the "speediest and only sure" way of reaching Texas, where the XIII Corps was stationed, was by way of New York City, he planned to first proceed there.[36]

McFarland, not hearing anything, sailed from Key West on July 24 and landed in New York City on the evening of the 27th. To facilitate his transfer, he brought along key documents, papers, and books.[37] Before departing from the Florida Reef, McFarland had placed Civil Engineer Frost in charge of the works.

Soon after reaching New York City, McFarland was dismayed to learn that in the post-Civil War rush to demobilize, the XIII Corps had been disbanded. He fired off letters to Adjutant General Lorenzo Thomas and General Delafield to ascertain whether he would join Maj. Gen. Gordon Granger in New Orleans or report to the Chief Engineer in Washington.[38]

On August 24, General Delafield notified McFarland that, if he were ordered to report to the Corps, he would be directed to resume his "labors on the Florida Reef." Since he was already in New York City, he would, as previously suggested, give attention to preparation of materials and procuring supplies with which to resume operations at the earliest possible date on his return to Key West.[39]

Some two weeks later, Adjutant General Thomas' approval secured, the Department ordered McFarland to be prepared to return to Florida. He was to write Civil Engineer Frost, giving him such instructions as were necessary. In the six weeks since his departure from Key West, no Departmental instructions had been sent to that point. The property was as McFarland had left it.[40]

---

36. McFarland to Delafield, June 19, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer. Vessels bound for the southwest avoided Key West at this season, because if they touched there, they were subject to a ten-day to two-week quarantine on reaching New Orleans.

37. McFarland to Delafield, July 28, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

38. McFarland to Delafield, Aug. 9, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

39. Delafield to McFarland, Aug. 24, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

40. Delafield to McFarland, Sept. 8, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

8. Major Burnham and Lieutenant Livermore Report to McFarland as Assistants

Captain McFarland returned to the Florida Reef in late November, landing at Key West on the 27th. The end of the Civil War had eased the personnel shortage, and the Department assigned two officers to assist McFarland. They were Bvt. Maj. Arthur H. Burnham and Lt. William R. Livermore. Both had reported by the time McFarland arrived, and he assigned the former to Fort Jefferson and the latter to Fort Taylor.[41]

On April 20, 1866, Captain McFarland reminded the Department that, in the years previous to the Civil War, construction had been generally suspended during the summers. Already, a number of workmen had claimed their discharges and had left for their homes in the North. Consequently, little could be accomplished in the forthcoming months. Moreover, fears were voiced that yellow fever might again ravage Key West as it had during the 1862 and 1864 sickly seasons.

McFarland recommended that the projects be closed down, and his assistants--Major Burnham and Lieutenant Livermore--be either granted furloughs or given temporary duty in the North.[42]

Chief Engineer Delafield assured McFarland that, anytime there was a threat of yellow fever and the foreign relations of the Nation did not demand haste in the construction program, superintending engineers were authorized to suspend operations. His assistant engineers were to take passage to Washington and report to the Department, while McFarland had the option of proceeding to some "healthy point on the Gulf or to New York City." If he opted for the latter, he was to take post at the Engineer Agency and make arrangements for the "active prosecution of operations" whenever the sickly season permitted.[43]

McFarland, his home being Brooklyn, chose to report at the Agency, now headed by Bvt. Maj. Nicholas Bowen.[44]

9. McFarland's Final Months on the Florida Reef

McFarland remained in and around New York City until November 3, when he boarded a Key West-bound ship. He was back on the Florida Reef on the 8th.[45]

---

41. McFarland to Delafield, Nov. 28, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

42. McFarland to Delafield, April 20, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

43. Delafield to McFarland, July 2, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

44. Bowen had replaced Trowbridge in February 1866.

45. McFarland to Humphreys, Nov. 12, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

Meanwhile, General Delafield had retired. His replacement as Chief Engineer was a distinguished engineer and soldier, Bvt. Maj. Gen. Andrew A. Humphreys.

Major Burnham did not return to the area. Burnham's replacement was Capt. William A. James, who was assigned by McFarland to be his assistant at Fort Jefferson.

In mid-June 1867 yellow fever returned to the Florida Reef, when four deaths occurred aboard the steamer Corwin. Captain McFarland, taking advantage of the authority granted him in July 1866, relieved his assistants and ordered them to repair to New York City and report to General Humphreys.[46]

Soon after his assistants' departure, McFarland received a letter from the Department, dated June 20, authorizing a suspension of operations, "should yellow fever prevail at Key West." He was perplexed whether this order superseded the one of July 1866 sanctioning suspension "whenever an epidemic threatens." Though an "epidemic threatened," and there had been deaths on ships arriving from La Habana and Jamaica, no case had been reported ashore. To wait until the fever appeared was to delay too long.

Personally, he continued, he had nothing to fear from the yellow jack, because he had been felled by it five years before. Even so, to attempt to carry on work locally during the summer was "destructive alike to mental and bodily vigor," and the labor force's effectiveness was cut more than fifty percent. Unless orders to the contrary were received, he would close down the projects and likewise catch a New York-bound ship.[47]

When his plans were not countermanded, McFarland laid-off the hands and proceeded to the North. He returned to Key West in November but remained less than two months. On January 1, 1868, he was relieved as superintending engineer of Forts Jefferson and Taylor by Col. J. H. Simpson.

B. Funding and Programming

1. Fiscal Year 1864 Appropriation and Program

On February 20, 1863, President Lincoln signed into law the "Fortifications Bill" passed by the 3d Session of the 37th Congress, appropriating $300,000 for construction of Fort Jefferson in Fiscal Year 1864. Relaying this news to Captain McFarland, General Totten advised him that Secretary of the Treasury Chase had determined that this money could be obligated immediately. In preparing his program for expenditure of these funds, McFarland was reminded that, as of February 1, there was still on deposit in the Treasury $54,910 of the appropriation for Fiscal Year 1863.[48]

---

46. McFarland to Humphreys, June 15, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

47. McFarland to Humphreys, July 15, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

48. Totten to McFarland, April 15, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

McFarland proposed and received authority to employ these monies to complete the barbette tier and four lower tier casemates; to finish excavating the ditch and constructing the counterscarp; and to expedite work on the barracks.[49]

When he prepared his operating budget for Fiscal Year 1864, McFarland calculated that, as of April 1, he had:

Sum open to expenditure.	$300,000.00
Unexpended balance at Asst. Treasury.	54,910.31
Unexpended balance on hand and proceeds on sales yet to credit USA.	5,089.69
	$360,000.00
Amount set aside for preservation of public works from July 1, 1864, to June 30, 1865.	10,000.00
Proposed expenditure between April 1, 1863, and June 30, 1864.	$350,000.00[50]

2. Congress Fails to Appropriate Any Funds for the Garden Key Fort in Fiscal Year 1865

On May 31, 1864, Chief Engineer Delafield, who had recently succeeded to the position, notified McFarland that the Fortifications Bill before Congress did not include any funds for construction at Forts Jefferson and Taylor in Fiscal Year 1865.[51] Consequently, his operations for the 12 months, beginning July 1, must be "restricted" to the $95,000 remaining from the 1864 appropriation, including "all liabilities and all likely to arise from engagements already entered into." McFarland was admonished to conduct his operations so as "to avoid any liability or debt of any sort beyond means now available unless you are specially authorized hereafter to do so."[52]

McFarland, in view of obligations already entered into, had great difficulty cutting back on his program to the scope demanded by the limited funds now available.

Early in September, he departed Key West aboard a New York-bound ship. His trip was dictated by the need to resolve the financial crunch, which could not be done without face-to-face discussions with personnel of the New York Agency.

---

49. McFarland to Totten, Aug. 29, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

50. Estimates of Funds Required, April 1, 1863, McFarland, April 1, 1863, FRC, East Point, Ga., Fort Jefferson.

51. Delafield to McFarland, May 31 & June 2, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

52. Ibid.

Upon reaching New York City, McFarland notified the Department of his arrival and asked it to approve the trip. At the same time, he informed General Delafield that, in May, he had submitted a requisition for $36,000 on account of Forts Jefferson and Taylor, and as yet it had not been forthcoming. Consequently, to meet operating expenses, he had been compelled to borrow money from local Key West merchants. Before sailing, he had given these people checks for the sums owed, promising them that measures would be taken to secure funding to cover these drafts.[53]

General Delafield's reply was blunt and to the point. The Department, as McFarland must know, could not sanction a trip made without its prior approval. Moreover, it lacked authority to approve borrowing money from any source by officers on account of the United States. The Treasury alone possessed that power.[54]

McFarland was disappointed by the failure to approve "a trip made soley for the benefit of the works" under his charge. To make it more embarrassing, he had declined a leave of absence offered him by Brig. Gen. Daniel P. Woodbury, commanding the District of Key West and the Tortugas, only weeks before Woodbury died, because he believed the interests of the service demanded his presence on the Florida Reef.[55]

McFarland would accordingly return to Key West at the first opportunity, whether or not he accomplished his mission.

The borrowed money, he assured General Delafield, in no way compromised the United States. The Department's disapproval of what he deemed a "praise-worthy act" left him no future option, but to stop work upon failure of the Treasury Department to promptly provide funds on his requisitions. Hereinafter, no effort would be made to keep men employed, when their pay was four or five months in arrears.[56]

After reviewing the books with Mr. Trowbridge at the Agency, McFarland provided the Department with data regarding the bleak financial outlook at Fort Jefferson. These figures showed:

---

53. McFarland to Delafield, Sept. 10, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

54. Delafield to McFarland, Sept. 14, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

55. McFarland to Delafield, Sept. 20, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer. General Woodbury had died of yellow fever at Key West, on August 15, and was buried there the next day.

56. Ibid.

Probable accounts unpaid on payrolls for May-October.		$16,000.00
Taxes due by appropriation.		434.66
Engagements entered into by Engineer Agency and which could not be stopped.		76,396.25
Total liabilities.		$92,830.91
Balance due U.S. as per account current to be rendered for October, probably $27,000		
Available yet undrawn from the Treasury.	$57,410.31	$84,410.31
Still due by U.S.		$ 8,420.60
Necessary to care for the works properly from Nov. 1, 1864, to June 30, 1865.		6,579.40
Additional appropriation required.		$15,000.00

Twenty-thousand dollars were needed to pay Forts Jefferson and Taylor workmen their back wages. In addition to this sum, McFarland called for $10,000 to be deposited to his credit, on account of Fort Jefferson.[57]

When two weeks passed and he received no reply to his request for a special allotment, McFarland, on October 23, again broached the subject. He was anxious, he explained, to know before he returned to Florida "whether the additional amounts needed to meet our remaining liabilities, after the entire appropriations are expended, will be furnished from contingent fund."[58]

Again, on November 1, he reminded the Department of his financial difficulties. Unless monies were made available, he, on arrival at Key West, must lay off the Fort Jefferson workmen.[59]

Finally, on November 23, Chief Engineer Delafield responded. He advised McFarland that he had written Secretary of War Stanton concerning the possibility of securing additional funding for certain of the coastal defenses, including Fort Jefferson. As several weeks had passed without a response, Delafield suggested that there was no reason for McFarland to wait any longer in New York City. He would return to Key West.[60]

McFarland sailed from New York City on the 26th and was back at Fort Taylor on December 1.

---

57. McFarland to Delafield, Oct. 5, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

58. McFarland to Delafield, Oct. 23, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

59. McFarland to Delafield, Nov. 1, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

60. Delafield to McFarland, Nov. 23, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

Meanwhile, Secretary Stanton had notified Chief Engineer Delafield that he could not authorize the requested transfer of funds.[61]

On being apprised of this, McFarland requested that the $57,410 in Fort Jefferson funds remaining in the Treasury be disbursed as follows: $25,000 to meet the claims of workmen through October 31 and to provide for security of the public property until June 30, 1865, and that the balance be remitted to Mr. Trowbridge at the Agency to meet, in part, the obligations incurred on account of the Garden Key fort.[62]

Late in January, McFarland wrote the Department that he continued to be embarrassed for want of money to meet long standing obligations. The four employees still on the roll at Fort Jefferson were "incessantly" asking for their pay.[63]

Once again, General Delafield reminded McFarland that no funds could be allotted from contingencies, because that appropriation was exhausted. The balance of the Fort Jefferson appropriation for Fiscal Year 1864 had been transmitted to the New York Agency. Until Congress acted on the pending Fortifications Bill, no other monies were available.[64]

3. Fiscal Year 1866 Appropriation and Program

Relief was forthcoming. On February 28, 1865, President Lincoln signed into law a Fortifications Bill appropriating $100,000 for construction at Fort Jefferson in Fiscal Year 1866. Notifying McFarland of this, General Delafield directed him to prepare and submit for approval a program for expenditure of this sum. These monies, Delafield cautioned, could not be expended before July 1.

McFarland was to specify the amounts necessary to liquidate all outstanding debts charged to the fort, and identify elements of the works to which he proposed to apply the remainder of the appropriation. He would withhold a sum to provide for security of the public property in the 12 months ending June 30, 1867, should Congress fail to vote any monies for the project in that year.

---

61. Delafield to McFarland, Nov. 26, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

62. McFarland to Delafield, Dec. 17, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

63. McFarland to Delafield, Jan. 23, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

64. Delafield to McFarland, Feb. 17, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

He would limit his operations to such parts of the works as "shall least conflict with modifications that may be adopted to conform with the views and opinions of a Board of Engineers that will have to consider this subject in connection with the proposed changes indicated in a Report of a Board of Engineers" constituted by Secretary of War Stanton in March 1864.[65]

A copy of the subject report was forwarded to McFarland by the Department.

Three days later, on March 2, the President signed another bill into law making available another $175,000 to supply a deficiency in the previous Fort Jefferson appropriation. As these latter funds were available for immediate expenditure, an application had been made by the Department for a remittance to Mr. Trowbridge of $45,000 to enable him to liquidate obligations contracted for by him on behalf of the Garden Key fort.[66]

It was mid-June before McFarland, because of his duties on General Canby's staff, found the opportunity to prepare and submit a program for expenditure of the $175,000. Of this sum, $70,000 had been remitted on April 8, $45,000 to Trowbridge and $25,000 to McFarland's credit.

After setting aside $10,000 to provide for security of the works in Fiscal Year 1867, McFarland proposed to apply the $95,000 remaining to completing: (a) the soldiers' barracks, (b) two sections of officers' quarters, (c) the drawbridge, (d) one detached magazine, (e) the lower tier of casemates, and (f) excavating the ditch.[67]

4. Fiscal Year 1867 Appropriation and Program

On August 23, 1866, from New York City, where he was on temporary duty at the Agency, Captain McFarland wrote the Department that he had heard nothing officially concerning fate of the Fortifications Bill for Fiscal Year 1867. This was becoming serious because it was "essential that the preparations necessary for carrying on next winter's operations . . . be made at once."[68]

---

65. Delafield to McFarland, March 1, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

66. Delafield to McFarland, March 4, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

67. McFarland to Delafield, June 20, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

68. McFarland to Humphreys, Aug. 23, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

Meanwhile, the Department had written McFarland that President Andrew Johnson, on June 12, had signed into law legislation appropriating $50,000 for Fort Jefferson in Fiscal Year 1867. McFarland was to forward for approval by the Department a program for expenditure of this sum. Sufficient monies would be reserved to provide for security of the public property during the 12 months ending June 30, 1868.[69]

In preparing his program, McFarland was to consider the need for a hospital, as called for by Assistant Surgeon John Bell in his letter of July 30. The limited appropriation, the Department noted, might make it "impracticable to meet the reasonable wants of the Medical Department in this respect," and to provide at the same time for other items of equal importance.[70]

McFarland found it impossible to allot any of the $50,000 for construction of a hospital, because of the urgent need to complete the officers' quarters and barracks. After paying for materials contracted for use in building these structures, there would be about $35,000 remaining from the appropriation for completion of the barracks and quarters.[71]

Chief Engineer Humphreys reviewed and approved the program as submitted.[72]

5. Fiscal Year 1868 Appropriation and Program

Some four months later, on March 10, 1867, Chief Engineer Humphreys wrote McFarland that Congress by an act approved March 2, 1867, by President Johnson had appropriated $50,000 in construction funds for Fort Jefferson in Fiscal Year 1868. This sum, however, had been reduced by the second section of the act, which provided "that there shall not be over fifty per cent of this appropriation expended during the subject fiscal year" unless specifically directed.

---

69. Humphreys to McFarland, Aug. 18, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

70. Humphreys to McFarland, Aug. 22, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer. The Department's request for $200,000 to underwrite the project in the subject fiscal year had been slashed by Congress to $50,000.

71. McFarland to Humphreys, Oct. 20 & Nov. 12, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

72. Humphreys to McFarland, Nov. 1, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

In accordance with procedures, McFarland was to prepare and submit for approval a program for expenditure of the reduced sum, and the $10,000 remaining in the Treasury from previous appropriations.[73]

McFarland, reviewing his books, found that, after earmarking $10,000 to retire outstanding obligations and $3,000 to provide for security of the fort and public property in Fiscal Year 1869, there would be available for construction $22,000. He proposed to spend these monies toward completion of the officers' quarters and barracks.[74]

The Department sanctioned the program as transmitted.[75]

C. Construction Progress Reported During the McFarland Years

1. Work Accomplished: May-August 1862

No annual report for construction activities was submitted by Lieutenant McFarland for the 12 months ending September 30, 1862. When reminded by the Department that he had failed to submit the prerequisite document, he was on leave. Responding to this call, McFarland explained that it was impossible for him to prepare a report for a facility that did not become his responsibility until mid-May. He knew of only two ways of coping with the problem--either wait until he returned to duty and secured from the files the necessary data, or to compile it from the monthly reports found among the papers at the Engineer Department.[76]

The latter alternative was pursued by the Department. Examining the subject reports for May through August, General Totten found that the masons had been employed laying bricks in the parade cornice, roof surfaces of the arches, stairway towers, barbette piers, and barbette magazines; in plastering the vertical breast-height scarp cornice wall and roof surfaces; in setting barbette pintle- and brace-blocks; in cutting and laying shot celler steps; in construction of a shot furnace; in setting the lower cordon and coping; in pointing barbette magazines; in receiving and laying asphalt on roof surfaces of arches and parade coping; in cutting stone for barbette piers and brick for stair towers; and in pointing traverse magazines.

---

73. Wright to McFarland, March 19, 1867, NA, RG 77, Ltrs. Sent, Chief Engineer.

74. McFarland to Humphreys, July 12, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

75. Humphreys to McFarland, Aug. 2, 1867, NA, RG 77, Ltrs. Sent, Chief Engineer.

76. McFarland to Totten, Nov. 4, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

The carpenters had seen to the repair of tools and machinery; made woodwork for towers; repaired temporary buildings and furniture; fashioned and hung doors and shutters for filtering closets of casemate cisterns; repaired schooner Tortugas and scows; built a small barge; and shaped woodwork for shot furnace and "Tower B."

The blacksmiths had made general repairs to tools and machinery; sharpened masons' and stonecutters' tools; fabricated hinges for tower doors and gateway; shoed mules and horses; made copperwork and hinges for casemate and tower magazines; and fitted lead to roof surfaces.

An applicateur had applied asphalt to roof and vertical surfaces of walls and arches of the barbette tier.

The machinist had operated and kept the steam engines in repair.

The laborers had assisted the mechanics; worked in the hospital; served as messengers; received and stored materials and provisions; boated coral and sand; worked in the messhall and bakery; fished; drove teams; slacked lime; drove piles; policed the grounds; mixed and poured concrete; and covered arches and drainage surfaces with coral and sand.[77]

2. Work Accomplished in Fiscal Year 1863

a. Frost Orders Galvanized Iron and Granite for 52 Service Magazines

Edward Frost, Civil Engineer, assumed supervision of construction at Fort Jefferson in mid-March 1863. Upon taking cognizance of the "condition" of the work and composition of the force, he urged that he be provided with 115 boxes of roofing tin or an equivalent amount of galvanized iron, and 52 sets of granite jamb stones and front flagging for the "entire number of shell recesses on barbette tier."[78]

Chief Engineer Totten approved Frost's request and ordered the galvanized iron and granite shipped from the New York Agency.[79]

---

77. Monthly Reports of Operations at Fort Jefferson for May-August 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

78. Frost to McFarland, March 21, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer. Each of the 115 boxes was to contain 112 sheets of 14" X 20" roofing tin.

79. Totten to McFarland, May 1, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

b. Use of Spoil from the Ditch as Fill

Next, Frost turned his attention to the Department's instructions that they were to use as fill for the area between the scarp and breast-height wall of the barbette tier, marly spoil excavated from the adjacent ditch. He was accordingly troubled to learn that the soil fronting Curtains Nos. 5 and 6 contained very little marl.[80]

Replying, the Department directed Frost to use the "excavated material as fill, even if it was not marly."[81]

c. Measures Taken to Flush Stagnant Water from Ditch

On April 19, 1863, Post Commander Lt. Col. William R. Alexander directed Frost to pierce the counterscarp at some point on fronts Nos. 1 and 2 to facilitate drainage of the ditch by tidal ebb and flow.[82] Then, some six weeks later, Alexander called on Frost to remove the parts of the cofferdam on front No. 6 interfering with tidal fluctuation. He also ordered Frost to build a floodgate in the 25-foot breach recently made in front No. 1 near Bastion A.[83]

On June 16 Alexander instructed Frost to do something about the stagnant water in the ditch along fronts Nos. 2 and 5. He blamed the Corps for constructing a cofferdam which caused this problem.[84]

d. McFarland Calls for Iron Floor Beams

Early in June Captain McFarland directed Frost to employ iron beams to support the barracks floors, but he was not to use them under the roof.[85]

e. McFarland's Annual Report

During the 12 months ending June 30, 1863, workmen completed the casemate roof surfaces of the second tier. They were covered with asphalt and dry brick, and the roof drains built. The sandfill, constituting the terrepleins on fronts Nos. 1 and 2, was finished, as had been the sandfill between the

---

80. Frost to McFarland, March 24, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

81. Totten to McFarland, May 1, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

82. Alexander to Frost, April 19, 1863, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

83. McFarland to Frost, June 6, 1863, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

84. Alexander to Frost, June 18, 1863, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

85. McFarland to Frost, June 8, 1863, FRC, East Point, GA., Ltrs. Recd., Fort Jefferson.

scarp and breast-height walls on these fronts, and the "top partly asphalted." Some of the asphalt, which projected a few inches beyond the face of the cornice, had softened and was drooping away from the cornice stones to which it was meant to adhere.

One hundred and six barbette pintle-blocks had been set. The traverse circles on fronts Nos. 1 and 2 had been positioned, and the pintles and iron traverse circles set in nine of them--Nos. 7, 8, 9, and 10 on front No. 1 and Nos. 15, 16, 17, 22, and 23 on front No. 2. Forty-two pounder smoothbores had been mounted on these platforms.

All 52 service magazines, excepting the doors and jamb stones, had been completed.

The masonry of the curtain traverses had been completed, and the framed roofing of two of them put up. The subject magazines, to make them serviceable, needed to be lined and have their doors hung.

The parade wall cornice had been completed, as had the masonry and roofs of the stair towers at bastions C, D, E, and F.

On the second tier, the only project undertaken and accomplished was completion of the tower magazines.

Work on the lower tier involved outfitting the curtain magazines. All casemates, except four, were ready for service, having traverse circles for either wooden or iron carriages set. The aforementioned four were missing only their traverse circles. In addition, one embrasure on each flank did not have its irons.

Seventy-three cisterns had been cleaned and tightened. The floors of several were taken up and relaid.

Out on the parade, the sewer paralleling front No. 2 had been completed. Spoil from the excavations, along with some of that secured from the ditch, was employed to raise "the parade along the rear of the casemates adjacent."

The foundations of the barracks, commenced in Fiscal Year 1862, had been completed; the watertable laid; three sections raised to the level of the lower window sills; and the fourth to the second story level.

The shot furnace had been completed.

To facilitate filling of the parapet's superior slope, along fronts Nos. 1 and 2 and a portion of front No. 6, the ditch had been excavated. Greater progress would have been made, Captain McFarland explained, "but the water, on front 6 gives us much trouble, and has greatly delayed operations."[86]

---

86. McFarland to Totten, Aug. 29, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

f. Photographs are Introduced to Document Progress

On January 25, 1864, McFarland transmitted to the Department the required annual drawing, showing the condition of the fort on June 30, 1863, and detailing progress made in Fiscal Year 1863. Also enclosed were four photographic views of the fort taken by the direction of Civil Engineer Frost and at his expense.

McFarland, impressed with the possibility of recording construction progress by photography, recommended that Frost be reimbursed for his out-of-pocket expenses.[87]

The Department was intrigued by this technique. But, before Frost could be reimbursed, General Totten must know the sum involved.[88]

Upon learning that the cost of the photographs was $32, the Department approved payment. In the interest of national security, McFarland was cautioned against circulating these prints. Those not needed for official use were to be destroyed, as well as the plates.

Additional photographs were to be taken and the prints submitted with future annual reports to measure progress.[89]

3. Work Accomplished in Fiscal Year 1864

a. Repairing the Wharves

General Woodbury, soon after assuming command of the District of Key West, directed Lieutenant Holgate to see that the Garden Key wharves were immediately repaired. Piles were driven at two of the wharves and one of them planked.[90]

b. Shortage of Maine Bricks Compels Readjustment in Priorities

On December 19, 1863, Captain McFarland at Fort Taylor found that he was running short of Maine bricks, and he ordered Lieutenant Holgate at Fort Jefferson to cease use of that type of brick and to ship those still on hand to Key West. The only reservation was that the number of bricks needed to finish the front elevation of the barracks be retained on Garden Key.[91]

---

87. McFarland to Totten, Jan. 25, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer. Copies of the subject drawing and photographs are on fie at Everglades NP.

88. Totten to McFarland, Feb. 25, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

89. McFarland to Totten, March 21 & Delafield to McFarland, May 27, 1864, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

90. Woodbury to Holgate, Sept. 26, 1863, & Holgate to McFarland, Nov. 2, 1863, FRC, East Point, Ga., Ltrs. Recd. & Sent, Fort Jefferson.

91. McFarland to Holgate, Dec. 19, 1863, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

c. Ironwork for the Quarters and Barracks

Early in April 1864, McFarland asked Holgate to review the plans and specifications for the iron stairways. The company that had contracted with the New York Agency for their manufacture had voiced concern regarding several of the details. McFarland chided, "Such a blunder as is therein involved should be made to fall upon the person through whose carelessness it was committed.[92]

Then, on May 26, Chief Engineer Delafield approved a change order recommended by Lieutenant Holgate to substitute iron roofs for those of wood to be positioned on the Fort Jefferson barracks and quarters.[93]

d. McFarland Calls for Plans and Elevations of Other Structures to be Erected on the Parade

Some five months before, Civil Engineer Frost had informed McFarland that the sewer was completed, and the pumps were dewatering the ditch paralleling front No. 6. Frost also advised that he hoped to forward a plan, "sufficient if approved" by which to start the Navy storehouse.[94]

On January 26 Frost informed the superintending engineer that the plan of operations for the year embraced partial construction of the Navy storehouse. But the only points upon which Frost was certain were that the structure was to be bombproof, two stories in height, 160 by 58 feet, and it was to be sited parallel to and adjacent to curtain No. 3. Materials for the foundations were on hand, as well as a sketch of a project for a Navy storehouse. The latter, Frost criticized severely, because it called for walls too heavy and the supports too light.[95]

McFarland laid these wants on the desk of the Chief Engineer, pointing out that he needed detailed plans and elevations of the Navy storehouse, chapel and offices, commanding officer's quarters, hospital, smaller detached magazines, and permanent wharf. He also complained that delays in receiving materials compelled them to work at a disadvantage.[96]

---

92. McFarland to Holgate, April 4, 1864, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

93. Kurtz to McFarland, May 26, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

94. Frost to McFarland, Jan. 10, 1864, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

95. Frost to McFarland, Jan. 26, 1864, FRC, East Point, Ga., Ltrs. Recd., Chief Engineer.

96. McFarland to Totten, Feb. 22, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

Because of General Totten's illness and then his death, a number of months slipped by before McFarland received a reply. On June 10, the Department transmitted drawings for the "small detached magazines." Some minor changes, General Delafield noted, had been made from the design furnished for the large magazines. The walls had been made "7' 6" all around, and . . . . the piers in the ante room which guard the entrance are made longer and placed nearer the outer door." This would afford more security for the inner door.[97]

No detailed plans and elevations for the other requested parade structures were forthcoming.

e. Progress Described in the Monthly and Annual Reports

During the 12 months ending June 30, 1864, the masons were employed laying bricks for the barracks walls and concrete in their floors; laying bricks, cutting brick watertable, setting flagstone girders, granite, and flagging in the officers' quarters; pointing and plastering counterscarp wall; setting and drilling traverse circles and stones of barbette tier, and positioning irons on same; building curbing for concrete work; laying flagging in 1st tier gunrooms; laying brick in officers' quarters kitchens; jointing and trimming stone; and trimming slate and slating officers' quarters kitchens.

The carpenters had been positioning woodwork in the barbette magazines; building a screw pump; making window frames and sash for barracks, and officers' quarters and kitchens; repairing wharves, scows, tools, and machinery; erecting temporary quarters; fabricating benches, tables, etc., for workmen's messhall and quarters; building scaffolding, forms for concrete and centers, and rafts for unloading vessels; roofing and flooring kitchens; assembling wheelbarrows; rigging derricks; and laying grillages for detached magazine.

The blacksmiths and machinists had been sharpening tools; shoeing mules; fabricating ironwork of screw pump, iron lintels for barracks and officers' quarters fireplaces, and pile driver; priming and repairing engines; and covering the roofs of the traverse magazines.

Laborers had been assisting artisans; excavating sewers, foundations for officers' quarters, ditch, and embankment of parade; boating sand and coral; caring for the sick; working in the messhall and bakery; policing the grounds; receiving and storing supplies; making and laying concrete for sewers, officers' quarters foundations, barracks flooring arches, barbette gun platforms, and kitchen foundations; driving teams; placing sand covering over barbette magazines; and building cofferdam at bastion E.[98]

---

97. Delafield to McFarland, June 10, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer. A copy of the subject plan is on file at Everglades NP.

98. Monthly Reports of Operations at Fort Jefferson, Oct. 1863-June 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

When he submitted his annual report for the fiscal year, Captain McFarland informed the Department that work on the barbette tier had been directed toward filling the parapet of front No. 6 and completion of the traverses. Serious difficulties encountered in excavating the ditches paralleling front No. 6 had prevented finishing the parapet at that point. Three steam engines, driving a 20-inch Worthington pump, two screw pumps, and four 12-inch lift pumps had been unable to keep the ditch dewatered in this area. To cope with this situation, McFarland had vainly called for a dredge.

Progress had been made in frabricating doors and supplying jamb stones for the 52 service magazines, but none were completed. The interior woodwork of the barbette traverse magazines was finished, while the exteriors of those on fronts Nos. 1 and 2 were completed, and rafters raised over the others. The banquette, except at the service magazines, was finished on fronts Nos. 1, 2 and 5--the remainder barely commenced.

On the 1st tier, 1,800 superficial feet of flagging had been laid in the gunrooms. In accordance with orders, work continued to be suspended on the 2d tier.

The main sewer was completed except for setting the gates or valves controling the outlets.

The masonry of the barracks was completed, and work would begin, whenever funds became available, on its roof and floors. The section of officers' quarters opposite front No. 6 had been laid-up to its "full height," and was likewise awaiting the floors and roof.

The two barracks kitchens at the southern extremity of the block had been built; two officers' quarters double kitchens (one intended to serve the post quartermaster) were almost finished; and the foundations for four more laid.

Workmen had put down the grillage and laid the foundations of the Parade magazine opposite front No. 1.[99]

To document the work accomplished during this period, McFarland forwarded to the Department the required annual drawing and four photographs of the fort. The latter were taken from the same position as those forwarded on January 25, 1864.[100]

4. Work Accomplished in Fiscal Year 1865

There being no appropriation for Fort Jefferson in Fiscal Year 1865, operations were limited to what could be accomplished with monies remaining from Fiscal Year 1864 and by employment of convict labor.

---

99. Fort Jefferson, Annual Report for Year Ending June 30, 1864; McFarland to Delafield, Oct. 10, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

100. McFarland to Delafield, Nov. 1, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer. Copies of the subject drawing and photographs are on file at Everglades NP.

During the year these projects were undertaken:

Barbette tier--The roofs of two traverse magazines had been finished, and nine others were finished, excepting the iron sheathing. Stone work for 21 service magazines (shot cellars) had been placed, and the banquette completed on fronts Nos. 1, 2, and 5.

Second tier--By this time, the walled in and loopholed embrasure openings were "disarranged." Many of these thin walls had been broken out, and "rickety porches or balconies of rough boards for accommodation of the lodgers projected from the casemates."

Lower tier--A small amount of flagging had been laid in certain of the casemates.

Parade--The sewers had been completed, but could not be used because of the unfinished condition of the ditch. The foundations of a small detached magazine had been laid. Two sections of the barracks had been roofed, the brick and air flooring laid, and the iron stairways positioned. Much of the "interior finish" was on hand ready for use. Temporary shed roofs had been erected by the Quartermaster people over several ground floor squadrooms to provide messing facilities for the convicts. Four barracks kitchens had been constructed and two double officers' quarters kitchens completed.[101]

Ditch--On October 28, Principal Overseer Phillips reported that excavation of the ditch, then being accomplished by convict labor, was progressing satisfactorily, though rainy weather had retarded it to some extent. The prisoners had not been turning out in the numbers Phillips desired, and he had brought this subject to the attention of Post Commander Charles Hamilton, who promised an improvement. If this occurred, the ditch on front No. 6 could be completed in eight days, and then work could be started along front No. 5.[102]

Phillips' expectations were dashed, and it was the last day of November before excavation of the ditch on front No. 6 was completed.[103]

In December, after shutting down work on the ditch in accordance with his December 6 instructions from Captain McFarland, Phillips was at a loss to find work for the idle convicts. He,however, managed to get the machinists, who had been running the engines, to resume work on their own responsibility. He then prevailed on the Post Quartermaster to provide one and a half tons of coal needed to fire the boilers.[104]

---

101. McFarland to Delafield, Sept. 30, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

102. Phillips to Frost, Oct. 28, 1864, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

103. Phillips to Frost, Nov. 30, 1864, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

104. Phillips to McFarland, Dec. 18, 1864, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

5. Fiscal Year 1866 Program

a. Friction Between the Corps and Garrison

The situation of Corps of Engineer personnel as to quarters and office space had been complicated, when it became necessary to prematurely garrison the fort. Upon arrival of the troops in January 1861, Post Commander Arnold had taken possession of the section of officers' quarters utilized by the superintending engineer and his staff. Since then the Engineer office and quarters had been relocated several times to "suit" the whim of various post commanders.

This had led Captain Morton, while superintending engineer, to have two more kitchens constructed as quarters on front No. 5 for the Engineer physician and clerk. Subsequently, Captain McFarland had had a third kitchen erected on the same front to serve as quarters for Lieutenant Holgate, when he and his family were unable to secure housing in the officers' quarters. These three kitchens, along with the one erected as quarters for accommodation of the overseer and his family on front No. 6 by Captain Woodbury, had been built out of sequence, because of the need to provide housing for key Corps personnel.

Now there was danger, Captain McFarland warned, that the Corps might be turned out of these unless General Delafield was able to get an order, signed by Secretary of War Stanton, "forbidding any interference with these four kitchens, erected especially for the benefit of the Engineer Department." Moreover, he continued, the Corps had "suffered considerably" from the interruption of its business due to the arbitrary removals of its offices from one part of a building to another. Currently, the staff occupied three rooms on the second floor of the officers' quarters.[105]

Chief Engineer Delafield was unable to secure such an order, and in mid-July there was additional friction between the garrison and Engineer personnel. It was triggered by a man acting as overseer for a work gang of military convicts. He employed them to transport hogs, which he claimed as personal property, from Long Key to Bird Key, "on which are . . . . the scattered graves of many Union soldiers who have died on this post during the war."

Civil Engineer Frost, in calling the subject to the attention of Post Commander Maj. Henry C. Devendorf of the 110th New York Infantry, requested that, as soon as the swine were returned to the Long Key ranging area, the cattle pen be relocated from the center of the parade to its former site on Long Key. The pen's location on the parade had resulted in destruction by the animals of a number of valuable shade trees.[106]

---

105. McFarland to Delafield, June 20, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

106. Frost to Devendorf, July 17, 1865, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

Nothing, however, was done about relocation of the cattle pen until mid-September, following replacement of the 110th New York as the garrison by the 82d U.S. Colored Infantry. At that time Maj. George Wentworth of the black regiment had the cattle removed from the parade.[107]

b. Plans and Guidelines for Roofing the Barracks and Quarters

On August 10, 1865, Captain McFarland reminded the Department that the most urgent project was to complete the barracks and officers' quarters. Work on them had been suspended for months, because of a failure to get a definite answer from Chief Engineer Delafield concerning the fireproof roofs. An estimate for an iron roof for the former, submitted by Althouse & Co., had placed its cost at $55,000 delivered in New York City.

Because of the necessity to provide cover for the stores, McFarland had had a temporary roof placed over two sections of the barracks. This had been done by laying up the end and side walls of the subject sections to the "general surface of the roof." Brick corbels had been constructed and heavy hackmatack purlins laid about 3' 6" from centre to centre. The latter were crossed by 3" by 4" scantling, and boarded over with waste lumber and slated.

This roof was "exceedingly stiff and strong" and practically fireproof.

If iron I-beams were substituted for the hackmatack purlins and galvanized iron sheathing for the roof covering, he informed the Department, they would have a "whooly [sic] "fire proof roof" at a cost of $12,000 for the barracks and $15,000 for the quarters.[108]

The Department responded by asking McFarland to refine and place in Mr. Trowbridge's hands his project for roofing the barracks and quarters. This was necessary if Trowbridge were to receive proposals.[109]

Some six weeks later, McFarland submitted to the Department for comment a roof plan. As General Delafield would see, McFarland proposed to employ trussed purlins instead of rolled I-beams. The subject purlins, he noted, would impart equal strength at a savings of one-fourth the cost.[110]

---

107. Duncan to Wentworth, Sept. 20, 1865, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

108. Frost to Trowbridge, July 19, & McFarland to Delafield, Aug. 10, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

109. Delafield to McFarland, Aug. 15, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

110. McFarland to Delafield, Oct. 1, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject drawing is on file at Everglades NP.

After studying the drawing, Delafield informed McFarland that he was to exercise his own judgment on the roof plan. But he was to bear in mind that no combustible materials were to be used unless unavoidable.

Can you, Delafield inquired, not employ with advantage iron beams resting on walls, 5 to 6 feet apart, with a 4-inch brick arch from one to the other, on top of which the roof surface and watershed can be placed? McFarland would, in view of the hot, humid climate, review the use of ventilators between the roof surface and the room ceilings.[111]

c. Department Revises its Guidelines for Construction of Breast-Height Walls, Parapets, and Platforms for Barbette Batteries

On January 18, 1865, the Department made available to its superintending engineers plans and details to be followed, hereinafter, in "preparing breast-height walls, parapets and barbette platforms for 100-, 200- & 300-pdr. Rifles, and 8 & 10-inch smoothbore guns."

The minimum distance between platform centres had been recently established at 22 feet, which rendered the traverse stones independent of each other. This insured that an exploding shell, wrecking one platform, would not necessarily damage the one adjoining. The parapet between guns had been thrown to the rear as far as practicable to serve as a traverse. Whenever the length of a face gave a fractional gun pit of more than 22 feet, the excess was to be positioned between the guns, and the breast-height wall of the intervening space "thrown as much more to the rear as practicable to give so much more traverse."

A step had been added to facilitate loading of barbette guns. Part of the step was to be hinged, to be raised and lowered as the situation dictated.[112]

d. Modification of Certain Barbette Platforms

Meanwhile, on July 21, the Department had notified the superintending engineers that, hereinafter, in constructing front-pintle barbette platforms for 10- and 15-inch guns, the top surface of the outer traverse circle would be laid one foot lower than at present. The vertical distance between the top of the outer traverse iron and the top of the inner, or pintle traverse iron, was to be 1' 4" instead of the present 4 inches for the 15-inch platforms. For smaller platforms, the vertical distance between the top of the outer and inner traverse circles was to be 1' 9" instead of 9 inches.

No alterations were to be made in existing platforms.[113]

---

111. Delafield to McFarland, Oct. 11, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

112. Delafield to Supt. Engrs., Jan. 18, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer. A copy of the subject plan is on file at Everglades NP.

113. Circular Letter, July 21, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

At the Pensacola forts, Fort Pulaski, and the masonry fortifications guarding the approaches to Charleston Harbor, it had been demonstrated that the masonry scarps of the handsome and expensive coastal defenses of the Third System were extremely vulnerable to bombardment by rifled cannon. Civil Engineer Frost, as he prepared for a new construction season on the Florida Reef, focused his attention on these lessons, and the need to strengthen the fort's armament to cope with warships mounting huge shell and rifled guns.

On July 31, Frost informed the Department that on the barbette tier, the foundations for the stone traverses on fronts Nos. 3-6 had been built in conformity to the Department's letter of February 19, 1863. In view of the advance state of completion of fronts Nos. 3-5 (all that remained to be accomplished was filling the parapet and the platforms of two gun centers near bastion C), he wished to know what, if any, reinforcing was required to make the platforms serviceable? If the Department so directed several of the pintles might be adapted in diameter to a larger chassis by shrinking on a collar of proper thickness. Experimental firings with progressively increased charges would enable them to determine the limit of resistance afforded by the masonry already arranged about the pintle.

For fronts Nos. 1 and 2 and the incomplete portion of front No. 6, Frost called for instructions. There, the old construction, of at least the traverse arcs, must be replaced.

With exception of the four 42-pounders on front No. 1 and five guns of similar caliber on front No. 5, there were no guns en barbette that could be employed for defense. The wooden temporary platforms of the six 10-inch columbiads were badly decayed.

Because the dimensions "afforded by the ground plan" were insufficient to afford the requisite width of the terreplein, Frost inquired, is it "admissible to provide the additional width by throwing out an iron platform, supported by brackets?"

The introduction of centre-pintle platforms into the bastions also presented problems, because the space between the breast-height walls on either side was inadequate.[114]

Replying, the Department directed that, where "old barbette platforms" had been reinforced or were to be reinforced, the traverse stones were to be replaced by "stones of the dimensions for new traverse circles," as described in the circular of February 25, 1863, and the circles laid at the lower level.

Only such platforms would be constructed or modified in accordance with the July 21 circular, as did not by their positions interfere with the views of the Board of Engineers reported in January 1864. These platforms would, hereinafter, be identified as those with low traverse stones.[115]

---

114. Frost to Delafield, July 31, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

115. Delafield to McFarland, Aug. 15, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

e. Strikebreaking in the 1860s

In December 1865, there were labor difficulties resulting in a strike. According to Major Burnham, the strikers had complained that: (a) they had agreed to work for $1.20 per day and were getting only $1; (b) they had reserved the right to leave the project whenever they chose; and (c) their rations were deficient in both quantity and quality.

Relaying this news to Superintending Engineer McFarland, Burnham noted that only a few men were seemingly involved in the dispute. Moreover, he held that of the three complaints, only the second had any validity. He had determined to give the strikers a day or two to decide whether they would return to work. If they refused, he intended to put them under guard, work them during the day, lock them up a night, and whether they decided to return to work or not, to ship the malcontents back to New York City.[116]

In view of the stance taken by Burnham, the strikers capitulated, and on the last day of the year, the project's payroll totaled 540.

f. Work Accomplished During the 12 Months Ending June 30, 1866

During the year, because of the hurricane, construction was "almost entirely limited" to the permanent buildings on the parade. Work accomplished included:

Officers' Quarters -The rear third story wall blown down in the October 22 hurricane was rebuilt, and the masonry of all the walls completed. Eighty-two iron roof beams were placed and the roof completed to a height of 33 feet. Eleven flights of iron stairways were put up. Iron floor beams of 12 floors were set and the brick floor arches thrown across. Two hallways were floored.

Two single kitchens and a double-kitchen were built, and the half double-kitchen wrecked by the storm rebuilt. The privies attached to the kitchens were erected.

Barracks--Seven gables were finished; eight flights of iron stairs erected; iron floor beams laid in seven rooms and the floor arches thrown across; four squadrooms completed and occupied (three by the garrison and one as a hospital); the first and second sections slated; three rooms furred and lathed; and three hallways floored.

Detached Magazines---The large magazine, near B bastion, had been raised from its foundation to reference (13' 6") and the principal arch turned. In accomplishing this, 566,000 bricks and 2,036 barrels of cement had been expended.

---

116. Burnham to McFarland, Dec. 13, 1865, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

The small magazine, near D bastion, had been raised 7 feet and the recess arches turned.

Casemate Cisterns--Five casemate cisterns had been made watertight.

Casemates, Barbette Magazines, etc.--Thirty-one curtain casemates had been completed; four bastions flagged; and the four barbette magazines, unroofed in the gale, repaired.

Ditch--Two-thirds of the moat in front of curtain No. 3 had been excavated to a proper depth, and a bridge constructed across it to the gateway. The counterscarp had been constructed for the same distance, workmen employing 60,000 bricks and 4,700 cubic feet of concrete in doing so. Some 80,000 cubic feet of sand had been removed from the ditch and embanked to "gain ground from the sea."[117]

6. Implementing the Fiscal Year 1867 Program

Construction during these 12 months was to be limited by a shortage of funds. Soon after returning to Key West in November 1866, prepared to inaugurate a new construction season on the Florida Reef, Captain McFarland was disappointed to discover a clerical error that reduced the "working balance" of the recent appropriation from $35,000 to $15,000. Of this latter sum, $3,000 must be deducted to care for the public property during Fiscal Year 1867.

Perhaps, McFarland had overlooked the letter of February 16, 1866, from Major Bowen at the Agency, applying to the Chief Engineer's Office for remittance to the Agency of $25,000 on the Fort Jefferson account for materials purchased and shipped to Garden Key. At that time, the undrawn balance in the Treasury of the Fort Jefferson appropriation ($9,703.34) did not permit remittance of the monies called for.[118]

Writing Civil Engineer Frost, McFarland cautioned that the "severest economy must be exercised . . . to produce any positive progress during the coming season." Frost would accordingly prepare a scheme for expenditure of the remaining $12,000 to make habitable a part of either or both the quarters and barracks.

---

117. McFarland to Humphreys, Sept. 25, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

118. Delafield to McFarland, Feb. 24, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

So far as possible, Frost was to employ convict labor, reinforced by a few craftsmen. If blacks were able to accomplish more work at a cheaper rate than whites, he was to discharge the latter.[119]

Frost replied that it would be compulsory to dispense with all employees and materials not already on the key. This mandated that the blacks, if not needed at Fort Taylor, seek employment elsewhere.[120]

By late March 1867, most of the funds had been spent, and in April the Department's payroll was pared from some 50 men to an overseer and two laborers. In June the workforce was increased to include a blacksmith and two stonecutters engaged in setting pintles and barbette platforms, and three laborers looking after the public property. Other employees included a physician, the chief overseer, and a clerk.[121]

The limited monies available had been applied to completing the officers' quarters. This enabled workmen to roof the structure "with galvanized iron over nearly its whole extent." The section next the "portion" long built had been completed, except for the halls and piazzas.

Sixteen front-pintle barbette platforms had new pattern pintles and plates positioned.[122]

On October 24, while in Washington, Captain McFarland left at the Department a sheet of photographic views of Fort Jefferson which he had neglected to include in his annual report.[123]

Several days later, after reviewing the photographs, General Humphreys cautioned McFarland that these views were classified and must not be published.[124]

---

119. McFarland to Frost, Nov. 15, 1866, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

120. Frost to McFarland, Nov. 17, 1866, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

121. Fort Jefferson, Monthly Reports for April-June 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

122. McFarland to Humphreys, Sept. 19, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

123. McFarland to Chief Engineer, Oct. 24, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

124. Kurtz to McFarland, Oct. 29, 1867, NA, RG 77, Ltrs. Sent, Chief Engineer.

D. Changes Mandated for the Barbette Tier Platforms

1. Totten Calls for Stronger Traverse Stones

General Totten deemed it important that McFarland be provided with means of reinforcing the "feeble traverse stones" previously shipped to Garden Key. To enable him to do so, the Department directed the New York Agency to ship some 150 stones.

Where the traverse circles had been finished or materially advanced no change would be made. The new stones, on their receipt, were to be laid in accordance with the enclosed drawing prepared by Captain Morton.

To afford greater stability to these circles, there was to be placed beneath the top stones, already stockpiled, a "course of still larger stones, as supports to them, instead of the thin brick wall first designed." These supporting stones were to be polygonal, 1 foot thick and 2 feet wide.

The traverse circle stones were to rest upon a bed of concrete, made of the best quality cement mortar, without any admixture of lime. This concrete base was to be carried as low as could be safely done in reference to the roof surface. It was to be laid in thoroughly rammed sand. The concrete, itself, would be "rammed in the severest manner; as it is found liable to be broken, and driven into the ground, by the violent recoiling shocks of the very heavy guns now getting into general use."[125]

2. Implementing the Change Order on Curtains Nos. 3-6

On receipt of Totten's letter, Civil Engineer Frost informed the Department that the traverse stones of curtains Nos. 1 and 2 had already been laid upon brick foundations. On curtain No. 6, the sand had been rammed and leveled and was ready for its brick foundations. A start had been made on the brick foundations of two circles. Nothing had yet been done on curtains Nos. 3, 4, and 5.

No traverse irons had been set, except for the six centre-pintle wooden platforms mounting the six 10-inch columbiads.

With the like exception, no pintles had been set.

The pintle-blocks, however, were complete, Frost reported, being executed in conformity with the details found on Sheet No. 50.

A necessary number of sets of traverse irons were on hand, and could be positioned on finished traverse circles, as rapidly as "the sand now piled over them can be disposed of." They were about to put down nine on curtains Nos. 1 and 2 for the purpose of mounting thereon a like number of 42-pounder smoothbores currently available.

---

125. Totten to McFarland, Feb. 19, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer. A copy of "Sketch of Traverse Circles for Centre-pintle Barbette Guns" is on file at Everglades NP.

There were on hand 105 pintles, adapted to the pintle-blocks as constructed, along with six pintles and a like number sets of traverse irons for the 15-inch Rodmans to be mounted in the bastions.

To meet the conditions outlined by the Department, Frost requisitioned these additional traverse stones for curtains Nos. 3, 4, 5, and 6 to implement the recent change order:

58 stones f, e, e, f
58 stones e, d, b, b, d, e
270 stones a, b, d, c
11 stones k, i, h, g, l
11 stones k, i, h, g, l, reversed
4 stones 1/2 a, b, d, c taken from the right
4 stones 1/2 a, b, d, c taken from the left

The one-half stones were to correspond, as if the stone were cut in half by the sectioned line 1-2. These stones were for the extremities of the traverse area, where they abutted on the bastions.[126]

3. Totten Provides Plans and Instructions for 15-inch Centre-Pintle Bastion Platforms

On February 25, 1863, the Department by circular letter and enclosed drawings provided Lieutenant McFarland with necessary details for laying barbette platforms for 15-inch Rodmans and for modifying those already laid. The tracings, marked A and B, depicted platform details. The pintle-block on A was a single stone, as were the several traverse stones on the side of the platform. Pintle-block B was "compounded" of 5 stones, held together by iron traverse circles on top, and by 2 side clamps of iron bolted to the stone.

The iron traverse circles were 1-inch thick, and the Ordnance Department had proposed that the set of circles next the pintle, counting outward, be severally 3", 3.3" & 4" broad, with narrow spaces between, making the total breadth 13-8/10".

The subject space could be so occupied as at A and B, or it could be occupied by 2 rings as at A', or by a polygonal piece as at A". The outer traverse circle irons were to include two of 4-inch width and two of 5 inches. These latter irons were to be in several arcs, each as large as could be conveniently formed and handled. They were to be bolted down (with provision for expansion and contraction) in a manner calculated to bind the stones together.

To seat the pintle, a hole 6 inches in diameter and 15 inches deep would be sunk in the pintle-block. After the pintle had been positioned and centered, wrought iron strips would be wedged between the stone and pintle, the tops of the wedges not quite reaching the top of the stone. Molten lead would be poured in to fill the voids and cover the tops of the wedges.[127]

---

126. Frost to McFarland, March 18, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

127. Circular Letter, Feb. 25, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

The distance below the horizontal plane of the axis of the trunnions of the traverse irons on the pintle-block would be 78.652 inches, and of the top of the outer sets of the traverse irons 84 inches.

Sections of drawings A and B gave "two cases of depression" of 3 and 6 degrees respectively. This demonstrated that, while a difference in this did not change the relative references of the axis of the trunnions and top of the platform, it affected the height of the crest and, consequently, the cover afforded by the parapet. The top of the breast-height wall would always be 2 feet below the crest. This 2-foot height above the top of the breast-height wall was to be earth sustained by thin flagging stones, "standing in a slope at right angles with the superior slope of the parapet." The flagging would be secured by clamps.

Where the 15-inch gun platforms were thrown in advance of the general line of the parapet crest, it was deemed advisable to place the surface of the concrete, lying between the most advanced part of the platform and the parapet, 6 feet 3 inches below the crest. This provided good drainage to the rear.

Under all circumstances, the polygonal sides of the recess for the big Rodmans were to circumscribe a circle having a radius of 11' 6 ".

Iron traverse circles affording the track to the eccentric track could be fabricated in three rings, or in polygonal plates. In either event, they were to be 1/2-inch thick, with their upper surface 1/8-inch above the top of the pintle-block.[128]

In the new front-pintle platforms, there would be no change in the pintle-block and bolster. There was to be a curbing of stones, i.e., a 5' 4" by 2' by 2' back piece; two side pieces of 6' by 2' by 1'4", each; three flat, or flagging stones, 6 or 8 inches thick; and one 3- or 4-inch flagging stone. These stones would be embedded in a large mass of high-grade concrete made with cement. Before being positioned, the platform side pieces were to be pierced with 2 holes to take 1-1/2-inch bolts and, after being laid, these bolts were to be driven 6 inches farther: one into the end of the pintle-block bolster, and the other into the back piece. A 12-inch bolt, smeared with pine bitumen, would be pushed to the bottom of these holes, the remainder of the void being plugged with cement mortar. The upper surface of these platform stones was to be 3/8-inch below the top of the pintle stone. The eccentric truck traverse irons were to be fastened to the flagstones.[129]

---

128. Ibid.

129. Ibid.

Tests had demonstrated that it was necessary to make the traverse stones and their foundations stronger than heretofore. They were to be in "polygonal portions," the stones 2 feet broad by 1-1/2 feet deep; and their concrete foundations to be 3 feet broad by 2-1/2 feet deep. Where the foundations rested on sand, the concrete should be deposited and rammed in thin layers, on a pavement of small stones, which had been driven into the sand by blows from a heavy rammer.[130]

Where the gun would not require a depression of more than 1 or 2 degrees, the top of the pintle-block would be 4' 10" below the plane of the crest. Where 3 degrees the distance must be 4' 8", where 6 degrees of depression was needed the distance to be 4' 4"; and where 9 degrees 4' 1" or below.

In all new breast-height walls, the top was to be 2 feet below the crest, instead of 18 inches as heretofore. This upper 2 feet was to be sustained by flagging and clamps.[131]

4. Department Forwards Plans for 15- and 10-inch Front-Pintle Platforms

On July 15, 1863, the Department transmitted to McFarland tracings of details of platforms for 15- and 10-inch front-pintle barbette guns.[132]

E. Boosting the Fort's Armament

1. Totten Calls for a Report of Effect of Recoil on Platforms of Barbette Guns

On February 20, 1863, General Totten asked for a report on whether any of the front-pintle barbette guns had been fired. If so, their platforms and circles were to be "given a minute examination to ascertain the effects" thereon.[133]

Four weeks later, Civil Engineer Frost notified the Department that no traverse irons had been positioned on the barbette tier, except for the six centre-pintle wooden platforms (one in each bastion) mounting the 10-inch columbiads. He was about to put down not more than nine traverse irons on curtains Nos. 1 and 2 for the purpose of emplacing a like number of 42-pounder smoothbores currently on hand. Also available were six pintles and a like number of traverse irons provided for the 15-inch Rodman platforms.[134]

---

130. Ibid.

131. Ibid.

132. Totten to McFarland, July 15, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

133. Totten to McFarland, Feb. 20, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

134. Frost to McFarland, March 18, 1863, NR, RG 77, Ltrs. Recd., Chief Engineer. On January 15, 1863, Totten had approved a proposal by Post Commander Alexander to position nine 42-pounder smoothbores en barbette on fronts Nos. 1 and

As yet, no guns had been mounted en barbette on which the effects of their recoil could be measured on the platforms and circles.[135]

2. Armament Mounted and Dismounted in Mid-March 1863

The next day, Frost sent Lieutenant McFarland a detailed report concerning the Fort Jefferson armament. There were emplaced in the second tier casemates six 42-pounder James rifles on wooden carriages. Their traverse irons and pintles were "only temporarily secured." There were emplaced in casemates Nos. 14 and 17 of curtain No. 3 two iron 24-pounders mounted on ships' carriages. They could not be fired, however, because there was no provision for absorbing the recoil.[136]

Only one second tier embrasure, No. 1 on curtain No. 3, had its embrasure irons, and they had been set in "luck alone, none of the prescribed cut stone" having been provided. There were 31 sets of embrasure irons, inclusive of the set positioned. A large number of traverse irons were on hand, and they could be laid down rapidly, but for the lack of requisite flagging and granite.

Most of the second tier casemates, not presently occupied as gunrooms, were being employed as storerooms and quarters.

Emplaced in the lower tier casemates were 37 8-inch columbiads, distributed: eight in curtain No. 1; five in curtain No. 2; three in curtain No. 3; nine in curtain No. 5; and nine in curtain No. 6. In addition, there were four 24-pounders in each of the six bastions.

All gun platforms in the lower tier, bastions included, were ready to receive their armament and had been adapted to either iron or wooden casemate carriages, excepting four in the curtains. The latter had been left unfinished to facilitate construction of drains, along with the outer two in each bastion.[137]

In addition, there were at Garden Key in mid-March, but not mounted:

	Guns
9	42-pounder smoothbores
10	24-pounder smoothbores
6	18-pounder smoothbores
2	24-pounders, flank defense

135. Ibid.

136. Frost to McFarland, March 19, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

137. Ibid.

	Carriages			
	Barbette		Casemate	
Types	No. of Carriages	No. of Chassis	No. of Carriages	No. of Chassis
42-pdr.	19	19		
32-pdr.	9	9	3	2
24-pdr.	18	18	2	2 (138)
12-pdr.	1	1		

3. June 1863 Armament Report

On June 30, 1863, there were emplaced in the fort:

six 10-inch columbiads en barbette on temporary platforms
nine 42-pounder smoothbores en barbette
thirty-seven 8-inch columbiads in the lower tier casemates
six 42-pounder James rifles on the second tier on temporary platforms
two 24-pounders on ship carriages on the second tier
twenty-four 24-pounder flanking howitzers on the lower tier

At Garden Key, but not mounted, were:

five 10-inch columbiads
two 24-pounder howitzers
six 24-pounder guns
six 18-pounder guns.[139]

4. Department Calls for More Guns and Carriages

On May 20, 1863, the Department had called on Chief of Ordnance Ripley to ship five 10-inch columbiads with casemate carriages to Fort Jefferson.[140]

This weaponry, however, was slow in forthcoming, and it was Fiscal Year 1865 before the big columbiads were received and emplaced in the lower tier casemates.[141]

During the last days of 1863, Chief Engineer Totten urged the Ordnance people to send to Garden Key two 100-pounder Parrotts, their front-pintle iron carriages, and eight rifled 42-pounders with iron casemate carriages.[142]

---

138. Frost to McFarland, March 20, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

139. McFarland to Totten, Aug. 29, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

140. Totten to McFarland, May 20, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

141. McFarland to Delafield, Oct. 10, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

142. Totten to McFarland, Dec. 30, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

5. Armament and Platforms in December 1863

On December 18, 1863, Captain McFarland notified the Department that these platforms were ready to receive their armament:

26* barbette front-pintle platforms for 8- or 10-inch columbiads
73 casemate front-pintle platforms for 8- or 10-inch columbiads
11 casemate front-pintle platforms for 24-pounder flanking howitzers

* Twenty-four of these platforms were without their pintles and traverse circles.[143]

There were emplaced in the fort on December 31, as there had been since mid-March, six 10-inch columbiads and nine 42-pounders on the barbette tier, six 42-pounder James rifles and two 24-pounders in the second tier casemates, and 37 8-inch columbiads and 24 flanking howitzers in the lower tier casemates.

6. Recesses are Cut in the Breast-Height Wall of Barbette Tier to Increase Traverse of 42-Pounders

On December 28, Chief Engineer Totten mailed to McFarland a sketch detailing steps to be taken to increase the traverse arc of the nine 42-pounders presently mounted on the barbette tier from 12 to 60 degrees in each direction.

This would be accomplished by cutting a recess (a) into the face of the breast-height wall to receive the corners of the chassis when traversed. Other recesses (bb) and (cc) were to be cut into the wall to admit the ends of the axle tree, and to permit the recoil of the carriage. The dimensions of these cuts, which were to be made with a chisel, were to be no greater than required for each particular carriage, and no cuts were to be made except where guns were mounted.

The recesses as constructed, Totten noted, were designed to receive the new iron carriages.[144]

These recesses were formed during the winter of 1863-64.[145]

7. Armament and Platforms in 1864

During calendar year 1864, the only guns added to the fort's armament were the five 10-inch columbiads and their casemate carriages. They were mounted in the lower tier gunrooms.

---

143. McFarland to Totten, Nov. 10 & Dec. 18, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

144. Totten to McFarland, Dec. 28, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

145. Manucy, "Construction History of Fort Jefferson," pp. 125-27.

As of June 30, all lower tier casemates, except four requiring traverse circles and the outer embrasures in each flank, had received or were ready for their armament. All front-pintle barbette platforms, except 14 on curtains Nos. 3 and 6, were prepared for their cannon.[146]

8. Armament and Platforms in 1865

The 100-pounder Parrotts and rifled 42-pounders and their carriages, requisitioned in December 1863, were not forthcoming. Consequently, the Chief Engineer, 12 months later, called on the Ordnance people to send to Fort Jefferson ten 10-inch Rodmans with casemate carriages, and two 200-pounder Parrotts and their front-pintle barbette carriages.[147]

Some four and one-half months passed before Chief Engineer Delafield notified Captain McFarland that the Ordnance Department was about to ship to the Tortugas the requisitioned Rodmans and carriages, along with 100 projectiles for each gun.[148]

By late May, some seven weeks after General Lee had surrendered at Appomattox, a ship reached Tortugas Harbor from New York City, and the anxiously awaited ten 10-inch Rodmans, seven 200-pounder and one 300-pounder Parrotts were landed. Several weeks later, another vessel arrived and put ashore another fifteen 10-inch Rodmans and their iron casemate carriages. By June 30, 16 of the big Rodmans had been mounted in first tier casemates.[149]

The Armament Report for June 30, 1865, thus documented the first increase in the number of guns emplaced in the fort since the spring of 1863. The report read:

	Tier	Number	Iron Carriages	Wooden Carriages	Permanent Platforms	Temporary Platforms
42-pounders	barbette	9	X	X		
10-inch columbiads	barbette	6		X		X
42-pounder James	2d	6		X		X
8-inch columbiads	1st	37		X	X	
10-inch Rodmans	1st	16	X		X	
24-pounder howitzer	1st	24		X	X	

146. Ibid., pp. 125-27.

147. Delafield to McFarland, Dec. 24, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

148. Kurtz to McFarland, May 3, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

149. Fort Jefferson, Monthly Reports of Operations for May & June 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

During the previous six months, the two 24-pounder flanking howitzers on ship carriages had been removed from the second tier casemates.

Accordingly, there were on hand but not mounted 47 guns: nine 10-inch Rodmans, seventeen 200-pounder and one 300-pounder Parrott, two 24-pounder howitzers, and twelve 24-pounder and six 18-pounder iron siege guns.[150]

In July, Civil Engineer Frost noted that, with the exception of the four 42-pounders on curtain No. 1 and five similar guns on curtain No. 2, the barbette tier had no guns for its defense. The other barbette guns, a 10-inch columbiad on each bastion, were mounted on wooden platforms that had decayed to a point where they were useless. Except for two occasions, there had been no firing from these columbiads in the last two years. And, on the last of these, a gun at its third discharge had been dismounted.[151]

Meanwhile, General Delafield had recommended to Secretary of War Stanton that the Ordnance Department ship to Fort Jefferson another fifteen 10-inch Rodman guns and an equal number of casemate carriages; five 200-pounder Parrotts and five front-pintle barbette carriages; and one 300-pounder Parrott and its front-pintle barbette carriage.[152]

Responding to this request, the Ordnance people announced plans to transport to Garden Key in August fifteen 10-inch smoothbore Rodmans with casemate carriages and an equal number of 10-inch Rodmans with front-pintle barbette carriages; in September fifteen 10-inch Rodmans with casemate carriages; in December fifteen 10-inch Rodmans with front-pintle barbette carriages; and as soon as possible four 100-pounder Parrotts with front-pintle casemate carriages and three 300-pounder Parrotts with centre-pintle barbette carriages.[153]

The Ordnance people were unable to meet this commitment. In July nine 10-inch Rodmans were received and three mounted; in August another Rodman and two 200-pounder Parrotts; and in October one more 200-pounder Parrott. Even so, there were delays in mounting the available armament.

On November 1, 1865, the Department, concerned about strained relations with France resulting from that nation's Mexican adventures, chided McFarland about a situation which led to there being a surplus of platforms at the fort and simultaneously a large number of guns and carriages on hand but not mounted.[154]

---

150. Fort Jefferson, Annual Report of Operations for the Year Ending June 30, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

151. Frost to Delafield, July 31, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

152. Delafield to McFarland, Feb. 20, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

153. Kurtz to McFarland, May 17, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

154. Delafield to McFarland, Nov. 1, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

Captain McFarland, upon investigating, reported the reason: A number of the platforms were "furnished with the small pintle," which did not permit use of the new iron carriage. Larger pintles were being "furnished" along with the carriages, and they were being positioned as rapidly as possible.[155]

Chief Engineer Delafield replied that the Engineer and Ordnance Departments had reached an agreement. Hereinafter, whenever the latter sent guns and carriages for casemates, they were to include a wrought iron pintle. Barbette carriages, however, were to be shipped without pintles, which the Corps was to supply. McFarland was to have the subject pintles fabricated in advance and inserted in the platforms as soon after receipt of the guns and carriages as feasible.[156]

Before the end of the month, the Ordnance Department was called on to make available for shipment to Garden Key fourteen 10-inch Rodmans with casemate carriages, and fifteen 15-inch Rodmans and their front-pintle barbette carriages.[157]

It was late January 1866, before the Ordnance people could ready three 10-inch Rodmans, their casemate carriages, equipments, and 300 projectiles for transfer to the Tortugas.[158]

9. Armament and Platforms in 1866

By mid-June 1866, the number of guns mounted in the fort had increased significantly. An armament report for June 17 disclosed:

Guns	Tier	No.	Iron Carriages	Wooden Carriages	Permanent Platforms	Temporary Platforms
10-inch columbiads	barbette	6		X		X
200-pdr. Parrotts	barbette	7	X		X	
10-inch Rodmans	barbette	15	X		X	
42-pdr. smoothbores	barbette	9		X	X	

There were on the barbette tier "old fashioned sea coast" 2 1/2-inch pintles positioned for 112 guns, while the traverse circles for 92 of the 112 platforms were furnished. Deducting the 37 platforms occupied, left 55 vacant.

Guns	Tier	No.	Iron Carriages	Wooden Carriages	Permanent Platforms	Temporary Platforms
42-pdr. James Rifles	2d	6		X		X
10-inch Rodmans	1st	34	X		X	
8-inch columbiads	1st	37		X	X	
24-pdr. howitzers	1st	24		X	X	

155. McFarland to Delafield, Feb. 5, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

156. Delafield to McFarland, March 1, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

157. Kurtz to McFarland, Nov. 25, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

158. Kurtz to McFarland, Jan. 25, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

On the 1st tier, there were 29 gun and 9 unoccupied howitzer embrasures. Only a few of these could be immediately armed, because the subject casemates were being used by the Navy or Engineers for storage, as a bakery, and for housing the water condensing apparatus.

According to the plans, Fort Jefferson, when completed, was to mount 420 guns and howitzers, viz:

en barbette.	112 guns.	112
on the second tier. . . .	121 guns and 41 howitzers.	162
on the first tier. . . .	191 guns and 35 howitzers.	196
	total. . .	420[159]

During the second half of June, six 10-inch Rodmans were received and 16 guns of this caliber mounted. In July, twelve more 10-inch Rodmans were delivered and 21 mounted. No more guns were landed or emplaced until December, when four 10-inch Rodmans reached the Tortugas. Thus, by the end of the year, the fort mounted 175 guns.[160]

On hand but not mounted were:

Gun	No.	Gun	No.
10-inch Rodmans	22	24-pounder howitzers	2
10-inch columbiads	1	18-pounder smoothbores	6
300-pounder Parrotts	4	24-pounder smoothbores	12

Carriages on hand and not positioned included:

18-pounder barbette, front-pintle, wooden.	1
32-pounder barbette, front-pintle, wooden.	6
42-pounder barbette, front-pintle, wooden.	10
300-pounder barbette, front-pintle, iron.	1
300-pounder barbette, centre-pintle, iron.	3
24-pounder howitzer, front-pintle, flank defense, wooden. .	2
32-pounder casemate, front-pintle, wooden.	2
10-inch Rodman, casemate, front-pintle, iron. . . .	28[161]

10. Armament and Platforms in 1867

Eleven 10-inch Rodmans were received in January, but no guns were mounted. In May, 15 front-pintle barbette carriages for the Rodmans were delivered. Then, in September, one 6-pounder bronze gun (Model 1840) and its carriage and a 10-inch seacoast mortar and its bed were landed.

---

159. Robinson to Chief of Ordnance, June 17, 1866, NA, RG 156, Ltrs. Recd., Chief of Ordnance. Lt. Frederick Robinson was post ordnance officer.

160. Fort Jefferson, Monthly Reports of Operations for June-Dec. 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

161. Fort Jefferson, Monthly Reports of Operations for Nov.-Dec. 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

Although there had been an increase in the number of guns and carriages on Garden Key during the 12 months, the fort's armament remained the same as it had been on the last day of 1866.[162]

11. Steps are Taken to Prepare the Six Bastion Terrepleins for Their Armament

The Ordnance Department was assigned responsibility for mounting the cannon. There was no officer from that Department posted on the Florida Reef, so Post Commander Capt. Val H. Stone undertook to have them emplaced by the troops.

Captain McFarland would afford the garrison all assistance in his power by making available machinery, teams, and manpower. Costs of this would be kept separate and a return made to headquarters for the purpose of seeking reimbursement from the Chief of Ordnance.

The 300-pounder Parrotts, Chief Engineer Humphreys pointed out, were intended for the centre-pintle bastion platforms. It was his understanding that the permanent stone bastion platforms had not been laid. According to the files, a drawing "giving details of roof drainage, barbette platforms, etc., of the bastions" had been forwarded to Captain Morton in June 1861. Since then the details of this class of platform had been modified. Consequently, a new drawing would be sent as soon as the Ordnance people provided certain information.

Meanwhile, McFarland was to check the bastion roof surfaces, drainage, breast-height walls, etc., to ascertain whether they had been constructed in accordance with the June 1861 drawing. If not, he was to prepare and submit a drawing documenting the changes.[163]

It might be good policy, the Department suggested, to remove the quartermaster and commissary stores from certain 1st tier casemates to the 2d tier, and have the former gunrooms armed.[164]

Orders were accordingly issued by Army Headquarters, authorizing the Fort Jefferson post commander to detail one non-commissioned officer and 12 privates for extra duty to assist in mounting the guns and caring for the ordnance.[165]

F. Frost Describes and Holgate Records the Subsidence

Civil Engineer Frost reached Garden Key in March 1863. On examining the structure, his attention was called to the subsidence of bastion C, and the cracks in the contiguous scarp wall and casemate arches of curtain No. 3. Indeed, "they necessarily arrest one's attention in approaching the Fort."

---

162. Fort Jefferson, Monthly Reports of Operations, Jan.-Dec. 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

163. Humphreys to McFarland, Aug. 26, 1867, NA, RG 77, Ltrs. Sent, Chief Engineer.

164. Ibid.

165. Special Orders No. 149, Sept. 2, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

Although the rate of subsidence had not been checked for months, Frost was told by Overseer Phillips that the subject cracks in the casemate arches had "gained the greater part of their present width" in February 1863. All the cracks had been pointed to enable them to detect farther openings.

To facilitate observance of this problem, Frost called on the Department to provide him with the subsurface tables and profiles prepared by Captains Woodbury and Morton and forwarded to Washington.[166]

Consequently, on May 20, General Totten mailed to Captain McFarland the packages received from Captain Morton 13 months before. Included were: (a) documents exhibiting in tabular form the elevations of the embrasures and other parts of the work, above low water, at various dates between 1858 and 1861; (b) a tabular record of the subsidence of the scarp and arches from 1857 to 1862, and diagrams of the settlement of the embrasures and other parts of the bastions for 1859, 1860, and 1861; and (c) memoranda of profiles constructed from the tabular record of levels. Several inconsistencies between these tables and those submitted by Captain Woodbury had been noted in pencil by General Totten.[167]

By September 3, Lieutenant Holgate was on-site. Although no further "Record of Settlement" had been attempted, he was preparing to make necessary experiments.[168] These, when completed, demonstrated that bastion A had settled 1.468', bastion B 0.469', bastion C 1.523', bastion D 1.492', bastion E 0.539', and bastion F 0.721'.

In some instances, there was a material difference between levels of the parade and scarp walls. Where this unequal settlement resulted in the casemate floors being uneven, flagging could not be positioned until some action was taken to correct "this evil."[169]

G. Magazine Capacity and Powder Stored Therein

On April 22, 1865, by circular letter, the Department called upon its superintending engineers to provide it with certain data regarding the capacity of the magazines at the forts for which they were responsible. Needed information included: (a) What was their capacity, measured in 100-pound barrels, and how much powder is currently stored in each magazine?[170]

---

166. Frost to Totten, March 30, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

167. Totten to McFarland, May 20, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

168. Holgate to McFarland, Sept. 3, 1863, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

169. Holgate to McFarland, May 3, 1864, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

170. Circular Letter, April 22, 1865, NA, RG 77, Ltrs. Sent, Chief Engineer.

Captain McFarland replied that at Fort Jefferson there was stored:

No.	Extreme Capacity	Ordinary Capacity
4 curtain magazines	3,960 barrels	3,450 barrels
12 tower magazines	3,480 barrels	2,400 barrels
Total magazine space	7,440 barrels	5,850 barrels
Currently occupied	3,800 barrels	3,800 barrels
Space available for storage.	3,640 barrels	2,050 barrels[171]

H. Construction of and Responsibility for Shot Beds

In the autumn of 1866, the post commander called on the Department to construct shot platforms. Relaying this information to Captain McFarland, Chief Engineer Humphreys directed him to proceed with this project. The platforms were to consist of sleepers of cordwood, with 2-inch plank nailed thereto, positioned on the terreplein convenient to the armament.[172]

Subsequently it was decided that, although the Corps would be responsible for the shot beds used in connection with the guns, the Ordnance Department should provide the beds for the shot stored on the parade.[173]

I. Struggle to Supply the Population with Potable Water

In November 1865, Col. B.H. Hill, the new post commander, wrote Quartermaster General Meigs, calling attention to a potable water problem at Garden Key. There were, he noted, about 2,000 people at the post dependent "mainly" on a Lighthall condenser for drinking water, which had never answered its expectations.

He recommended that a new condenser be provided and the old one rehabilitated, so there would be two on hand to meet emergencies.

Colonel Hill trusted that the parts needed for repair of the condenser, along with the requisitioned mules and carts, beef cattle, and clothing, would be forwarded via the first New Orleans-bound vessel scheduled to call at the Tortugas.[174]

Acknowledging receipt of Hill's communication, General Meigs called for more information.[175]

---

171. McFarland to Delafield, May 10, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

172. Humphreys to McFarland, Nov. 3, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

173. Humphreys to Chief of Ordnance, May 17, 1867, NA, RG 77, Ltrs. Sent, Chief Engineer.

174. Hill to Meigs, Nov. 15, 1865, NA, RG 92, Consolidated Correspondence File. Colonel Hill and four companies of the 5th U.S. Artillery (D, I, L and M) had reached the fort on November 10. As senior officer, Hill assumed command of the garrison.

175. Meigs to Hill, Dec. 2, 1865, NA, RG 92, Consolidated Correspondence File.

Responding, Hill explained that the Normandy condenser had been dismantled and packed preparatory for shipment to New York City, where it was to be either sold or repaired. In accordance to instructions, he had had it examined by a Navy engineer, as well as Captain McFarland, and they had concurred that it could be rehabilitated on-site at a slight expense by the mechanic who had recently repaired the Fort Taylor condenser. The principal part needed was a new fire box. Consequently, Colonel Hill favored its repair, in preference to purchase of a new unit.[176]

The proposal to repair and retain the Normandy condenser at Fort Jefferson was approved by Brig. Gen. John Newton.[177]

Meanwhile, Colonel Hill had issued orders limiting the consumption of water from the condenser by the troops. Major Burnham protested, complaining that he saw no reason why his 250 workmen were "excluded from the benefits of an apparatus intended for the well being of all the island inhabitants." He was especially incensed by a refusal to provide "even a pitcher full for his office."[178]

To alleviate this situation and justify employment of a third condenser at Fort Jefferson, Captain McFarland noted: (a) the collection of rain water falling on the terrepleins had failed, because that collected was "so highly charged with salt and lime as to be unfit for use," while water drawn from the roofs of buildings was inadequate to meet the garrison's requirements; (b) the only source of drinking water was from the condensers, which, although each was warranted to furnish 5,000 gallons daily, had failed to more than meet current needs; and (c) the nearest points from where water could be secured, in sufficient quantities, were Cape Sable and La Habana.[179]

Upon being apprised of the situation, Chief Engineer Delafield called on McFarland to submit a project for providing an abundance of "wholesome water" for use of all personnel at Fort Jefferson. It was desirable that the water be obtained by the Engineer Department for its own use independent of the Navy.[180]

---

176. Hill to Meigs, Nov. 20, 1865, NA, RG 92, Consolidated Correspondence File.

177. Special Orders No. 26 1/2, Dec. 28, 1865, NA, RG 92, Consolidated Correspondence File. Newton at this time commanded the District of Middle Florida and the Sub-Districts of West Florida and Key West.

178. Burham to Hill, Dec. 28, 1865, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

179. McFarland to Newton, Jan. 1, 1866, NA, RG 92, Consolidated Correspondence File.

180. Delafield to McFarland, Feb. 9, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

During the winter and spring of 1866, the drinking water situation became less pressing as the garrison shrank from a peak strength of 803 officers and men. On December 29, two of the six remaining companies and regimental headquarters, 82d U.S. Colored Infantry, were transferred to the mainland. They were followed by Company K on March 28 and Company F on May 16. Thus, by mid-May, the garrison had been pared to four companies of the 5th Artillery and two companies of the 82d U.S.C.T. Coincidentially, the number of military convicts had decreased, although the fort, since July 1865, had been the site of incarceration for four of the Lincoln assassination conspirators, one of whom was Dr. Samuel Mudd.

McFarland's proposal for relieving the Corps of its dependence on the Navy for potable water was to purchase a condensing machine from the Quartermaster Department. General Delafield, in sanctioning this measure, directed that details of the transaction be hammered out by Captain McFarland and Lt. Samuel Peoples, post quartermaster.[181]

J. Measures Taken to Restrict Access to the Fort by Unauthorized People

On June 11, 1867, by circular letter, the Department called on its superintending engineers to report on measures taken to restrict access to the seacoast defenses for which they were responsible by unauthorized persons.

Replying, Captain McFarland reported that Fort Jefferson was currently garrisoned by four companies (I, K, L, and M) of the 5th U.S. Artillery, commanded by Maj. George P. Andrews. As of July 1, there were only eight Corps of Engineer employees on Garden Key. They had been given no instructions regarding the guns and ammunition, because the ordnance was Major Andrews' responsibility.[182]

K. Maintaining an Effective Workforce

1. Phasing Out Slave Labor

During the summer of 1862, Col. Joseph S. Morgan of the 90th New York Infantry, currently the post commander at Key West, caused the Engineers problems. A man of strong beliefs, Morgan had intervened and declared the slaves employed at Forts Jefferson and Taylor "independent" of their masters. When McFarland protested most of the slaves had walked off the job. Morgan offered to compel them to return to the projects, provided McFarland paid them. This McFarland refused to do because it was illegal, and carried his protest to the Department.[183]

---

181. Delafield to McFarland, Feb. 9, & Aug. 3, 1966, NA, RG 77, Ltrs. Sent, Chief Engineer.

182. Circular Letter, June 11, 1867, McFarland to Humphreys, July 11, 1867, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. There was also an ordnance-sargeant stationed at the fort. Major Andrews had assumed command of the post on June 2, 1867.

183. McFarland to Totten, Sept. 13, 1862, & Totten to Kurtz, Sept. 29, 1862, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. General Totten, in turn, brought the subject to the attention of Secretary of War Stanton. Particularly hard hit Colonel Morgan's action was long-time employee George Phillips, who lost "custody of five servants" valued at $6,700. Phillips to Totten, Oct. 23, 1862, NA, RG 77, Ltrs. Recd., Chief Engineer.

The Department failed to take action, probably because, on September 22, President Lincoln had issued his preliminary Emancipation Proclamation, declaring that on January 1, 1863, all slaves in rebellious states or parts of states thereof shall be free. Since the Florida Reef was occupied by United States troops, the Proclamation did not apply to slaves owned by legal residents of Key West and the Tortugas.[184]

The slave roll was discontinued on April 18, 1863, some 15 weeks after President Lincoln by his Emancipation Proclamation had declared those slaves in regions "in rebellion" free. At that time, there were 22 black slaves employed on the project. It must be noted, however, that the Florida Reef was exempt from provisions of the Proclamation.

2. General Banks Reinforces the Labor Force with Louisiana Blacks

Upon returning to duty at Key West from Hilton Head in mid-May 1863, Captain McFarland found that many of the hands, fearing another outbreak of yellow fever, had left Key West, and not more than 20 or 30 were on the job. To compound the Florida Reef labor shortage, General Hunter had removed all local blacks to camps on the South Carolina Sea Islands. As a possible source of labor, McFarland wrote Maj. Gen. Nathaniel P. Banks, commanding the Department of the Gulf, to inquire into the possibility of recruiting 300 Louisiana blacks for employment on the Florida Reef projects.[185]

On June 12, McFarland received good news from New Orleans. Three hundred blacks would be sent to the Florida Reef on the first available transportation. Apprising the Department of this welcomed news, McFarland announced that he planned to reinforce the Garden Key workforce with 100 of these blacks.[186].

The Department approved the proposal, and authorized McFarland to take all necessary measures to receive, work, feed, clothe and take care of the blacks."[187]

On December 1, the Department mailed to McFarland a copy of Secretary of War Stanton's decision relative to "employment of contrabands on public work, and the manner of their payment." The Secretary had ruled that "contrabands" were to be paid for services rendered by officers of the Departments in which they were employed, except when engaged in construction of fortifications. When this occurred, they were to be paid by the officer responsible, who in turn was to be reimbursed by the Corps of Engineers.[188]

---

184. Register of Ltrs. Sent by Chief Engineer, 1812-66, NA, RG 77.

185. McFarland to Totten, May 19, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

186. McFarland to Totten, June 12, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

187. Totten to McFarland, June 19, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

188. Stanton to Totten, Nov. 23 & Totten to McFarland, Dec. 1, 1863, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

3. Employees Win a Pay Raise

On December 10, 1863, the Department, taking cognizance of the inflationary spiral caused by the war, authorized McFarland to raise the pay of each of his civilian assistants at Forts Jefferson and Taylor to $150 per month.[189]

When the workmen learned of this, they presented McFarland with a petition, phrased in strong words, demanding that their pay be boosted--mechanics to $4.50 for a 10-hour day and laborers to $2.75 per diem. McFarland, although he deemed these sums unreasonable, admitted that, because of the general esculation of wages, some increase was warranted. Key West wages, during the past several months, had been considerably higher then the Corps was paying at Forts Jefferson and Taylor.

To document the problem, McFarland prepared and submitted a table of prevailing local wage rates:

	Eng. Dept. 10-hour day	Town Shops 9-hour day	U.S. Navy Machine Shop 8-hour day
Masons		$4.50	
Foreman	$3.50		
1st class	3.00		
2d class	2.75		
Carpenters		$4.75-3/50	$4.75
Master	4.00		
1st class	3.00		
2d class	2.50		
Blacksmiths	3.50-2.50		$4.00-4.50
Machinists			4.00-4.50
Boilermakers			4.00-4.50
Laborers	1.61	$2.00	2.75

As General Totten could see, the Corps' people were working longer hours, as well as receiving less pay, than other Florida Reef mechanics and laborers. McFarland accordingly recommended that the Department's workmen be granted an increase of from 20 to 25 percent.[190]

The Department, General Totten replied, could not judge "the various causes which influence the rates of wages at distant works, but must necessarily leave the determination of those rates to the officer in charge." On doing so, McFarland was to first consider the interest of the United States and not exceed the local rate. While he was to treat "considerately the 'petition' of your workmen for what they may regard as a just increase," he must be careful that they did not come to believe that they could impose demands.

---

189. Totten to McFarland, Dec. 10, 1863, NA, RG 77, Ltrs. Sent, Chief Engineer.

190. McFarland to Totten, Dec. 30, 1863, NA, RG 77, Ltrs. Recd., Chief Engineer.

A wise solution might be a call for Mr. Trowbridge to send down from New York City some men at the most favorable local wage rates. This would enable McFarland to fire the troublemakers.[191]

McFarland determined to give a 20 percent increase in wages and it eased tensions, although a few men walked off the job.

The Treasury Department seemingly had difficulty meeting McFarland's requisitions. It was late January 1864 before he received the $40,000 called for on November 12. This sum enabled him to pay off the workmen, their wages being in arrears at that time some 40 days. The $9,000 remaining was sufficient to pay the men at either Forts Jefferson or Taylor, but not both, their wages for January, which were now 15 days overdue.

Remonstrating against these delays, McFarland warned that men could not be expected to continue working under such circumstances, especially at a season when their families must suffer the most. He feared that many, if this situation continued, would soon return to their homes.[192]

This protest galvanized the Department into action, and the Assistant Treasurer at New York City deposited $24,000 to McFarland's Fort Jefferson account.[193]

4. Employment of Military Convicts

Congress, having failed to appropriate any funds for construction at Fort Jefferson in Fiscal Year 1865, McFarland, in early December 1864, on his return from New York City, was compelled to lay-off all hands except the physician, chief overseer, captain and crew of Tortugas, 3 masons, 3 carpenters, and 10 laborers. This stoppage of operations threw the more than 880 military prisoners confined at the fort out of work.

For some months, the increasingly large number of prisoners sent to Garden Key under sentence by court martial had been employed at hard labor excavating the ditch on the land fronts.

---

191. Totten to McFarland, Feb. 5, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

192. McFarland to Totten, Feb. 15, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

193. Totten to McFarland, Feb. 26, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

Some difficulty had been experienced previously in keeping the military convicts at their jobs. On October 28, Chief Overseer Phillips had written that the excavation of the ditch, along with construction in general, was progressing satisfactorily, although rainy weather was retarding it to some extent. The prisoners, however, were not being turned out in the numbers Phillips desired. He had called this subject to the attention of Post Commander Charles Hamilton, who had promised a better turnout.[194]

Thus, the December suspension of work by the military convicts, troubled McFarland, because "their services would be an immense advantage to the works in the amount of money saved in the single item of labor."[195]

Meanwhile, by circular letter, the Department had inquired of its superintending engineers the number of military convicts that might be kept employed on the works under their supervision "in such manner as to save the expense of the employment of laborers." Projects which could be entrusted to prisoners included breaking concrete, police, etc. They would also indicate whether there were quarters available for confinement of the convicts when not employed.[196]

Replying, McFarland reported that at Fort Jefferson there would be employment for 200 prisoners for several years. Under present arrangements, this would mandate a population of 500 to 600 convicts, because experience had demonstrated that the sick, worthless, and those on detail to other Departments usually accounted for three-fifths of those incarcerated. Although guards and security were no problem, quarters were. At present, the 700 to 800 prisoners were confined in quarters and casemates formerly occupied by employees of the Corps of Engineers.[197]

L. Quality and Quantity of Key Materials Plague the Corps

1. Failure of Salvaged Lime

In the summer of 1862, a shed, near the center of the parade under which was stored hundreds of barrels of lime, burned. Immediately thereafter, trenches were dug against the parade wall on fronts Nos. 1, 5, and 6 and the lime salvaged from the fire slaked with saltwater and buried.

---

194. Phillips to Frost, Oct. 28, 1864, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson. The number of military convicts at the fort had numbered 116 in October 1863, and had increased slowly until June 1864, when the population zoomed to more than 760. Post Returns, Fort Jefferson, 1863-64, NA, Microcopy M-617.

195. McFarland to Delafield, Dec. 27, 1864, NA, RG 77, Ltrs. Recd., Chief Engineer.

196. Delafield to Supt. Engrs., Dec. 23, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

197. McFarland to Delafield, Feb. 4, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

By the time Lieutenant Holgate reached Garden Key, this lime had seemingly lost its value as a cementing material. The mortar hardened slowly and crumbled easily. Calling this to Captain McFarland's attention, Holgate recommended that lime be eliminated from the mortar.

McFarland referred him to the latest instructions from the Department: that in exterior walls lime mortar was to be employed to a depth of 1/2-brick. Holgate next sought to recalcinate the lime but this was a failure. After being laid for several weeks, the lime mortar crumbled under a thumbnail like soft chalk.

Consequently, Holgate urged and the Department approved the discontinuation of use of salvaged lime. Supplies of "fresh lime" were ordered from the New York Agency in 80-barrel lots and upon receipt was stored in closed vats.[198]

2. Wartime Shortages Effect the Quality and Quantity of Bricks

A brick shortage plagued the project in early April 1863. Civil Engineer Frost, on relaying this information to the New York Agency, ordered 400,000 bricks.[199] On June 5, 150,000 bricks were landed, and Frost wrote Trowbridge, "as to the bricks, I am extremely disappointed firstly because of the kind and secondly it is a very poor lot of this kind. At least 3/5 of the whole lot must be counted as soft brick."[200]

Then, in the fourth week of August, the brig Renshaw, encountering wild gales off Cape Hatteras, had to jettison 15,000 Fort Jefferson bricks.[201]

On November 2, Lieutenant Holgate complained to Captain McFarland of the continued brick shortage.[202] Perhaps, the reason for this shortfall is documented in Trowbridge's November 28 letter to Captain McFarland, "bricks are very scarce and high I am trying my best to ship all I can but fear the quality of some will be low and the price very high."[203]

---

198. Holgate to McFarland, March 12 & Kurtz to McFarland, March 28, 1864, NA, RG 77, Ltrs. Recd. and Sent, Chief Engineer.

199. Frost to Trowbridge, April 7, 1863, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

200. Frost to Trowbrudge, June 5, 1863, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

201. Frost to Trowbridge, Sept. 23, 1863, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

202. Holgate to McFarland, Nov. 2, 1863, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

203. Trowbridge to McFarland, Nov. 28, 1863, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

3. Stockpiling and Use of Materials in 1863

During the 12 months ending December 31, 1863, there were used by the Engineers in the construction program:

Bricks		
On hand Dec. 31, 1862	294,928	$1,622.10
Additions to Mar. 31, 1863	267,650	1,550.00
Consumption to Mar. 31, 1863	60,624	326.27
On hand to Mar. 31, 1863	501,954	2,845.92
Consumption to June 30, 1863	378,719	2,095.92
On hand to June 30, 1863	123,235	750.00
Additions to Sept. 30, 1863	314,000	2,821.00
Consumption to " " "	224,169	2,029.54
On hand to Sept. 30, 1863	213,066	1,541.46
Additions to Dec. 31, 1863	667,800	5,208.90
Consumption to " " "	603,520	4,980.36
On hand " " "	277,346	1,770.00
Total additions during 1863	1,249,450[204]	
Cement		
On hand at Dec. 31, 1862	2,752 bbls	$2,064.00
Consumption to Mar. 31, 1863	940	705.00
On hand " " "	1,812	1,359.00
Consumption to June 30, "	735	507.75
On hand " " "	1,077	851.25
Additions to Sept. 30, 1863	1,000	1,200.00
Consumption " " "	1,023	824.25
On hand " " "	1,054	1,227.00
Additions to Dec. 31, 1863	1,900	2,280.00
Consumption " " "	1,934	2,314.00
On hand " " "	1,020	1,193.00
Total Additions during 1863	2,900[205]	

204. Fort Jefferson Materials Book, 1862-64, p. 19, FRC, East Point, Ga., Fort Jefferson.

205. Ibid.

White Pine		
On hand on Dec. 31, 1862	230,829	$4,141.48
Addition to Mar. 31, 1863	20,004	700.14
Consumption " " "	50,059	1,750.00
On hand on " " "	200,774	3,091.62
Addition to June 30, 1863	88,147	2,252.81
Consumption to June 30, "	80,407	2,049.42
On hand to June 30, 1863	208,514	3,295.00
Additions to Sept. 30, 1863	10,011	194.92
Consumption to " " "	13,459	204.00
On hand Sept. 30, 1863	205,066	3,285.92
Additions to Dec. 31, 1863	143½	7.42
Consumption " " "	96,384	
	108,825½	
Total Additions during 1863	118,310½[206]	

4. Shortage of Quality Bricks is Compounded by Skyrocketing Prices

On January 21, 1864, McFarland called on Trowbridge to ship to Fort Taylor the large quantity of Maine bricks ordered for Fort Jefferson.[207] No bricks were available on the Maine market, so, failing to obtain bricks elsewhere, Trowbridge was compelled to send more and more North River bricks for use on the Florida Reef projects.[208] Then, in late April, the working season ended at Fort Taylor, and McFarland promptly removed the prohibition placed by himself on use of Maine bricks at Fort Jefferson.[209]

Meanwhile, in mid-March, Trowbridge had cautioned that, because of inflation, the price of materials had become enormously expensive and "will continue so as long as the war lasts."[210]

5. McFarland Lists Materials Needed to Complete Certain Structures

In mid-June 1864, McFarland reported that, to complete certain of the parade structures, would require:

---

206. Ibid., p. 121.

207. McFarland to trowbridge, Jan. 21, 1864, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

208. Trowbridge to Holgate, Jan. 25, 1864, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

209. McFarland to Holgate, April 23, 1864, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

210. Trowbridge to Holgate, March 29, 1864, FRC, East Point, Ga., Ltrs. Recd., Fort Jefferson.

Building	No. Bricks	Bbls. Lime	Bbls. Cement	Remarks
Large detached magazine	550,000	150	5000	Brick wall commenced.
New Barracks	350,000	25	750	External walls etc. completed.
Kitchens for New Barracks	108,000	40	350	Two nearly completed.
Four sections of Officers' Quarters	410,000	60	900	Say two stories completed.
Kitchens of Officers' Quarters including privies and yard walls	245,000	100	1000	one completed
TOTAL	1,663,000	375	8000	
On hand June 18, 1864	1,082,500	1200	5661	
Ordered from agency	1,159,000		3838	
On hand and to be received	2,241,500	1200	9499[211]	

6. Poor Quality Bricks Continue into the First Post-War Year Construction Season

The large construction crew employed during the 1865-66 season was using some 50 barrels of cement per day in January. The quality of bricks received from the Agency was so poor that Major Burnham protested that at least 70 percent should have been rejected.[212]

M. The October 1865 Hurricane

On Sunday morning, October 22, a strong breeze was blowing out of the northeast. Soon thereafter, a driving rain set in and fell throughout the day. By 7 p.m., the wind had become a gale and bore around to the north. Crossing the parade at 9 o'clock, Clerk John Barker found several trees uprooted, panels of the cattle pen down, and the livestock loose.

---

211. Fort Jefferson Letter Book, June 19, 1864, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

212. Burnham to Bowen, Jan. 19, 1866, FRC, East Point, Ga., Ltrs. Sent, Fort Jefferson.

The storm continued to increase in violence. At 1 a.m., on the 23d, the rear wall of the 3d story of the first section of the unfinished range of officers' quarters fell inwards. Some four hours later, the upper story of the south section of the officers' quarters toppled outwards, crushing the kitchen to its rear, killing Lt. John W. Sterling in his bed, and injurying Capt. R.A. Stearns.

Soon thereafter, the winds began to subside and wear around to the west. Upon checking the damage, it was found that: the rear wall of the third-story of the officers' quarters must be rebuilt; two traverse magazines had been unroofed; the chimney of the officers' quarters blown down and the roof damaged; the ridge of the barracks injured; the carpenters' shed outside the fort wrecked; the roof of kitchen in rear of officers' quarters destroyed and the walls injured; the shed covering the engine on the counterscarp wall blown away; the middle wharf damaged; and the hogs and hog pen on Long Key washed away.

Daylight revealed a parade obstructed by uprooted trees and shattered branches. Water was knee-deep near the hospital. Slates and bricks were scattered about the fort. To escape the fury of the blow, soldiers and their dependents had taken refuge in the casemates.

Post Commander George W. Wenthworth, observing that the rear wall of the middle section of the quarters' 3d story, though standing, was unstable, directed Clerk Barker to have it taken down. A rope was thrown around it, "and with an almost imperceptible resistance the heavy mass of masonry gave way."

The schooner Tortugas had been caught by the hurricane at Key West. Her bulwarks were stove in, and she sank at the quartermaster wharf.[213]

The killer hurricane caught at sea three vessels under charter to the federal government. Aboard the steamer Governor Marvin were Civil Engineer Frost and 150 workmen en route from New York City for Fort Taylor, on the bark Aegean were 200 men bound for Fort Jefferson, and on the schooner Nelly Barrett was freight for Garden Key. The latter foundered, while Governor Marvin, although battered by mountainous seas off Cape Canaveral, reached Key West with two dead workmen.[214]

Captain McFarland, upon reaching Key West and checking with Frost and Barker, estimated that damage to Fort Jefferson, including loss of Tortugas, at not less than $25,000.

He blamed the absence of floors to tie the front and rear walls of the officers' quarters together for the serious damage to that structure. Iron girders for this purpose had been ordered in the autumn of 1863, but none had been supplied until October. And now these had been lost aboard Nelly Barrett.[215]

---

213. McFarland to Delafield, Dec. 7, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

214. Ibid.; Frost to McFarland, Oct. 27, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

215. McFarland to Delafield, Dec. 7, 1865, NA, RG 77, Ltrs. Recd., Chief Engineer.

A survey demonstrated that Tortugas was beyond salvage, and Captain McFarland requested authority to spend $15,000 to $16,000 to contract for construction of a replacement. The Department approved sale of the wreckage of the schooner, but directed that no agreement be entered into for building a replacement until further efforts had been made to effect a purchase.[216]

The loss of Tortugas compounded the communications problem, and Post Commander B.H. Hill urged that a powerful steam tug be assigned to Garden Key. According to persons familiar with the area, the steamer Rainey was useless and should be sold. News that repair of the steamer had been authorized and that she would soon be returning to the Key West-Dry Tortugas run negated the necessity for a steam tug.[217]

During the summer of 1866, McFarland again broached the question of procuring a replacement for Tortugas. He was of the opinion that they should contract for a craft similar to the sailing cutters employed by the Revenue Service. Currently, they were paying $300 per month for charter of "vessel not half large enough for our purposes." More delays, and finally an extensive search of nearly every harbor in the northeast proved fruitless in finding a replacement.[218]

General Humphreys, now satisfied that a vessel was indispensable, authorized a visit by McFarland to the ports of Boston, Philadelphia, Wilmington, and Baltimore to arrange for construction of a vessel to be charged to the Fort Jefferson appropriation.[219]

McFarland, for some unexplained reason, failed to take advantage of this authority.[220]

N. Yellow Jack Scourges the Tortugas

1. Dread Plague Smites the Garrison in 1867

Until mid-August 1867, the post was deemed to be a healthy assignment. The principal complaints heretofore had been dengue and diarrhea, although the climate resulted in "a remarkable deterioration of bodily strength." Then, on the 19th, a soldier in Company K quartered in the "fungus-grown" upper casemates on front No. 4, overlooking the unfinished ditch was felled with

---

216. McFarland to Delafield, Dec. 7, 1865, & Delafield to McFarland, May 1, 1866, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

217. Hill to Meigs, Nov. 20, 1865, NA, RG 92, Consolidated Correspondence File.

218. McFarland to Humphreys, Aug. 23 & Nov. 1, 1866, NA, RG 77, Ltrs. Recd., Chief Engineer.

219. Humphreys to McFarland, Nov. a, 1866, NA, RG 77, Ltrs. Sent, Chief Engineer.

220. Register of Letters Received, Dec. 5, 1866-Nov. 10, 1867, NA, RG 77.

yellow fever. He died on the 22d. Meanwhile, on the 20th a second Company K soldier was stricken and two more on the 21st. The empty beds in the casemates were reported to be contiguous, and on the 22d Surgeon Joseph Smith ordered the embrasures of Company K's quarters boarded up, and the next day the unit moved into the casemates centering on bastion C, between those occupied by Company L and the military convicts.[221]

By the 25th, when the schooner Matchless arrived from Tampa with one case aboard, four Company K soldiers were confined to the post hospital in two unplastered rooms in the north end of the barracks.

The fever now spread to Company L and to the officers' servants. Company I housed in the barracks adjoining the hospital was then attacked. Company M housed in the north casemates escaped the plague until September 7, when 35 men were stricken.

On September 1, a hospital had been established on Sand Key in the frame structure that had housed smallpox patients in 1862. Three days later, Company L was sent to Bird Key.

Surgeon Smith was felled on September 5 and died on the 8th. Dr. Mudd, a prisoner, volunteered his services and was placed in charge of the post hospital by Bvt. Maj. Val H. Stone. Mudd "rendered faithful and efficient service until arrival of Dr. D. W. Whitehurst from Key West," on the 7th.

Dr. Mudd, previous to Whitehurst's arrival, had discontinued the Sand Key hospital and had turned four lower tier casemates directly behind the barracks into an infirmary. As the plague worsened, more casemates were appropriated to hospital purposes.

On the 8th, Company K was evacuated to Loggerhead Key, where it was joined on the 21st by Company L. Only one case of yellow fever was reported at Loggerhead, although the plague "continued to rage with unabated severity at the Fort."

The Yellow Jack reached its height about September 20, and gradually declined until late October. The last case was reported on November 14. All told, there were 270 cases and 38 deaths. The mortality rate among recruits was much higher than among those who had spent the winter of 1866-67 on Garden Key. Of the 54 prisoners, 44 had been at Fort Jefferson for more than a year. One of them had died. Not a man detailed to the hospital as cooks or nurses escaped, and four had died. The figures showed:

---

221. Evidence points to the probability that the yellow fever was introduced to the garrison from La Habana by Capt. George W. Crabb, who returned to Fort Jefferson from the Cuban city on August 1. Crabb was slightly ill when he arrived, but recovered without knowing the nature of his illness. Mauncy, "Fort Jefferson History," unpublished manuscript, May 1942, files Everglades NP.

	Acclimated			Unacclimated		
	Present	Taken sick	Died	Present	Taken sick	Died
Soldiers	207	126	9	106	60	24
Citizens	11	X	X	9	7	3
White prisoners	30	9	1	10	10	1
Black prisoners	14	4	X	X	X	X
	262	135	10	125	17	28[222]

2. An Investigation

A Board was constituted to investigate and ascertain the probable cause or causes of the plague. It assembled at Fort Jefferson on December 16, and, after questioning a number of survivors and reconnoitering the area, found that six circumstances may have influenced the epidemic. They were: (a) the prevalence of yellow fever in the West Indies and at Key West; (b) the arrival at the post in May and June of 106 unacclimated recruits; (c) the heavy rainfall in the period May-August; (d) the "persistance" of winds out of the southeast from mid-May to September 1. Normally, the winds at this season were from the northeast. (e) The unfinished condition of the ditch on fronts Nos. 3 and 4, resulting in its bottom being exposed at low tide; and (f) the situation of the sewers, causing the vaults to be filled with filth.[223]

3. Corps Takes Measures to Meet the Board's Recommendations

The Department transmitted to Lt. Col. James H. Simpson, McFarland's successor, extracts from the Board's report. After reviewing these papers Simpson was to submit a detailed report on the subject.[224]

Colonel Simpson found that five recommendations of the Board pertained to services for which the Engineers were responsible. Taking up the suggestion that the barracks be completed at an early date to allow the troops' removal from the "damp and unhealthy" casemate quarters, Simpson pointed out that the limited appropriations for Fiscal Years 1867 and 68, excepting a small sum expended on the barbette gun platforms and ditch, had been applied to the barracks and quarters. As of January 1868, four large squadrooms (22 by 25 feet) had been finished. Since then, two more had been completed, except for the stone mantels, and three more were ready for plastering. Plans called for early completion of the barracks, provided necessary appropriations were forthcoming.

---

222. Report of Board to Investigate Yellow Fever Outbreak, Dec. 1867, NA, RG 77, Ltrs. Recd., Chief Engineer. The Board included Bvt. Maj. A.H. Smith, Lt. Paul Roemer, and Asst. Surg. Edward Thomas. Among those who died was Major Stone.

223. Ibid.

224. Humphreys to Simpson, July 20, 1868, NA, RG 77, Ltrs. Sent, Chief Engineer.

To meet the recommendation that priority be given to completion of the counterscarp and ditch, so that the bottom of the latter would not be exposed at ebb tide, Lieutenant Livermore had turned out 40 workmen on June 15, 1868. As of August 1, the moat had been excavated, while on fronts Nos. 3 and 4 the counterscarp, for a distance of 550 feet, was unfinished. In its place, stood a cofferdam.

The request that "the connecting sluices between the privies and the sewers be opened, and if necessary enlarged, and the outlets of the sewers be carried across the moat so they may discharge outside the sea wall and not as at present into the moat" was answered. Two of these privies, the most objectional ones, Simpson noted, had been built several years before by request of the post health officer. They were positioned directly above the main sewer into which they discharged. One of these had been closed, and in the other a "temporary device had been applied to exclude the gas from the sewer until a proper privy could be constructed."

Connecting sluices between the privies and sewers, which had been choked with rubbish and filth, had been flushed and cleaned.

It would, he wrote, be unnecessary to either enlarge the sewers or to carry them across the ditch.

Colonel Simpson had taken steps to remove the three temporary wooden structures (a blacksmithy, a paint shop, and a dwelling) belonging to the Corps from the parade.

The Board had recommended that the site of the proposed post hospital be changed from the area between the officers' quarters and barracks to outside the fort and to its leeward. Simpson held that this change could not be accomplished until Congress made an appropriation. Accommodations for the sick, he agreed, should be provided outside the fort for use in peacetime, but must be inside in event of hostilities.[225]

Meanwhile, it had been decided by Colonel Hill that, hereinafter, the troops, during the sickly season, were to be quartered in tents. Tents were accordingly requisitioned, along with lumber for construction of a temporary hospital, through the Quartermaster General.[226]

---

225. Livermore to Simpson, Oct. 3, 1868, & Kurtz to Humphreys, Oct. 22, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

226. Adj. Gen. to Quartermaster General, Oct. 6, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

X. THE "MODERNIZATION" YEARS: 1868-1874

A. Colonel Simpson Becomes Superintending Engineer

In the first week of January 1868, some 67 months after he had been named superintending engineer for Fort Jefferson, Major McFarland surrendered responsibility for the Florida Reef defenses to his designated successor--Lt. Col. James H. Simpson. The latter had graduated from the U.S. Military Academy as No. 18 in the Class of 1832. Commissioned a brevet 2d lieutenant, he was assigned to the 3d Artillery. After service in the Second Seminole War, Simpson, in July 1837, was commissioned a 1st lieutenant in the Topographical Engineers. On August 12, 1861, he was commissioned colonel of the 4th New Jersey Volunteer Infantry, and led his regiment in McClellan's Peninsula and Seven Days' Campaigns. Simpson resigned his volunteer commission and returned to duty with the Engineers in August 1862. On June 1, 1863, he was promoted lieutenant colonel of Engineers.[1]

Simpson was told that McFarland had been in the habit, when necessary, of employing a physician at each of the forts to attend to the hired men at a salary not to exceed $125 per month. Consequently, he had continued on the Fort Taylor rolls a surgeon at this rate. With the Department's approval, he would also employ a physician at Fort Jefferson whenever it became necessary.[2]

Chief Engineer Humphreys was agreeable, and explained that existing authority covered these personnel actions, along with the purchase of medicines for Engineer employees.[3]

B. Simpson Wrestles with Residual Problems

1. Corps and Garrison Row Over Quarters

Colonel Simpson inherited several problems from the McFarland administration, the resolution of which engrossed considerable time and attention. In mid-December, only two weeks before Simpson's arrival at Key West, Major Andrews clashed with McFarland over control of certain Fort Jefferson housing. The dispute was precipitated, when Major Andrews told Engineer Clerk Barker that he must vacate his quarters in the kitchen erected under Captain Morton's supervision in 1861. Upon being apprised of this, McFarland had addressed a letter of protest to Andrews. He pointed out that General Totten had authorized building this structure for use by the principal employees of the Corps, who under Army Regulation had no claim for quarters in housing constructed for Army officers.[4]

---

1. Cullum, Biographical Register, Vol. I, pp. 405-06.

2. Simpson to Humphreys, Jan. 7, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

3. Humphreys to Simpson, May 20, 1868, NA, RG 77, Ltrs. Sent, Chief Engineer.

4. McFarland to Andrews, Dec. 18, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

Replying, Major Andrews declared that, when he had assumed command of the post, an Army officer occupied the subject quarters. Until now Andrews had believed he had "complete control of that building." On arrival of Bvt. Maj. A.H. Smith at Garden Key he, in accordance with Army Regulations, had selected this structure as his quarters. Clerk Barker then moved into another structure.

If it were necessary to segregate quarters, Andrews failed to see how the Engineers and their employees could be given first choice, and the other officers excluded "from the most pleasant and healthy parts of the Fort." As for himself, an officer of 22 years service and post commander, he was unwilling to "stand back and let a clerk take choice of quarters before me."[5]

Major McFarland had promptly informed the Department of his difficulties with Andrews.[6]

When no action was taken by Washington to resolve this problem, Colonel Simpson reminded General Humphreys that measures should be taken to do so. At present, he noted, the first and second sections of the officers' quarters, 36 capacious, airy and well furnished rooms, were available as quarters. Consequently, there was no reason to keep the Engineer clerk out of the housing to which he had been assigned by Major McFarland.

In addition, Simpson continued, there were now only two companies of artillery stationed on Garden Key, and their six officers, according to Regulations, were entitled to a total of ten rooms. He, therefore, urged that the quarters currently occupied by Surgeon Smith be restored to the Corps of Engineers. Like McFarland, he regarded the principal employees of the Department, including Clerk Barker, as entitled to "treatment as a gentleman, and not to be stowed or crammed in anywhere, as under workmen, day laborers, or prisoners."[7]

These difficulties were aggravated in early May, when the new Post Commander C. C. McConnell, evicted the family of one of the Corps' employees from his kitchen quarters in rear of the recently completed section of the officers' quarters. On doing so, a detail of soldiers pitched the family's furnishings out-of-doors.[8]

---

5. Andrews to McFarland, Dec. 23, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

6. McFarland to Humphreys, Dec. 31, 1867, NA, RG 77, Ltrs. Recd., Chief Engineer.

7. Simpson to Humphreys, April 18, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer. The fort since November 1865 had been garrisoned by Companies I, K, L, and M, 5th U.S. Artillery.

8. Jones to Simpson, May 6, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

Colonel Simpson again protested. Writing Chief Engineer Humphreys, he called on the War Department to set aside for exclusive use by the Corps of three of the detached kitchens; the west end rooms of the recently finished officers' quarters; and the kitchen pertaining to the western section of the subject quarters. By this arrangement, the Engineer officer and his principal subordinates would occupy housing separate from the garrison officers and adjacent to their office.[9]

Chief Engineer Humphreys referred the problem to Secretary of War John M. Schofield. After reviewing the correspondence, the Secretary decided that the Engineers were to have a "proper allowance of quarters" and were to retain "them with a change of officers in the garrison which may occur from time to time."[10]

Before the situation was finally resolved, Bvt. Maj. Thomson P. McElrath (who had recently arrived at the post and had assumed command of Company L) caused additional difficulties. During the absence of Overseer Thomas Geraghty, McElrath took possession of one of the three kitchens the Secretary of War had assigned to the Engineer employees.[11]

Upon being notified of this, Colonel Simpson transmitted to Geraghty a copy of the Secretary's order of September 14. When shown this correspondence by Geraghty, McElrath explained that, until such time as he was given instructions by his immediate superior, Colonel Hill, he would retain possession of these quarters.[12]

The War Department, to resolve the problem, forwarded the correspondence to Maj. Gen. George G. Meade, commanding the Department of Georgia and Florida. Meade found that the letter from the Secretary of War had reached Fort Jefferson on December 8. At that time, Assistant Surgeon William E. Day occupied one of the Engineer quarters, Major McElrath another, and Overseer Geraghty a third. Day was alerted to be prepared to vacate whenever the Corps required his housing.[13] Meade's action apparently resolved the issue, and relations between the Corps and garrison again became amicable.

2. Coping with Foul Odors and Sink and Sewer Filth

Early in March, 1868, General Meade had called attention to the discomfort arising from faulty construction of the Fort Jefferson sinks. The smell, during the summers, was not only offensive, but "must be very detrimental to health of the garrison." The culverts, he noted, frequently became clogged, keeping the sinks in a filthy condition. When open, the culverts discharged filth into the moat, where it "remained as . . . there is no constant change of the water in the ditch."

---

9. Simpson to Humphreys, June 3, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

10. Schriver to Kelton, Sept. 14, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

11. Simpson to Humphreys, Oct. 31, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

12. Geraghty to Simpson, Dec. 2, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

13. Meade to Adj. Gen., Dec. 21, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

Unless this were corrected, General Meade feared the garrison's health must continue to suffer.[14]

Chief Engineer Humphreys, after studying Meade's report, pointed out that Fort Jefferson was an unfinished work and accommodations for the garrison incomplete. To finish them properly would require both time and money. Currently, the privies inside the fort should not be used, and personnel must look to the sinks constructed on "the margin of the shoal."[15]

Next, General Humphreys contacted Superintending Engineer Simpson. To cope with the problem, Simpson was to purchase pipes and pumps. Excavations were to be made in the parade, and pumps installed for the purpose of employing seawater to flush the privy vaults and sewers. It also might be expedient to construct a wooden tank adjacent to each vault to accumulate water and, through a large flushing pipe, to discharge water into the vault by opening a slide valve at the junction of the pipe and tank. Or it might be more practicable to pump water into the vault, employing a slide to open and discharge it into the sewer.

Simpson was to consider extending the sewers across the ditch to the counterscarp, and opening outlets through it for them.[16]

Commenting on General Meade's complaint, Assistant Engineer Jones pointed out that the only sinks in use inside the fort were those in the hospital and those by the officers behind the kitchens. The latter were connected with the sewer by a small passage. The tides did not flow into these sinks to any extent, and they were flushed by directing a jet of water into them from a hose attached to a steam pump. The hospital sinks were directly above the sewer, but the current in it was so sluggish that these sinks were more offensive than the officers' privies.

Continuing, Captain Jones assured the Department that the plan and construction of the vaults and sewers was sound, and if they were properly maintained, there would be no problems. Until recently, they had been too often chocked with refuse.

He did not believe there was any justification for an extension of the sewers across the ditch and through the counterscarp wall. As soon as the counterscarp was completed and the corresponding portion of the ditch excavated, tidal currents would keep the ditch free of filth. If this failed, floodgates could then be built in the sluiceway.[17]

---

14. Meade for Adj. Gen., March 3, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

15. Adj. Gen. to Meade, March 24, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

16. Humphreys to Simpson, March 23, 1868, NA, RG 77, Ltrs. Sent, Chief Engineer.

17. Jones to Simpson, April 14, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

3. Preparations are Made to Expediate Completion of the Ditch and Counterscarp

Consequently, on April 14, Captain Jones recommended that the prisoners be detailed to the Corps, as it was the only Department able "to supply them with the continuous hard labour which there sentences call for."

If this were done, he would employ them to complete the counterscarp wall and ditch. Cost of this project, Jones placed at:

150,000 bricks	at $14 per m	$2,100
1,030 barrels of cement	at $2.50 per bbl	2,575
10,000 feet of lumber	at $60 per m	600
transferring and emplacing machinery		225
1 machinist	40 days at $3.50	140
2 carpenters	40 days at 3.00	240
4 masons	40 days at 3.00	480
180 laborers	35 days at 1.25	7,875
6,580 days' board	at .60	3,949
Miscellaneous		500
TOTAL		$18,683[18]

Colonel Simpson approved the proposal and called on Maj. C. C. McConnell to make available the necessary convict labor.

4. McFarland Clarifies the Situation Pertaining to Flagging and Eccentric Traverse Circles

On November 7, 1867, Chief Engineer Humphreys, after reviewing the annual report and photographic views of the fort for Fiscal Year 1867, had written Major McFarland reminding him of General Totten's February 19, 1863, instructions for strengthening the front-pintle traverse circles not then completed. Six weeks later, McFarland had mailed to Washington a report by Civil Engineer Frost relative to these platforms and traverses. Then, on July 15, 1863, the Department had forwarded to McFarland the promised drawings.

Humphreys was accordingly disturbed by the inference in the subject annual report that "none of the platforms have been provided with stone flagging and eccentric traverse circles," as referred to in General Totten's letter of February 19 and depicted in the July 15 drawings. At the same time, it appeared that the "outer traverse circles on the four fronts have been constructed in accordance with Totten's instruction."

Humphreys desired to know whether this interpretation was correct.[19]

---

18. Jones to Simpson, April 14, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

19. Kurtz to McFarland, Nov. 7, 1867, NA, RG 77, Ltrs. Sent, Chief Engineer.

Replying, McFarland informed General Humphreys that his inference was correct: none of the subject platforms had been provided "either with stone flagging or with Eccentric traverse circles."

He was, he explained, under the impression that platforms "already constructed were not to be interfered with until special instructions were given therefor." As the Fort Jefferson platforms differed greatly from the drawings forwarded by the Department on February 19 and July 15, 1863, this merely confirmed his view.[20]

C. 1868 Construction Season

1. Simpson's Plan of Operations

The Fort Taylor appropriation nearly exhausted, Colonel Simpson proposed to close down operations at Key West and transfer a number of mechanics and laborers to Garden Key, where there was sufficient money to keep a force employed for several more months. Lieutenant Livermore would also be shifted from Key West and placed in charge at Fort Jefferson. Simpson and Captain Jones would then be free for temporary assignment in the North.[21]

The Department approved Simpson's plans. It, however, cautioned that it would be imprudent to sell any property which might be required in future operations at Fort Jefferson or Key West, because it would bring a low price, and when construction was resumed must be replaced at the market price. Perishable items could be disposed of, while those that could be employed at Fort Jefferson were to be transferred to Garden Key.[22]

In mid-April, Simpson notified the Department that the mechanics and laborers brought down from New York were unwilling to remain on the Florida Reef after the 30th, and would be paid off as of that date. Operations would then be carried on by personnel calling Key West their home and prisoners.[23]

Before boarding the Baltimore-bound steamer Liberty, on May 8, Colonel Simpson gave Lieutenant Livermore his instructions. Livermore was to bend all his energy to excavating the ditch and completing as much of the counterscarp as possible. Construction would also be continued on the barracks, priority being given to finishing the middle section. His labor would be limited by the appropriation available--$32,800--less the $8,000 it was proposed to retain at the close of operations for care of the public property.[24]

---

20. McFarland to Humphreys, Jan. 18, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

21. Simpson to Humphreys, March 17, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer. Lieutenant Livermore had requested to remain on the Florida Reef until the close of the season.

22. Humphreys to Simpson, April 3, 1868, NA, RG 77, Ltrs. Sent, Chief Engineer.

23. Simpson to Humphreys, April 17, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

24. Simpson to Livermore, & Simpson to Humphreys, May 7, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

2. Chief Engineer Humphreys' Guidelines

On July 13, Chief Engineer Humphreys reminded Colonel Simpson that, in addition to the counterscarp and ditch projects, Livermore was to see that four of the barracks squadrooms were speedily readied for occupation.[25]

Simpson advised the Department that Livermore expected to complete the middle section by July 31. If this were done, 18 large rooms would be ready for the troops.[26]

3. Work Accomplished in the 1868 Season

From July 1, 1867, to January 22, 1868, three men, including Overseer Geraghty, had spent their days looking after the Engineer property and storing timber. Upon arrival of the artisans and laborers from New York City, on the latter date, construction was resumed on the officers' quarters. By May 11, 18 rooms in the second section were completed.

As of June 30, 1868, the status of the quarters was

1st section--18 rooms already furnished.

2d section--9 rooms finished this season, except folding doors in 2 first story rooms.

3d section--2 first story rooms finished, excepting folding doors.

2 rooms of second story finished and partitions put up; iron stairways hung and painted, one coat; and windows and door opening closed up for preservation of structure.

4th section--2 rooms of first story finished, except partitions; 2 rooms of second story completed, except mantles; 5 rooms of third story lathed and plastered; remainder of rooms lathed; and doors and windows partially closed.

Roof--finished, including chimneys, iron girders of pediment and part of third section set; roof boarded and covered with galvanized iron, and three chimneys topped.

Piazza--in front of sections Nos. 2-4, it had been completed, except for the roof covering.

From May 10 to June 15, workmen had made preparations for excavating the unfinished portion of the ditch. The pumps were overhauled.

---

25. Humphreys to Simpson, July 13, 1868, NA, RG 77, Ltrs. Sent, Chief Engineer.

26. Simpson to Humphreys, July 20, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

Between June 15 and 30, some 40 laborers nearly completed excavation of the ditch paralleling front No. 3, and on four days, when the pumps were broken down, worked on the front No. 4 ditch. On front No. 3 the average depth of the spoil removed was 4'6". The sand was hoisted to the top of the scarp, and used as fill for the parapet's superior slope. The excess earth was dumped on the terreplein.[27]

As of October 1, the status of the barracks was

4 large rooms, 2d & 3d stories, 24'6" X 32'8", 2d set, finished.
2 large rooms, 2d & 3d stories, 24'6" X 34'8", 1st set, finished except stone mantels.
1 large room, 1st story, 24'6" X 34'8", 1st set, needs plasterings.
2 large rooms, 1st story, 24'6" X 32'8", 2d set, needs plastering.

The third section had been furred and floored throughout during the 1868 building season. In April, a requisition had been made on the New York Agency for galvanized roofing, but none could be supplied before late July. Denied the roofing, the workmen could neither floor nor plaster the barracks. By the date the roofing finally arrived, the hands had been laid off and the project closed down for the season.[28]

When he secured the work in early July, Lieutenant Livermore discharged all the hands, except Overseer Geraghty who was placed in charge of the Engineer property. The public mules were transported to Key West and auctioned.[29]

4. Simpson calls for $100,000

On September 12, 1868, Colonel Simpson submitted an estimate of funds needed for construction at Fort Jefferson in Fiscal Year 1869. He called for a $100,000 appropriation to be apportioned

for construction of magazines	$30,000
for completion of counterscarp wall.	5,000
for completion of officers' quarters.	10,000
for completion of barracks.	30,000
for purchase of schooner.	15,000
for alteration of gun platforms.	10,000
total.	$100,000[30]

27. Simpson to Humphreys, Oct. 16, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

28. Livermore to Simpson, Oct. 3, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

29. Simpson to Humphreys, Aug. 11, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

30. Simpson to Humphreys, Sept. 12, 1868, NA, RG 77, Ltrs. Recd., Chief Engineer.

D. Fiscal Years 1869 and 1870 Construction Programs Focus on the Quarters and Barracks

1. Major Blunt Succeeds Colonel Simpson

Congress, when it next enacted a Fortifications Bill to fund construction of coastal defenses in Fiscal Year 1869, failed to include any monies for Fort Jefferson. This would not be Colonel Simpson's problem, because he had been reassigned as superintending engineer of the defenses of Baltimore. His successor as superintending engineer on the Florida Reef would be Lt. Col. Charles E. Blunt.

Blunt, New Hampshire-born and reared, was graduated from the U.S. Military Academy as No. 3 in the class of 1846. Commissioned a brevet 2d lieutenant in the Corps of Engineers, he was ordered to Boston as assistant engineer for construction of Fort Winthrop. In 1854, he was placed in charge of construction of Fort Montgomery at Rouse's Point, New York, and for repair of Forts Wayne, Porter, Niagara, and Ontario.

Blunt, now a captain, was called to Washington in May 1861 and made assistant engineer for construction of the defenses of the capital city south of the Potomac. In November, he was ordered to Boston as superintending engineer for the defenses of Boston and Massachusetts Bay. He was promoted major on March 7, 1867. From January 20, 1865, to May 18, 1867, Blunt was a member of the Board of Engineers for modernization of the defenses of Boston Harbor.[31]

E. 1869-70 Construction Seasons

1. Blunt Charters a Schooner

Preparatory to resuming operations, Colonel Blunt learned that he must hire the schooner Oriental as an Engineer tender at $575 per month. After discussing the subject with Key Westers familiar with the situation, he concluded that chartering her by the month was preferrable to "employing and sustaining the crew, with an additional sum for the use of the vessel." In this, as in many other official matters, Blunt wrote the Department, it would be necessary for him to use his initiative, because of the irregularity of communications between the Florida Reef and Washington.[32]

Chief Engineer Humphreys sanctioned the charter of Oriental.[33]

2. Organizing a Workforce for the 1869 Season

Meanwhile, Captain Jones had returned to Florida and had resumed his duty station on Garden Key. Pending anticipated passage by the current session of Congress of the Fortifications Bill, Colonel Blunt would resume construction, employing the small balance left in the Treasury, when work was suspended in the summer of 1868.

---

31. Cullum, Biographical Register, Vol. II, p. 255.

32. Blunt to Humphreys, Feb. 4, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

33. Humphreys to Blunt, Feb. 12, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

To facilitate this goal, Colonel Blunt employed a clerk at $120 per month and his rations, and a draughtsman on a when actually employed basis.[34]

By the end of March, there were engaged on the project:

No.	Trade	Time of Piece Work	Wages
1	clerk	1 month	$120.00
1	physician	1 month	75.00
1	overseer	31 days	4.00 per day
3	masons	94-5/8 days	2.00 per day
1	blacksmith	33-6/8 days	2.00 per day
2	roofers	67-4/8 days	2.50 per day
6	carpenters	202-4/8 days	2.00 per day
1	carpenter	30 days	2.48 per day
4	laborers	150 days	1.20 per day
11	laborers	363-7/8 days	1.00 per day

When Blunt was unable to hire any plasterers at Key West, the Department called on Col. John Newton in New York City. He was to recruit six skilled men practicing this trade to take employment at Fort Jefferson at $2.50 per day and their passage from New York to Key West. As a further inducement, he promised them their return passage, but found no takers. The reasons given were the lateness of the season, the fear of yellow fever, and high local wages.[35]

Newton questioned whether good workmen could be employed at any price in view of these circumstances. If Blunt were disappointed, he could rest assured that "no effort to find the men had been spared," Newton explained.[36]

The situation, however, improved. In late March, Colonel Newton finally engaged five plasterers for Fort Jefferson, while Colonel Simpson hired two in Baltimore. The latter sailed for Key West aboard Cuba on April 12.[37]

Meanwhile, Colonel Blunt had written the Department that, as there was little hope that the plasterers would arrive before late spring or early summer, it would be impossible to finish the quarters and barracks this season. Consequently, he proposed to reduce his force on approach of the sickly months. He would then proceed to New York City, leaving Captain Jones to superintendent operations during his absence.[38]

---

34. Humphreys to Blunt, Feb. 4 & Blunt to Humphreys, Feb. 4, 1869, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

35. Newton to Humphreys, March 13, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

36. Newton to Humphreys, March 20, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

37. Simpson to Humphreys, April 14, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

38. Blunt to Humphreys, March 29, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

The Department gave its approval. But, before leaving the Florida Reef, Blunt was to apprise the Chief Engineer as to the date he planned to sail.[39]

The seven plasterers landed at Key West on April 17. Writing the Department, Blunt noted that, although it would now be impossible to complete the barracks and quarters before the sickly season, one-half the west end of the latter would be finished. On his latest visit to Garden Key everything was moving ahead expeditiously.[40]

3. Blunt Submits a Program to be Funded from Contingencies

On January 22, 1869, the Department had called on Colonel Blunt to provide it with data on the number of rooms in the officers' quarters and barracks that were finished and occupied or ready for occupancy, and estimates of the cost and time necessary to complete each of these structures.[41]

In addition, Blunt was to take measures to complete, as soon as practicable, the upper two stories of the officers' quarters, along with that section of the barracks that could be most expeditiously finished. To accomplish these goals he could expend about $10,000. If he deemed it vital, the "lower . . . story of the officers' quarters" could also be completed. Funds for this project, in addition to $4,901.70 still available in the Treasury, would be allotted from the appropriation for contingencies.[42]

Responding, Colonel Blunt reported that there were in the officers' quarters 36 rooms ready for occupancy and 4 in the barracks. He estimated the cost of completing the former at $15,000 and the latter at $17,000. Since there was a greater need for housing enlisted personnel of the four companies of the 3d U.S. Artillery recently assigned to the post as replacements for the 5th U.S. Artillery, he would give first priority to the barracks.[43]

The Department, in approving Blunt's plan to complete both the quarters and barracks, cautioned that the estimated cost of $32,000 must not be exceeded.[44]

---

39. Kurtz to Blunt, April 14, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

40. Blunt to Humphreys, April 17, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

41. Humphreys to Blunt, Jan. 22, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

42. Ibid.

43. Blunt to Humphreys, Feb. 16, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer. Companies F, I, L, and M, 3d Artillery, reached Fort Jefferson from Fort Warren, Massachusetts, aboard the steamer Rapidan on February 25, 1869, and relieved the battalion of the 5th Artillery.

44. Humphreys to Blunt, March 2, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

45. Humphreys to Blunt, March 20, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

4. Addition of Blinds to the Quarters' Piazza is a Mistake

On March 20, Chief Engineer Humphreys noted that the quarters piazza appeared to be built "very narrow." He therefore called on Blunt to consider measures for providing greater shelter against the sun for the walls and rooms. Venetian blinds or louvers, with moveable slats, might be the answer. These could be arranged to shut fairly tight, and to be opened to admit a breeze or light, but not the direct rays of the sun. During damp weather they could be opened wide. The frame, holding the louvers, could be arranged to swing to various angles. Blunt was to prepare plans and estimates for such an arrangement.[45]

Blunt accordingly prepared two sets of drawings of blinds for the piazza at the south side of the officers' quarters. These blinds, as General Humphreys could see, were fixed, "which virtually reduce the height or increases the width of the Piazzas, and prevents the direct sun rays from reaching the rooms or walls."

To entirely enclose the piazza by blinds, Blunt believed was unnecessary, because the windows already had blinds, and the sun in this latitude is so high during most of the day that it was off the walls by 10 A.M.

Blunt placed the cost of the proposed lattice work at $2,500, and it might be accomplished during the summer by two carpenters, assisted by prisoners.[46]

General Humphreys approved the lattice concept. Style would be left to Blunt's judgment. Funds to underwrite the project would be remitted on requisition.[47]

Then, in mid-February 1870, the post surgeon complained that the piazza blinds excluded the sun, which should not be done in the subtropics, where "the atmosphere" was "supersaturated with moisture." The officers, themselves, cared very "little whether the blinds were put up or not."

This information was timely, because Colonel Blunt did not believe the blinds could be finished with available funding.[48]

---

45. Humphreys to Blunt, March 20, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

46. Blunt to Humphreys, April 19, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the subject plan titled "Sketch of Proposed Lattice Work for Piazzas of Officers Quarters" is on file at Everglades NP.

47. Humphreys to Blunt, April 28, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

48. Blunt to Humphreys, Feb. 23, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

Post Commander Augustus A. Gibson made it official. On March 4, he informed Assistant Engineer James B. Quinn that after nearly a year's occupation of the quarters, he deemed that the blinds would be no improvement. From 8 to 11 A.M. the blinds would ward off the sunlight, but after the latter hour the sun would not bear on the blinds, which would be counterproductive as they obstructed ventilation.[49]

Work was accordingly suspended on the blinds, and then stopped by order of the Chief Engineer on the last day of March.[50]

5. Progress Made During the Second Six Months of Fiscal Year 1869

In the weeks before construction was resumed on the quarters and barracks by between 20 and 30 Key Westers, considerable work was accomplished by a detail of prisoners under Overseer Geraghty's supervision. Attention was focused on the interiors of the quarters and barracks and the roof of the former.

By June 30, a 18-room section in the quarters was essentially finished, and Colonel Blunt forecast that it would be ready for occupancy in a few weeks. Five rooms had been plastered in the barracks; a "great deal of flooring, furring and other woodwork" had been positioned in sections Nos. 3 and 4; and the structure roofed with galvanized iron.[51]

Some work was also accomplished on the ditch and counterscarp wall fronting curtains Nos. 3 and 4. The spoil was either deposited on the parade or outside the counterscarp wall. One sluice gate and a hoist gate were positioned on fronts Nos. 3 and 4, and a sluice gate on front No. 6.[52]

6. Department Cautions Against Over Spending

On the last day of May 1869, Colonel Blunt informed the Department that he proposed to spend, on the barracks and quarters, during the next 30 days, $6,000, as a large percentage of the materials had been received. To reduce expenditures, he planned to lay-off his clerk on June 30.[53]

Some three months later, on August 25, Blunt placed the cost of materials, including provisions, for completing the quarters and barracks at $15,000. Before ordering these items, through the New York Agency, he desired to be assured that money would be available when needed, because the appropriation for "contingencies" was much reduced.[54]

---

49. Gibson to Quinn, March 4, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

50. Quinn to Humphreys, March 16, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

51. Blunt to Humphreys, July 31, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

52. Ibid.

53. Blunt to Humphreys, May 31, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

54. Blunt to Humphreys, Aug. 25, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

The Department cautioned that, on March 2, Chief Engineer Humphreys had allotted $32,000 from "contingencies" for completion of the quarters and barracks. Blunt had been informed that his estimate was to be "carefully adhered to and by no means exceeded." Subsequently, $2,500 had been added to this figure for piazza blinds, making a total of $34,500. Of this sum, there had been remitted $21,000, leaving $13,400 still available.

Blunt's current requisition exceeded this figure by $1,600. If the $15,000 called for was to fund materials alone, Blunt was to prepare and transmit estimates of monies required for labor to complete the structures.[55]

Blunt feared his previous estimates had been too conservative. Prices for labor and materials had been greater than anticipated, causing the cost of the work to greatly exceed expectations, notwithstanding vigorous efforts in interest of economy. Labor expenses must be added to the $15,000 for materials. They could not be placed at less than $6,000, thus exhibiting an excess of $7,600 over his estimate of August 25.[56]

The appropriation for "contingencies," General Humphreys chided, was too much reduced to admit of an arrearage of $7,600 for the project. Blunt was to prepare figures for finishing the quarters and barracks within the March 2 allotment.[57]

More than four months passed before Colonel Blunt returned from the North to Key West. After an early January 1870 visit to Garden Key, he informed the Department that, upon receipt of its September 13 communication, measures had been taken to reduce the quantities of materials procured in New York City and to keep the force of mechanics and laborers to "the minimum consistent with meeting the pressing needs" of the program. By the first week of the new year, the quarters had been placed in condition to accommodate all officers now posted or likely to be stationed there, provided there was no substantial increase in the garrison. Except for some minor finishing, a little painting, and positioning the piazza blinds, no more monies would be expended on this structure, pending another appropriation.

During the next three months, Blunt would concentrate his limited resources on the barracks. By April 1, he hoped to have the fourth section, containing six squadrooms, finished.

---

55. Humphreys to Blunt, Sept. 1, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

56. Blunt to Humphreys, Sept. 3, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

57. Humphreys to Blunt, Sept. 13, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

When he closed down the project, Blunt inquired, could he employ the small balance remaining from "contingencies" to pay persons retained to look after the Engineer property?[58]

Chief Engineer Humphreys directed that if any funds from "contingencies" were still on the books at the close of the working season, Blunt was to retain them until instructed differently. Such expenditures as were necessary for hire of protection personnel were to be charged to the appropriation for "Preservation and Repair."[59]

7. Construction Progress Through May 1, 1870

By March 1, 1870, fifty-eight rooms in the quarters had been finished. This included all those in sections Nos. 1-3 and four in section No. 4. From then until May 1, when the project was secured, work was continued on the halls, stairways, blinds, and sash.

Between January 10 and March 1, nine more barracks squadrooms (four in section No. 2 and five in section No. 4) were finished. Although considerable progress was made on halls, stairways, and windows, no more rooms were completed during the next eight weeks.[60]

F. Increasing the Fort's Armament in 1869-70

1. General Humphreys Gives Instructions and Blunt Responds

In mid-April 1869, Chief Engineer Humphreys called on the Army's commanding officer, Gen. William T. Sherman, for orders requiring the post commanders at Forts Jefferson and Taylor to have their troops mount, without delay, all heavy guns at these defenses for which platforms were ready. Most of these cannon had casemate carriages, and there was no reason to further delay arming the casemates. Correspondence on file from Colonel Simpson and Major McFarland also indicated that the barbette platforms were probably ready to receive their armament.

---

58. Blunt to Humphreys, Jan. 10, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

59. Humphreys to Blunt, Feb. 24, 1870, NA, RG 77, Ltrs. Sent, Chief Engineer.

60. Fort Jefferson Annual Report, Fiscal Year 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

Colonel Blunt was to advise the Department of the number of barbette platforms ready to receive the large unmounted guns, and, if there were any deficiencies, to give their nature.

Reports of his predecessors had stated that 4-inch pintles with keys were on hand, and it was inferred that the eccentrics were positioned. If only the keyed pintles were in place, the front-pintle platforms could be raised to the requisite height, by framing timbers around the pintle-block to receive temporarily the truck irons. Such platforms in the future would be supplied with flagstone and reinforced.[61]

Blunt replied that there were mounted at the fort:

Whereabouts	Caliber	No.	Location Of Pintle
barbette bastions	10-inch columbiads	5	centre
barbette curtains	10-inch Rodmans	5	front
barbette curtains	42-pdr. smoothbores	9	front
barbette curtains	200-pdr. Parrotts	6	front
casemate curtains	10-inch Rodmans	39	front
casemate curtains	8-inch columbiads	37	front

At the fort, there were 16 10-inch Rodmans and their front-pintle barbette carriages, and 31 10-inch Rodmans and their casemate carriages. On the barbette tier, there were only six 4-inch pintles set on vacant platforms and no traverse irons for the eccentric wheeles. The 35 vacant lower tier casemate platforms lacked their wrought iron pintles.[62]

General Humphreys accordingly directed Blunt to requisition from the New York Agency the prerequisite pintles and traverse irons for the 16 barbette platforms. The latter were to be inserted as soon as received, while the traverse circles were to be laid upon a temporary framework.

Whenever Blunt had accomplished all that was practicable to facilitate the mounting of the armament, including ordering the pintles and eccentric track irons, he was to notify the Department by telegraph.[63]

Colonel Blunt, upon receipt of this letter, spend several days at Fort Jefferson, reviewing with the post commander measures to be taken for mounting the additional armament. Arrangements were made with the post ordnance officer for requisitioning from the Ordnance Department casemate pintles, and an order placed with Colonel Newton for 16 4-inch pintles. Blunt proposed to use some old irons for the eccentric traverses.[64]

---

61. Humphreys to Blunt, April 20, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

62. Blunt to Humphreys, May 1, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

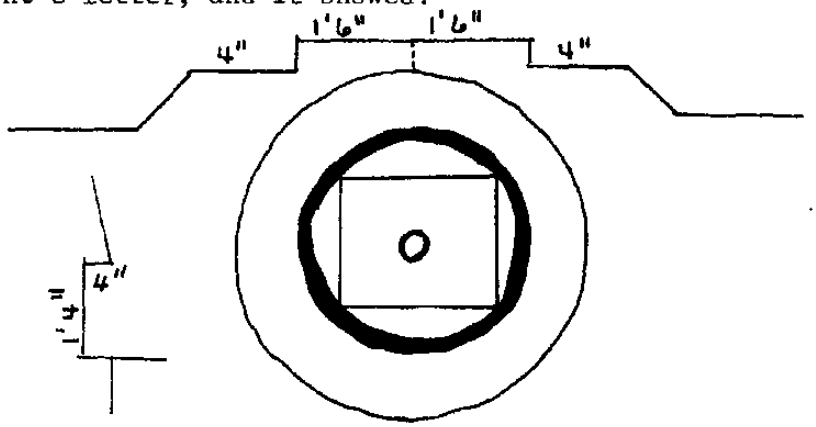
63. Humphreys to Blunt, May 18, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

64. Blunt to Humphreys, May 31, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

2. Small Recesses are Mandated to Give the Barbette Guns a Full Traverse

Late in May, the Department notified Blunt that, if the five 10-inch Rodmans and six 200-pounder Parrotts mounted on front-pintle barbette carriages did not have 4-inch pintles, he was to procure necessary pintles and eccentric track circles for these platforms.

To secure a full traverse for the chassis of a 10-inch Rodman, it was mandatory to cut a small recess in the breast-height wall. This recess would be made at all barbette platforms now occupied or to be occupied by 10-inch Rodmans and 200-pounder Parrotts.[65] A drawing of the recess accompanied the Department's letter, and it showed:



A yellow fever scare at Key West had compelled Colonel Blunt to close down operations and transfer his duty station to New York City. In the hustle and bustle of the move, Blunt failed to acknowledge or reply to the Department's request, which was not repeated.[66]

3. Platforms are Readied and 29 Additional Guns Mounted

By the end of Fiscal Year 1869, workmen had put down 11 eccentric traverse circles on temporary wooden supports.[67]

On November 3, 1869, Colonel Blunt, who had traveled to the West Point, New York, Foundry to supervise construction of an iron beacon for the Florida Reef, notified the Department that the pintles and traverse irons contracted for would be shipped from the New York Depot on the 10th.[68]

---

65. Humphreys to Blunt, May 24, 1869, NA, RG 77, Ltrs. Sent, Chief Engineer.

66. Register of Letters Recd., Nov. 11, 1867-Dec. 31, 1870, NA, RG 77.

67. Blunt to Humphreys, July 31, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

68. Blunt to Humphreys, Nov. 3, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

These items were received and positioned early in the new year. This enabled the garrison to materially strengthen the fort's armament. During the seven months, between November 1869 and May 1870, 21 additional 10-inch Rodmans were emplaced on the barbette tier and eight 10-inch Rodmans in the lower tier casemates.

On hand but not mounted were: three 24-pounder flank howitzers, eight 10-inch Rodmans, one 10-inch columbiad, ten 8-inch columbiads, and four 300-pounder Parrotts.[69]

G. Construction Programs for Fiscal Years 1871-1874

1. Fiscal Year 1872 Appropriation and Program

There was no appropriation by Congress for construction at Fort Jefferson in Fiscal Year 1871. Consequently, to fund necessary maintenance of the fort and to provide for protection of the Engineer property, the Department allotted $1,000 from "Contingencies."[70]

Fort Jefferson, after being ignored for months by Congress, was included in the 1872 Fortifications Bill. On March 22, 1871, the Department wrote Colonel Blunt that President U.S. Grant had signed into law legislation enacted by the 2d Session of the 41st Congress, appropriating $42,500 for the Garden Key Fort. The money was available for immediate use, and was to be applied to the barracks and seawall. It could be used for both or either, as recommended, as well as for general preservation of the fort and Engineer property.

Blunt was to prepare and submit a program for expenditure of the appropriation. He was to reserve a sum sufficient to maintain a proper watch over the public property from the close of operations until June 30, 1873.[71]

Subject to the Department's approval, Blunt proposed to employ these monies on the barracks, quarters, and seawall. Among the projects calling for attention at the barracks were: considerable plastering, while the windows, doors, interior finish, and much masonry were required in section No. 5, which was a mere shell.

In the officers' quarters, workmen would look to the baseboards, and hang the rest of the windows and doors. The roof of the first section of the quarters, which was leaking badly, must be either repaired or renewed.

---

69. Fort Jefferson, Annual Report, Fiscal Year 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

70. Humphreys to Blunt, Sept. 17, 1870, NA, RG 77, Ltrs. Sent, Chief Engineer.

71. Humphreys to Blunt, March 22, 1871, NA, RG 77, Ltrs. Sent, Chief Engineer.

Between 500 and 600 feet of counterscarp would be built. This would require purchase of pumping machinery, as well as bricks. When the last section of the counterscarp had been built under Lieutenant Livermore's supervision, he had employed a pump which belonged to him. It had been sold to a person in Key West, whose asking price was $2,000.[72]

2. To Escape the Quarantine the Construction Season is Postponed

The post surgeon, upon learning that construction was to be resumed, reminded Colonel Blunt that, if workmen were turned to before autumn, it would interfere with the quarantine. Experience had demonstrated that a quarantine could not be effective while a construction program was in effect "necessitating regular intercourse with Key West."[73]

Upon relaying this information to the Department, Blunt admitted that not much would be "gained by working in summer in this vicinity," and he would defer sending any men to Garden Key until he heard from General Humphreys.[74]

The Department agreed that there was little reason to begin operations before November. Meanwhile, Blunt would be given temporary duty in the North during the forthcoming sickly season.[75]

3. Department Sanctions Hire of a Tender

News that work was to be resumed in Fiscal Year 1872 led Colonel Blunt to request authority to "hire" a vessel as an Engineer tender during the approaching construction season. Two years before he had been granted permission to do so, but he had not taken advantage of it, because he had been able to utilize the craft employed for lighthouse purposes. This would now be impossible, because the lighthouse tug was needed by the aids to navigation people. Nor could the Quartermaster schooner Matchless be used without great inconvenience.

---

72. Blunt to Humphreys, April 6 & May 20, 1871, NA, RG 77, Ltrs. Recd., Chief Engineer.

73. Storrow to Blunt, April 28, 1871, NA, RG 77, Ltrs. Recd., Chief Engineer. Storrow was post surgeon at Fort Jefferson from 1869 to mid-March 1872.

74. Blunt to Humphreys, May 2, 1871, NA, RG 77, Ltrs. Recd., Chief Engineer.

75. Humphreys to Blunt, April 15, 1871, NA, RG 77, Ltrs. Sent, Chief Engineer.

The charge for a "good light-draught schooner" would be $600, and this figure would cover everything.[76]

Authority was granted by the Department to charter a vessel at the rate cited, provided the craft was only hired while active operations were in progress.[77]

4. Alabama Claims Crisis Changes Priorities

The Alabama Claims crisis, however, led to a reordering of priorities, and Chief Engineer Humphreys, in Jaunary 1872, directed Colonel Blunt to expend the approved funds in readying the barbette tier for heavier armament (see appropriate section for details of this undertaking).

a. Work Accomplished on the Counterscarp

In November 1871, when work had been resumed, attention was focused on the counterscarp. That portion of the ditch west of the drawbridge, adjoining the unfinished portion, was sealed off by sheet piling, and the water expelled by a powerful Andrews pump. Before construction was suspended on the seawall in mid-January, the concrete foundation of this section of wall was laid, and 283 running feet of superstructure carried up to low water mark.[78]

But, in mid-April, Post Commander Romeyn B. Ayres urged Blunt to have his men resume work on the counterscarp. The surf, Ayres pointed out, had washed great amounts of sand through the breach into the ditch and it had formed a bar. The latter limited tidal ebb and flow, which was essential to keep the ditch free of sewage.

Blunt concurred with Ayres, and recommended that priority be given to completion of the seawall, as soon as the 15-inch Rodmans were mounted.[79]

---

76. Blunt to Humphreys, April 14, 1871, NA, RG 77, Ltrs. Recd., Chief Engineer. Blunt was also superintendent of the 7th Lighthouse District.

77. Humphreys to Blunt, April 25, 1871, NA, RG 77, Ltrs. Sent, Chief Engineer.

78. Blunt to Humphreys, July 25, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

79. Ayres to Blunt, April 17 & Blunt to Humphreys, April 20, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

The Department was agreeable to this course of action. Blunt, however, must bear in mind that the armament project must be prosecuted with "unremitted vigor, and carried to completion if available funds allow."[80]

Blunt told Colonel Ayres that he had apprised the Department of the need to complete the counterscarp and that it would be finished when work was resumed in the autumn.[81]

b. Work Accomplished on the Barracks

During the year, before the change in program, one large room in the barracks had been plastered and the carpentry work in three others finished.[82]

5. Fiscal Year 1873 Appropriation and Program

On June 10, 1872, President Grant signed into law the Fortifications Bill enacted by the 2d Session of the 42d Congress, appropriating $42,500 in construction funds for Fort Jefferson in Fiscal Year 1873. These monies became immediately available. Upon advising Colonel Blunt of this, General Humphreys called on him to prepare and submit for review and approval a program for expenditure of this money. Upon doing so, Blunt was to keep in mind that priority was to be given to the speedy construction of emplacements for the greatest number of guns and their magazines and traverses.

The subject act also appropriated $250,000 for "Contingencies." Blunt was to submit separate programs for funds needed from this appropriation in Fiscal Year 1873 for each of the defenses for which he was responsible.[83]

Blunt announced that he proposed to employ the $42,500 to complete the counterscarp, the modification of the traverse magazines, and the revetments to shield the 15-inch Rodman emplacements. Any funds remaining would be employed to advance the barracks toward completion.[84]

After reviewing the program, Chief Engineer Humphreys approved it as submitted.[85]

---

80. Casey to Blunt, May 4, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

81. Blunt to Humphreys, June 28, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

82. Fort Jefferson, Annual Report, Fiscal Year 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

83. Casey to Blunt, June 22, 1872, NA, RG 77, Ltrs, Sent, Chief Engineer.

84. Blunt to Humphreys, July 29, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

85. Parke to Blunt, July 29, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

6. Blunt Increases the Work Day and Wages

Soon after the beginning of the 1872-73 construction season, Colonel Blunt, to expedite progress, proposed to establish for his workmen, as of January 1, a 9-hour day. Both the artisans and laborers, he informed the Department, would be pleased by this arrangement, because it would boost their daily pay by one-eight. At the same time the wages of the overseer would be increased from $120 to $135 per month.[86]

The number of hours to be worked daily by the labor force was left to the judgment of the officer in charge and the foremen, the Department advised Blunt. It, at the same time, approved the proposal to pay the overseer $135 per month.[87]

7. Counterscarp (Seawall) is Finally Completed

In December 1872, the workmen completed the section of counterscarp left unfinished when the project was shutdown for the sickly season. Next, another section of the ditch was enclosed by a cofferdam, the water pumped out, and 138 running feet of concrete foundation laid for the remainder of the wall.

During the first two months of the new year, the laborers completed the masonry of the seawall encircling the fort, and two bulkheads were positioned across the ditch, enclosing the portion it was proposed to landscape.

In April, the excavation and grading of the front No. 3 ditch (which had become filled with sand because of the unfinished condition of the seawall) was completed and water admitted. Sand removed from the ditch was filled in behind the counterscarp. Upon completion of this work, Colonel Blunt reported, there is "now a clear and good circulation all around the fort."[88]

8. Closing Down the Project for the 1872-73 Season

On May 1, 1873, Blunt informed the Department that he planned to close down the project for the season in about four weeks and, with its permission, proceed to New York City. There was, he reminded General Humphreys, little that could be accomplished at Garden Key by his workmen after establishment of the annual quarantine.

---

86. Blunt to Humphreys, Dec. 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

87. Casey to Blunt, Jan. 2, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

88. Fort Jefferson, Monthly Reports for Dec. 1872-May 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

Already, all his workmen from the North had claimed their pay and had returned to their homes, leaving him with only a few Key Westers.[89]

The Department was agreeable. Upon reaching New York, Blunt was to notify the Department in writing.[90]

9. Fiscal Year 1874 Appropriation and Program

On February 21, 1873, President Grant signed into law the Fortifications Bill enacted by the 3d Session of the 42d Congress, appropriating $50,000 for construction at Fort Jefferson in Fiscal Year 1874. These funds were available for immediate use. Notifying Colonel Blunt of this, the Department called on him to prepare and forward a program for expenditure of these monies. As heretofore, priority was to be given to those projects aimed at accelerating construction of emplacements and magazines.

The act also made available $100,000 for "Contingencies" in the subject 12 months. Blunt would therefore prepare a separate project for application of funds from this appropriation.[91]

Blunt proposed to employ the $50,000 "mainly in completing the modifications of the magazines and continuing the construction of the South (and unfinished) section of the soldiers barracks."[92]

Blunt foresaw no reason to call for an allotment from "Contingencies." For a number of months, he explained, he had had on deposit a balance of $3,190.13 belonging to a former appropriation for this purpose.[93]

The Department approved, without comment, the program as submitted.[94]

10. October 1873 Hurricane and Repairing the Damage

Once again, events over which the Corps of Engineers had no control affected the program. This time it was an act of God.

---

89. Blunt to Humphreys, May 1, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

90. Casey to Blunt, May 7, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

91. Casey to Blunt, March 18, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

92. Blunt to Humphreys, undated, NA, RG 77, Ltrs. Recd., Chief Engineer.

93. Blunt to Humphreys, April 18, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

94. Casey to Blunt, April 29, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

For the third time in seven years, a hurricane savaged the Tortugas on October 6 and 7, 1873, causing heavy damage to the public property. Slates and chimneys on the roof of the first section of the officers' quarters were torn off; the rooms below flooded with rain water to the ground floor, causing an estimated $5,000 damage. Blinds were ripped off the windows and many lights broken.

The iron roof of the barracks was badly damaged. In several instances the iron girders were carried over the parapet and landed in the ditch. Water cascaded through, flooding squadrooms below.

The hospital was unroofed, and water poured into the storeroom, wetting down medical stores, and flooding the wards. The patients were evacuated to Battery M's messhall. The hospital kitchen was so badly battered that the cooking facilities had to be relocated into one of the company kitchens. The dispensary was inundated, but the medicines on the shelves were sufficiently sheltered.

The bakehouse and oven were battered so badly as to be almost useless.

The enlisted men's sink, constructed during the winter of 1872-73 outside the fort, was swept away.

Nineteen cattle belonging to the commissary department were drowned, while the quartermaster's cattle pen, slaughterhouse, and stable were swept away. A dingy and its boathouse were gone. The roof of the room used by the post quartermaster for storage of clothing and camp equipage was battered and some of the contents damaged by seepage.[95]

When called on to comment on Post Commander Loomis Langdon's report, Colonel Blunt expressed the view that $20,000 would cover costs of repairing the damage. Even in its battered condition, there were 36 rooms available for occupancy in the officers' quarters. If the barracks were injured so they could not be occupied in damp weather, the second tier of casemates could be employed as barracks, a use to which many of them had been put in the past.[96]

---

95. Langdon to Adj. Gen., Dept. of the Gulf, Oct. 7, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

96. Blunt to Humphreys, Oct. 18 & Nov. 14, 1873, NA, RG 77, Ltrs. Recd. Chief Engineer.

Relaying this information to Secretary of War William W. Belknap, Chief Engineer Humphreys explained that, as soon as the extent of the damage was known, Colonel Blunt would be directed to effect repairs. They would be continued until the barracks and quarters were restored to "through order."[97]

Repair of the quarters consisted of covering an entire section of the roof with galvanized iron, including eight ventilators. The chimneys were rebuilt and 16 large rooms replastered. The only work remaining on the structure, at the end of Fiscal Year 1874, consisted of erecting the rear piazza, and completing the carpentry and painting in one section.

A new galvanized roof was positioned on the barracks. Iron girders and the wooden portions of the roof and cornice had been placed on one and a half sections. Three brick gables and the two remaining chimneys had been finished. Six iron stairways were secured and hung. Fifteen rooms and 16 hallways had been completed, along with details in the other rooms. Thus by June 30, 1874, little remained to be accomplished "to complete the building in every particular."[98]

H. Bolstering the Barbette Tier's Armament to Meet Challenges from Abroad

1. Plans are Prepared, Submitted, and Approved for Modernizing the Armament

On May 31, 1870, Chief Engineer Humphreys notified Colonel Blunt that he was to begin studies necessary for and preparation of plans for modernization of Fort Jefferson. As soon as they were finalized, he was to notify the Department, in writing, and hold himself ready to lay the project before the Board of Engineers for Fortifications, with which he was to be associated as a member, while Fort Jefferson was under consideration. Any plans or drawings filed in Washington would be placed at his disposal.[99]

Colonel Blunt, who had gone North, acknowledged receipt of his instructions on June 3 from New York City. To facilitate planning, Assistant Engineer Quinn mailed Blunt a drawing of Fort Jefferson on the last day of the fiscal year.[100]

---

97. Humphreys to Belknap, Nov. 15, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

98. Fort Jefferson, Annual Report for Fiscal Year 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

99. Humphreys to Blunt, May 31, 1870, NA, RG 77, Ltrs. Sent, Chief Engineer.

100. Blunt to Humphreys, June 3 & Quinn to Blunt, June 30, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

Some seven months later, in January 1871, to facilitate planning, the Department mailed to the Board of Engineers these Fort Jefferson drawings: (a) "Projected Fort for Garden Key, Tortugas, approved Nov. 1846"; (b) "General Plan of Fort Jefferson, 1870"; (c) "Sketch showing condition of officers' quarters, Fort Jefferson, June 30, 1869"; (d) "Fort Jefferson, condition of work, June 30, 1867"; (e) Fort Jefferson, Plans of 1st and 2d Tiers of N, NE, SE, S, & SW bastions"; (f) "Fort Jefferson, Sections of N, NE, SE, S & SW bastions"; (g) "Fort Jefferson, plans, sections, etc., of portions of barbette tier showing positions of gun centres and circles, also magazine traverse, platforms, banquettes, etc."; and (h) "Fort Jefferson, plans, sections and elevations of gateway and adjoining casemates."[101]

Colonel Blunt, after preparing preliminary plans and estimates, met with other members of the Board (Brig. Gen. John G. Barnard, Col. George W. Cullum, and Lt. Col. Zealous B. Tower) in New York City in mid-July. The Board's report on modification of Fort Jefferson, along with necessary drawings, was forwarded to Chief Engineer Humphreys. The Board noted that the changes proposed were limited and

> are only intended to adapt the barbette tier to the service of guns of a sufficient calibre to be of some utility against armored vessels; to give to these guns all the cover that can be attained by traverse magazines on the narrow ramparts; and to increase the thickness of the scarp walls of the magazines in the curtains of the fort, filling the ventilators with masonry and constructing blind embrasures on the exterior of the wall as shown in accompanying drawings.
>
> The six Tower Bastions are too narrow to admit the 12-inch rifle; arrangements have therefore been indicated for mounting one gun of this calibre immediately in rear of each bastion, covering it to the right and left by a parapet 20 feet thick extending to the parade line of the terreplein. It is impossible to cover these guns against reverse fire over the fort. Sand bags piled up over the stairway would furnish some protection against this fire, at least against fragments of shells. To utilize the bastions as much as possible they should be prepared to receive 10-inch rifles equal to the English model. The platforms for this gun, as well as for the 12-inch rifle in rear of it, may be of wood.
>
> A traverse with a covered communication through it separates the 12-inch rifled cannon from the 10-inch. This covered way communicates with the casemates below by an opening 2 1/2 ft. by 3 ft. which is intended as a hoistway for ammunition for the service of the

---

101. Casey to Cullum, Jan. 14, 1871, NA, RG 77, Ltrs. Sent, Chief Engineer.

two guns above, as well as for a communication when needed. The space in each bastion provided, as per accompanying plan, for a 10-inch rifled gun may seem very restricted; yet it allows the traverse of the English 10-inch carriage. So few large guns can be mounted 'en barbette' the Board think it necessary to make provision for one in each bastion even though the space is limited and the traverse intervening restricts somewhat the fire of the 12-inch rifle in its rear. This restriction is of little importance however, as the gun has a sufficient field of fire to fully occupy it. Should the bastion gun become unserviceable the top of the traverse can readily be thrown down so as to form a simple parapet.

The existing magazines on the terreplein of the ramparts are not sufficiently protected; but when modified in accordance with the plans submitted herewith, they will be much more secure against direct and curved fire, and more serviceable as traverses to cover the contiguous guns.

The parapets of the curtains as now built are not thick enough to resist heavy projectiles at short ranges. The Board do not however propose to make any additions to these parapets at present, but prefer to leave the 10-inch smooth bore platforms in position till a suitable rifled gun is provided to replace the smooth bore. When these guns shall be supplied, in laying the new platforms to receive them, the parapets may be increased to a thickness of 20 feet at the recesses.

Figs. A and B on the drawings submitted show intermediate sand bag traverses that may be introduced on the approach of war to give additional protection and cover to the barbette guns of the curtains. By these plans with the intermediate traverses it will be seen that the barbette tier will mount six 10-inch rifles in the bastions, 32 10-inch smooth bore guns on the curtains and six 12-inch rifles at the angles of the curtains.

Fort Jefferson has 232 gun casemates on the curtains. If the 10-inch smooth bore can be converted into an 8 or 9-inch rifled gun it may perhaps be served with good effect in some of these casemates if needed before the embrasures are modified.

The above modifications do not provide requisite emplacements for the most efficient guns known to the service and which are especially needed at this position which can be nearly surrounded by a hostile fleet at distances varying from a half mile to a mile. The largest rifle guns will doubtless be required to contend with the more recently constructed iron-clads of the English navy. The recommendations of the Board therefore, must be regarded only as an expedient for giving some efficiency to Fort Jefferson while the question of the defense of the anchorage in its vicinity is being further studied.

The Board placed cost of the project at:

Barbette Tier	
4,298 cu. yds. of earth in parapet and traverses	$1,396
1,058 cu. yds. of brick in B.H. wall and magazines	19,044
1,273 cu. yds. of concrete in B.H. wall, magazines and passages	11,457
1,648 running feet of balcony	16,480
252 feet of coping	378
6 15-inch gun platforms	4,800
6 9-inch gun platforms	4,200
Lower Casemate Tier	
240 cu. yds. of brick in 4 curtain magazines	4,320
contingencies	13,855
total	$83,130[102]

Meanwhile, the Department had cautioned Superintending Engineer Blunt that, until trials of King's counterpoise carriage for 15-inch guns were completed and further instructions issued, no breast-height walls, gun recesses, or platforms for barbette batteries were to be built. Neither should any work be done upon barbette batteries situated above casemates other than embanking the parapets, leaving the interior slope of the parapet at the natural slope of the earth used.

Where there were no casemates under the barbette batteries, construction could be continued on the traverses and parados. But where the side slopes of these structures were in excess of 14 feet in height, they must not be embanked at a steeper slope than three upon four.[103]

On December 8, 1871, General Barnard notified the Department that the Board would soon review its modernization projects at Dry Tortugas and Key West in reference to adapting them to employment of King's depressing carriage. As this might result in a modification of the original design, several members of the Board planned to visit Forts Jefferson and Taylor.[104]

But, before they could do so, United States relations with Great Britain, because of the Alabama Claims, were acerbated by demands of the former that the British be compelled to pay a huge sum for prolongation of the Civil War. The British press and public bitterly assailed these claims, and the Gladstone ministry came near being overthrown in Parliament. This would result in the scuttling of the Geneva Tribunal.

---

102. Board of Engineers to Humphreys, July 17, 1871, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of the plan for modernization of Fort Jefferson titled "Plan and Sections of Fort Jefferson, Dry Tortugas, Fla., Showing Modifications Proposed by the Board of Engineers for Fortifications" is on file at Everglades NP.

103. Casey to Blunt & Gillmore, June 5, 1871, NA, RG 77, Ltrs. Sent, Chief Engineer.

104. Barnard to Humphreys, Dec. 8, 1871, NA, RG 77, Ltrs. Recd., Chief Engineer.

There was much sabre rattling on both sides of the Atlantic before cooler heads prevailed. Finally, the United States Senate amended the Treaty of Washington so as to waive all claims to "indirect losses" before the Tribunal. This eased the crisis, and on September 20, 1872, the Tribunal awarded the United States $15,500,000 for damages committed to the commerce by the Confederate raiders Florida, Alabama, and Shenandoah in consequence of Britain's failure to exercise due diligence in the enforcement of her neutrality.[105]

Consequently, on January 6, 1872, Secretary of War Belknap, taking cognizance of international tensions, reviewed and approved the modernization project, subject to such changes in details as the Chief Engineer might find necessary in the course of construction.[106]

2. Threat of War with Britain Results in a Crash Program

On January 11, 1872, responding to the saber rattling, Chief Engineer Humphreys telegraphed Colonel Blunt to "suspend all work on Fort Jefferson."[107] The next day a letter went out, directing Blunt to employ the appropriated funds for preparation of the fort for its armament. Enclosed he would find a copy of the project, dated June 30, 1871, along with three drawings by the Board of Engineers. These were being sent for information and guidance.[108]

Blunt was to proceed in conformity to these plans, constructing upon each bastion a platform for a centre-pintle 15-inch gun. The centre of the platform was to be 5 feet in advance, or nearer the salient, than the platform represented in the drawings, and "omitting entirely the constructions which contemplate putting in position a heavy rifled gun near the Salient of the bastion, which gun it is not designed to prepare for at present."

He was not to build the traverse shown on the drawing between the two designated guns. Instead, he was to bring up the "mass of sand across the gorge of the bastion to a height and thickness to form a parapet for a 15-inch gun, eliminating all masonry construction behind it."

---

105. James F. Rhodes, History of the United States from the Compromise of 1850 to the End of the Roosevelt Administration, 9 vols. (New York, 1928), Vol. VI., pp. 470-87.

106. Belknap to Humphreys, Jan. 6, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

107. Casey to Blunt, Jan. 11, 1972, NA, RG 77, Ltrs. Sent, Chief Engineer.

108. Copies of the subject drawings titled, Sheets 1, 2, and 3 of the "Plan of Fort Jefferson, Dry Tortugas, Fla., Showing Modifications Proposed by the Board of Engineers for Fortifications February 1871" are on file at Everglades NP.

All revetments were to be of a temporary character, while the platforms were to be of timber laid upon a bed of concrete. Casemate magazines were to be strengthened "permanently in the manner prescribed by the project of the Board of Engineers enclosed."

Should available funds exceed those needed for these purposes, Blunt was to employ this money to reinforce the barbette tier traverse magazines, in accordance with the Board's plans, selecting those that in his judgment would be most exposed to hostile bombardment.

Blunt was to mount six 15-inch Rodmans on the bastion platforms and four 300-pounder Parrotts. Three centre-pintle platforms for the latter would be removed from Fort Taylor, and he was to build, if necessary, one front-pintle platform.

He would emplace in the lower tier casemates the four 10-inch Rodmans, dismounted to make room for the Parrotts. Their positions would be determined in consultation with the post commander.

Any guns and carriages currently mounted on the bastions and obstructing the field of fire of the 15-inch Rodmans were to be dismounted.

It was expected that this work would be vigorously pressed, and the heavy armament mounted by the advent of the sickly season.[109]

The next day, the 13th, General Humphreys asked the Ordnance Department to ship to Fort Jefferson six 15-inch Rodmans, and four centre-pintle carriages for these huge guns. The other two needed carriages were to be transferred from Key West to Garden Key.[110]

Two days later, the Department apprised the commander of the Department of the South, Brig. Gen. Alfred H. Terry, of its orders to prepare the barbette tier of the fort for heavier armament. Since the mounting of the huge 50,000-pound Rodmans would be backbreaking work, the Engineers might require the cooperation of the garrison. General Humphreys accordingly suggested that the post commander be instructed to hold himself ready to afford requisite aid, when called upon by Colonal Blunt.[111]

---

109. Casey to Blunt, Jan. 12, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

110. Humphreys to Chief of Ordnance, Jan. 13, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

111. Humphreys to Terry, Jan. 15 & Emory to Humphreys, Jan. 29, 1872, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

By circular letter, the Department now advised its superintending engineers that recent Fort Monroe firing tests had led to the conclusion that, in construction of barbette batteries, certain principles prevailed. Against single shots at short ranges from the heaviest caliber shellguns, a sand parapet, 20 feet thick between crests, will afford adequate protection if supported by a two-foot breast-height wall. As the number of shots from a warship that will strike the same spot is limited, a parapet of this thickness backed by a thicker wall will suffice as minimum cover for a gun.

Where circumstances permitted, without a great increase of cost, and, particularly when the battery will be subjected to a prolonged bombardment, the thickness of the parapet should be increased, so it will withstand the effects of several shots in the same area.

As for materials, sand was far superior to clay. No experiments had been undertaken at Old Point Comfort upon parapets constructed of fragments of stone covered with earth, or upon parapets of gravelly soil. It, however, was believed that epaulments of these materials would be inadmissable from the likelihood of dangerous fragments being hurled about the emplacement whenever the parapet was struck by a high explosive projectile.

All parapets having a thickness of 25 feet and under were to be constructed of sand, "confined in a parapet by a casing of loam upon which grasses may be made to take root." The lower limit of the sand was to be a horizontal plane passed through the intersection of the terreplein and interior slope of the parapet; and "its exterior limit, a vertical plane passed parallel to the interior crest, and not less than 25 feet or 20 feet from it."[112]

3. Salient Angles are Prepared for the 15-inch Rodmans

Colonel Blunt accordingly estimated the cost of modifying the fort to mount the heavier armament at:

Preparing for mounting the 6 15-inch guns, including platforms, traverses, etc.	$30,000
Strengthening the principal magazines	5,000
Total	$35,000
To bombproof the 18 traverse magazines would cost about $1,000 per structure, or.	$18,000[113]

---

112. Circular Letter, Jan. 25, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

113. Blunt to Humphreys, undated, NA, RG 77, Ltrs. Recd., Chief Engineer.

Because of the tense international situation, and to expedite early completion of the project, the work day was established at ten hours. During March, the concrete foundations of two of the 15-inch platforms were completed, along with the breast-height wall steps. The scarp of No. 3 curtain magazine had been reinforced by increasing its thickness to 12 feet. New doorways had been cut into eight of the traverse magazines and the old entrances and recesses bricked up.[114]

Upon relaying this information to the Department, Blunt noted that most of the barbette magazines had been modified, without completing any of them. He had been obliged to do this, because of the need to find work for his masons, who would be idle while the curtain magazines were being emptied.

He now suggested a modification in the barbette magazines. Instead of cutting the new entrance in the "body of the present brick masonry," they would be constructed outside of it.[115]

Chief Engineer Humphreys approved this change order. Colonel Blunt was to make the entrances as proposed, sending the Department a sketch illustrating the change.[116]

By May 31, the foundations of the four remaining 15-inch salient angle platforms were positioned, and the adjoining breast-height walls and steps finished. Three front-pintle masonry platforms for 300-pounder Parrotts had been completed.

The scarp reinforcement for the magazine in curtain No. 4 was finished. On the barbette tier, five doorways were cut and four bricked-up in the traverse magazines.

A large amount of sand (9,500 cubic yards) had been hoisted to the terreplein for fill in the salients.[117]

---

114. Blunt to Humphreys, March 2 & April 15, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

115. Ibid. A drawing illustrating the suggested change order is on file at Everglades NP.

116. Casey to Blunt, April 25, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

117. Blunt to Humphreys, June 4, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

4. Securing and Positioning Timber Platforms

Platform timbers for the six huge guns had been ordered through the New York Agency. On February 28, 1872, the Department inquired of Colonel Newton whether the platforms were being prepared by the Seely preservation process. It was feared that, because of the haste, some provisions of the December 15, 1870, circular may have been overlooked. This stipulation was important, particularly at subtropical sites, such as the Tortugas and Key West, where timbers must be cured before being used.[118]

On December 15, 1870, the Department had named Colonel Newton and Major Gillmore to a Board and charged them with preparing "a design for a centre-pintle 15-inch carriage to be built of wood to be used in our barbette batteries."[119]

Colonel Newton, in acknowledging the call for the platforms, cautioned that, because of the Seely creosoting process, there would be some delay. By April 25, although more than five weeks had slipped by, the contractor still refused to name a date when he would begin work. Urged on by Newton, he finally began creosating the timbers on May 1.[120]

Consequently, the Department authorized Newton to await consummation of the creosoting process before shipping the timbers. Since it was important that the platforms be promptly positioned, he was to see that there were no more unavoidable delays.[121]

The ship aboard which Colonel Newton embarked the wooden platforms reached Key West from New York City on May 29. When he inspected them, Colonel Blunt was disappointed to see that the timbers had not been creosoted, and they were not as "well made" as one might expect.[122]

The approach of the sickly season led the Department to alert Blunt to commence a reduction of his force by June 15, with the goal of closing operations by the 30th. It was anticipated that by then all the gun platforms would be in position, and ready for their armament.

---

118. Casey to Newton, Feb. 28, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

119. Humphreys to Newton and Gillmore, Dec. 15, 1870, NA, RG 77, Ltrs. Sent, Chief Engineer.

120. Newton to Humphreys, March 15, April 25, & May 1, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

121. Casey to Newton, May 1, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

122. Casey to Blunt, May 16 & Blunt to Humphreys, June 4, 1872, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

After completing arrangements looking toward security of the Engineer property, Blunt was to proceed to New York City. Upon his arrival there, he was to report by letter to the Chief Engineer.[123]

Replying, Blunt questioned whether the 15-inch platforms would be positioned by June 30, because of the time lost in transporting them from Key West to Fort Jefferson. At this season, sailing vessels frequently required 4 to 5 days to navigate the 70 miles. Valuable time would have been saved if the steamer had landed them in the Tortugas instead of at Key West.

The weather was now so hot and humid that it was difficult to keep his force at full strength, although all the men were blacks.[124]

The blacks, however, met the challenge, and on June 21, Blunt reported the centre-pintle platforms on the south and southwest bastions ready for their armament, and on the 26th that the other four bastion 15-inch platforms could receive their guns.[125]

5. Problem with Traverse Wheels Causes Delays

The guns, however, were not mounted, because the garrison found that the new traverse wheels were too high for the platforms.

Upon being apprised of this, Chief Engineer Humphreys, in April 1873, explained to Colonel Blunt that, until 1865, all 15-inch gun platforms were constructed with a "difference of level of only 4" between the inner and outer traverse circles." Then, in July of that year, General Delafield had directed that hereinafter the outer traverse circles of permanent platforms be lowered 12 inches, so as to make the difference in level 1 foot 4 inches, instead of 4 inches. This change had dictated an alteration in the forks of the rear traverse wheels of the chassis. As there would be, in many of the defenses, platforms of both types (high and low traverse stones), an agreement had been reached with the Ordnance Department that, in shipping carriages for 15-inch guns, they would send with them a "bolster" which could be interposed between the rear forks and the chassis. Consequently, if the carriages were to be mounted on a low circle platform the bolster could be used, and if on a high circle platform it would be dispensed with.

---

123. Casey to Blunt, June 3, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

124. Blunt to Humphreys, June 11, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer.

125. Blunt to Humphreys, June 21 & 26, 1872, & Humphreys to Dyer, June 21 & 27, 1872, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

Accordingly, the Engineers had been at liberty to build their platforms with either a low or high traverse platform.

In case of temporary platforms, to secure a proper margin of strength, it had been necessary in the Staten Island tests to waive the difference in level between the traverse irons to 4 inches. The carriages furnished by the Ordnance people for Fort Jefferson and the Charleston defenses had been adapted to this level. As Blunt's platforms could not be changed, the Ordnance Department would be asked to supply short forks for the rear traverse wheels.[126]

Colonel Blunt, when he acknowledged receipt of this correspondence, did not allude to whether the six 15-inch platforms were high or low traverse.[127]

6. Ten Big Guns: Six 15-inch Rodmans and Four 300-pdr. Parrotts are Mounted

This enabled the Engineers, during the 1872-73 construction season, to mount the six 15-inch Rodmans and the four 300-pounder Parrotts.

In addition, the workmen were able to complete the brick masonry of 14 of the traverse magazines, as called for in the approved change order. Wooden galleries were also positioned.

Considerable sand was hoisted to the barbette tier and used as fill in the bastion salient angles.[128]

7. The "Virginius Crisis" Causes a Brief Furor

The arbitration of the Alabama Claims had eased tensions with Great Britain, but outbreak of another insurrection in Cuba tested American neutrality. The capture and execution of 50 men aboard the filibustering steamer Virginius, flying the "stars and stripes," by the Spanish in Santiago-de-Cuba caused many Americans to call for war.

Consequently, on November 21, 1873, the Department alerted Colonel Blunt, as well as its other Engineers charged with responsibility for the Gulf and South Atlantic defenses, to employ "all possible dispatch in preparing all your works, so as to be able to place every available gun now at them in the

---

126. Casey to Blunt, April 1, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

127. Blunt to Humphreys, May 1, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

128. Fort Jefferson, Monthly Reports for Dec. 1872-May 1873, NA, RG 77, Ltrs. Recd., Chief Engineer. Some eight years before, in 1864, the Department had mailed to the superintending engineers for guidance a sheet of drawings illustrating the mode of housing 15-inch Rodmans on the terreplein of Castle Williams. Delafield to McFarland, Nov. 22, 1864, NA, RG 77, Ltrs. Sent, Chief Engineer.

best positions for defense from sea-attack." It was believed that the works contained many more platforms than there were guns. If such were not the case, Blunt was to proceed to put down the necessary platforms. If there were funds available after tending to this, he was to strengthen and increase the extent of the defenses in accordance with approved plans.

Colonel Blunt was to advise the Department of: (a) the available funds for each work for which he was responsible; (b) the additional sums required to finish and position needed platforms for the disposable guns; and (c) the monies needed for erection and preparation of "such positions as were deemed indispensable for an efficient defense."

He was to utilize wooden platforms or any other that could be secured in the shortest time, and be careful in carrying out these measures not to "excite the suspicions of any pressing emergencies."[129]

Blunt, upon returning to Key West in early December, notified the Board that at Fort Jefferson "every available gun is in position." He was satisfied that the $47,500 on hand or in the Treasury was sufficient to meet all demands during the 1873-74 construction season.[130]

The Department approved Blunt's plans and notified the Chief of Ordnance that, inasmuch as the Corps' operations were concerned, Fort Jefferson was ready for occupation by a large garrison.[131]

This crisis in Spanish-American relations was soon resolved and it resulted in the suspension of plans to strengthen and reinforce the coastal defenses. It was established that Virginius was owned by Cuban revolutionaries and was illegally registered; that she had been carrying arms to Cuba; and was fraudently flying the "stars and stripes." Although Spain refused to punish her officers who had carried out the seizure or salute the United States flag, she released Virginius' survivors and paid an indemnity of $80,000 to families of the American victims.

8. Limited Fiscal Year 1874 Program

The urgency having passed and funds being limited, the Corps' program during the 12 months ending June 30, 1874, was modest. Five of the barbette platforms were modified by substituting 4-inch pintles for the old ones. Pintles had been secured and arrangements perfected for setting them in the eight remaining platforms.

---

129. Humphreys to Blunt, Gillmore, etc., Nov. 1, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

130. Blunt to Humphreys, Dec. 5, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

131. Humphreys to Chief of Ordnance, Dec. 15 & Casey to Blunt, Dec. 17, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

To keep the sand slopes of the traverse magazines in place, it was found necessary to employ wooden or iron roofing. Eight of these magazines were embanked with sand and roofed with timbers. Another was covered with galvanized iron salvaged from the roofing plates. The remaining magazines were sheltered by partially completed wooden roofs.[132]

9. Fiscal Year 1876 Improvements

It was Fiscal Year 1876 before the eight 4-inch pintles were set in the pintle-blocks.[133]

10. Department Calls for Annual Armament Drawings

On January 20, 1872, the Department called on its superintending engineers to provide it with a sketch of the works for which they were responsible, showing each tier, and giving the position of pintles and traverse circles. Each platform was to be assigned a number, and opposite each platform was to be entered the caliber of gun mounted thereon, whether the carriage was iron or wood, the diameter of the pintle, whether it had high or low traverse stones, and if the platform was ready for its gun.[134]

Colonel Blunt promptly prepared and submitted the desired drawing, titled, "Fort Jefferson, Dry Tortugas, Fla., Showing Condition of Armament, March 1st, 1872."[135]

11. Delinating the Fort's Field of Fire

In late July 1873, in response to Post Commander Langdon's request, the Department provided him with "a tracing" showing the field of fire of Fort Jefferson as established by the Board of Engineers in 1871.[136]

---

132. Fort Jefferson, Annual Report for Fiscal Year 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

133. Fort Jefferson, Annual Report for Fiscal Year 1875, NA, RG 77, Ltrs. Recd., Chief Engineer.

134. Circular Letter, Jan. 20, 1872, NA, RG 77, Ltrs. Sent, Chief Engineer.

135. Blunt to Humphreys, March 2, 1872, NA, RG 77, Ltrs. Recd., Chief Engineer. Hereinafter, the superintending engineers were called on and expected to submit annual armament drawings containing this information. At Fort Jefferson this was done 1873, 1875, 1883, and 1892.

136. Langdon to Humphreys, July 13 & Blunt to Langdon, July 30, 1873, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. A copy of the subject drawing titled, "Diagram of Fire of Fort Jefferson, Dry Tortugas, Fla.," is on file at Everglades NP.

I. Quartermaster Department Funds Repair of One of the Wharves

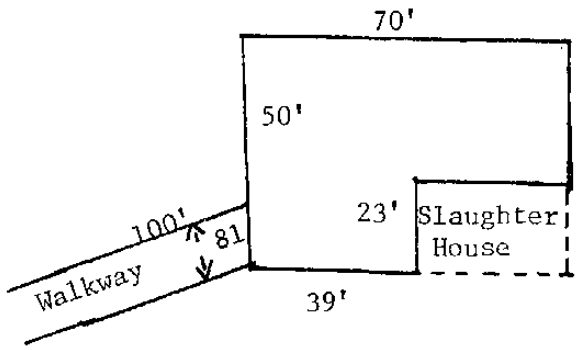
On May 7, 1869, Lt. Albert Pike, post quartermaster, forwarded a requisition, through channels to Quartermaster General Meigs, for a barge to replace the one that had been condemned and for lumber, etc., to repair the wharf.[137]

The colonel of the 3d Artillery agreed that there was need for a barge, as there was only one boat at the fort. He recommended that the barge be a "plain, strong, copper fastened six-oared" craft. He also found the estimate for repair of the wharf to be proper.[138]

About the same time, Lieutenant Pike submitted a requisition for materials for construction of a frame commissary storehouse on the parade. At present, he explained, this department was allotted but two storerooms, and both were too damp. Room No. 1, on the ground floor of the barracks, was unfinished and still under control of the Engineer Department. It would have to be vacated by the commissary people within several weeks, so that it could be completed. Room No. 2, used for storing pork and bacon, was in a first tier casemate, separated from the others by "an insecure board partition." This casemate was so damp that Lieutenant Pike had been compelled to transfer the bacon to room No. 1.[139]

---

137. Pike to Saxton, May 7, 1869, NA, RG 92, Consolidated Correspondence File. To repair the wharf, Pike called for: 230 40-foot palmetto piles; 9,353 feet of 8 x 8s, 30 feet long; 30,653 feet of 3 1/2-inch plank; 300 pounds 8-inch spikes; and 600 pounds 4-inch spikes.



Plan of Wharf

138. T.W. Sherman to Hq., Dept. of the South, June 30, 1869, NA, RG 92, Consolidated Correspondence File.

139. Pike to Saxton, May 6, 1869, NA, RG 92, Consolidated Correspondence File.

Quartermaster General Meigs, on reviewing the documents, recommended that funds be allotted for repair of the wharf. He, however, shot down the proposal to erect a temporary frame storehouse. Fort Jefferson, he informed Secretary of War John Rawlins, was a three-tier work, "each tier half a mile in total development." A structure of such size "must afford well ventilated cover for all the stores that are needed for its garrison in time of peace." If any safeguards were needed, "open slat partitions could be erected" to provide security for the casemates to be occupied by stores.[140] Secretary Rawlins agreed with Meigs.

The materials were accordingly purchased and the wharf repaired.

J. October 20, 1870, Hurricane

Accompanied by several other officers, Lt. Asa T. Abbott had sailed from Garden Key, on the morning of October 19, 1870, aboard the schooner Matchless for Key West. They encountered gale-like-winds at 4 P.M., 10 miles northwest of the Marquesas. They laid-to till daylight on the 20th, by which time the winds had become a hurricane.

Matchless skidded before the gale "under bare poles, with 100 fathoms of 9-inch rope dragging behind. She logged 14 miles per hour till 4 P.M., on the 20th, when the wind moderated enough for her to again heave to. Here, she stayed until dawn on the 21st. Taking bearings, Abbott and his comrades found that they were off Cape Romaine. They hoisted sail and shaped a course for Key West, where they dropped anchor by mid-afternoon.

Matchless had proved herself in this storm, and Lieutenant Abbott hoped that the government would never dispose of her so long as there was need for vessels of her class.

From Key West, Abbott returned to Fort Jefferson. After reconnoitering the key, he submitted a report of the damage caused by the hurricane. He listed two government boats wrecked; the post sutler's small yacht badly damaged; two small fort wharves carried away; the 100-foot walkway leading to one of the wharves smashed; the slaughter house and an enlisted men's privy blown down and carried to sea; the casemate laundresses' quarters wrecked; the coal pen partially washed away and 25 tons of coal lost; most of the parade fencing overturned; and nearly all the slating blown off the old section of the officers' quarters.[141]

---

140. Meigs to Rawlins, Aug. 28 & Rawlins to Meigs, Aug. 31, 1869, NA, RG 92, Consolidated Correspondence File.

141. Abbott to Eddy, Oct. 26, 1870, NA, RG 92, Consolidated Correspondence File.

To repair the damage, Lieutenant Abbott requisitioned 1 small 18-foot yawl; one 15-foot dingey; 50 yards of canvas for sails; 200 pounds of charcoal; and for repair of the quarters 2,000 feet of 2x6's for scantling, 1,000 feet 4x4's, 5,000 feet yellow pine boards, 100 pounds shingle nails, 200 pounds 10d nails, and 200 pounds of putty.[142]

K. Hospital is Housed in the Barracks

In December 1867, the Board constituted to study the yellow fever outbreak had recommended against construction of the post hospital at the site contemplated in the master plan. They proposed its erection "outside of and to the leeward of the fort where there is a very favorable ground for that purpose."

Some 20 months later, nothing having been done to consummate this proposal, the post surgeon called for "speedy erection of a hospital." After his proposal had been reviewed, it was decided that the frame hospital would not exceed 12 beds. The plan having received the approval of the Secretary of War, Chief Engineer Humphreys called on Colonel Blunt to designate a site for the hospital, which would be built by the Quartermaster Department.[143]

Although Colonel Blunt did as directed, no hospital was built. The Quartermaster General declined to fund the project.[144]

By the spring of 1873 there was still no post hospital. Temporary facilities had been fitted up in the unfinished barracks. A lower room in one section was employed as a dispensary, the room on the second story above as Ward No. 1, and the room in the third story above the former as Ward No. 2. This thus provided two good wards.

By the winter of 1872-73, Ward No. 2 had become untenable, "owing to the loosening of the heavy plaster on the ceiling." As there were few patients, the want of a second ward caused no problems until mid-April, when one of the garrison was felled by typhoid fever. Assistant Surgeon Joseph Porter ordered the soldier isolated. It then became necessary to remove the other patients

---

142. Special Requisition, Oct. 26, 1870, NA, RG 92, Consolidated Correspondence File.

143. Humphreys to Blunt, Nov. 3 & McFerran to Humphreys, Nov. 8, 1869, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

144. Letters Sent by the Quartermaster General, 1864-70, NA, RG 92.

to the only available room, on the second floor of an adjoining hall, the upper and lower rooms of which were already in use as a hospital laundry and medical storeroom. This hall and room, however, were separated from the rest of the hospital (dispensary and nurse's room) by a thin partition wall, which prevented any communication, except by going downstairs, outdoors, and upstairs again. Consequently, Surgeon Porter asked Captain Langdon to take steps to alleviate this situation, and his men cut a doorway through the wall.[145]

L. Corps Razes Three Temporary Parade Structures

On April 25, 1870, Post Surgeon W.E. Day called on Assistant Engineer James B. Quinn to take down and remove the three temporary buildings (the blacksmithy, paint shop, and bakery) about which the December 1867 Yellow Fever Board had complained. These structures were decaying, liable to produce disease, and an eyesore.

In addition, Colonel Gibson desired to relocate the laundresses' quarters from the casemates on the western front into the "Theatre."[146]

Lieutenant Quinn recommended to Chief Engineer Humphreys that the Corps sanction the demolishion of the three structures by the Quartermaster Department. If the laundresses were to be quartered in the "Theatre," there should be an understanding that it was to revert to the Department in event work was resumed on the fort and it was needed by the Corps.[147]

Chief Engineer Humphreys, after reviewing the correspondence, directed Assistant Engineer Quinn "to carry out the orders of the Secretary of War so far as they concern the removal of the temporary" Corps buildings.[148]

M. Corps Enforces a Policy Against Photographers

Lt. Sedgewick Pratt, having acquired a camera, requested authority to make photographs of the Fort Jefferson parade, which must unavoidably include the casemates.[149]

---

145. Langdon to Townsend, April 22, 1873, NA, RG 92, Consolidated Correspondence File.

146. Day to Quinn, April 25, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer.

147. Quinn to Humphreys, April 27, 1870, NA, RG 77, Ltrs. Recd., Chief Engineer. The "Theatre" had been used as quarters by Corps employees.

148. Humphreys to Quinn, May 12, 1870, NA, RG 77, Ltrs. Sent, Chief Engineer.

149. Pratt to Adjt. Gen., Sept. 14, 1869, NA, RG 77, Ltrs. Recd., Chief Engineer.

Although Pratt's request enjoyed considerable support as it was bucked up the chain of command, it ran into a stone wall upon reaching the Chief Engineer's Office. In rejecting it, General Humphreys found no reason why General Order 39, prohibiting the taking of photographs of the Nation's coastal defenses, should be suspended in this case. He was unable to see any benefits accruing to the Army from Pratt's proposal.[150]

N. Garrison is Withdrawn from the Tortugas

1. August-September 1873 Yellow Fever Outbreak

On August 9, 1873, 13-year-old Charles Gould, a son of Asst. Surg. F.J. Gould, sailed for Key West aboard Matchless. During his four days there, he spent considerable time on the docks, visiting cattle steamers and fruit and fishing boats. A number of these had recently arrived from La Habana. Among them was the Norwegian bark Tonsberghus, who had lost two of her crew from yellow fever while anchored at the Cuban city.

Young Gould returned to Garden Key on the 13th. He was not feeling well, but said nothing about it until the 16th, when he stayed in bed. His father diagnosed Charles' sickness as "Bilious Remittent Fever." He was confined to his room for a week, and while convalescencing visited the barracks.

On August 23, Pvt. Joseph Baumstock of Company M was taken sick, and died of black vomit on the 27th. Meanwhile, on the 25th, two more soldiers had been hospitalized. One of these men died on the 28th and the other on the 30th. Lizzie Gould, Charles' sister, had been stricken on the 23d. After the 26th every day saw more cases, and an epidemic was declared by Surg. J.Y. Porter. Post Commander James E. Bell was felled and died on September 11. Several days before Captain Langdon had arrived and had assumed command.

Asst. Surgeon Harvey E. Brown, upon reaching Fort Jefferson on September 6, found that Captain Langdon had evacuated the command to Loggerhead Key. The only persons remaining at the fort were the sick, a few soldiers detailed to care for them, the families of Drs. Gould and Porter, Lighthouse Keeper Masson, and a few citizens, some 30 in all, not counting the sick.

Dr. Brown took charge of the hospital. The plague was at its worst during the first days of September. Every person, except one, who returned to the fort from Loggerhead Key was taken sick until the 20th, when no more cases were reported. The last death occurred on October 6. The total number of cases, including the five Gould children, was 37. There were 14 deaths.[151]

---

150. Humphreys' endorsement to Pratt's Sept. 14, 1869, letter, NA, Ltrs. Recd. by Adj. Gen., Microcopy M-566.

151. Bell to Asst. Adj. Gen., Sept. 2, 1873; Langdon to Asst. Adj. Gen., Sept. 11 & Oct. 6; Brown to Surgeon General, Oct. 17, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer. A marble monument to commemorate the bravery and the death of Dr. Smith in the epidemic of 1867 had been erected in front of the post hospital. The fort was garrisoned in August 1873 by Company M, 1st U.S. Artillery. Bell to Adj. Gen., Sept. 5, 1873, found in The History of the First Regiment of Artillery, from its Organization in 1821, to January 1st, 1876, compiled by William L. Haskin (Portland, ME. 1879), pp. 563-65.

Dr. Brown, upon his arrival, had inspected and made a report on the fort's sanitary condition. Although there had been no police calls since the majority of the garrison had been evacuated to Loggerhead Key, the appearance of the parade, galleries, ditch, and seawall were "admirable." The parade buildings were clean and well maintained, but the same could not be said for those outside the fort. The frame roofs of most of these had decayed and should be replaced with slate.

Adjoining the officers' quarters on the west was a tumbled down shed sheltering a quantity of old lumber covered with fungus. Dr. Brown urged that this shed and its contents be destroyed or removed. In addition, a number of frame shanties in the vicinity of the wharf merited demolition.

Brown found the sewage system defective. The gate designed to facilitate flushing of the ditch by tidal currents was not watertight, and accordingly water did not flow with sufficient velocity into the sewers to flush them. In addition, the orifice of the sewers was "far below low water mark, so that the tide rises gradually in them instead of suddenly, thus practically rendering any thorough cleansing of the sewers aborative."[152]

A mulatto, James Dunbar, employed as a male nurse, had assumed the duties of hospital steward on the death of Samuel Horner. Dr. Brown commended Dunbar for the admirable manner in which he performed these responsibilities.[153]

2. Captain Langdon Levels Grave Charges Against the Corps

Captain Langdon, calling attention to Dr. Brown's report, noted that the "old buildings" referred to were the property of the Corps of Engineers. At the time that Langdon had reported for duty at Fort Jefferson, he continued, these structures were filthy. This condition had been made worse by the Engineer employees' practice of burying their garbage and permitting it to rot.

About one-half of the "old buildings," besides being filled with decaying lumber, were of no use to anybody and should be razed. It was Langdon's opinion that the fort would not be completed in the next 50 years. Since the Engineers seemed determined to continue work, he urged that permanent structures, roofed with slate, be erected for their use.

In event of war, these shanties would, he warned, be more dangerous to the garrison than the recommended permanent buildings.[154]

---

152. Brown to Langdon, Sept. 8, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

153. Ibid.

154. Langdon to Adj. Gen., Dept. of the South, Sept. 20, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

Captain Langdon called his superiors' attention to the opinion of the surgeons that it would be unsafe for "unacclimated men" to reoccupy the quarters until after a "heavy and cold 'norther,' nor even then unless the place is thoroughly disinfected." Moreover, the surgeons held that the entire fort was contaminated "with the poison of the fatal disease" and that it would require three or four months' work by acclimated blacks to accomplish this project. Then, to compound the situation, the hurricane of October 6 had heavily damaged a number of structures. As an example, he pointed out, "I sleep and eat in the same room and I cannot have my family with me because to remain in my quarters in dry weather on account of the liability of the falling of the thick plastering of the ceiling, in wet weather it is simply impossible. One might as well die of yellow fever."

Accordingly, Langdon recommended that his command evacuate the Tortugas and be transferred to St. Augustine.[155]

3. Troops are Transferred

Headquarters Department of the Gulf, after reviewing Langdon's report, agreed that the post was untenable without extensive repairs. It was recommended that the garrison be withdrawn to Fort Barrancas and that Fort Jefferson be turned over to the Engineers for completion and repair.[156]

Commander of the Army William T. Sherman approved evacuation of the post, provided the international situation did not mandate the continued occupation of Forts Jefferson and Taylor by the Army.[157] President Grant, when advised of the situation, approved transfer of the troops from Fort Jefferson to Fort Barrancas.[158]

Captain Langdon, upon receipt of this news, left the fort on November 19. On January 11, 1874, he was followed to Fort Barrancas by the rest of the garrison, except for Sgt. Adolph Dangerfield and a few privates left to look after the armament and ordnance stores.[159]

---

155. Ibid; Langdon to Humphreys, Oct. 22, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

156. Emory to McDowell, Oct. 20, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

157. Sherman to Belknap, Oct. 27, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

158. Townsend to Sherman, Nov. 10, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

159. Fort Jefferson, Returns from U.S. Military Posts, 1800-1916, Microcopy M-617.

Meanwhile, on December 29, the War Department notified General Sherman that the yellow fever had abated and the quarters and barracks were being repaired. Consequently, Secretary Belknap believed that, under the circumstances, the garrison should remain. It would be the department commander's perogative whether to make a change next spring in anticipation of the ensuing sickly season.[160]

This order, however, arrived too late, and more than four years were to pass before the fort would again be garrisoned and then only for a few months.

4. Corps Counterattacks

Engineer Clerk F. W. Whitaker, when called on for an explanation of the cause of the plague, disagreed with Surgeon Brown. Whitaker argued that no blame could be attached to the sewers and ditch. Indeed, they were both cleaner than they had been in years.

He held that its cause was the working of the soldiers during the heat of the day by Captain Langdon and Lieutenant Bell. As for the stench from the sewers, it was not as much of a problem as that from the privy in rear of the soldiers' barracks erected by order of the post commander.[161]

On November 13, Chief Engineer Humphreys called upon Colonel Blunt for his comments on Captain Langdon's and Surgeon Brown's reports on the sanitary condition of the fort and its impact on the yellow fever epedemic.[162]

Colonel Blunt challenged Langdon's contention that the plague was caused by the "filthy condition of the engineer premises" and the way the Corps handled its garbage. On doing so, he called attention to Dr. Brown's statement that the engineer buildings were clean while the garbage had never been buried. Blunt termed Langdon's view that these buildings, although somewhat dilapidated, as tending to cause disease "absurd."[163]

After reviewing Blunt's report, Chief of Engineers Humphreys informed Secretary of War Belknap that he did not believe the yellow fever was caused by any "operations, tools, appliances or constructions of the Engineer Department nor by the state of police of any of the "Corps' buildings. If it were

---

160. Adj. Gen. to Sherman, Dec. 29, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

161. Whitaker to Blunt, Oct. 17, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

162. Humphreys to Blunt, Nov. 13, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

163. Blunt to Humphreys, Nov. 14 & 16 & Dec. 3, 1873, NA, RG 77, Ltrs. Recd., Chief Engineer.

attributed to the latter, then the fault was with Captain Langdon, who had written that he had convinced the "Engineer agent of his power and might to enforce a proper police of every portion of the Post." If Langdon had failed to enforce his orders, he had only himself to criticize. There was, General Humphreys reminded the Secretary, no reference in Captain Langdon's communication to the "exposure of unacclimated men in the heat of the day during a summer of an epidemic year."[164]

Some six weeks later, after having had an opportunity to see all the correspondence, General Humphreys wrote a second and stronger letter to the Secretary. He characterized Langdon's statements as gross exaggerations, written "in an unwarranted spirit of hostility" to the Corps of Engineers.

The Corps' operations at the Tortugas, Humphreys continued, were carried on under the Secretary's orders and the seasons of labor were the same there as upon other works in that region. The Engineer buildings and shops were authorized by Regulations, and the police of these structures was the same as it had always been, and they were not "filthy or even uncleanly."

All medical sources concurred that the yellow fever had been introduced into the Tortugas by "contagion and that there was nothing in the operations, doings or acts of the Engineers or agents to warrant the assertion of Captain Langdon, that in this epidemic the fruits of years of the Engineers were developed."

General Humphreys pronounced Langdon's strictures upon the Engineers to be not only disrespectful of Congress and the rules and regulations of the War Department, but of his superior officers.[165]

5. Corps Takes Mitigating Action

Taking cognizance of the complaints, the Engineers razed six of the temporary structures and repaired the others.

Attention was next given to the sewers, and they were "carefully and regularly flushed at proper stages of the tides and every reasonable precaution. . . taken to place the sanitary conditions of the work beyond the reach of criticism."[166]

---

164. Humphreys to Belknap, Nov. 15, 1873, NA, RG 77, Ltrs. Sent, Chief Engineer.

165. Humphreys to Belknap, Jan. 3, 1874, NA, RG 77, Ltrs. Sent, Chief Engineer.

166. Fort Jefferson, Annual Report for Fiscal Year 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

XI. THE CORPS' FINAL GARDEN KEY YEARS: 1874-1890

A. Repair and Maintenance of the Fort During the Smith Years: 1874-76

1. Captain Smith Takes Charge

On January 1, 1874, Capt. Jared A. Smith replaced Colonel Blunt as superintending engineer for Forts Jefferson and Taylor. A Maineman, Smith was graduated from the U.S. Military Academy as No. 5 in the Class of 1862. Commissioned a 2d lieutenant in the Corps of Engineers, he reported to duty to Maj. Gen. Nathaniel P. Banks. He participated in the battle of Cedar Mountain on August 9, 1862, where he was breveted for gallantry.

After a prolonged illness in the autumn of 1862, Lieutenant Smith was ordered to duty at West Point as Assistant Professor of Geography. From August 1863 until August 1864, he served as assistant engineer for construction of the defenses of Portland, Maine. He was promoted captain in June 1864. Smith was superintending engineer for construction of the defenses of New Bedford Harbor and preservation of the beach at Plymouth, Massachusetts, from November 1866 to June 1869. From April 1871 to December 1873, Captain Smith was assigned to duty on the Great Lakes.[1]

2. Smith's Plan to Replace the Privy Vaults with Water Closets Flushed by Gravity

On February 7, 1874, the Department notified Major Smith that there was available in the Treasury $3,500 to fund operations at Fort Jefferson during the remaining five months of Fiscal Year 1874.

In view of Surgeon Brown's complaint that the tidal ebb and flow in the moat was not as "complete as formerly and that the water has become foul and offensive," Smith was to investigate the situation and report on "appliances for changing the water." He would also discuss the character of the drains leading from the fort into the ditch, and "any appliance that may exist at their outlets for closing or opening them during periods of high or low water and whether they are flushed by tides in their ebb and flow."[2]

Upon checking the ditch, Major Smith found the water to be "as pure as the clearest sea-water." There were two 15'6" sluiceways through the seawall--the one at bastion C had its bottom at 6 inches below mean low water and the other at bastion F was at reference (0). The former was on the front most subject to accumulations of sand. These had built-up to an elevation higher than the bottom of the sluiceway on the outside, while a spit had formed in the ditch. If the sluiceway were enlarged or deepened, the moat would rapidly silt in, unless expensive jetties were build extending into deep water.

---

1. Cullum, Biographical Register, Vol. II, pp. 848-49.

2. Casey to Smith, Feb. 19, 1874, NA, RG 77, Ltrs. Sent, Chief Engineer. Smith was promoted major on January 13, 1874.

Major Smith had determined that the drains on fronts Nos. 1 and 6 united and discharged into the ditch, and the opening was at reference (6'). The scarp, however, had subsided "in some areas, so that the openings were deeper than when built." The openings had also been reduced in diameter by the settling of the structure, and this prevented a thorough flushing by the tides, even if their height had been greater.

The arrangement of the privy vault trap obstructed the flushing action of any water in the sewers and largely prevented removal of any accumulations, "which are thus left for the extreme heat to generate foul gasses to an almost unlimited and sickening extent." These odors did not escape into the sewers, but passed through the privies and permeated the fort.

Smith accordingly recommended removal of the privies and substitution of water closets for the quarters and hospital, the pipes to lead vertically into the sewers. A cistern and windmill would be built to supply them with water. The enlisted men's privies were to be directly above the sewers "with some suitable device for dumping, and preventing escape of foul air."[3]

That autumn the Department called on Major Smith to prepare the necessary estimates to implement his recommendations.

Replying, Smith noted that, on further thought, it had been deemed that pumps operated by a large undershot wheel in the sluiceways would be more efficient than a windmill for supplying water for the water closet cisterns. The cisterns should be positioned as high as practicable to provide maximum force for flushing the water closets and sewers. Good locations were found in the unfinished second tier casemates in rear of the officers' quarters and barracks.

Iron pipes were to connect the cisterns and water closets. They should be equipped with hydrants to furnish water for flushing the sewers or extinguishing fires.

For the officers' quarters, there should be four double privies, one side for the officer and his family and the other for the servants. There were to be two privies for the barracks.

Smith estimated the costs at:

four privies for officers' quarters		$ 2,975.00
two privies for barracks		2,846.20
two casemate cisterns		2,188.00
two sets pumps, waterwheels, etc.,		6,000.00
opening outlets through scarp		500.00
	contingencies	1,500.00
	total	$16,009.20[4]

3. Smith to Humphreys, April 13, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

4. Humphreys to Smith, Oct. 31, 1874, & Smith to Humphreys, Feb. 2, 1875, NA, RG 77, Ltrs. Recd., Chief Engineer. A copy of a plan illustrating Smith's proposal (74-93) is on file at Everglades NP.

No monies were available to underwrite the cost of Major Smith's proposal, and it was pigeon-holed.

3. Fort Gets No Construction Funds in Fiscal Year 1875

On May 12, 1874, Major Smith notified the Department that there were "many places in and about the quarters and cisterns" greatly in need of repair. Although the fort had been garrisoned until January, it seemed to be the responsibility of the Engineers rather than the Quartermaster to keep these structures in repair.[5]

The Department responded that no repairs should be made to these structures, aimed at the comfort and convenience of the garrison, until such time as the post was reoccupied by the troops.[6]

The Fortifications Bill signed into law by President Grant on April 3, 1874, did not include any line item for construction at Fort Jefferson. It did include $75,000 for contingencies. The Department therefore called on Major Smith to prepare and submit estimates for monies required from this appropriation for care and preservation of the defenses for which he was responsible.[7]

Major Smith requested and was allotted $2,000 for hire of a fort keeper to look after the defense and day labor to assist the keeper in policing the work and caring for the public property.[8]

During the year an audit of the books disclosed that $578.05 in construction funds for Fiscal Year 1874 were still available. This balance was increased by $100 from sale at Key West of condemned Fort Jefferson public property.[9]

4. September 1875 Hurricane

On September 13, 1875, a hurricane punished the Florida Reef. Heavy damage was done to the Engineer property at Key West, but apparently the Garden Key defenses escaped the storm's fury.

Not so fortunate was the property of the Lighthouse Service. The 1825 tower was battered and the lantern rendered "almost useless."[10]

---

5. Smith to Humphreys, May 12, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

6. Humphreys to Smith, July 2, 1874, NA, RG 77, Ltrs. Sent, Chief Engineer.

7. Humphreys to Smith, May 12, 1874, NA, RG 77, Ltrs. Sent, Chief Engineer.

8. Smith to Humphreys, May 26 & Casey to Smith, June 12, 1874, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. The salary of the keeper was to be $3.60 per day.

9. Fort Jefferson, Annual Report for Fiscal Year 1875, NA, RG 77, Ltrs. Recd., Chief Engineer.

10. Smith to Humphreys, Oct. 7, 1875, NA, RG 77, Ltrs. Recd., Chief Engineer. Dry Tortugas Clipping File, Lighthouse Service, NA, RG 26.

5. Maintaining the Fort in Fiscal Year 1876

On February 10, 1875, President Grant signed into law the Fortifications Bill enacted by the 2d session of the 43d Congress. For the second consecutive year, there was no line item for Fort Jefferson. Once again, the act included an appropriation of $75,000 for contingencies.

When he apprised Major Smith of this, General Humphreys asked him to prepare estimates of the monies required from contingencies to provide for care and preservation of the fort in Fiscal Year 1876.[11]

Major Smith again called for and was allotted $12,000 for the keeper's salary and hire of laborers to look after the public property and materials.[12]

During the subject 12 months, the fort keeper and several day laborers removed much of the Engineer property from the frame storehouses outside the fort and placed it in some of the casemates and several of the unfinished barracks squadrooms.

Except for the rooms occupied by a small detachment of soldiers and a contract physician, the quarters and barracks were secured against weather and trespassers by means of temporary wooden shutters, "secured by lashing on the inside in such manner as to avoid defacing the frames and windows in which they are placed."

The drains had been occasionally flushed and the grounds and structures kept in a fair state of police.[13]

6. Smith's Fiscal Year 1877 Program

Congress, beginning in 1876, ceased for a number of years to make an annual appropriation for construction of seacoast defenses. In that year the Fortifications Bill, signed into law by President Grant, appropriated $100,000 for "Contingencies of Fortifications." Consequently, the Department on June 27, 1876, called on the superintending engineers to submit, as soon as practicable, estimates of the monies required from this appropriation to meet needs during Fiscal Year 1877 for maintenance and preservation of the defenses for which they were responsible.[14]

---

11. Casey to Smith, March 10, 1875, NA, RG 77, Ltrs. Sent, Chief Engineer.

12. Smith to Humphreys, March 31 & Casey to Smith, May 20, 1875, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

13. Fort Jefferson, Annual Report for Fiscal Year 1876, NA, RG 77, Ltrs. Recd., Chief Engineer.

14. Casey to Smith, June 27, 1876, NA, RG 77, Ltrs. Sent, Chief Engineer.

Major Smith accordingly called for and was allotted $1,100 from "Contingencies" to fund operations of Fort Jefferson in the subject 12 months. Of this sum, $900 was budgeted for pay of the keeper at a rate of $75 per month and $200 for contingencies.[15]

7. Board's 1876 Inspection and Report

Cols. Horatio G. Wright and Zealous B. Tower of the Board of Engineers for Fortifications scheduled a visit to the Tortugas in early March 1876. Apprised of their coming, Major Smith telegraphed for authority to charter a vessel for $130 to transport them from Key West to Fort Jefferson, and return.[16]

This expenditure was approved and, on March 5, Colonels Wright and Tower and Major Smith landed on the Garden Key wharf. This was Wright's first visit to the Tortugas in almost 20 years. Three days were spent on the key, the officers returning to Key West on the 8th.

Wright and Tower submitted a comprehensive report. They called attention to:

a. Condition of the Works--The fort, they wrote, was essentially finished, except for the 2d tier embrasures. Some of the large rectangular spaces, left for construction of the embrasures, had been closed with a thin brick wall and a glazed sash, dating to the Civil War when the casemates were used as barracks.

The masonry of the scarp and casemates was in good condition, but the counterscarp needed to be repointed. There were two "considerable cracks" in the scarp, "but they do not seem to effect the stability of the work."

The fort's big guns were in excellent condition, but the iron embrasures were badly rusted. Wright and Tower urged that the latter be cleaned and painted as soon as funds became available.[17]

b. Officers' Quarters--One block had been erected, they found, and "generally finished with the exception of some of the doors." Many of the window blinds had been injured by gales and some of the lights broken. These should be repaired to protect the structure's interior from the weather. The front and rear piazzas were badly decayed and likely to be destroyed in the next hurricane. If not repaired, they should be taken down.

The stairways, except those in the first section, were of iron and badly rusted. They should be cleaned and painted or lacquered.

---

15. Smith to Humphreys, July 1 & Casey to Smith, July 21, 1876, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

16. Smith to Humphreys, Feb. 29, 1876, NA, RG 77, Ltrs. Recd., Chief Engineer.

17. Wright and Tower to Humphreys, May 3, 1876, NA, RG 77, Ltrs. Recd., Chief Engineer.

Two chimneys, one at each end of the block, had been toppled by the September 1875 hurricane. Wright and Tower recommended that they be "topped out anew." When this was done, the chimneys should be strongly braced to enable them to withstand high winds, "as they have much less width and perhaps twice the unsupported height of other chimneys."[18]

c. Barracks--Although the block was enclosed, only about half the squadrooms had their interior finish. Some of the doors and windows required attention. About half the detached kitchens had been erected.[19]

d. Detached Magazines--The large magazine on front No. 1, they saw, had its walls laid up to the spring line of the principal arch and the arch turned. The centres were still in position. A second magazine on Front No. 4 had its walls raised up nearly to the spring of the main arch.

Because their walls were only 6 feet thick, they were not shotproof. Wright and Tower also questioned whether the arches detailed in the plans were bombproof. An additional course of concrete on top might correct this deficiency.[20]

e. Offices-Chapel--This structure had been raised to the level of the first floor. The part below was arranged as cisterns.[21]

f. Temporary Structures--All frame buildings, except the lighthouse keeper's dwelling, had been removed from the parade. The wooden buildings outside the work were in a dilapidated condition.[22]

g. Wharves--The two wharves were in "tolerable condition." The principal wharf was opposite the sally port, and the other near the southern extremity of the key.[23]

B. Wrought Iron Lighthouse Tower is Positioned on C Bastion and the 1826 Tower Razed

On March 27, 1874, Chairman Joseph Henry of the Lighthouse Board called attention to the need for a new light tower at Garden Key. The 1826 tower and keeper's quarters had been damaged by the October 1873 hurricane. Located on the parade, the old tower was an obstruction, besides "greatly injuring the appearance of the interior of the defensive works." The Board therefore wished authority "to build a new structure on one of the towers of Fort Jefferson nearest the present position of the Light." The new tower would consist of a room, surmounted by a lantern.[24]

---

18. Ibid.

19. Ibid.

20. Ibid.

21. Ibid.

22. Ibid.

23. Ibid.

24. Henry to Richardson, March 27, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

Secretary of the Treasury William A. Richardson forwarded Henry's request to Secretary of War Belknap. If not inconsistent with the public interest, Richardson trusted the necessary permission would be forthcoming.[25]

The Department accordingly called on Superintending Engineer Smith for a report on the feasibility of the Lighthouse Board's request.[26]

Smith responded that the stair-tower in question was in rear of bastion C. He found that the only structural alteration involved would be slightly strengthening the upper portion of the tower. This would in no way interfere with its use by the troops. Moreover, the proposed modification would rid the parade of "the unsightly light-tower now occupying a large space next a front angle or corner of barracks."[27]

Secretary of War Belknap, upon being apprised of the situation, notified the Treasury Department that the Lighthouse Board could proceed with the project.[28]

The War Department having approved the undertaking, Congress in March 1875 appropriated $45,000 for transferring the light "to a new tower on an adjacent bastion of Fort Jefferson." Some four months later, in July, the Lighthouse Board called on Major Smith to design "a lighthouse for the stair-tower." But, to do so, he needed a drawing of the barbette tier bastion showing the arrangement of the guns. This could be a problem, because he was on temporary duty at New Bedford, Massachusetts, and yellow fever was raging at Key West.[29]

Apprised of Smith's difficulties, the Department searched its files and forwarded a copy of the desired drawing.

General Humphreys cautioned that the Department's approval of the light-house plans was mandatory before any construction. Before Smith proceeded any further, it was recommended that he review the drawing of the skeleton wrought iron tower built over the Fort Point, California, stair-tower.

A masonry tower, the Chief Engineer cautioned, so near the guns and rising above the parapet was objectionable, because of the danger to personnel from fragments sundered by exploding shells.[30]

---

25. Richardson to Belknap, March 30, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

26. Humphreys to Smith, April 16, 1874, NA, RG 77, Ltrs. Sent, Chief Engineer.

27. Smith to Humphreys, April 18, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

28. Belknap to Richardson, May 2, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer. About the same time, the Department rejected a request by the Lighthouse Board that the light keeper be permitted to occupy the quarters on the parade formely used by the Engineers. Smith to Humphreys, April 27, 1874, NA, RG 77, Ltrs. Recd., Chief Engineer.

29. Smith to Humphreys, July 26, 1875, NA, RG 77, Ltrs. Recd., Chief Engineer.

30. Elliot to Smith, Aug. 23, 1875, NA, RG 77, Ltrs. Sent, Chief Engineer.

After examining the subject plans, Smith prepared and submitted for review a tracing of the lighthouse tower. This structure, he explained, was to be principally of wrought iron, its base to rest on the stair-tower masonry, and to be secured to it by long iron bolts.

The base of the tower was to be hexagonal, each face to be 7'4" in length. The plates were to be 1/4-inch boiler iron, the faces stiffened by channels and T-irons. A few castings had been introduced about the doors and windows.[31]

General Humphreys reviewed and approved the plan as submitted.[32]

During the late winter and early spring of 1876, Major Smith supervised erection of the wrought iron lighthouse over the stair-tower near bastion C, and demolition of the old tower.[33] The new light was lighted on April 6.[34]

C. Fort Jefferson as Shown on Coast Survey Charts

Late in June 1874, Superintendent C. P. Patterson of the Coast Survey wrote the Department that the angles and fronts of the fort provided the ranges and marks for navigating Tortugas Harbor. Accordingly, he was enclosing two sketches for review depicting the outline of the fort and the key at low water.

Patterson desired to know if the Department had any objection to the fort's outline, as shown on sketch A, being placed upon the chart the Survey was preparing of the harbor.[35]

General Humphreys advised Superintendent Patterson that, in the interest of national security, the "exact trace" of coastal defenses was never shown on nautical charts. As the plan of Fort Jefferson outlined in Sketch A conformed "almost identically with the direction" of the works' fronts, Humphreys preferred that the Survey use an imaginary trace.

He also recommended that whatever ranges or marks were needed for sailing directions be positioned by the Lighthouse Board.[36]

---

31. Smith to Humphreys, Nov. 6, 1875, NA, RG 77, Ltrs. Recd., Chief Engineer.

32. Humphreys to Smith, Nov. 15, 1875, NA, RG 77, Ltrs. Sent, Chief Engineer.

33. Fort Jefferson, Annual Report for Fiscal Year 1876, NA, RG 77, Ltrs. Recd., Chief Engineer.

34. Dry Tortugas Clipping File, Lighthouse Service, NA, RG 26.

35. Patterson to Humphreys, June 27, 1874, NA, RG 77, Ltrs. Recd. Chief Engineer.

36. Humphreys to Patterson, July 10, 1874, NA, RG 77, Ltrs. Sent, Chief Engineer.

Almost four years later, in March 1878, Superintendent Patterson forwarded to the Department, a tracing prepared by the Survey of that part of Tortugas Harbor, "upon which is given the fictitious form of Fort Jefferson."

Because the fort constituted the principal local landmark, and the angles, lighthouse, and wharves the only ranges and marks for navigators, Patterson hoped General Humphreys would reconsider his earlier decision. A description of these features, Patterson continued, were so easily obtained that he could see no "special harm to result from placing them upon the chart."[37]

If Humphreys made a written reply, it has been misfiled because a diligent search of pertinent record groups failed to locate the subject document.[38]

D. Captain Heuer's First Superintendency

1. Captain Heuer Replaces Major Smith

On December 16, 1876, Major Smith was reassigned. His successor as superintending engineer was Capt. William B. Heuer. A Missourian, Heuer was graduated from the United States Military Academy as No. 8 in the Class of 1865. Commissioned a 1st lieutenant in the Corps of Engineers, he was ordered to California on surveying duty. He was promoted captain in September 1870, and in April 1871 joined the Engineer Battalion at Willetts Point, New York.

After tours of duty in Panama, the recruiting service, and as assistant engineer on the survey of the Union and Central Pacific Railroads, Captain Heuer was ordered to Key West on December 16, 1876, as superintending engineer for Forts Jefferson and Taylor.[39]

2. Heuer's 1877 Annual Report and Recommendations

No construction was attempted during Fiscal Year 1877. When he submitted his first annual report, Captain Heuer noted, the fort "is essentially in the same condition" as 12 months before.

---

37. Patterson to Humphreys, March 6, 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

38. Names and Subject Indexes to Series 47, 54, 59, and 66 for 1871-86, NA, RG 77.

39. Cullum, Biographical Register, Vol. III, p. 34.

He recommended that these projects be given high priority in Fiscal Year 1878:

(a) repointing certain sections of the counterscarp;

(b) the iron embrasure shutters should be removed, cleaned, and painted;

(c) the piazzas at the front and rear of the officers' quarters should be renewed; and

(d) two officers' quarters chimneys should be rebuilt.

In addition, a sand bar had formed outside the counterscarp on the northern face of the work, extending from near the sluiceway around in an easterly direction some 750 feet. At its greatest width, the bar was 300 feet. It had closed the sluiceway, allowing sand to wash into the ditch, and preventing flushing through the gate.

The fort keeper, on several occasions, had dug a trench through the bar, hoping that the water would scour it deeper. He, however, had failed.[40]

3. Colonel Davis' April 1877 Inspection and Report

Inspector-General Nelson H. Davis spent April 24, 1877, at Garden Key. When he filed his report, he called attention to:

a. Cracks in Masonry--There were many cracks in the casemate piers and arches, and the scarp walls. Some of these were serious. Bastions C and D, connected by the east curtain, had settled, the former some 18 inches at the salient, causing a bad crack at its gorge, and the latter about 12 inches. Colonel Davis believed that these cracks were caused by subsidence of the heavy walls and piers. Otherwise, the main structure was intact, and its strength and durability probably unimpared by these conditions.[41]

b. Traverse Magazines--He saw that the subject magazines (originally covered with sand, over which had been placed timber frames boarded in and covered with galvanized iron) had been "very much stripped of their coverings, and the sand" blown away by the severe storms of this latitude. At present, only one of the magazines was intact. Their balconies were badly decayed and in several cases gone.[42]

---

40. Fort Jefferson, Annual Report for Fiscal Year 1877, NA, RG 77, Ltrs. Recd., Chief Engineer.

41. Davis to Humphreys, June 26, 1877, NA, RG 77, Ltrs. Recd., Chief Engineer.

42. Ibid.

c. Ironwork--The embrasures, shutters, stairways, and floor girders, where exposed, were rusted and in need of painting.[43]

d. Wharves--The main dock was "in fair condition," while the other one was "somewhat decayed and broken." Both were supported on wooden piles, which were ravaged by teredoes.[44]

4. Repairs, Maintenance, and Protection in Fiscal Year 1878

a. Financial Situation

On March 26, 1877, Chief Engineer Humphreys notified his superintending engineers that President Grant, on the 3d, had approved an appropriation by Congress of $100,000 for "Protection, Preservation and Repair of Fortifications," in Fiscal Year 1878. They would submit estimates of the sums needed for care and preservation of each work for which they were responsible.[45]

Captain Heuer estimated that, during the 12 months ending June 30, 1878, he would require for protection and preservation of Fort Jefferson:

for 1 fort keeper 12 months' salary at $75 per month.	$ 900.
for a clerk 12 months at $60 per month.	720.
for office stationery, stamps, etc., ...	10.
Total . . .	$1,630.

In addition, there was on deposit in the Treasury $9,240.64 from former Fort Jefferson appropriations made by Congress for construction purposes.[46]

The allotment from the Fiscal Year 1878 appropriation was made on May 19.

b. Heuer Spends the Funds Remaining on the Books for Repairs to Quarters, Barracks, Kitchens, etc.

On December 26, 1877, Captain Heuer notified the Department that the officers' quarters, though occupied prior to the evacuation of the garrison four years before, had never been completed. He had recently inspected them and had found that they required $5,000 in immediate repairs. As he had a workforce at Key West and funds were available from the 1874 appropriation, he asked for and received authority to proceed with this project.[47]

---

43. Ibid.

44. Ibid.

45. Humphreys to Heuer, March 26, 1877, NA, RG 77, Ltrs. Sent, Chief Engineer.

46. Heuer to Humphreys, April 11, 1877, NA, RG 77, Ltrs. Recd., Chief Engineer. The Department some nine months before had apprised Major Smith of this windfall. Casey to Smith, Aug. 10, 1876, NA, RG 77, Ltrs. Sent, Chief Engineer.

47. Heuer to Humphreys, Dec. 26 & Twining to Heuer, Dec. 27, 1877, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

These monies were employed during Fiscal Year 1878 to make repairs to the quarters and barracks. The front and rear piazzas of the former were "painted, roofed over and generally overhauled." Plastering was renewed where required, and four chimneys rebuilt.

The kitchen belonging to the officers' block was reshingled and the interior rehabilitated.

Workmen scraped and coal tarred the embrasure irons and shutters.[48]

5. Fort's Condition in the Winter of 1877-78

a. Captain Heuer's February 1878 Report

On the last day of February 1878, Captain Heuer prepared and submitted a comprehensive report on the fort's condition:

(a) Structural Failures of Scarp and Casemates--The unequal settlement, he noted, had caused three one-half inch cracks, extending from the coping to near the surface of the water in the scarp wall. A few of the casemate arches on the first and second tiers were slightly cracked, "just sufficiently to be visible."

In as many as a dozen of the upper tier casemates, the scarp wall was beginning to separate from the casemate arches, as though it were falling outward. Several of these openings were as much as 3/4-inch in width, narrowing from the top downward. At the floors of the lower tier, the separation was scarcely visible.

Many of the second tier casemates had been closed up in front and rear by 4-inch brick walls. A number of these temporary walls had been blown out by hurricanes, and the rubble lay in the ditch or near the parade walls.

Many sections of the scarp required repointing.[49]

(b) Barbette Tier--Certain portions of the subject tier, between the scarp wall and the interior crest, had never been filled with sand. Many of the flues leading from the casemates to the barbette tier had been blown down.

The gun platforms were nearly all front-pintle and were "generally of stone, brick and concrete." Five platforms for 10-inch guns had not been completed, but their stones were on hand. The temporary wooden platforms mounting the huge 15-inch Rodmans were so rotten as to be useless.[50]

---

48. Fort Jefferson, Annual Report for Fiscal Year 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

49. Heuer to Humphreys, Feb. 23, 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

50. Ibid.

(c) Stair-Towers--The windows and tin roofing in the towers surmounting the five spiral stone stairways were in bad condition.[51]

(d) Counterscarp--The seaward face needed to be repointed.[52]

(e) Sally Port Bridge--The bridge had been recently rebuilt by the Corps of Engineers.[53]

(f) Officers' Quarters--A portion of the block had never been "thoroughly completed," while three-fourths of the front piazza "were never roofed nor ceiled, consequently much of the woodwork of the piazza was decayed from exposure to the weather."[54]

(g) Sewers--He found that people were in the habit of throwing "old boots, clothing, bottles, tin ware," etc., into the privies. These had "choked" the openings to the sewers, causing the disagreeable odor so often charged "to the so-called defective sewage of this fort." After his men had recently cleared out the privys, removing 15 cartloads of rubish therefrom, the situation had improved.[55]

b. Heuer's Estimate for Correcting Deficiencies

After reviewing Heuer's report, the Department called upon him to prepare and submit estimates of the cost of placing the fort in "general good repair, including the building of permanent platforms for the 15-inch guns."[56]

To accomplish these goals, Captain Heuer reported, would require:

for repointing brick seawall, 3,520 sup. yds. @ $1.	$ 3,520.00
for repointing and repair of scarp wall, 5,000 sq. yds. #1. .	5,000.00
for 225 sq. yds. cement stuccoing on end of officers' quarters @ $1	225.00
for 350 ft. picket fence front of officers' quarters @ $7.75.	612.50
for 6 stone platforms for 15-inch guns @ $2,000 each.	12,000.00
for erecting same @ $1,000 each	6,000.00
for erecting 5 small gun platforms @ $100 each	500.00
Total . . .	$27,857.50[57]

---

51. Ibid.

52. Ibid.

53. Ibid.

54. Ibid.

55. Ibid.

56. Twining to Heuer, March 18, 1878, NA, RG 77, Ltrs. Sent, Chief Engineer.

57. Heuer to Humphreys, April 19, 1878, NA, RG 77, Ltrs. Recd. Chief Engineer.

6. General Hancock Vainly Seeks to Have the 15-inch Platforms Rebuilt

The previous summer, Capt. Francis L. Guenther, commanding at Key West, had prepared and submitted estimates of the cost of placing the platforms of Forts Jefferson and Taylor and the Key West sand batteries in serviceable condition.

Upon receipt of these figures, Chief Engineer Humphreys reminded Army headquarters that "general plans" for these works had been considered by the Board of Engineers, along with necessary modifications. In his last annual report, Humphreys had written, "the heavy guns now in these batteries and main works are on wooden platforms which are becoming unserviceable and should be permanently rebuilt." Funds had been called for to accomplish this, but none had been appropriated by the Congress.[58]

Then, in the winter of 1877-78, Maj. Gen. Winfield S. Hancock, the commanding officer of the Department of the East, inspected the Gulf Coast defenses. Accompanied by his aide and Captain Guenther, he sailed from Key West on the evening of January 25 aboard Matchless, and landed on Garden Key at daybreak on the 26th.

At the fort, Hancock encountered Captain Heuer supervising repair of the quarters and barracks. He found Heuer to be an energetic and hard working officer, who served as his own foreman. Within a few days, the workmen should be through with the project and 48 rooms in the quarters would be ready for occupancy, along with barracks squadrooms for four 100-man companies.

Hancock pronounced the fort ready for occupation by a garrison, the only possible problem being the question involving the sewer system. Although the drainage plan showed that differences in elevation (3 1/2 feet) were so trifling that the circulation of "water through the sewers and beyond the outlets is a matter requiring study and attention."

He saw that the scarp, especially at one angle and in one of the curtains, was cracked. At the subject angle, the wall had subsided at least two feet. The foundations were seemingly sound, but here they had not been sufficiently tested. Hancock presumed that, at this point, the fort had been "built a little over the solid rock and placed on material not perfectly crystalized."

The fort's armament included: six cast iron rifled 42-pounders (dismounted and condemned), four 30-pounder Parrotts, seven 200-pounder Parrotts, four 300-pounder Parrotts, nine 42-pounder smoothbores (dismounted and condemned), thirty-seven 8-inch columbiads, six 10-inch columbiads, ninety 10-inch Rodmans, six 15-inch Rodmans, twenty-six 24-pounder flank defense howitzers (dismounted and condemned), one 24-pounder bronze coehorn mortar, one 10-inch siege mortar, one 10-inch siege mortar (dismounted and condemned), and one 6-pounder bronze field piece.

---

58. Twining to Adj. Gen., Aug. 23, 1877, NA, RG 77, Ltrs. Sent, Chief Engineer.

Hancock observed that the wooden platforms for the six 15-inch Rodmans were in "an advanced stage of decay and are worthless in consequence." These platforms, he noted, must be promptly replaced, because they supported the fort's most effective armament.

The only persons residing on Garden Key not belonging to the military or on its payroll were the lighthouse keeper and a 45-year Pequot Indian. The latter, referred to as the "Chief," had drifted to the Tortugas, some 20 years before. An expert pilot, the "Chief" was a self-reliant bachelor and expert fisherman.

Whether Fort Jefferson could withstand the shock of the firing of its own armament, Hancock would not forecast. But, because of the tortuous channels through the reef, enemy warships would find it difficult to approach, and this may prove to be its best protection against a naval bombardment.

If the fort were "razeed" and the parade filled with earth, he was certain that it would prove to be quite formidable.

General Hancock, before returning to Key West, visited the military graveyards on Bird and Sand Keys, and recommended that the bodies, along with the one burial on Garden Key, be disinterred and reburied in the Fort Barrancas National Cemetery.[59]

The Department forwarded to Captain Heuer for comment a copy of General Hancock's report, calling attention to the decayed condition of the barbette tier 15-inch platforms. Heuer replied that, in his reports, dated February 28 and April 19, he had called attention to this situation, and in the latter had estimated the cost of its correction at $18,000.[60]

Upon receiving Heuer's comments, Acting Chief Engineer Wright informed the War Department that the small sums available for Fort Jefferson were inadequate for the purpose indicated. Should the appropriation asked for in the estimates for Fiscal Year 1880 be granted by Congress, the temporary wooden platforms would be replaced by ones of masonry, and other needed repairs made.[61]

---

59. Hancock to Sherman, Jan. 27, 1878, NA, Ltrs. Recd., Adj. Gen., Microcopy M-666.

60. Heuer to Humphreys, Sept. 18, 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

61. Wright to Adj. Gen., Sept. 21, 1878, NA, RG 77, Ltrs. Sent, Chief Engineer.

7. Sewer System Continues to Plague the Military

Captain Heuer, commenting on Hancock's criticism of the fort's sewer system, noted that, after the sewers were cleaned out last winter, marked wooden floats were thrown into the privies and manholes to test the circulation. It was found that the floats lodged near the scarp wall flood gates. When these were raised, the floats did not escape into the ditch on an ebb tide.

This led to an examination of the outlets, and it was found that they were closed by brick and rubbish from the falling of the thin walls laid-up to close the openings in the second tier casemates. After the debris was removed, the floats still failed to escape. Upon investigating further, Heuer found that the low water level was higher than the outlets, resulting from the scarp's subsidence.

Consequently, he thought, "considerable velocity will be necessary to the flow of water in the sewers to carry offensive floating matter into the ditch." To provide this, he echoed Major Smith's 1874 recommendation that flushing cisterns be placed in several second tier casemates.

In addition, it was mandatory to free the ditch of "offensive matter." This was complicated by the large sand bar that obstructed the sluiceway near bastion F. If it were impractical, because of cost to remove the bar, he suggested that a third sluiceway be opened through the counterscarp.[62]

Acting Chief Engineer Wright, upon reviewing the correspondence, informed the Adjutant General that there were no funds available to underwrite Captain Heuer's recommendations for correcting the deficiencies in the sewage system noted by General Hancock.[63]

Post Commander Guenther, commenting in the report, noted that his command was in no way responsible for the condition of the privies and sewers. He believed they had been left in that situation by Captain Langdon's troops when they evacuated the fort in the winter 1873-74.[64]

---

62. Heuer to Humphreys, Oct. 19, 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

63. Wright to Adj. Gen., Oct. 23, 1878, NA, RG 77, Ltrs. Sent, Chief Engineer.

64. Guenther to Adj. Gen., Dept. of the South, Nov. 8, 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

8. Department Seeks to Cut the Keeper's Salary

On April 22, 1878, the Department reminded Captain Heuer that the pay of the Forts Jefferson and Taylor keepers was considerably higher than that paid elsewhere to people in this category. He would report what, if any, reductions were possible.[65]

Heuer reminded the Chief Engineer that Fort Jefferson was an isolated station with no mainland facilities. The keeper's only way of communicating with Key West, the nearest market, was by an occasional fishing smack or a chance visit by the lighthouse tender. Moreover, the incumbent (Joseph E. Cole) was a carpenter and was "almost continually at work repairing the quarters and barracks." His salary was $75 per month and, in Heuer's opinion, he earned every cent of it.[66]

Satisfied by this explanation, the Department dropped its efforts to effect economies during this austere period by slashing the Fort Jefferson keeper's salary.

9. Maintenance and Protection in Fiscal Year 1879

On July 2, 1879, Captain Heuer submitted the annual report for Fiscal Year 1879. The fort, he noted, had been garrisoned from July 12 to mid-November, 1878, by two companies of the 5th U.S. Artillery, sent there to escape a yellow fever outbreak at Key West.

During these 12 months, the only funds expended by the Department at Garden Key were for hire of the fort keeper and day labor to care for the public property and buildings.

Since Heuer's last annual report, some of the plaster had fallen in the officers' quarters kitchens. The sand bar, fronting bastions A, B, and F, had continued to grow, both in area and height. At its highest point, it was level with the top of the ditch wall.[67]

10. Maintenance and Protection in Fiscal Year 1880

The Army got a new Chief Engineer on July 1, 1879. Sixty-eight-year-old General Humphreys had retired the day before. Hereinafter, his successors would face mandatory retirement on reaching their 64th birthday. The new Chief Engineer was Brig. Gen. Horatio G. Wright, who had been superintending engineer at Fort Jefferson from 1846 to 1855.

---

65. Twining to Heuer, April 22, 1878, NA, RG 77, Ltrs. Sent, Chief Engineer.

66. Heuer to Humphreys, May 6, 1878, NA, RG 77, Ltrs. Recd., Chief Engineer.

67. Fort Jefferson, Annual Report for Fiscal Year 1879, NA, RG 77, Ltrs. Recd., Chief Engineer.

Congress, in March 1879, appropriated $100,000 for "Protection, Preservation, and Repair of Fortifications" for the fiscal year ending June 30, 1880.[68] Upon being notified of this, Captain Heuer advised the Department that no allotment was required from this appropriation to fund operations at Fort Jefferson during the subject 12 months. Charges for hire of a fort keeper and other incidential expenditures would be made against the balance in the Fort Jefferson account from previous line item appropriations.

When he filed his annual report for the 12 months ending June 30, 1880, Captain Heuer noted that no work had been done at the fort since his last annual report, beyond caring for the public property and buildings.

To repair the fort and replace the six temporary 15-inch gun platforms with ones of stone, Heuer called for a $18,000 appropriation.[69]

11. Maintenance and Protection in Fiscal Year 1881

Congress, in 1880, appropriated $100,000 for "Protection, Preservation, and Repair of Fortifications" in the fiscal year ending June 30, 1881.[70] Once again, Captain Heuer did not call for an allotment to fund expenses at Garden Key. Instead, he would continue to draw upon the unexpended balance for monies to pay the fort keeper and other minor day-to-day expenses.

When Heuer submitted his annual report for Fiscal Year 1881, he accordingly noted that no work had been accomplished during the subject period beyond the care afforded the public property and buildings by the keeper.[71]

12. Professor Agassiz's Field Trip to the Tortugas

In August 1880, the distinguished Swiss-American Naturalist Alexander Agassiz requested permission of the War Department for himself and an assistant to occupy "some of the vacant officers' quarters. . . and to use such space as may be assigned to him for a Laboratory in scientific investigation at the Tortugas during the coming winter."[72]

---

68. Humphreys to Heuer, undated, NA, RG 77, Ltrs. Sent, Chief Engineer.

69. Fort Jefferson, Annual Report of Operations for the Year Ending June 30, 1880, NA, RG 77, Ltrs. Recd., Chief Engineer.

70. Wright to Heuer, May 4, 1880, NA, RG 77, Ltrs. Sent, Chief Engineer.

71. Fort Jefferson, Annual Report for Fiscal Year 1881, NA, RG 77, Ltrs. Recd., Chief Engineer.

72. Dunn to Comdg. Gen., Mil. Div. of the Atlantic, Sept. 16, 1880, NA, RG 77, Ltrs. Recd., Chief Engineer. R.G. Dunn was Adjutant General of the United States.

The Department was agreeable, and Secretary of War Alexander Ramsey granted the necessary authority. Upon being notified of this, Dr. Agassiz thanked Chief Engineer Wright for his courtesy, and expressed his hope that the field trip would be "as successful as I have every reason to believe it shall be."[73]

It was early March 1881, before Professor Agassiz reached the Florida Reef and resumed his study of coral formations. On April 16, from his quarters in Fort Jefferson, Agassiz wrote a long letter to Charles Darwin.

"I came down here about six weeks ago," he wrote, "to study the surface fauna of the Gulf Stream. The Coast Survey placed a small launch at my disposal to go out and scour the surface when the weather is favorable."[74]

13. Maintenance and Protection in Fiscal Year 1882

a. Captain Heuer Proposes to Employ Funds on the Books to Provide for the Fort's Protection

On February 28, 1881, Chief Engineer Wright called on his superintending engineers to report, without delay, what funds were necessary for "ordinary expenses on account of the fortifications" in their charge during the four months ending June 30. At the same time, they would detail maintenance and protection projects necessary at each fortification for which they were responsible, and the cost thereof.[75]

Captain Heuer responded that no monies were needed at Fort Jefferson to fund projects, because there was a small balance, about $2,200, available from the line item appropriation voted by Congress for Fiscal Year 1874.[76]

President Rutherford B. Hayes signed into law on March 3, 1881, an act passed by the 3d Session of the 46th Congress, appropriating $175,000 for "Protection, Preservation, and Repair of Fortifications" in the fiscal year ending June 30, 1882. The superintending engineers were called on by the Department to submit estimates of funds necessary for maintenance and protection of the defenses for which they were charged during the subject 12 months. They would also detail the projects on which these funds were to be disbursed.[77]

---

73. Heuer to Wright, Aug. 30; Wright to Secretary of War, Sept. 3; & Agassiz to Wright, Sept. 20, 1880, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. The only War Department employees currently at the fort were the keeper and ordnance-sergeant.

74. George Agassiz, Letters and Recollections of Alexander Agassiz (Boston, 1913), pp. 280-82.

75. Circular Letter, Feb. 28, 1881, NA, RG 77, Ltrs. Sent, Chief Engineer.

76. Heuer to Wright, March 8, 1881, NA, RG 77, Ltrs. Recd., Chief Engineer.

77. Circular Letter, June 18, 1881, NA, RG 77, Ltrs. Sent, Chief Engineer.

On June 28, Heuer, replying to the Department's circular, reminded Chief Engineer Wright that no funds were needed for Fort Jefferson in Fiscal Year 1882, because money from the special appropriation was available.[78]

b. Guarding and Caring for the Fort and Public Property

During Fiscal Year 1882, expenditures at the fort were accordingly limited to caring for the public property and buildings.[79]

14. Maintenance and Protection in Fiscal Year 1883

a. The Allotment

On May 19, 1882, President Chester A. Arthur signed into law an act passed by the 1st Session of the 47th Congress, appropriating $175,000 for "Preservation and Repair" of Fortifications in Fiscal Year 1883. Consequently, General Wright called on his superintending engineers to communicate to the Department by July 1 the sums necessary for the "ordinary expenses" of the works for which they were responsible in the subject fiscal year.[80]

Captain Heuer, replying, noted that no funds were needed for Fort Jefferson in Fiscal Year 1883, because money was still available from the special appropriation of nine years before.[81]

Chief Engineer Wright questioned Heuer's logic, because the unexpended balance of "no limit" appropriations should be held in reserve, for as long as funds voted annually for "Preservation and Repair" were adequate for those purposes.

Heuer would therefore submit an estimate of monies needed for Fort Jefferson in Fiscal Year 1883 from the subject appropriation, so an allotment could be made.[82]

Heuer accordingly called for and was granted a $900 allotment from the appropriation for "Preservation and Repair" for the keeper's salary of $75 per month in Fiscal Year 1883.[83]

---

78. Heuer to Wright, June 28, 1881, NA, RG 77, Ltrs. Recd., Chief Engineer.

79. Fort Jefferson, Annual Report for Fiscal Year 1882, NA, RG 77, Ltrs. Recd., Chief Engineer.

80. Wright to Heuer, June 2, 1882, NA, RG 77, Ltrs. Sent, Chief Engineer.

81. Heuer to Wright, June 26, 1882, NA, RG 77, Ltrs. Recd., Chief Engineer.

82. Elliot to Heuer, June 16, 1882, NA, RG 77, Ltrs. Sent, Chief Engineer.

83. Heuer to Wright, June 26, 1882, NA, RG 77, Ltrs. Recd., Chief Engineer.

b. Deterioration of Certain Features Accelerates

Consequently, in the 12 months ending June 30, 1883, no work was done on the fort beyond "its protection, preservation and repair."

Captain Heuer reported that at this time, the fort, although it mounted 132 guns, was defenseless against ironclads. The six 15-inch Rodmans were unserviceable, because their platforms were worm-eaten and so rotten that "a cane could be pushed through them."

The galleries, giving access to the traverse magazines, were rotten and insecure, while the subject magazines could not stop a shot from a 8-inch rifle.

The principal wharf was rotten and ravaged by teredoes.[84]

c. Plans are Made to Dismount the Rodmans

In March 1883, Fort Jefferson Ord. Sgt. David A. Carey had warned the Department that the woodwork in the 15-inch Rodman platforms had rotted, and the irons of the traverse circles were falling away from the traverse wheels. If this were allowed to continue, the chassis were likely to be injured. To cope with this situation, he urged that the 50,000-pound guns be dismounted and the platforms repaired.[85]

When called on for an explanation, Captain Heuer noted that he had first brought this problem to the Department's attention in 1878. Congress, however, had failed to appropriate money to remedy the situation.

The cost of replacing the temporary 15-inch platforms with ones of stone, he reiterated, was about $18,000.[86]

Since Congress was unlikely to appropriate money for obsolete armament, Chief Engineer Wright directed Heuer to formulate and submit estimates of the cost of dismounting the guns. In event the Ordnance Department funded the project, would Heuer be in position to employ a force and supervise the undertaking?[87]

---

82. Elliot to Heuer, June 16, 1882, NA, RG 77, Ltrs. Sent, Chief Engineer.

83. Heuer to Wright, June 26, 1882, NA, RG 77, Ltrs. Recd., Chief Engineer.

84. Fort Jefferson, Annual Report for Fiscal Year 1883, NA, RG 77, Ltrs. Recd., Chief Engineer.

85. Carey to Wright, March 31, 1883, NA, RG 77, Ltrs. Recd., Chief Engineer.

86. Wilson to Heuer, April 17 & Heuer to Wright, April 21, 1883, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

87. Wilson to Heuer, June 26, 1883, NA, RG 77, Ltrs. Sent, Chief Engineer.

Responding, Heuer cautioned that he did not know if there was stored at the fort the equipment needed to dismount the huge guns--15-inch derricks and tackles or hydraulic jacks.

He usually visited Garden Key on his annual inspection in May. If the project could be deferred until then, he and the crew of the lighthouse tender could dismount the guns at a minimum cost to the United States of $15 per tube. Should conditions dictate that they be dismounted sooner, the project would cost $270.[88]

The Chief Engineer, not believing it to be an emergency, directed that, if Heuer, on his May 1884 visit to the Tortugas, found the big Rodmans in danger of falling, he was to have the tender's crew dismount them.[89]

d. Fort's Armament

On June 30, 1883, the fort's armament included:

Guns Mounted in Casemates

10-inch columbiads. . . .	60	Coehorn mortar.	1
24-pounder howitzers. . .	23	10-inch siege mortar. . . .	1

Guns Mounted en Barbette

Guns	Number	Front or centre-pintle
10-inch Rodmans . . .	30	front
15-inch Rodmans . . .	6	center
200-pounder Parrotts. . .	7	front
300-pounder Parrotts. . .	3	center
300-pounder Parrotts. . .	1	front

Guns Not Mounted

6-pounder bronze. . . .	1	24-pounder howitzers. . . .	3[90]
30-pounder Parrotts . .	4		

e. Condition of the Quarters, Barracks, etc.

On December 31, 1883, Ordnance-Sergeant Carey submitted a report to the Quartermaster General on the capacity and condition of the structures that would be used to quarter the garrison if the fort were again occupied by troops. He reported:

---

88. Heuer to Wright, July 9, 1883, NA, RG 77, Ltrs. Recd., Chief Engineer. Heuer, in addition to being superintending engineer for Forts Jefferson and Taylor was superintendent of the 7th Lighthouse District and Engineer for Improvements to Sabine Pass, Blue Buck Bar, and the Neches and Sabine Rivers.

89. Wilson to Heuer, July 12, 1883, NA, RG 77, Ltrs. Sent, Chief Engineer.

90. Fort Jefferson, Annual Report for Fiscal Year 1883, NA, RG 77, Ltrs. Recd., Chief Engineer.

Number of buildings used for company quarters

One brick building of 5 sections, 3-story, 50 rooms.

Twenty-seven rooms finished, 23 rooms unfinished.

Four of the unfinished rooms used by Engineers as storerooms.

Five of the finished rooms had been employed as a hospital--1 for surgery and 4 as wards.

One room was used as a chapel.

The plastering in 4 of the finished rooms had fallen.

Number of buildings used as officers' quarters

One brick building of 5 sections, 3-story, 63 rooms.

The 1st and 2d story rooms were in good condition.

Plastering in 7 of the upper story rooms had fallen.

Nine rooms were unfinished.

A number of windows were broken.

The structure leaked.

Number of buildings used as storehouses

There were 7 casemate storerooms, and they were in poor condition.

They were occupied by ordnance property.

The casemates had been used as storehouses, when the post was garrisoned, but all the woodwork had been pulled down and burned.

Capacity of Hospital

There was no separate structure built as a post hospital.

There were 5 rooms in the barracks that had been used as the hospital--1 for surgery and 4 as wards. The hospital had a capacity of 25 beds.

Remarks

There were 12 brick officers' kitchens, and they were in bad condition, the laths and plaster having fallen. Windows were broken and some doors off their hinges.

There were 8 brick company kitchens, likewise in bad condition. Some of the doors and windows had been removed. The flooring in one had been taken up.

There was no bakehouse. When the fort was garrisoned, the baking had been done in one of the casemates.[91]

91. Carey to Quartermaster, Dept. of the East, Dec. 31, 1883, NA, RG 92, Consolidated Correspondence File.

E. Captain Turtle's Seven Months as Superintending Engineer

1. Maintenance and Protection in Fiscal Year 1884

a. Appropriation and Allotment

Congress, before adjourning on March 3, 1883, had appropriated $175,000 for "Protection, Preservation, and Repair of Fortifications" in the fiscal year beginning July 1. Chief Engineer Wright accordingly, on March 20, called on his superintending engineers for estimates of funds needed to underwrite the costs of maintenance and protection in Fiscal Year 1884.[92] Captain Heuer reported that sufficient funds were on deposit in the Treasury to pay Keeper Cole's salary during the subject period.[93]

b. Fort Jefferson Gets a New Superintending Engineer

On February 1, 1884, Capt. Thomas Turtle replaced Captain Heuer as superintending engineer, the latter officer was reassigned as superintending engineer for improvements and survey of rivers and harbors in Delaware, eastern Pennsylvania and southern New Jersey.

Born in Massachusetts, Turtle had graduated from the U.S. Military Academy as No. 4 in the Class of 1867. Commissioned a 2d lieutenant in the Corps of Engineers, he was assigned to the Engineer Battalion at Willett's Point.

On August 11, 1870, Lieutenant Turtle was ordered to Massachusetts as assistant engineer on the defenses of Boston Harbor. From 1875 to 1884 Turtle pulled duty as engineer for improvement of the Great Kanawha and other rivers; construction of the Yorktown Memorial; and rivers and harbors improvements in Delaware, Maryland, Virginia, West Virginia, and North Carolina.[94]

c. Fort's Condition on June 30, 1884

On July 2, Captain Turtle submitted his annual report for the fiscal year. Work, during these 12 months, had been limited to preservation of the public property and buildings.

The lower tier of casemates, he noted, were "generally in good condition and the barbette platforms for the guns of the lesser calibers are also in good condition generally though some of them are incomplete." The 15-inch Rodmans had not been dismounted.

---

92. Wright to Heuer, March 10, 1883, NA, RG 77, Ltrs. Sent, Chief Engineer.

93. Heuer to Wright, undated, NA, RG 77, Ltrs. Recd., Chief Engineer.

94. Cullum, Biographical Register, Vol. III, p. 82.

In places the scarp had not been finished, the parapet not being entirely embanked, "and the traverses, most of which are incomplete are suffering from deterioration through loss of material."[95]

F. Captain Rossell's 15 Months as Superintending Engineer

1. Maintenance and Protection in Fiscal Year 1885

a. Appropriation and Allotment

Three days later, on July 5, 1884, President Arthur signed into law an act of the 1st Session of the 48th Congress, appropriating $175,000 for "Preservation and Repair" of fortifications in Fiscal Year 1885. Upon notifying his superintending engineers of this, Chief Engineer John Newton called on them to prepare and submit programs for maintenance of the coastal defenses for which they were responsible. They would also indicate the sums necessary for the salaries of fort keepers.

In connection with the latter, their attention was called to General Order No. 36, Series of 1884, which provided that, at all ungarrisoned defenses where ordnance-sergeants were posted, the fort keepers were to be laid off, unless their discharge would be injurious to the service.[96]

Captain Turtle, when he submitted his program, called for $450 for six months' keeper's pay at $75 per month, and $3,586.67 to rebuild the principal wharf.[97]

The Department allotted the requested sum for pay of the keeper, but slashed Turtle's request for construction funds. He was given $2,780 for maintenance of Forts Jefferson and Taylor and the Key West martello towers in Fiscal Year 1885.[98]

b. Captain Rossell Replaces Captain Turtle

Captain Turtle's tenure as superintending engineer was brief. On August 31, he turned over responsibility for Forts Jefferson and Taylor to Capt. William T. Rossell.

---

95. Fort Jefferson, Annual Report for Fiscal Year 1884, NA, RG 77, Ltrs. Recd., Chief Engineer.

96. Circular Letter, July 11, 1884, NA, RG 77, Ltrs. Sent, Chief Engineer. Horatio G. Wright had retired as Chief Engineer on March 6, 1884, his 64th birthday. His successor as Chief Engineer was Brig. Gen. John Newton.

97. Turtle to Newton, July 15 & 31, 1884, NA, RG 77, Ltrs. Recd., Chief Engineer.

98. Wilson to Turtle, July 18 & Wilson to Rossell, Aug. 19, 1884, NA, RG 77, Ltrs. Sent, Chief Engineer.

Although born in Alabama, Rossell was living in New Jersey, when he was appointed to the U.S. Military Academy. He graduated No. 3 in the Class of 1873, was commissioned a 2d lieutenant in the Corps of Engineers, and was ordered to duty with the Engineer Battalion at Willett's Point, New York. He returned to West Point in 1876 as Assistant Professor of Engineering. Between September 1880 and August 1884, he was successively assistant engineer to Col. George Thom, Col. Quincy G. Gillmore, and Capt. James C. Post.[99]

c. Keeper is Laid-Off

On November 6, Chief Engineer Newton wrote Captain Rossell reminding him that there was an ordnance-sergeant at the fort and no work was in progress or programmed. Consequently, it was to the Corps' interest to lay off Fort Keeper Cole, on the last day of December, when the monies allotted for his salary would be expended.[100]

Rossell was agreeable and orders were issued for Fort Keeper Cole to transfer custody of the Engineer property to Ord.-Sgt. George M. Brown. The keeper was also informed that his services would not be required after December 31.[101]

d. Maintenance and Protection Problems Haunt the Department

The decision to lay-off Keeper Cole proved a false economy. Already, Ordnance-Sergeant Brown had submitted a critical report to Chief of Ordnance Stephen V. Benét. Brown noted that the ninety 10-inch Rodmans emplaced in the casemates and on the barbette tier were in "very bad order," 40 of them having been painted last spring; while the remainder, not having received a coat for years, were exceedingly rusty. The six 15-inch Rodmans were unsafe to work around until such time as they were blocked up. Their platforms were rotten and the guns canted, one as much as 13 inches. The carriages of the flanking howitzers was badly rusted.

Brown had recently painted a number of 200-pound powder barrels and many implements. But, without "considerable assistance, it would be impossible to put the property in any kind of repair or prevent it from being spoiled by the action of the Sun and Salt air."[102]

Chief Engineer Newton, upon receipt of a copy of Brown's report, forwarded it to Captain Rossell. As soon as convenient, Rossell was to submit an "estimate of funds absolutely necessary for care and preservation of Fort Jefferson."[103]

---

99. Culum, Biographical Register, Vol. III, p. 207.

100. Wilson to Rossell, Nov. 6, 1884, NA, RG 77, Ltrs. Sent, Chief Engineer.

101. Rossell to Newton, Nov. 17, 1884, NA, RG 77, Ltrs. Recd., Chief Engineer.

102. Brown to Benét, Sept. 30, 1884, NA, RG 156, Ltrs. Recd., Chief of Ordnance.

103. Wilson to Rossell, Aug. 14, 1884, NA, RG 77, Ltrs. Sent, Chief Engineer.

Meanwhile, Sergeant Brown had asked to be provided with a schooner-rigged craft capable of transporting up to ten tons from Key West to the Tortugas. When called on for his thoughts on the subject, Superintending Engineer Rossell recommended against the proposal. He suggested that a contract be entered into for providing necessary transportation between Key West and Fort Jefferson.[104]

A number of months slipped by before Captain Rossell, who was based at St. Augustine, had an opportunity to visit Garden Key and submit the called for report. On March 26, 1885, Captain Rossell finally informed the Department that much damage had been inflicted on the parade structures' roofs, temporary buildings, etc., by hurricanes. In addition, the warm, humid climate was conducive to rapid decay of both wood and metals. This had resulted in much deterioration.

At present, there was stored in the fort nearly 90,000 pounds of black powder and a large number of shot and shell. Where the powder was stored in wooden barrels, there was a serious problem of preservation. Even the metal containers were rusting through. The shot and shell had rusted and needed scraping and painting. Cartridge-bags were worm-eaten.

The temporary wooden enclosures of some of the casemates used for storage had rotted. The frame building housing the water condenser was in ruins, and the large chimney had partially fallen. The condenser was useless.

Water dripping on the casemated guns and carriages had caused rusting. The guns and carriages of the barbette tier were in better condition.

The cisterns needed to be cleaned, as did one of the sewer outlets.

In many of the buildings, where the plaster had fallen, lath nails had rusted through.

A number of the embrasure irons were so seriously rusted that they crumbled and broke in the fingers.[105]

All property, if it were to be preserved, Rossell noted, must be carefully cared for. Ironwork must be painted or tarred often. Magazines should be aired whenever the weather was suitable.

To properly care for the buildings and property required the services, in Rossell's opinion, of at least 10 men. But, due to financial limitations, all this work fell on the shoulders of one man--Ordnance-Sergeant Brown. Complicating the situation was the post's isolation. At present, the only communication with Key West was by an occasional fisherman. In return for bringing out mail and supplies, these people, while refusing pay, expected to be allowed use of the public property. The alternative was to charter a vessel at $50 per trip. To alleviate Sergeant Brown's dependence on these fishermen, Captain Rossell recommended purchase of a New Bedford whaleboat.[106]

---

104. Wilson to Rossell, Aug. 16 & Keever to Newton, Sept. 4, 1884, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

105. Rossell to Newton, March 26, 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

106. Ibid.

Impressed with the difficult situation confronting Sergeant Brown, Chief Engineer Newton forwarded Rossell's report to Secretary of War William C. Endicott. Newton urged that the Ordnance and Quartermaster Departments' attention be called to the quantity of ordnance stores requiring care. Especially troublesome was Brown's isolation. If the Adjutant General were unable to detail a second ordnance-sergeant to Fort Jefferson, the Corps would again be compelled to have a keeper to help look after its property.[107]

Upon learning from the Adjutant General that it was illegal to assign more than one ordnance-sergeant to Fort Jefferson, General Newton inquired of Captain Rossell, "Do you still believe a fort keeper to be necessary?" If so, one was to be employed to enter on duty July 1.[108]

As an alternative to hire of a keeper, Rossell recommended employment of three or four laborers to work under Sergeant Brown's supervision.[109]

Sergeant Brown, when asked about the proposal to provide him with a New Bedford whaleboat, stated that he could not handle such a craft alone. Continuing, he announced that he preferred for the Quartermaster Department to make arrangements for a monthly trip from Key West to Garden Key with supplies and mail. This was done at a cost to the government of $50 per roundtrip.[110]

e. Rossell Gets $350 for Emergency Repairs

On March 10, 1885, Chief Engineer Newton notified his superintending engineers that there remained unallotted from the Fiscal Year 1885 appropriation for "Preservation and Repair" $54,000. They would therefore submit programs defining needed repairs at the defenses for which they were responsible.[111]

Responding to this circular letter, Captain Rossell called for $5,365 for necessary repairs. His estimate breakdown:

clearing sewers.	$50.
temporary postern doors	65.
stopping leaks, new gutters and leaders, and necessary repairs to officers' quarters piazza . . .	5,000.
repairs to ordnance-sergeant's quarters	250.
TOTAL	$5,365.[112]

107. Newton to Endicott, April 8, 1885, NA, RG 77, Ltrs. Sent, Chief Engineer.

108. Wilson to Rossell, May 29 & Drum to Newton, June 10, 1885, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

109. Rossell to Newton, June 10, 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

110. Hdqrs., Div. of the Atlantic, to Holabird, March 30, 1886, NA, RG 92, Consolidated Correspondence File.

111. Circular Letter, March 10, 1885, NA, RG 77, Ltrs. Sent, Chief Engineer.

112. Rossell to Newton, March 16, 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

The piazzas of the quarters occupied by the ordnance-sergeant, Rossell explained, were almost dropping off and the roof leaked badly.

As the doors to the sally port would not move on their hinges, temporary postern doors should be cut and hung.[113]

Upon evaluating the Department's nation-wide responsibilities, Chief Engineer Newton allotted $350 for repairs at Fort Jefferson: $50 for clearing sewers, $65 for doors to postern, and $235 for repair of the ordnance-sergeant's quarters.[114]

f. Department Calls for Figures on Placing the Guns and Magazines in Serviceable Condition

By circular letter on March 10, 1885, the Department had called on its superintending engineers to submit, as soon as feasible, estimates of the cost of placing in serviceable condition existing platforms for 8-, 10-, and 15-inch guns, as well as mortars and rifled guns, bearing upon the channels at the various defenses for which they were responsible. Similar data was required for the magazines pertaining to these guns and mortars.[115]

Captain Rossell, upon reviewing his files, reported that he needed to:

rebuild six 15-inch center-pintle barbette platforms at $3,000 each	$18,000.
repair 16 traverses at $800 each	12,800.
TOTAL. . . .	$30,800

There were, he noted, no mortar platforms bearing on the channels.[116]

Congress, however, was in no mood to appropriate monies for repair of obsolete fortifications and weaponry. Another five years would pass before Congress resumed making large sums available for the Nation's seacoast defenses, and when it did it would be for a new and radically different system.

g. Fort's Condition on June 30, 1885

During the year, besides caring for the public property, workmen made slight repairs to the ordnance-sergeant's quarters, cleared out the sewers, fashioned a postern, and shored up some of the falling temporary casemate partitions.

---

113. Rossell to Newton, March 26, 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

114. Wilson to Rossell, March 26, 1885, NA, RG 77, Ltrs. Sent, Chief Engineer.

115. Circular Letter, March 10, 1885, NA, RG 77, Ltrs. Sent, Chief Engineer.

116. Rossell to Newton, March 26, 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

When he made his annual inspection, Captain Rossell saw that the fort's scarp in some places was "incomplete"; the parapet not being entirely embanked and the traverses, many of which were incomplete, were deteriorating through loss of material.[117]

2. Maintenance and Protection in Fiscal Year 1886

a. The Need

On March 3, 1885, President Arthur signed into law a bill appropriating $100,000 for "Protection, Preservation, and Repair of Fortifications" in the year ending June 30, 1886. This was $75,000 less than the amounts heretofore allotted for this program. Chief Engineer Newton accordingly sent out a circular letter, on March 30, calling on his superintending engineers to provide estimates for projects requiring immediate attention.[118]

On May 29, Captain Rossell called for an allotment of $2,300 to fund operations of Garden Key in Fiscal Year 1886. This sum would be used for:

hire of 4 laborers at $40 per month each for 12 months	$1,920.
lumber, nails, tar, paint, and brushes	380.
TOTAL.	$2,300.[119]

Rossell took this opportunity to remind the Chief Engineer of the continuing "rapid deterioration" of all iron- and woodwork. If they were to be preserved, they must receive constant attention.

The ditch, he pointed out, was filling with sand and the growth of sea moss was accelerating. Small leaks were appearing in the buildings. The iron stairways in the barracks and quarters must be scraped and repainted. Iron roofs were in need of similar treatment. The embrasure irons, both those in position and storage, were rust eaten. The wharf and bridge across the moat were in such weakened condition, they could not be used for facilitating landing of heavy stores.

The large doors to the sally port could not be moved because rust had frozen the hinges.

The six 15-inch Rodman platforms were worthless. To replace them with ones of stone would cost $3,500 a platform or $21,000.

---

117. Fort Jefferson, Annual Report of Operations for Fiscal Year 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

118. Newton to Rossell, March 30, 1885, NA, RG 77, Ltrs. Sent, Chief Engineer.

119. Rossell to Newton, May 29, 1885, NA, RG 77, Ltrs. Recd., Chief Engineer.

2. His February 1886 Inspection

On February 15, 1886, Heuer spent the day at Fort Jefferson. He found the work unoccupied and an ordnance-sergeant in charge. During the 33 months since his last visit, the coral reefs outside the ditch on the fronts (Nos. 1 and 6) farthest from the sally port had "grown and become islands covered with brush and undergrowth," and their surfaces were on a level with the counterscarp.

The galvanized iron roof of the officers' quarters was leaking, especially into the fourth section, much worse. Water coming through, along with the damp climate, had rusted out the lath nails of the ceiling, causing the laths and plastering, in many places, to fall. The kitchens were in much worse condition than the main structure.

The piazzas, fronting the "handsome" quarters, were weathering badly. The outside walls of the 1847 section of the quarters had been attacked by the elements, and "fully 2 inches in depth of solid brick has been washed or beaten away." Little of the pointing done by the workmen in 1878 remained.

The principal wharf was so decayed that "it would be unsafe to roll a barrel of powder over it." Major Heuer urged that $3,500 be allotted to rebuild the wharf.[123]

3. He Orders Materials for Repair of Barbette Magazines

On March 27, Heuer requisitioned for use in repair of the barbette magazines:

350 feet pine timber, 3 by 4s	$ 80.50
6,000 feet dressed ceiling lumber	165.00
508 feet rough boards	11.17
500 lbs. 10d galv. nails	23.75
300 lbs. 8d galv. nails	14.25
400 lbs. zinc paint	36.00
4 lbs. lamp black	.80
20 gallons linseed oil	16.00
5 bbls. coal tar	35.00
TOTAL	$382.47[124]

The Department approved purchase of these materials in the open market, and authorized repair of the subject magazines by day labor.[125]

---

123. Heuer to Chief Engineer, March 8, 1886, NA, RG 77, Ltrs. Recd., Chief Engineer.

124. Heuer to Newton, March 27, 1886, NA, RG 77, Ltrs. Recd., Chief Engineer.

125. Adams to Heuer, March 30, 1886, NA, RG 77, Ltrs. Sent, Chief Engineer.

Other platforms for the 8- and 10-inch guns and rifles required repairs to the inner and outer traverse irons. On the barbette tier, nine of the platforms had small 2-1/2-inch pintles without keys. Forty-seven platforms, having 4-inch pintles and keys, either lacked inside traverse rails or had these rails placed on wood which had decayed. Six platforms had no outer rails.

To effect these repairs would cost:

position six traverse rails at $40	$ 340
position 47 traverse rails at $30	1,410
TOTAL	$1,610

Repair of the doors and casings of the bastion and curtain magazine could be effected for. . . . . $ 400

The magazines on the barbette tier were damp. Some of the brickwork had fallen near the entrances of several, and the doors and woodwork must be replaced. If these magazines were to be used, they should be recovered and the passageways in rear rebuilt. Cost of these repairs were estimated at:

for doors and brickwork, 16 magazines at $50	$ 800
for covering 90,000 feet of lumber at $25.	2,250
for 18,000 sq. ft. sheet iron at 2-3/4"	1,395
for nails	50
for labor	2,000
TOTAL	$6,495[120]

b. The Allotment

After evaluating its nation-wide commitments, the Department allotted to Captain Rossell $7,985 to underwrite costs of necessary projects at Forts Jefferson and Taylor in Fiscal Year 1886.[121]

G. Heuer's Second Superintendency: November 1885-November 1887

1. His Return

On November 15, 1885, William B. Heuer, now a major, again became responsible for maintenance and protection of Forts Jefferson and Taylor. This was triggered by a Departmental order establishing Engineer Districts. Heuer was placed in charge of the New Orleans District, which was responsible for Corps projects in Louisiana and Mississippi, as well as Forts Jefferson and Taylor.[122]

---

120. Ibid.

121. Wilson to Rossell, June 29, 1886, NA, RG 77, Ltrs. Sent, Chief Engineer.

122. Cullum, Biographical Register, Vol. III, p. 34.

4. Professor Brooks and His Students Visit Garden Key

On April 10, Johns Hopkins University Professor of Zoology, W.K. Brooks wrote Secretary of War Endicott of his plans to visit the Tortugas, in May and June, with about seven graduate students. If permissable, he wished authority for his party to occupy vacant quarters at the fort, as they had in previous years at Fort Wool.

The university, Brooks added, would be responsible for any injury the structures might suffer during their occupancy.[126]

After checking with Major Heuer and ascertaining that he had no objection to use of the quarters, Secretary Endicott granted the necessary authority on condition "the University will be responsible for any damage which may result from such occupancy."[127]

5. Fort and its Armament on June 30, 1886

Major Heuer's annual report for Fort Jefferson for Fiscal Year 1886 is missing from Record Group 77. The armament report, however, is on file. As of June 30, 1886, the fort mounted:

Caliber	Number en casemate	Number en barbette	Total	Front-pintle	Center-pintle
10-inch Rodmans	60	30	90	60	30
24-pounder howitzers	23		23		
coehorn mortar	1		1		
10-inch siege mortar	1		1		
15-inch Rodmans		6	6		6
200-pounder Parrotts		7	7	7	
300-pounder Parrotts		4	4	1	3
TOTAL	85	47	132	68	39

In addition, there were at the fort but not mounted: one 6-pounder bronze gun, four 20-pounder Parrotts, and three 24-pounder howitzers. Also on hand were ten carriages for 10-inch Rodmans.[128]

---

126. Brooks to Endicott, April 10, 1886, NA, RG 77, Ltrs. Recd., Chief Engineer.

127. Wilson to Heuer, April 16, 1886, & Endicott to Brooks, April 27, 1886, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer.

128. Heuer to Newton, July 5, 1886, NA, RG 77, Ltrs. Recd., Chief Engineer.

6. Congress Refuses to Appropriate Funds for Obsolete Fortifications

Congress, during the two years following completion of the Endicott study on measures to provide the Nation with a modern coast defense system, refused to make an appropriation for protection, preservation, and repair of the obsolete fortifications guarding the Unites States' ports and harbors.

Since there would be no funds for this purpose in Fiscal Year 1887, Major Heuer was compelled to discharge Fort Keeper Cole and the watchman on August 5. The task of looking after the fort and the Engineer property would be the responsibility of Ord.-Sgt. Henry Wilkins.[129]

7. Mid-August 1886 Hurricane

A hurricane hammered the area on the night of August 14, causing considerable damage. Most of the piazza fronting the officers' quarters was wrenched loose from the supports and crashed to the ground. Seven of the walkways giving access to the parapet magazines were wrecked. The galvanized metal roofs "experienced considerable damage," and the wharf was nearly destroyed. On the parade a number of palms and other trees were shreaded.[130]

8. Fort in June 1887

The Department, taking cognizance of the time and costs involved in traveling from his New Orleans duty station to the Florida Reef, excused Major Heuer from making the prerequisite annual inspections of Forts Jefferson and Taylor. He would have the ordnance-sergeants at the respective forts submit, through him, a report on the condition of the works, buildings, and public property.[131]

Consequently, on July 1, 1887, upon receipt of the necessary data from Sergeant Wilkins, Heuer informed the Department that the scarp wall "is cracked in places, owing to settlement." The first and second tiers were in generally good condition. The barbette magazines, which had never been completed, were deteriorating rapidly, and their sand coverings were being blown away.

The lower tier gun platforms continued to be in good condition, as were those of stone on the barbette tier. The wooden center-pintle platforms occupied by six 15-inch Rodmans were useless.

---

128. Heuer to Newton, July 5, 1886, NA, RG 77, Ltrs. Recd., Chief Engineer.

129. Heuer to Chief Engineer, Aug. 10 & Wilson to Heuer, Aug. 19, 1886, NA, RG 77, Ltrs. Recd. & Sent, Chief Engineer. An allotment from "contingencies" was made to pay Cole and the watchman for the days worked between July 1 and August 5.

130. Heuer to Chief Engineer, Sept. 13, 1886, NA, RG 77, Ltrs. Recd., Chief Engineer.

131. Raymond to Heuer, May 23, 1887, NA, RG 77, Ltrs. Sent, Chief Engineer.

The first tier Totten iron embrasure shutters were again badly rusted.

The officers' quarters were "in bad order." Serious leakage through the roof had resulted in falling plaster and rotten laths in the ceilings of the third story rooms. About one-half the piazza had been wrecked by the August 1886 hurricane. The adjacent kitchens were dilapidated.

The barracks was in better condition, but its kitchens were "in very bad order."

The two sets of quarters built by the Engineers were habitable. One was occupied by Ordnance-Sergeant Wilkins, while the one formerly used by Keeper Cole was vacant.

On the parade, the only other structures belonging to the Army were the shot furnace, principal magazine, and the foundations of the chapel-office.

The wharf was so rotten as to be useless, while the bridge spanning the ditch was little better. Only one of the temporary structures, a shed, remained outside the fort, and it was so dilapidated that it might collapse at any minute.

The fort's water supply was dependent on cisterns: a cemented brick and concrete cistern (25' by 20' by 6') at the officers' quarters; one constituting the chapel-office foundations (56' by 56' by 5'); and 99 cisterns under the lower tier of casemates, each about 30' by 12' by 5'. The water stored therein was "good and sweet." The fort's condensing apparatus, dating to the Civil War, was useless and had been condemned.[132]

When and if Congress made another appropriation for "Preservation and Repairs," Major Heuer noted, priority should be given to rebuilding the wharf and bridge, at an estimated cost of $3,500.[133]

H. Army Pulls Out of Garden Key

1. Captain Fisk Becomes Superintending Engineer

On October 31, 1887, Major Heuer was transferred to the Pacific coast. His replacement as district engineer for the New Orleans District was Capt. Walter L. Fisk. Born in Illinois, Fisk was appointed to the U.S. Military Academy from Iowa. Graduating No. 2 in the Class of 1877, he was commissioned a 2d lieutenant in the Corps of Engineers and ordered to duty at the academy as Assistant Professor of Natural and Experimental Philosophy. He held this position until December 1877, when he reported to the Engineer Battalion at Willett's Point.

---

132. Fort Jefferson, Annual Report for Fiscal Year 1887, NA, RG 77, Ltrs. Recd., Chief Engineer.

133. Ibid.

After pulling duty as assistant engineer to Colonel Gillmore (1880-1882) and Maj. Samuel M. Mansfield (1882-84), Fisk served as Secretary of the Missouri River Commission. He was promoted captain in Jaunary 1887, and soon afterwards assigned to duty in the office of the Chief Engineer.[134]

2. Captain Fisk's March 1888 Visit to the Fort and His First Annual Report

Captain Fisk visited Garden Key for the first time on March 10, 1888. He found Ordnance-Sergeant Wilkins in charge, and "everything there . . . exactly" in "the condition described at length in Major Heuer's report of July 1, 1887."

When Fisk filed the prerequisite annual report for Fiscal Year 1888, he was unable to add anything to the aforementioned report. As of July 1, 1887, there had been $1,350.15 credited to the Fort Jefferson account, and on June 30, 1888, the same sum was still available. Thus there had neither been an allotment nor an expenditure by the Corps for the Dry Tortugas fort in more than 22 months.[135]

3. September 1888 Storm

On September 5 and 6 there were near hurricane-force gales along the Florida Reef. Buffeted by the winds, one of the 15-inch Rodman's platforms gave way. The gun was dismounted, and in the accident its carriage was strained and the loading rod bent.[136]

4. Lighthouse Service Expands its Facilities

In Fiscal Year 1888, on September 28, the War Department, at the request of the Treasury Department, transferred to the Lighthouse Service the Garden Key sand spit westward of the Engineer wharf. On the spit the Lighthouse people proceeded to erect a wharf and buoy and blacksmith sheds. This transfer had been made on condition that these sheds would be removed and the land restored to control of the War Department whenever required for military purposes.[137]

5. Army Agrees to Turn the Fort and Certain Keys Over to the Marine-Hospital Service

On August 2, 1888, President Grover Cleveland signed into law an act passed by the 1st Session of the 50th Congress, setting aside Garden, Bird, and Loggerhead Keys as the site of a national quarantine station. Some three months later,

---

134. Cullum, Biographical Register, Vol. III, p. 271.

135. Fort Jefferson, Annual Report for Fiscal Year 1888, NA, RG 77, Ltrs. Recd., Chief Engineer.

136. Wilkins to Chief of Ordnance, Sept. 30, 1888, NA, RG 77, Ltrs. Recd., Chief Engineer.

137. Site File, Dry Tortugas, NA, RG 26.

on November 5, Secretary of War Endicott informed Secretary of the Treasury Thomas F. Bayard that there were no objections to such occupancy, provided existing defense works were left unchanged and that, when needed, the area be restored to the War Department.

On January 16, 1889, the Department accordingly transmitted the transfer papers to Captain Fisk's New Orleans Office. This was followed on February 2 by orders for Fisk to be prepared to remove the Corps' property from Fort Jefferson to Fort Taylor, provided it could be accomplished with funds currently on hand. If not, it was to be placed in casemates under lock and key, and the hospital personnel asked to see that it was not molested.[138]

Captain Fisk, on making inquiries, estimated the cost of removing from Garden Key to Key West the property shown on his returns and storing the same at Fort Taylor at $1,000. This included hire of a schooner for $250; hauling and loading the property at Fort Jefferson, and cartage from the Key West wharf to Fort Taylor $600; and $100 for storage of old property at Garden Key. In addition, it would cost not less than $1,000 to pack and store in the Fort Jefferson casemates certain other property belonging to Corps, but not carried on Fisk's inventory.[139]

Upon reflecting on the situation, Chief Engineer Thomas L. Casey directed Fisk to prepare such casemates or storerooms as were adequate, and place all public property therein. He was to notify the medical office in charge that this property belonged to the United States Army. Under no circumstances was it to be interferred with.

Any reasonable expense necessary to handle the property and to prepare the casemates by bulkheads, partitions, fastenings, etc., to secure it would be met from the $1,350 still credited to Fort Jefferson.[140]

6. George Phillips Describes the Fort in April 1889

Former employee George Phillips was hired by Captain Fisk to oversee the project. On April 21, Phillips wrote Fisk, advising him that "everything here is going fast to distruction [sic]." The handsome officers' quarters and barracks, he observed, were

---

138. Turtle to Fisk, Feb. 2, 1889, NA, RG 77, Ltrs. Sent, Chief Engineer.

139. Fisk to Chief Engineer, March 11, 1889, NA, RG 77, Ltrs. Recd., Chief Engineer.

140. Sears to Fisk, March 16, 1889, NA, RG 77, Ltrs. Sent, Chief Engineer. Thomas Casey had been named Chief of Engineers on July 9, 1888, to succeed Brig. Gen. J.C. Duane. Duane had replaced General Newton as Chief Engineer on October 11, 1886.

now but a little more than a wreck, the windows and doors are broken and lie shattered around but few of them can either be open or shut, many of them are open and can not be shut until repaired, and the water now pouring though them whenever it rains, destroying the fine stucco walls and ceilings by the hundreds of sqs. yds. The roofs of these . . . [structures] are of tin, and so badly rusted through in many places as to allow the water to run through them and destroy whatever property there may be stored within. The piazzas of the Officers quarters are in a dangerous condition not being safe to walk over, the roof of them being blown off and lodged upon the roof of the main building. The conductor pipes and gutters are rusted through so badly as to allow but little water to flow through them into the cisterns.

The cornice was rotten and falling, while the Totten iron embrasures would neither open nor shut. The barbette magazines were "going to decay."

The Ordnance property was in as bad condition as the Engineers'. Shot and shells by the thousands were sinking into the parade.

Vandalism was rampant. Not less than 77 stone covers to cistern manholes had been broken to make off with the brass rings by which they were lifted. Doors and windows had been removed from the quarters and barracks.[141]

7. Marine-Hospital Service Takes Charge

The Marine-Hospital Service was impatient to begin use of the facilities. On April 21, while Phillips and his men were securing the property, a Mallory Line steamer hove to in Tortugas Harbor. Aboard was a hospital steward, who came ashore and told Sergeant Wilkins that he was bringing a smallpox patient to quarter in the fort.

"No!" said Wilkins, "no orders have been received from the Department that the fort has been turned over to the Marine-Hospital Service as a quarantine station." And besides, he added, the lighthouse keeper and his family were residing in quarters on the fort's parade.

The crew, however, was determined to be rid of the patient, and left him on the wharf. Sergeant Wilkins, recognizing that "this was not a proper place for a sick person," directed the steward and smallpox victim into one of the Lighthouse Service's buildings on the spit outside the fort.

Upon being apprised of this, Phillips' workforce abandoned the project, boarded their vessel, and returned to Key West. Phillips, unable to prevail on them to return, was compelled to hire a crew of men who were immune to smallpox.[142]

---

141. Phillips to Fisk, April 21, 1889, FRC, East Point, Ga., RG 77.

142. Wilkins to Adj. Gen., April 30, 1889, NA, Returns from U.S. Military Post, 1800-1916, Microcopy M-617.

Despite this interruption, Phillips and his people by June 30 had packed and stored all the Engineer property, except the embrasure jambs weighing more than 1700 pounds each and the heavier pieces of cut stone, in casemates under lock and key. Orders were then given by Fisk to Sergeant Wilkins to turn the fort and Garden Key over to Surgeon R.D. Murray of the Marine-Hospital Service. Not to be included in the transfer were the Tortugas lighthouse tower, the lighthouse keeper's dwelling, lighthouse wharf, and buoy and coal shed, and those casemates in which Engineer and Ordnance property were stored.[143]

On July 1, 1889, Sergeant Wilkins turned the Army installation, except those reserved by Captain Fisk, over to the Marine-Hospital Service.[144]

---

143. Fisk to Chief Engineer, June 30, 1889; Fort Jefferson, Annual Report for Fiscal Year 1889, NA, RG 77, Ltrs. Recd., Chief Engineer.

144. Casey to Fisk, July 10, 1889, NA, RG 77, Ltrs. Sent, Chief Engineer.

XII. GARDEN KEY AS A QUARANTINE STATION

A. Marine-Hospital Service Opens Station

1. Plans are Made

In fiscal year 1889, the War Department having agreed to transfer of its facilities in the Tortugas to the Treasury Department for establishment of a quarantine station, the Marine-Hospital people made preparations to take possession of Garden and Bird Keys. Plans were made and funds secured for construction of a new wharf at Garden Key and establishment and equiping of a laboratory for investigation into the causes of yellow fever.[1]

2. Quarters Selected and a Laboratory Established

Consequently, during the 12 months ending June 30, 1890, the assistant surgeon in charge of the station arrived and designated Section 4 of the officers' quarters to be his office, and it was rehabilitated and refurnished. Coincidentally, three second-story rooms were outfitted as a bacteriological laboratory. These rooms were isolated from the rest of the structure to facilitate investigations into the causes of yellow fever. The laboratory was provided with the most up-to-date equipment, including a Springfield gas apparatus and a Pictel ice machine.[2]

The channels leading into the harbor were staked and the anchorage marked by buoys positioned by personnel of the Lighthouse Service.[3]

3. Surgeon Wyman's Mid-November 1890 Report

In mid-November 1890, Surgeon Walter Wyman reached the quarantine station on a tour of inspection. He was met at the wharf, as he disembarked from the revenue steamer Forward, by Asst. Surg. H.D. Geddings and his five-man staff. After examining the books and inspecting the quarters, Dr. Wyman visited the fort areas utilized as a quarantine station.

The sections of the fort occupied by Marine-Hospital personnel had been "placed in partial repair." The roof of the officers' quarters had been mended and painted, but many other areas of the fort showed signs of decay of its "perishable material." The moat was filled with stagnant water, as the two sluiceways were clogged by sand. When questioned about this, Dr. Geddings explained that his people had cleared the sluceways but they immediately silted up again.

---

1. Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1889 (Washington, 1889), p. 111.

2. Annual Report of the Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1890 (Washington, 1890), p. 30.

3. Ibid.

A sewer passed behind the quarters and discharged into the harbor some distance beyond the counterscarp. Dr. Geddings had been unable to locate the outlet, and it had clogged up. Unless corrected, the odor from the sewer would soon be unendurable. To address this situation, Dr. Wyman called on the Corps of Engineers for assistance.[4]

Also residing on the parade, besides the personnel manning the quarantine station, were the ordnance-sergeant and the lighthouse keeper and his family. The keeper and his family were housed in a building near the sally port. The sergeant had reserved for his use three of the kitchens and a room in the officers' quarters.[5]

Dr. Wyman found that the station needed:

(a) A deep-draft steamer to be used for boarding purposes, as a tug, and for communication to and from Key West.

(b) A wharf to be sited nearly opposite the sally port and close to the lighthouse wharf. This wharf should be at least 120 feet long, and it would house at one end a steam disinfecting chamber and sulphur furnace and at the other hoisting apparatus for discharging ballast.

(c) A hospital for persons confined with non-contagious illnesses had been opened in the former officers' quarters. Patients suspected of being stricken with contagious diseases were placed in floored tents outside the scarp and west of the sally port. This, however, was a temporary expedient, and Dr. Wyman suggested that the lazaretto be sited on the sand spit that had built up off the northwest point of Garden Key. Here it would be opposite the proposed wharf, and an approach could be made to it from the parade through an embrasure and a ponton bridge spanning the moat.

(d) An effort should be made to secure transfer of the wharf and buoy shed belonging to the Lighthouse Board to the Marine-Hospital Service. This shed was 100 feet long and could be divided into three sections--one for coal, a second for storage, and the third for quarters. Connected to the shed was a large cistern.[6]

4. Operations in Fiscal Year 1891

During the quarantine season, five vessels were received at the station for inspection and four of these were disinfected. In addition to his quarantine duties, Dr. Geddings continued his investigations into the cause of yellow fever.

---

4. Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1891, (Washington, 1891), p. 40.

5. Ibid.

6. Ibid., p. 41.

As a follow-up on Dr. Wyman's visit and recommendations, the steamer Dagmar was purchased for $25,000 and arrived on station in July 1891. Coincidentally, construction was commenced on a 120-foot iron pier.[7]

B. Construction and Outfitting the Quarantine Wharf

In fiscal year 1892, the Marine-Hospital Service spent $30,000 to construct a wharf. The 120-foot long by 32-foot wide wharf was connected with the fort by a bridge. The wharf fronted the sally port and paralleled the counterscarp. A shed, 120 feet by 24 feet, covered the wharf, leaving a 8-foot walkway on one side, which proved to be too narrow. The minimum depths of water next the wharf's outboard side was 19 feet.[8]

Pending completion of the wharf, the fumigation plant was positioned on a barge. A wooden steam chamber had been built by the employees. Although it served its purpose, Assistant Surgeon Geddings hoped for early delivery of the steel chamber ordered from Valk & Murdock of Charleston.

Water from the fort cisterns was conveyed through pipes to the barge and provided water for both the disinfecting apparatus and the steamer Dagmar.[9]

The wharf shed was completed in the autumn of 1892, and the Valk & Murdock 15-by 8-by 8-foot steam chamber delivered and positioned.[10] In addition to the steam chamber, the shed sheltered the disinfecting plant. The latter included a 30,000-gallon tank; a storeroom; a sulphur furnace, fan and engine; and a boiler to provide steam to the Valk & Murdock chamber. The vacuum in the steam chamber was produced by a steam jet.

Other heavy equipment present were a steam pump to draw water from the fort cisterns, a steam pump connected to a 2,500-gallon tank with which to wash vessels down with a solution of bichloride of mercury, and a steam hoister for coal and ballast.[11]

---

7. Ibid., pp. 39-40.

8. Murray to Surgeon General, July 10, 1895, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1895 (Washington, 1895), p. 283.

9. Geddings to Surgeon-General, Sept. 12, 1892, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1892 (Washington, 1892), p. 65.

10. Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1893 (Washington, 1894), p. 255.

11. Murray to Surgeon-General, July 10, 1895, found in Operations of the U.S. Marine-Hospital Service in 1895, p. 283.

Coincidentally, a site was cleared for a 250-ton coal bin, and a contract awarded for a coal car and rail to convey coal with a minimum expenditure of labor from the bin to a steamer.[12]

C. Fiscal Year 1892 Maintenance

On September 12, 1892, Dr. Geddings reported that in the 12 months ending June 30, his men had kept in repair "so much of the buildings. . . as are occupied for quarters and administrative purposes. . ., and the roof [was] painted and kept tight." But, he cautioned, because of the "size of the buildings and their condition when first occupied, it is. . . a question of a few years before the ravages of time and the elements will render them uninhabitable."[13]

D. Station and Facilities in Fiscal Year 1894

1. Improvements and Maintenance

The annual report for fiscal year 1893, filed by the assistant surgeon in charge of the Dry Tortugas Quarantine Station, failed to focus on either improvements or maintenance. Surgeon H.R. Carter, who had assumed command of the station at the beginning of June 1894, submitted, insofar as historians are concerned, a much more satisfactory report for fiscal year 1894.

On August 31, he informed the Surgeon-General that in the year ending June 30, 1894, alterations and repairs to the station had been limited to four projects. They included:

(a) A coal shed had been constructed beside the wharf gangway. This "well-constructed" building, with a capacity of 150 tons of coal, had been erected by the attendants at a cost of $481.19 for materials.

(b) The roof of the officers' quarters had been painted by the crew.

(c) Minor alterations and repairs had been made to the disinfecting plant.

(d) A diver had cut off the worm-eaten piles of the old 60- by 90-foot lighthouse wharf, the latter structure having collapsed in 1893.[14]

---

12. Geddings to Surgeon-General, Sept. 12, 1892, found in Operation of the United States Marine-Hospital Service 1892, p. 65.

13. Ibid.

14. Carter to Surgeon-General, Aug. 31, 1894, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1894, (Washington, 1895), p. 210.

2. Condition of the Disinfecting Plant

Although he had been onsite only three months, Dr. Carter found the steam chamber satisfactory. A steam exhaust had been added by which a vacuum of 6-1/2 pounds could be obtained within 4 minutes. The sulphur furnace also gave satisfaction, but the arrangement of the delivery pipes could be improved.

The arrangement for using the bichloride solutions was a problem. The tank on top of the shelf leaked so badly that it destroyed the gutters and fouled the water in the large tank to a degree, where it was no longer potable, "besides eating through the galvanized-iron covering of the platform and injuring the covering of the steam chamber." Carter had been compelled to remove the tank from the shelf and position it on the wharf.[15]

3. Problems with Wharf's Location

To complicate the situation, the T-wharf was poorly located, being in a recess between two sand spits, and vessels had to be dropped in sidewise to be brought alongside. Moreover, the wharf was faced so that a ship of 300 or more feet in length could not be brought close alongside. If the station were to be developed to accommodate a fair proportion of the shipping entering the Gulf of Mexico, there must be either a new wharf, or the two points which "pocket it" cut away, or a floating disinfecting plant provided.

Meanwhile, the wharf was to be extended by the dolphins now under order. They would provide additional mooring space. The wharf house was also badly placed, and Dr. Carter forecast that it will be "pulled down by some vessel coming in where it is."

The tug Foster, assigned to the station on June 1, to replace Dagmar was powerful, swift, and invaluable in handling vessels brought alongside the wharf for disinfection.[16]

E. Surgeon Murray's Fiscal Year 1895 Report

1. Condition of Fort

When Surgeon R.D. Murray filed his annual report for fiscal year 1895, he noted that Fort Jefferson was surrounded by a 70-foot wide moat, with two sluiceways in the counterscarp--on the southeast and west fronts--through which the tide ebbs and flows.

The parade, measuring some nine acres, was occupied by the officers' quarters (44 by 288 feet), the barracks (38 1/2 by 337 feet), the lightkeeper's residence, the ordnance-sergeant's quarters, an unfinished magazine, and numerous kitchens.

---

15. Ibid.

16. Carter to Surgeon General, Sept. 13, 1894, found in Ibid.

The officers' quarters was divided into 69 rooms, some of which were unfinished. The plaster ceilings in more than one-half the rooms had fallen. The roof, except the section covering the block that had been painted four times since 1889, was in bad condition. The rear roof gutter had been blown down by the 1894 hurricane. Part of the front piazza had collapsed in 1890, and the remainder was rotting rapidly. To prevent the piazza from falling, it had been shored. The piazza must be soon repaired or replaced.

The ground floor rooms were used as storerooms and offices, as they were too damp for sleeping quarters.

Several rooms in the barracks were used by the Corps of Engineers and Quartermaster Department for storage. Most of the barracks rooms, however, were unfinished, and, although they were commodius, they were too damp for use by the quarantine station.

The upper tier casemates, which had been used by the Army as quarters, Surgeon Murray observed, could provide housing for detained crews, passengers, and immigrants should the need arise. These casemates were cool, well ventilated, and easy to keep clean.[17]

2. Condition of Structures Exterior to Moat

Near the 1894 coal shed was the frame structure formerly used by the Engineers as a carpenter's shop. It had been fitted with gutters and these, in conjunction with those on the coal shed, were used to supply a large concrete cistern on the southeast spit.[18]

A dormitory for crews of vessels being fumigated was about 50 feet from the drawbridge. Masters were housed in the surgeon's quarters.[19]

3. Maintenance and Repairs

During the year, these repairs were made to the station:

(a) Metal-covered fender and mooring piles were positioned on the front of the wharf and two mooring dolphins driven at a cost of $1,764.

(b) Three mooring anchors were positioned.

(c) The carpenter's shop foundations were renewed.

(d) The Engineer cistern (18 by 36 feet) was flushed, cleaned, and roofed with salvaged shingles.

---

17. Murray to Surgeon-General, July 10, 1895, found in Operations of U.S. Marine-Hospital Service for 1895, pp. 282-83.

18. Ibid., p. 283.

19. Ibid.

(e) Five hundred feet of 1-1/2-inch galvanized pipe was removed from the 53-by 66-foot parade cistern and relocated to the Engineer cistern and connected with the wharf tank.

(f) Six hundred feet of 2-inch galvanized pipe was employed to connect the parade cistern with the water tank.

(g) New gutters were hung on the wharf shed to connect with the wharf tank.

(h) Gutters were positioned on the coal shed and carpenter's shop to feed the 2,500-gallon tank.

(i) Materials were purchased for construction of the Bird Key lazaretto, to consist of a 30-by 34-foot hospital, 8-by 16-foot kitchen, and 6-by 10-foot outhouse.[20]

4. Construction of Bird Key Lazaretto

The lazaretto was constructed in the summer of 1895, but there were no monies for its equipment and furnishings.[21]

F. Station in Fiscal Year 1896

1. Maintenance and Repairs

During fiscal year 1896, the wharf boiler's smokestacks were replaced, and workmen repaired the roof of the officers' quarters and hung new gutters. Coincidentally, new gutters were positioned on the 12 kitchens, and the window sash repaired as necessary. Four of the kitchen roofs were reshingled and the roofs of the other eight repaired.

Two cisterns were cemented, and a new walkway laid out connecting the medical officers' quarters and the sally port.[22]

2. Needed Repairs

Dr. Louis L. Williams called for these repairs in fiscal year 1897:

---

20. Ibid., p. 285.

21. Williams to Surgeon General, Aug. 9, 1896, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1896, (Washington, 1896), p. 541.

22. Ibid.

Project	Estimated Cost
Renewal of officers' quarters piazza	$2,000
Repair of officers' quarters plastering	200
Four stationary bathtubs and fittings for officers' and attendants' quarters	250
Small hot air pumping engine to supply quarters with water	300
Dredging sand spits and extension of wharf	7,000
Construction of small pier at Bird Key	Work to be done by station force
Building a boathouse	
Erection of a roof over wharf bridge	
TOTAL	$9,750[23]

3. Quarantine Season Activities

In the year ending June 30, 1896, 32 vessels were inspected and passed by station personnel, and 46 vessels disinfected. Of those disinfected, 19 were steamers, 20 schooners, 1 bark, 4 barkentines, 1 brig, and 1 brigantine.

Seven cases of yellow fever were identified and the patients hospitalized.[24]

G. Station in Fiscal Year 1897

1. Quarantine Season Activities

During the next 12 months, 63 vessels were boarded. Of these, 12 were inspected and passed and 51 disinfected and held for observation. The vessels subjected to disinfection included 17 steamers, 5 barks, 2 barkentines, 1 brigantine, and 26 schooners. One case of yellow fever, ending in the patient's death, was identified and treated. Nine other seamen were hospitalized for other diseases and relief was given to 21 outpatients.[25]

2. Maintenance and Repairs

Five thousand feet of lumber and 10,000 shingles were purchased and used to extend the wharf shed.[26]

---

23. Ibid., p. 542.

24. Ibid., p. 541.

25. Williams to Surgeon General, Oct. 20, 1897, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1897 (Washington, 1899) p. 494.

26. Ibid.

The crew painted the interiors of the officers' and attendants' quarters. The stairways, including those in the unoccupied portions of the building, were chipped and treated with coal tar. Coincidentally, the cistern under the officers' quarters was cemented.[27]

3. Furnishing the Lazaretto

The Bird Key lazaretto was equipped with necessary furniture and utensils. A small landing was built for use by the naphtha launch and was connected with the lazaretto by a board walk.[28]

H. Station in Fiscal Year 1898

1. Quarantine Season Activities

In the year ending June 30, 1898, the year in which the United States wneent to war against Spain, personnel of the Marine-Hospital Service inspected and passed eight vessels, and disinfected 50 craft consisting of 13 steamships, 3 tugs, 28 schooners, 6 barks, 4 barkentines, and 4 barges. Of these, those infected, the schooner B. Frank Neally arrived July 10, with two cases of yellow fever; the schooner Anna B. Stammer arrived July 16, with two suspicious cases at sea and two cases of yellow fever occurring immediately after arrival; the schooner John C. Smith arrived September 5, with one case of yellow fever; and the bark Ragna arrived Christmas Eve, and had two deaths from yellow fever at sea.

During the season, there had been hospitalized and treated at the lazaretto for yellow fever six seamen, one of whom died. In the third week of February, nine wounded survivors from the battleship Maine were brought to the station from La Habana and hospitalized.[29]

2. War Comes to the Station

The destruction of Maine in La Habana Harbor placed the United States and Spain on a collision course that led to a declaration of war by Congress on April 25. Some three weeks before, the Navy laid a cable connecting Garden Key with Key West. Four days later, the Surgeon General ordered the commercial quarantine suspended, and coincidentally Dr. Williams was directed to keep the station open for treatment of infected warships and troop transports. Already,

---

27. Ibid.

28. Ibid., pp. 494-95.

29. Williams to Surgeon-General, Aug. 16 & 29, 1898, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for Fiscal Year 1898 (Washington, 1899), pp. 728-29.

several torpedo boats had put into the anchorage to take aboard water. Then, on May 8, the Army returned to Fort Jefferson, when Companies A and C, 5th U.S. Infantry, arrived from Port Tampa aboard ship. Landing, the soldiers went into camp on the spacious parade.[30]

3. Maintenance and Repairs

Station personnel during the year repaired the wharf bridge and reshingled the Bird Key lazaretto.[31]

4. Condition of the Fort's Weaponry

Before the end of May, with America at war, 2d Lt. R.P. Johnston spent the day at Garden Key inspecting the fort's armament. He found that the weaponry included six 15-inch Rodmans, ninety 10-inch Rodmans, three 300-pounder Parrotts, eight 200-pounder Parrotts, twenty-six 24-pounder flank defense howitzers on wooden carriages, two small mortars, and a few small cannon without carriages.

The six 15-inch Rodmans, he reported, were on the bastions, where they had been mounted on temporary platforms. The wooden platforms had rotted, and most of the guns and carriages had toppled. The six guns were in fair condition, about like the similar cannon recently remounted at Fort Taylor.

The carriages of bastions C, D, and E's guns were in fair condition; those on bastions A and B were unserviceable, their chassis rusted out. The carriage on bastion F was in similar condition to those at Fort Taylor. The pintles, pintle plates, and traverse circles were in reasonably good condition, though a few of the circle irons were bent.

Lieutenant Johnston estimated that the cost of rebuilding the six platforms and remounting the guns would be about the same per piece as that for the two Fort Taylor 15-inch Rodmans.

He noted that the 10-inch Rodmans had been seemingly injured by rust--those in the casemates being in much worse condition than those en barbette. The former he listed as unserviceable, their bores being considerably enlarged by rust, while their carriages were in foul shape.

The Parrott platforms seemed to be in satisfactory condition, while the guns and carriages were serviceable.

All the fort's weaponry needed cleaning, oiling, and painting.[32]

---

30. Ibid. The soldiers remained at Fort Jefferson until mid-July, 1898.

31. Ibid.

32. Johnston to McKinstry, May 31, 1898, NA, RG 77, General Correspondence, 1894-1923.

With Spanish Vice Admiral Pascual Cervera y Topete's squadron bottled up in the harbor at Santiago-de-Cuba since May 26, the fears that had gripped the civil populous of Atlantic and Gulf coast cities that they might be bombarded were allayed. The presumed crisis having passed, the War Department shelved its plans to remount and make serviceable the six Fort Jefferson 15-inch Rodmans.

5. Navy Begins Development of Site as Coaling Station

To support the war effort in the Gulf of Mexico and the Caribbean, the Navy Department determined to locate a coaling depot at Tortugas Harbor. A site was selected and contracts let for construction of facilities and extensive dredging.

Seemingly, as a second thought, Secretary of the Navy John D. Long, through the War Department, apprised the Secretary of the Treasury of his plans. Along with this information, Long asked that Fort Jefferson and Garden Key be transferred to the Navy Department.

On September 1, some three weeks after the end of hostilities with Spain, Secretary of the Treasury Lyman J. Gage replied. His answer was no. To justify his position, Gage pointed out that, in the years since the 1888 transfer, the area had been constantly in use by his department as a national quarantine station, and there had been expended for site quarantine improvements $115,000.

Coincidentally, the Surgeon General of the Marine-Hospital Service had reported that the Tortugas station was "of great and growing importance, it being the disinfecting station of vessels from Cuba and other West India islands, and from Central and South America bound for ports in the United States." It was also needed to support the post war redeployment by disinfecting U.S. troop transport and warships in southern waters should any become infected with yellow fever.[33]

I. Station in Fiscal Year 1899

1. Disinfecting Troops Returning from Cuba

Fiscal year 1899, despite the Navy's presence, was a busy one at the station. Eighty-six vessels were disinfected, of which 16 were steamships. In addition, three vessels were inspected and passed, and eight others departed the anchorage without treatment.[34]

---

33. Gage to Secretary of War, Sept. 1, 1898, NA, RG 77, General Correspondence, 1894-1923.

34. Clark to Surgeon-General, July 1, 1899, found in Annual Report of Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1899 (Washington, 1899), pp. 812-13.

Two weeks were particularly hectic. On the morning of March 23, the transports Florida and Kilpatrick, with the 1st Texas Infantry arrived from La Habana. Florida carrying the baggage, equipage and four companies of soldiers came alongside the wharf. Kilpatrick, however, drew too much water to navigate the channel and dropped anchor in the outer harbor.

The troops aboard Florida promptly disembarked, and as each company landed, the soldiers' blanket rolls and knapsacks were inspected. All fabrics were bundled in the blankets, the bundles stenciled, and then placed in the steam chamber. The ponchos were placed in piles by companies, and dipped in a solution of bichloride of mercury by station employees. The troops were quartered in the 2d tier casemates.

Heavy baggage was hoisted onto the dock and there opened by fatigue details. The clothing and fabrics were bundled under the supervision of a medical officer, marked, and, after steaming, repacked. Tents, cots, etc., remained in the holds and were positioned to permit fumigation by sulphur dioxide. Uniforms of officers were placed in staterooms and disinfected by formaldehyde gas. Three days were needed to complete work on Florida.

The majority of the 1st Texas Infantry were aboard Kilpatrick, but as they had no baggage with them, except their blanket rolls and knapsacks, their disinfection was easily accomplished. The fabrics contained in these were bundled, marked, and transported to the disinfecting wharf by the tug Powhatan.

Both vessels were discharged on March 30, and the next day the transport Vigilancia put into the harbor with four companies of the 9th Illinois Infantry. She had left La Habana without a bill of health. As she was too large to be brought alongside the dock, the troops' blanket rolls, knapsacks, ponchos, and officers' uniforms were treated in the same manner as those of Kilpatrick's passengers. The heavy baggage was opened in the holds, the clothing bundled, and sent ashore. On April 2, the disinfected clothing was returned to the ship and, after the troops were inspected, she was discharged.

On April 8, the transport Logan, the 3d Nebraska Infantry aboard, put in for detention and disinfection. Too large to reach the wharf, she anchored in the outer harbor. A heavy norther was blowing and the sea was too rough for putting the troops and their baggage ashore. After vainly waiting two days for the seas to calm, Logan sailed for Savannah.[35]

---

35. McAdam to Surgeon-General, May 22, 1899, found in Operations of the U.S. Marine-Hospital Service for Fiscal Year 1899, pp. 813-14.

2. Presence of Naval Contractors Cause Difficulties

The mission of the quarantine station was complicated by the presence of employees of the Union Bridge Co., the Alabama Bridging and Jetty Co., and Babcock & Wilcox Co., engaged on various Navy Department contracts. These activities, Assistant Surgeon Taliaferro Clark complained, "militates most strongly against strictness of quarantine and greatly to the difficulties and responsibilities of the officer in charge."

It was Dr. Clark's opinion that the quarantine station could not be continued without interferring with the operations of the Navy and without relaxation of the quarantine. The presence of the Navy, however, resulted in one plus--the extensive dredging undertaken had made it possible for steamers drawing up to 30 feet to approach the wharf.[36]

3. Improvements and Maintenance

Only limited sums had been spent for improvements during the year, because of the practical closure of the station during the war. Even so, a small hurricane-proof hospital had been erected at the Bird Key lazaretto. Workmen had also painted the interior of the medical officer's and steward's quarters.[37]

J. Closure of Garden Key Quarantine Station

1. Final Quarantine Season

The last season in which the station operated was in fiscal year 1900. During the year, the station, now commanded by Assistant Surgeon John McMullen, inspected 38 steamers, 42 sailing vessels, and 3 barges. Of this number, 79 were disinfected, 1 inspected and passed, 1 held to complete period of detention, 1 refused treatment, and 1 remanded to Mullat Key, because of the press of work in establishing a detention camp at Garden Key. Fifty-six of these vessels had sailed from La Habana.

The detention camp was opened on September 6, during the yellow fever outbreak at Key West and closed on November 15, 1899. During this period, 143 refugees were received, and 20 cases of yellow fever treated at the Bird Key lazaretto. There were no deaths.[38]

---

36. Clark to Surgeon-General, July 1, 1899, found in Ibid., p. 815.

37. Ibid.

38. McMullen to Surgeon General, Sept. 11, 1900, found in Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1900 (Washington, 1901), p. 636.

2. Station is Closed and Turned Over to Navy

On October 1, 1898, the Secretary of War, after reviewing the correspondence, had refused to agree to the transfer of the area to the Navy. Whereupon, Secretary of the Navy Long had referred the subject to the Judge Advocate General, "for the necessary action, with a view to securing from the Treasury Department, if possible, the transfer of Fort Jefferson to the Navy Department. . . ." The question was resolved in favor of the Navy.

Apprised of this development unofficially, Surgeon-General Walter Wyman addressed a memorandum on the subject to Secretary of the Treasury Gage. On doing so, he discussed the facility's mission as a refuge station, between Blackbeard Island, Georgia, and Ship Island, Mississippi. A refuge station, he emphasized, was one at which a badly infected vessel could be treated.

As a war measure, Dr. Wyman explained, erection of the coal sheds by the Navy had not been objected to, because of the national emergency. In addition, that facility was outside the fort and removed from vessels undergoing quarantine. Thus this activity had not been deemed incompatible with the station's mission. It had been the understanding by Marine-Hospital personnel at the time the sheds were built that they were to be subsidiary to the quarantine, but now the Navy was employing them to demand the surrender of the entire area.[39]

If the service's facilities were to be turned over to the Navy, Dr. Wyman urged that it not be done until November 1900 at the close of the current quarantine season which began on April 1. Already, the Navy, in compliance with this request, had agreed to a cessation of work on the Garden Key projects to begin as of April 1. This was good, because Dr. Wyman looked on the coming season with apprehension, because yellow fever had appeared in La Habana in December 1899.[40]

On April 7, 1900, the Secretary of War formally transferred to the Navy, by direction of the President, the Dry Tortugas military reservation as reserved by President Polk's executive order of September 17, 1845.

Writing to Secretary of the Treasury Gage on April 10, Acting Secretary of the Navy Charles H. Allen noted that, inasmuch as the reservation was needed by the Navy as a coaling station and for other purposes, he requested the removal of the quarantine station.[41]

Responding to Assistant Secretary Allen's communication, Secretary of the Treasury Gage called attention to a recent hearing before the House Committee on Appropriations. At the hearing, Rear Admiral Royal B. Bradford, in response to a question by the committee chairman, had agreed to leave the Marine-Hospital Service in undisturbed possession of the Tortugas until November 1, 1900. In the meantime, the service would submit estimates for an appropriation to relocate the Tortugas station.[42]

---

39. Wyman to Gage, March 29, 1900 found in Ibid., p. 637.

40. Ibid.

41. Allen to Gage, April 10, 1900, found in Ibid., p. 636.

42. Gage to Secretary of the Navy, April 18, 1900, found in Ibid., p. 638.

Consequently, the Marine-Hospital Service remained in possession of the station until November 15, 1900, when the officer in charge turned the facilities over to the Navy.

APPENDIX

GLOSSARY
by Al Manucy

applicateur. Fort Jefferson: workman engaged in applying asphaltum to roof surfaces of arches.

architrave. Beam or lowest division of entablature, which extends from column to column. The term is also applied to the moulded frame around door or window.

archivolt. Mouldings on face of arch, following its contour.

arrondisment. (French: arrondissement) Rounding (noun).

askew arch. Fort Jefferson: segmental arch which springs from oblique piers, and twists gracefully in its length to seat its weight fully upon the skewbacks.

ballister. Small pillar or column supporting handrail or coping. Series of such is called a balustrade.

baluster. See ballister.

banquette. Raised way, or foot bank, running along inside of parapet, on which riflemen stand to fire on enemy.

barbette. Platform in fortification on which guns are mounted to fire over parapet.

barrack. Large building for lodging of soldiers; barracks (plural): building or buildings for that purpose.

barrel vault. Fort Jefferson: brick semicircular arched covering of greater length than breadth.

bastion. Work projecting outward from main enclosure of fort, consisting of two faces and two flanks, and so constructed that it is able to defend by flanking fire the adjacent curtain or wall which extends from one bastion to another.

bastion towers. Fort Jefferson: section of the bastion enclosing the spiral stairway.

batten. Narrow strip of wood or scantling used in various ways: at Fort Jefferson, to rest upon piazza joists and provide additional support for flooring.

batter. Backward slope of retaining wall.

battery. Any place where cannon or mortars are mounted for attack or defense.

bead. Fort Jefferson: narrow rounded moulding or protecting band at masonry corners.

belt. Strip or band.

breakwater. Fort Jefferson: counterscarp (moat) wall, seawall built to exhaust force of waves.

breast-height wall. Fort Jefferson: interior slope of parapet, against which the garrison lean in firing.

breastwork. A defensive work of moderate height, hastily thrown up, of earth or other materials.

brick facing. The outer or exposed portion of brick wall.

caballero. (Spanish) Sort of fortification, or part of fortification.

carriage. Fort Jefferson: wheeled stand or movable support of gun.

casemate. Bomb proof chamber, in which cannon may be placed to be fired through embrasures in its front.

cistern. Receptacle for storing water; reservoir.

coal rig. Coal storehouse and apparatus for depositing coal in bunkers of vessel.

cofferdam. Water tight structure of pilings, used in engineering for excluding water from area excavated, so that foundations may be built dry.

communication arch. Fort Jefferson: arched opening that pierces casemate pier and gives access to adjoining casemate. These openings are near the rear of gunroom or casemate, away from the arc described by traverse of gun carriage, which impeded progress through main and larger connecting casemate arches.

contrabands. Escaped black slaves, termed "contraband of war."

coping. Highest or covering course of masonry in wall, often with sloping edges to carry off water.

corbel. Fort Jefferson: projecting brick, generally used for support of element above, although occasionally for ornamentation.

cordon. Coping of scarp wall, which projects a few inches beyond face of wall.

cornice. Horizontal projection which crowns or finishes the work to which it is affixed.

counterscarp. Exterior slope of ditch or moat opposite the scarp; moat wall: see scarp.

curtain. That part of rampart and parapet which extends between two bastions or gates.

dentil. Tooth-like cube in cornice.

elliptical. Arch, the rise of which follows oval curve above the long horizontal axis of an ellipse.

embrasure. Opening in a fort wall from which to fire guns.

embrasure cheek. Vertical side or jamb of an embrasure.

embrasure iron. Iron protecting frame about outer opening of embrasure.

embrasure shutters. Iron shutters to close embrasure.

emplacement. Position of guns within fortification.

enrockment. Fort Jefferson: protective layer of loose stone to prevent undermining of counterscarp foundation.

entablature. Fort Jefferson: upper part of the architecture, comprising architrave, frieze, and cornice.

facade. Face or elevation of building.

fascine. Bundle of sticks or fagots bound together and used for fortifying ditches, building earthworks, etc.

filter closets. Fort Jefferson: opening in casemate pier where was placed apparatus to filter water conducted from terreplein to casemate cisterns.

flagging. Pavement of flagstones; sometimes used to denote a single flagstone.

flagstone. Large flat paving stone; at Fort Jefferson, a "Blue Stone Flagging," about six inches thick.

front. Fort Jefferson: designation of a side of the hexagonal figure; curtain. The sides of the hexagon are numbered, the angles (or bastions) lettered.

gabion. Large cylindrical bottomless basket filled with earth and used in building earthworks.

girder. Main beam in a floor.

gorge. Entrance into a bastion; usually synonymous with rear.

grillage. Arrangement of sleepers and crossbeams forming a foundation in loose or marshy soil. At Fort Jefferson, the grillage was placed under casemate and bastion piers, and extended between those elements to form the under-structure for cistern floors. See sketches showing construction of piers: text, ante.

groin. Curved arris (sharp edge) formed by the insection of vaulting surfaces.

grudgeon. Pin, wedge or pivot placed at the end of a shaft to prevent pulley from slipping.

gun circles. See traverse arc.

hot shot furnace. Furnace in which round shot was heated. Apparatus within the oven delivered the red hot balls to artillerists who by means of tongs conveyed them to muzzle loading cannon. These missiles could set a wooden vessel on fire, or wreak havoc in a magazine. They were capable of skipping upon water several times and still retaining enough heat to start a blaze.

howitzer. Short, light, large bore cannon, in which the hollow projectile could be placed by hand.

jamb. Upright side of a doorway, window, or fireplace.

joist. Horizontal timber to which boards of floor or laths of ceiling are fastened.

linstock. Pointed, forked staff, shod with iron at the foot, to hold lighted match for firing cannon.

lintel (lintle). Horizontal member spanning an opening and carrying superincumbent weight by means of its strength in resisting crosswise fracture.

loopholes. Narrow aperture for observation or defense.

lunette. Detached bastion.

magazine. Building or room in which powder and explosives are kept in a fortification or ship.

magistral. Line from which the positions of various units of the fortification are determined.

mitred. Joined on a slanting line at the corners.

moat. Deep ditch around a fort, usually containing water.

mortised. Joined (as timbers) by putting a projecting part into a hole made to fit.

pan-coupé. Fort Jefferson: cant-wise slope of wall or skirt on parapet below mouth of gun to deflect shell fire.

parade. Courtyard or enclosure in fortification where troops are drilled.

parapet. Wall crowning curtain to protect soldiers from enemy fire.

pediment. Triangular piece over the entablature, which fills in and supports the sloping roof.

permanent buildings. Fort Jefferson: those buildings on Garden Key designed as integral units of the fortification or for the use of its garrison.

piazza. Veranda.

pier. Fort Jefferson: mass of detached masonry, distinct from a column, from which an arch springs.

pilaster. Rectangular column or pillar, inserted partly in or attached to a wall.

pintle. Pivot about which the chassis of the gun carriage swings.

pintle stone. Stone in which pintle is set.

plinth. Lowest square member at the base of a column; projecting face at the base of a wall.

postern. Entrance (usually subterranean) beneath the parapet and through the rampart of a fortification. Fort Jefferson: term that engineers used as synonymous with sally port or entrance.

primage. Small sum of money paid to a shipowner in addition to payment for carrying goods, as for the care of the goods.

purlin. Horizontal beam in a roof resting on the principal rafters and supporting the common rafters and roof covering.

quarters. Lodging; at Fort Jefferson, usually dwelling place for officers.

quoin. Term applied to corner stone at angle of building; hence, the angle itself. Also; support at breech of cannon.

rampart. Broad embankment round a place, upon which the parapet is raised.

ravelin. Detached work with two embankments which make a salient angle. It is raised before the curtain on the counterscarp of the fortification.

recess. Niche or hollow in the wall.

reference. Fort Jefferson: established level or elevation; engineers used the mean low water level as elevation (or reference) zero, and made their computations of height upon that basis. A point five feet below low water level was at reference minus five feet; ten feet above low water was similarly designated as at reference ten feet.

revetment. Facing of wood, stone, or any other material, to sustain an embankment when it receives a slope steeper than the natural slope; also a retaining wall.

riser. Upright part of a step.

rusticated. With reference to stonework, made with grooved joints or roughened surface.

salient. Projection.

sally port. Gate in a fortification, through which besieged troops might rush forth. See postern.

scarp. Slope of the protecting ditch or moat which touches the wall or parapet; inner slope of the protecting ditch at the foot of the parapet, nearly perpendicular.

segmental arch. Arch, the curve of which forms less than half a circle. This type of low arch the engineers usually referred to as "flat"; technically speaking, the soffit of a flat or straight arch is on the same level with its skewbacks--it is horizontal.

semi-circular arch. Arch, the curve of which forms a half circle. Sometimes called round arch.

shoal. Fort Jefferson: shallows about Garden Key.

skewback. In masonry, a stone block, steel plate, or the like, having a sloping face against which an end of the arch rests.

soffit. Ceiling or under surface.

subsidence. Sinking or settling.

surbase. Moulding around the top of a pedestal or where the wall of a masonry building rests on its foundation; interior; moulding or chair rail along the top of a wainscot or baseboard.

temporary buildings. Fort Jefferson: structures on Garden Key erected for use of the workmen, and to be demolished as the permanent units replaced their utility.

terreplein. Main upper level of a rampart, where guns, shielded by a parapet, are mounted; roof of the fort.

tiebeam. Beam which acts as a tie in connecting the lower ends of rafters.

transom. Piece of wood or iron connecting the checks of some gun carriages.

traverse arc. Arc of part of a circle described by movement of gun carriage about the pintle or center point; the stone support and iron track upon which the gun carriage rolls to turn the gun right or left. By traversing the arc, the gun thus commands a horizontal range of about ninety degrees. Traverse arcs were laid in casemates and terreplein fronts.

traverse circles. The complete circle described by movement of gun carriage about the pintle or center point; the stone support and iron track upon which the gun carriage rolls to turn the gun right or left. By traversing the circle, the gun thus commands a horizontal range of three hundred sixty degrees. Traverse circles were laid on the bastion terreplein, Cf. traverse arc.

traverse iron. Iron track embedded in the traverse stone, and forming an arc upon which the wheels of the gun carriage roll.

traverse magazine. Fort Jefferson: magazine built athwart the terreplein.

traverse stone. Fort Jefferson: granite stone cut in the form of a small segment of a circle, so that with its mates it comprised the traverse arch.

tremie. Caisson-like device for laying concrete under water. The tremie used at Fort Jefferson was in the general shape of a truncated pyramid, the base of which rested on the sea bottom, and defined the limits of the mortar bed. Mortar was lowered through the upper opening of the apparatus, spread evenly on the bed, and rammed. Unlike a caisson, the tremie was not waterproof, and the experimental blocks laid at Fort Jefferson by that method were comparatively soft and porous.

triangular arch. So-called arch, the sides of which are straight and meet in a peak.

Venetian blind. Window shade or blind made of horizontal slats of wood on cords, turnable so as to admit or exclude light and air.

vault. Arched roof.

voussoirs. Truncated, wedge-shaped blocks forming an arch.

wainscot. Paneled wooden lining on walls.

water table. Projecting course of masonry or moulding to throw water away from a wall.

zero level. Fort Jefferson: mean low water level; see reference.

PART II

The U.S. Naval Coal Depot, Dry Tortugas Fla., 1898-1916

Fort Jefferson National Monument, Fla.

by

Charles W. Snell

The Navy at Fort Jefferson, Dry Tortugas, Florida, 1898-1916

1. A Change in Jurisdiction at Fort Jefferson, 1898-1900

On August 9, 1898, the Bureau of Equipment, U.S. Navy, suggested that the War Department be asked to transfer Fort Jefferson, Dry Tortugas, to the Navy and that the post be made a part of the Naval Station, Key West, Florida.[1] The War Department responded on October 1, 1898, reporting that the Treasury Department, which was using Fort Jefferson as a quarantine station, declined to accede to the request for the transfer of the post to the Navy. The Secretary of the Navy referred the question to the Judge Advocate General, "for the necessary action, with a view to securing from the Treasury Department, if possible the transfer of Fort Jefferson to the Navy Department; and from the Department of Justice such measures as will insure the preservation of the peace and prevent such disturbances at Dry Tortugas as are complained of by the Inspector in charge of the work now in progress at that place, in his report dated September 21st. . ."[2]

The question was resolved in favor of the Navy. By direction of the President, the military reservation of Dry Tortugas, including Fort Jefferson, was formally transferred by the War Department to the Navy Department on April 7, 1900.[3] As a part of the resolution of this dispute, the Treasury Department was allowed to retain its quarantine hospital at Fort Jefferson from 1899 to November 15, 1900.[4]

On December 21, 1900, the Naval Reservation of Dry Tortugas, including Fort Jefferson, officially became a part of the Naval Station, Key West, Florida, under the command of the Commanding Officer at Key West.[5]

Construction work executed at Fort Jefferson during the period August 1898 to July 1900 was supervised by the Navy Bureau of Yards and Docks, which also held jurisdiction over the Naval Reservation. With this work largely completed, the Navy Department formally placed the Dry Tortugas Reservation under the charge of the Navy Bureau of Equipment, as a Naval Coal Depot on July 11, 1901.[6]

---

1. National Archives, Washington, D.C., Record Group 80-file 6011/3. 1st Endorsement.

2. R.G. 80-file 6011/4, 4th Endorsement (underlining added).

3. R.G. 80-file 6538/46, Chief of Bureau of Equipment to the Secretary of the Navy, June 21, 1902.

4. R.G. 71-Entry 10, General Correspondence, Bureau of Yards and Docks, file 7854, July 2, 1900; file 7854/4, November 13, 1900, Chief Bureau of Yards and Docks to Superintendent of Improvements, Dry Tortugas, RG. 80-file 6538-48, Aug. 24, 1902 - 6th endorsement.

5. R.G. 71-Entry 10, file 7854/5.

6. R.G. 71-Entry 10, file 7854/10-Endorsement of Sec. of Navy, July 11, 1901; also R.G. 80-file 6538/46-June 21, 1902.

During the period 1901 to 1916, the Naval Coal Depot at Dry Tortugas and Fort Jefferson were under the charge of the Commanding Officer, Naval Station, Key West, and of the Bureau of Equipment, Navy Department, Washington, D.C.

2. Constructing a Naval Coal Depot, 1898-1901

In 1886, the Chief of Engineers had described Fort Jefferson, Garden Key, Tortugas, Florida, as follows:

> This casemated work, commenced in 1846, perfectly commands the admirable harbor lying in the heart of this group of keys.
>
> The wharf is utterly decayed, and is so far gone that it would be unsafe to roll a barrel of powder over it. . . .
>
> The quarters are suffering from neglect, and the unfinished barracks should be completed.

The post was under the charge of an ordnance-sergeant.[7] Because Fort Jefferson was obsolete, the War Department neither asked for nor spent funds for new construction at Fort Jefferson from 1876 to 1900, when the reservation was transferred to the Navy Department.

All detailed records relating to the Bureau of Yards and Docks' construction of the Dry Tortugas Coaling Depot, including the Superintendent of Construction's monthly and weekly reports, photographs taken illustrating the progress of construction, fiscal records, estimates, specifications for the piers and coal sheds, and the contracts with the builders for construction, machinery, and dredging, were destroyed by the Bureau of Yards and Docks in a record disposal program. The following account of construction is therefore based on general records and also an index to the destroyed correspondence that has survived.[8]

Evidence already cited indicates that construction on the Dry Tortugas Naval Coal Depot got underway in August 1898.[9] The work was done by contract, with the Union Bridge Company and the Brown Hoisting and Conveyer Machine Company being the prime contractors.[10] The Bureau of Yards and Docks had a

---

7. Annual Report of the Chief of Engineers to the Secretary of War for the Fiscal Year Ending June 30, 1886 (Washington, D.C., 1886), Serial No. 2462, pp. 39-40.

8. Record Group 71, Entry 10, correspond file No. 5204, 5403, 5528, 5711, 5713, 5714, 5834, 5897, 5976, 6030, 6067, 6192, 6276, 6381, 6379, 6348, 6384, 6532, 6806, 6899, 7382, 7346, 7725, 8352, for period 1899-1901 no longer exist.

9. See page 1 and footnotes No. 1 and 2.

10. R.G. 71, Entry 10, file No. 7854/9-dated March 21, 1901.

Superintendent of Construction at Fort Jefferson to oversee the work of the contractors. Work continued from August 1898 to about March 1899 and then was suspended because of the quarantine season.[11]

Work was resumed in June 1899 and continued until January 1900, when it was again suspended because of the quarantine season.[12] Construction began again in May 1900 and continued until the end of January 1901.[13]

The coal sheds, piers, and hoisting apparatus for loading the coal having been completed, the Dry Tortugas Coal Depot was turned over to the Navy Bureau of Equipment for operation on July 11, 1901,[14] as has been noted.

Additional dredging of the Dry Tortugas Channel was accomplished under contract in 1904.[15] The total amount of money expended by the Navy Department for physical improvements at the Dry Tortugas Coal Depot, August 1898 to March 9, 1906, came to $1,043,307. The money was spent:

A. By Bureau of Yards and Docks

Dredging (Contracts 693, 897, and 1220)	$318,624
Coal handling machinery (Contract No. 694)	96,410
Coal Sheds, two, piers, and channel beacons, (Contracts No. 695 and 994)	479,340
Building for Condenser Plant, Stand Pipe and Cistern (Contract No. 762)	24,600
TOTAL:	$918,974.

---

11. R.G. 71, Entry 10, File 7854, April 18, 1899.

12. R.G. 71, Entry 14, card index to destroyed Entry 10 correspondence, for weekly and monthly reports established this pattern of work. See files 5204, 5403, 5528, 5713, 5714, 5834, 5976, 6030, 6067, 6192, 6276, 6381, 6348, 6384, covering period June 1899 to Jan. 1900.

13. R.G. 71, Entry 14, card index to monthly and weekly reports of Superintendent of Construction.

14. R.G. 71, Entry 10, file 7854/10.

15. R.G. 80, file 6538/52. Inspection report of Commanding Officer, U.S. Naval Station, Key West, August 25, 1904.

B. Expenditures by Bureau of Equipment:

For Distilling Plant to provide water for Marine Garrison	$ 32,000
Repairs to Coal Handling Machinery	15,213
Eight Dolphins	8,320
Wireless Telegraph Station and Equipment	9,000
Repairing Cable	3,000
Cleaning out moat of Fort Jefferson and running pipe line, sanitary disposal for Marine Garrison	5,000
Repairing Wharf	2,000
Repairs and Improvements to Buildings, Officers' Quarters, etc. for Marine Garrison	30,000
Repairing Quarantine Wharf	3,300
Fire Protection	2,500
Water Closets, Bath Rooms, Etc.	5,000
Permanent Moorings	9,000
TOTAL:	$124,333.

Grand Total: $1,043,307.

It was also estimated that the operating expenses of the Dry Tortugas Coal Depot, exclusive of handling coal, averaged about $8,500 per year.[16]

3. Use as Coaling Depot, 1898-March 1912

Official records of the station indicate that the following amounts of coal were delivered to Dry Tortugas:

July 1904	5,668 tons
September 1904	2,205 tons
December 1904	2,203 tons
June 1905	3,707 tons
October 1905	3,079 tons
December 1905	3,119 tons
Total to 1912	19,984 tons

16. R.G. 80, File 6538/57. Chief of Bureau of Equipment to Secretary of Navy, March 9, 1906. R.G. 71, Entry 10, file 7854/37, Chief of Bureau of Yards and Docks to Chief of Bureau of Equipment, March 9, 1906.

Besides small amounts issued at different times, the following amounts of coal were taken away, 1904-1912:

April 1906:	two cargoes totaling:	4,862 tons
May 1906:	four cargoes totaling:	9,949 tons
		14,811 tons

The balance of the coal was issued from time to time, the last 52 tons being issued to U.S.S. OSCEOLA in March 1912.[17]

4. Marines at Dry Tortugas, 1901-1906

On January 29, 1901, the Commanding Officer of the Naval Station, Key West, received instructions to place a Marine guard at the Dry Tortugas to guard the coal depot.[18] The detachment, under the command of Captain T.C. Treadwell, was at Fort Jefferson by May 13, 1901, for under the date he reported:

> The moat around the fort at this station is gradually filling up with sand and one of the openings to the sea is blocked, and about 100 feet of sand beach in front of it; and near the other opening it is very shallow and blocked at low tide. The water in the moat is so shallow, that the bottom is exposed at some places at low tide while at other the depth is about 5 feet.
>
> 2. Believe moat should be dredged to have a uniform depth of at less 4 feet at low tide, and the 2 openings to the sea cut so as to maintain this depth and continuous flow of water. . . . The sewage system opens into the moat in 3 places, and its efficiency depends on the flow of water out of the moat.[19]

George W. Brown, Assistant Superintendent of Improvements at the Key West Naval Station was directed to study the problem and prepare estimates of the cost of correcting the situation. Brown submitted his report and an estimate of $4,500 on June 24, 1901.[20] The project was approved by the Chief of the Bureau of Equipment on July 9, 1901, and, as has been noted, $5,000 was expended to clean out the moat and to run a pipe line at Fort Jefferson.[21]

On October 30, 1901, a board of survey reported on the need for repair "on roofs and piazza at Marine Barracks, Fort Jefferson."[22]

---

17. R.G. 71, Entry 10, File 7854/47. U.S. Naval Station, Key West, Florida, memo, March 12, 1912.

18. R.G. 71, Entry 10, file 7854/6.

19. R.G. 71, Entry 10, File 7854/16.

20. R.G. 71, Entry 10, File 7854/16, 10th endorsement. Brown's detailed report and estimate on the moat will be found in Appendix 1.

21. R.G. 71, file 7854/16, 11th endorsement; see fn 16, page 5.

22. R.G. 71, Entry 10, file 7854/20.

23. R.G. 71, Entry 10, file 7854/21. The specifications for the work are not in the files.

On June 14, 1902, the Bureau of Yards and Docks directed George W. Brown to assist the Bureau of Equipment by preparing the specifications necessary to repair the roof of the officers' quarters and other buildings at Fort Jefferson. Brown was also to supervise the work.[23]

As has been noted, a total of $30,000 was expended in the period 1901-1906 for the repair and improvement of barracks and officers' quarters at Fort Jefferson.

Although the War Department had turned Fort Jefferson over to the Navy Department on April 7, 1900, Captain A.B.H. Lillie, Commanding Officer, U.S. Naval Station, Key West, informed the Secretary of Navy on February 12, 1902, that the Army still had an ordnance-sergeant on duty at Fort Jefferson. Lillie reported, "All the ordnance material which he had care of has been sold by the government and removed by the contractor with the exception of 11 guns (8 24-pdrs, 1 6-pdr, and 1 24-pdr and 1 10-pdr mortars) and six wooden gun carriages, which, I understand, have been donated to various patriotic societies. . . ." He requested that the ordnance-sergeant be withdrawn "as the house which he and his family occupies is needed for use of the marine garrison or a hospital or put to some other use."[24]

The letter opened a long series of exchanges between the Secretaries of the Army and Navy in which the War Department endeavored to have the Navy pick up the guns in a vessel and deliver them to the New York Arsenal, Governors Island, New York Harbor, and the Navy Department offered to provide a vessel to carry the ordnance from the Dry Tortugas to Fort Taylor, Florida. On April 26, 1902, the Secretary of the Navy ordered the guns transported from Fort Jefferson to Fort Taylor.[25] On June 4, 1902, Captain Lillie reported to the Secretary of the Navy that the guns had been moved from Fort Jefferson to Fort Taylor, but complained that the ordnance-sergeant was still at Fort Jefferson, as the soldier had not yet received orders to leave his post. This letter was also sent to the Secretary of War and as there is no further mention of the problem, it appears that the last army personnel left Fort Jefferson in June 1902.[26]

---

23. R.G. 71, Entry 10, file 7854/21. The specifications for the work are not in the files.

24. R.G. 80, File 6538/31-2.

25. R.G. 80, File 6538/31-3, 4, 44.

26. R.G. 80, File 6538/45.

In the spring of 1902, the Bureau of Equipment completed a distilling plant to provide water for the Marine garrison at a cost of $32,000.[27]

On August 23, 1904, the Commanding Officer of the U.S. Naval Station, Key West, inspected the Dry Tortugas Coal Depot and reported to the Secretary of the Navy on August 25 (in part):

> 2. The dredging of the Tortugas channel, and survey of the same, are being conducted under the superintendence of Mr. Geo. W. Brown, Assistant Superintendent of Improvements. The bad condition of the dredging machine used by the contractors causes frequent delays, and the survey has been made only in a small section, high winds interfering with its progress during the past few days.
>
> 3. The general appearance of Fort Jefferson is good, though somewhat dilapidated; but the spacious quarters, still habitable, afford good accommodations for the officers, marines and employees at Garden Key. If it is contemplated to maintain and increase the present establishment, repairs and alterations to a considerable extent would be required, as specified in the report of Mr. Brown, No. 71, for the month of July, 1904.
>
> 4. The health of the personnel at Tortugas seems excellent. The almost complete isolation of this Station, on a coral rock, sixty miles from Key West, on which it depends for all supplies--makes it an object deserving special consideration and care in regard to the health and comfort of those who are stationed there.
>
> 5. The quarters and grounds are neat and clean. The marines present a soldierly appearance, and they seem contented. I think credit is due to their Commanding Officer, First Lieutenant Eli T. Fryer, U.S.M.C., for the discretion he shows under somewhat trying conditions.
>
> 6. The coaling sheds are in good order and condition, excepting the hoisting machine wrecked on April 30, 1904. It has been secured to prevent further damage, and preparatory steps have been taken for its repair, but no material has yet arrived. The paint on the sheds seems good, but timely precautions must be taken or deterioration may be expected.
>
> 7. The distilling plant is in good condition, inside and out. It is only used sufficiently to test the efficiency of the machinery and boilers, there being a good supply of water on hand.
>
> 8. The instruments of the wireless telegraphy plant are neat and in good order. The batteries are well charged, and the voltage of individual cells not less than 2.1.

---

27. R.G. 80, File 6538/41, February 4, 1902, and 8th endorsement by Secretary of Navy, Feb. 8, 1902.

With regards to needed improvements, Captain George A. Bicknell recommended:

> (c) An electric light and power plant, sufficient to light all beacons, the Barracks, the Quarters, the Fort, the coal sheds, the piers and the distilling plant, and also to furnish power for an ice making and cold storage plant, and a surplus of power.
>
> (d) The installation of a supply service and tanks in the third floor of the Officers' Quarters, with the necessary pipes and drainage to supply water from the standpipe and from the cisterns in the Fort, by a windmill and pumps, with at least eight bath-room sets, consisting of a bath-tub, lavatory and closet each.
>
> (e) A change from the use of latrines for the Barracks to water closets flushed by salt water.[28]

On July 1, 1905, the marine garrison at the Dry Tortugas was reduced to "a Sergeant's guard."[29]

In March 1906, the House Committee on Interstate and Foreign commerce considered a bill that would transfer the Dry Tortugas from the Navy Department to the Treasury Department for use as a quarantine station. Asked by the Secretary of the Navy to comment on the proposal, the Chief of the Bureau replied in part:

> 2. The Bureau recommends that the Dry Tortugas be turned over to the Treasury Department for a quarantine station as proposed. . . .
>
> 4. If this place is turned over to the Treasury Department the Bureau recommends that it be under such conditions as the Secretary of the Navy and the Secretary of the Treasury may agree upon, and that one of these conditions be that the Navy Department may have a reasonable length of time to vacate the place and/or remove therefrom such improvements as can be moved at a moderate cost and can be utilized to good advantage at other stations. . . .[30]

On March 28, 1906, when the Commanding Officer of the Marines at the Key West Naval Base requested permission to withdraw the Marine detachment from the Dry Tortugas on March 31, the Secretary of the Navy informed him that the "entire marine guard will not be withdrawn from Dry Tortugas until such time as the station may be entirely transferred to the Treasury Department."[31]

---

28. R.G. 80, File 6538/52.

29. R.G. 80, File 6538/55. Annual Inspection Report, June 8, 1905.

30. R.G. 80, File 6538/56. March 6, 1906. Also File 6538/61, April 6, 1906. This was HR 14316.

31. R.G. 80, File 6538/58.

Nevertheless, in early April, the Navy Department granted the Chief of the Bureau of Equipment authority to remove the distilling plant at the U.S. Naval Coal Depot, Dry Tortugas, to the U.S. Coal Depot, Guantanamo, Cuba.[32] The departure of this water-making plant must have been accompanied by the removal of the last of the marine garrison shortly thereafter.

The bill to transfer jurisdiction was still being considered in June 1906, but failed to pass Congress as there is no further reference to the proposal in the files.[33]

The Navy, however, appears to have withdrawn all personnel except for two laborers to maintain the coal plants from Fort Jefferson and the Dry Tortugas Naval Coal Depot by June 1906.

5. The Naval Coal Depot, 1907-1916

On March 24 and 25, 1909, a Board appointed by the Commanding Officer of the U.S. Naval Station at Key West, inspected the government property at Dry Tortugas, particularly the coaling plant, and rendered the following report:

> The machinery and boiler of the coal handling plant were found to be in good condition as far as could be determined. . . . The conveyor supports and bridges are in good condition except that the smoke pipes, hoppers and coal chutes need cleaning and painting, the machinery houses need painting and broken glass in the windows of machinery houses should be replaced. The galvanized steel roofs and gables of the coal sheds should be repainted. Iron ladders to same need cleaning and painting. Valley and wooden walks of sheds need repairs. The north end and about two-thirds of the east side of the north shed is badly rusted and should be cleaned and painted without delay. The same is true of the southwest end and about three-fifths of southeast side of the south shed. (Each shed was about 50 feet wide and 200 feet long.)[34] The piers are in fair condition except that approaches need some minor repairs and three lower string pieces are missing from south pier. Fender piles in front of piers are considerably worm-eaten. For two years or more only two laborers have been employed for the maintenance of the plant and it is manifestly impossible to keep it in proper condition with this force. The sheds are now rapidly deteriorating and unless repairs be made they will soon become unserviceable. The wireless mast needs painting and rigging should be tarred and set up. All buildings inside the fort are in fair condition. . . .

---

32. R.G. 80, File 6538/60.

33. R.G. 80, File 6538/61. Report on Status of Bill, Dated June 14, 1906.

34. R.G. 71, Entry 10, File 7854/56.

4. The only tank now at Dry Tortugas is a small one of steel 8 feet diameter by 8 feet high, capacity 3000 gallons. It is in good condition. There is a concrete cistern outside the fort, capacity 26,000 gallons, now about half full, condition good except that a new roof is needed. Inside the fort there is a cistern in good condition with a capacity of 92,000 gallons now full. There is also a series of cisterns under the casemates, about 140 in all, each with a capacity of about 15,000 gallons. Most of these are in poor condition and contain brackish water. In about 47 of these cisterns however the water is pure. There is, therefore, at present about 810,000 gallons of fresh water at Dry Tortugas and this quantity could probably be considerably increased at a comparatively small expense by repairing the defective cisterns under the casemates.

5. There are at present no facilities for supplying vessels with fresh water at Dry Tortugas nor is there any way of pumping water for the coal handling machines. There is a small boiler and pump for this purpose but the boiler is in bad condition, the pump is unsuitable and it has never been possible to deliver water with the outfit. . . .

6. There are now no facilities for extinguishing fires in the coal sheds, except by drawing off the coal. It is recommended that before these sheds are again filled with coal suitable fire pumps be mounted on each conveyor with lines of pipe and hose connections on the bridges.

Finally, the Board recommended:

The re-establishment of the wireless station at Dry Tortugas. The large amount of Government property at this place, the possibility of accidents to or sickness of people in the Government service and the frequent wrecks in this vicinity render some method of communication most necessary. The expense of maintaining a station at this point is small and excellent results are obtained with small installation on account of the freedom from outside disturbances.[35]

Before the Navy Department took any action, Nature intervened. On October 17, 1910, a killer hurricane struck the Dry Tortugas and badly damaged the coaling depot. George C. Short, Mate, U.S. Navy, reported from the Dry Tortugas:

---

35. R.G. 80, File 6538/63.

I am sorry to inform that Tortugas is a wreck. Both coal rigs down and in falling smashed sheds and shifting bridge. North breakwater completely destroyed. South breakwater about half destroyed. Officers quarters; a great number of slates and chimneys gone, one at each end. Barracks entirely stripped of tin and some of sheathing; windows missing. Gutters of all buildings nearly gone. Sheds on entrance of wharf from Fort, down. Blacksmith shop broken up. Approach to North dock gone. Weather Bureau tower wrecked and twisted up, and lying inside of fort. All water on island ruined. Parade ground flooded. Launch sunk in 18 ft. water sandy bottom. . . .[36]

On October 28, 1910, F.C. Brown, Sub-Inspector, U.S.N., submitted a detailed report on the damage at the Dry Tortugas Naval Coal Depot. He reported in part (the full report is in Appendix 2):

COAL CONVEYORS, GENERAL.

The dolphins of both piers appear to have been uninjured by the storm, both are more or less worm eaten and decayed. The jetty at the north pier is entirely gone, and the beach has been washed back towards the shed. At the south pier, the jetty wall still stands, but is broken in several places. Seven outside fenders of the south pier are missing. The approach to the north pier is washed away. The piers themselves, except for things before noted, are in excellent condition. Taken altogether, it is estimated that to repair the coal conveyors in place will require 50 per cent of their cost (or about $48,000); but if removed elsewhere, at 35 per cent aside from the cost of taking them down, transporting, and erecting them.

COAL SHEDS PROPER.

These have been damaged in hatches and walks where the coal conveyors fell across them. Estimated cost of repairs, $500.00.

QUARANTINE PIER.

The deck seems to be in good condition. Many of the diagonal ties beneath are broken or corroded away. A steel pile at the north end is missing. The fenders along the face are worm eaten, and half worm in to, and some are broken off below the water surface. All should be renewed. The building on this pier needs but slight repairs. The approach awning is down, as is also the boat house.

---

36. R.G. 80, 23084, 10. Short was on the Navy Tug Massasoit. Living there were a lighthouse keeper and two laborers. The storm panes of the Tortugas light were broken and the light was not lighted on October 18.

OTHER BUILDINGS OUTSIDE THE FORT.

Pump House roof is partly gone. Blow off pipe from boiler is broken. Boiler hood and stack are off. The blacksmith shop is down, is not worth repairing. The storage shed is in apparent good order.

BUILDINGS WITHIN THE FORT.

Barracks. All the metal roof covering is gone. This is of zinc, which should be saved. Pieces blew over the parapet into the moat beyond.

Officers' Quarters. The two gable chimneys are gone. Some slate are gone from the south end.

Cottages. Leaked badly. Slight repairs needed.

The Weather Bureau signal tower is a twisted mass of wreckage, and lies in the parade. The signal lanterns are apparently uninjured except for the breaking of the chimneys.

CISTERNS.

The water in the 92,000 gallon cistern appears to be sweet, as is also that in the 48,000 gallon cistern outside the moat near the south coal shed. The 4" pipe leading from the pump house to quarantine pier is broken, and should be repaired as soon as possible. Were a proper outfit of tools provided, slight repairs such as these would be made at once on their occurrence, without the necessity for the delay in transferring men and tools from Key West.

BRIDGES OVER SPILLWAYS OF MOAT.

Both these are down, that at the rear of the fort entirely, that near the Quarantine Pier, partially.

SAND IN THE MOAT.

On the north side of the fort near the bridge at the northwest bastion, the moat has been filled with drifted in sand a couple feet or so above the water, which circulates through a small channel left next to the fort wall. On the opposite side of the fort, considerable sand has washed into the moat, but not to the same extent as on the north side.[37]

---

37. R.G. 80, File 6538/46. Same report also in R.G. 71, File 8587/72.

On March 25, 1911, Civil Engineer F.O. Maxson, U.S.N., in company with Lt. Col. Edward Burr, Corps of Engineers, U.S.A., inspected Fort Jefferson. Engineer Maxson reported on April 10, 1911:

> 2. Nothing is being done to the fort or its buildings to prevent deterioration from decay, and weather, save in a few rooms occupied by Mate Short, U.S.N., and those dependent upon his living there, the Light-house keeper, and the employees engaged in the care of the coaling plants, wharves and buildings. In consequence woodwork generally is decaying and falling away, giving entrance to the weather which in turn is washing down banks and fills, causing plastering to fall and rusting metal work, and the like so that there is now a constant retrogression in the condition of the Fort and everything attached to it. The hurricane of October 14-17th, 1910, has hastened this action by the blowing down of protection which otherwise might have remained for years, the tearing off of roofs, as of the barracks for enlisted men, the overturn of chimneys, as of the Officers' Quarters, and the breaking of sash and glass, so that the interior of buildings stands open to the weather. The damage done is scarcely to be estimated as it is the result of years of disuse and neglect, the failure to repair when deterioration was first noted, and more recently, of a lack of funds which has precluded any attempt at restoration of the Fort and its appurtenances in general, and the limited care and repairs only of the coaling plants and accessories and of these to a very small amount. . . .
>
> 4. The coaling conveyors are losing value every day they are left in their present condition. If taken in hand soon the machinery of all four can probably be put in good order. The bridges are badly injured. With proper facilities much could be salvaged, but it is doubtful if it would not be cheaper to replace than to repair. A rough estimate of placing the four conveyors in order is 50% of the original value, probably $45,000.00. The coal sheds are comparatively uninjured, repairs could probably be made for $2000.00. Attention is invited to the accompanying photographs as showing how complete was the wreckage of the conveyors by the storm of last October.
>
> 5. The new company barracks, never completed, but occupied more or less by troops since it was practically finished was unroofed in the storm and a number of sash and panes of glass blown out of their frames or sash. In its present condition the building, already showing evidence of slight settlement of foundations in cracks at either end, is exposed to the weather so that it will rapidly deteriorate. If it is to be maintained it should be repaired and put in good order, if not, it might be taken down and its material used elsewhere.

6. The Officers' Quarters are gradually losing their woodwork, all that of front and rear porches being practically decayed. The interiors are badly in need of repairs. Some slate are gone, chimneys down, etc. Some little time since a force of men was sent from this Station to Dry Tortugas and a lot of water pipe, no longer in use or usable there was dug up and taken apart ready for shipment here. There is considerable more of this pipe to be thus salvaged. The conductors and down spouts of the coal sheds, no longer of any use at Tortugas should be taken down for use in repairs to the coal sheds at this Station. The portable track, a number of cars, a lot of timber, several thousand pounds of nails, doors, steel of various sizes and various other items, of no value there but valuable here, should be brought to this place. There are two fine swing derrick cranes, one at least of which might be installed here.

7. If it is the intention to retain Dry Tortugas in shape for instant accommodation of a large force of men, repairs to that end should be estimated for carefully, and the work be done as quickly as funds can be provided. If on the other hand it is the intention to abandon the place save for a wireless station and a light-house, such material as can be secured there should be brought here and used, saving deterioration.

8. Thirteen photographs accompany this report. They show better than description, the havoc wrought by the storm. The subjects and location are noted on the back of each.[38]

On May 11, 1911, the Secretary of the Navy informed the Bureau of Yards and Docks, "It is not desired to rehabilitate the plant at Tortugas." On May 22, the Secretary directed the Bureau of Supplies to "issue the necessary instructions to transfer such of the other material [at Dry Tortugas] to other Stations as is recommended."[39]

Finally, on June 7, 1911, the Navy Department ordered the Bureau of Yards and Docks to transfer the material at Dry Tortugas to the Key West Naval Station.[40]

---

38. Record Group 80, File 6538/46.

39. R.G. 80, File 6538/68.

40. R.G. 71, File 7854/46.

Fort Jefferson's problems were not yet over. After having been damaged by wind and water in October 1910, the fort was struck by fire on January 5, 1912. George C. Short, Mate, U.S.N. and the Custodian at the Dry Tortugas, was again the bearer of bad tidings, reporting on January 10:

> 1. I have to report that fire was discovered, at about 2:00 a.m., January 5th, 1912, in the lighthouse reservation, by the keeper. It was blowing a hard gale from the Northwest. All the keeper's dwelling and outhouses went up like tinder; in one hour everything was destroyed. The sashes in Southeast room in Marine barracks caught fire and fell inside, igniting the flooring and it burned until 10:00 a.m., when it burned itself out, with the exception of a small smouldering fire on a moulding at the gable end. At 3:30 p.m., the fire started afresh, and in ten minutes the gable end of the roof was in flames and the upper floors were going. At 10:00 p.m., the building was completely destroyed. At 4:00 p.m., I signalled to five smacks at anchor at Bird Key for assistance, and fourteen men came on shore; and through their help, we checked the grass fire which was working towards the officers' quarters. The sparks from the keeper's dwelling swept through the sally-port and caught one of the string pieces on fire, which was extinguished, and the moat bridge was wet down to prevent further ignition.
>
> 2. The origin of the fire is unknown.
>
> 3. Mr. Felton deserves great credit for his excellent work, as, at the time of the fire, I was suffering from a very severe cold, and went to my bed at 6:00 p.m., the night of the fire, and when Mr. Felton called me at 2:15 a.m., I had a high fever, but am getting better.
>
> 4. At 1:30 a.m., the 6th, the fire was still burning on lower floor of Marine barracks, but at this report is entirely out.[41]

A board made a detailed report on the fire on January 19, 1912 (see Appendix No. 3). They found that the fire was first noticed in the out-door toilet of the Lighthouse's dwelling about 2:30 a.m., January 5, 1912. Its cause was unknown. "From the first it was beyond control," they reported, "and after involving all the out-buildings, spread to the dwelling itself." The wind was strong from the northwest, and as the fire increased, the dry

---

41. R.G. 80, File 6538/69.

grass and small growth on the top of "the parapet of the fort ignited. Either through cinders over the parapet, or as thought more likely, by those blown through the sally port, which was in line of the wind, the bridge over the moat caught fire, but never to any great extent, though the fire smouldered for several hours before it was finally extinguished."

> 3. Owing to the construction of the fort, the strong northwest wind produced eddies in the angle of the casemates, and these carried burning cinders toward the marine barracks which stood nearly in the direction from which the wind was blowing. The galvanized roof of this building had been torn off in the hurricane of October 17th, 1910, leaving the wooden roof/sheathing exposed. Apparently this, dry as tinder from its age and long exposure, readily inflamed, fire being noticed first in the south end about 4:30 a.m. Efforts were made to put it out, but without success, it being hidden in the space between the roof covering and the ceiling of the rooms below. Through this space it crept until about 3:30 p.m., when it burst through the roofs of the three south sections. After this there was no hope, without fire apparatus, to save the building. The fire spread rapidly to the stories below, and advanced along the barracks, which were all burning together until 10:30 p.m., when the roof fell in and to some extent smothered the flames. Practically the entire building was gutted. . . .

In conclusion, they noted:

> 8. Nothing definite could be ascertained as to the origin of the fire except that it was discovered in the toilet of the Lighthouse keeper's dwelling about 2:30 a.m. As this toilet was detached, was used only for toilet purposes, and was visited by the Lighthouse keeper himself about 12 midnight, when no fire was visible, it is surmised that either he or some member of his family may have been indirectly and accidentally the cause through open candle or smoking.

Four photographs, showing the lighthouse keeper's dwelling and the Marine Barracks before and after the fire, accompanied the report.[42]

This information was submitted to the Secretary of Commerce and Labor and on February 5, 1912, the Acting Secretary informed the Secretary of the Navy--, "Arrangements have already been made for the establishment of a non-attended automatic light at this station, which will dispense with the necessity of a resident keeper."[43] Thus the Dry Tortugas lost more residents--the lighthouse keeper and his family, in 1912.

---

42. R.G. 80, File 6538/69.

43. R.G. 80, File 6538/69.

On October 31, 1912, the Secretary of the Navy informed the Chief, Bureau of Yards and Docks, "The Department has this day authorized the disposal of the coaling station at Dry Tortugas.

"2. No further money will therefore be spent on repair at this place."[44]

Assistant Secretary of the Navy Franklin D. Roosevelt, on June 24, 1913, granted the Bureau of Supplies authority to sell all of the condemned property at the Dry Tortugas, except for 10 large cannon--which had been sold by the Bureau of Ordnance before the transfer of Fort Jefferson to the Navy. The purchasers had never removed these guns, and they are still at Fort Jefferson.[45]

On November 25, 1913, Assistant Secretary Roosevelt next advised the commanding officer of the Naval Station at Key West that the sale of the condemned property at Dry Tortugas had been completed and that the Boston Iron and Metal Company was the successful bidder, with a high bid of $3,151. The estimated value of the eight items had been $3,524.50.[46]

On June 5, 1914, the winning bidder--Boston Iron and Metal Company--was reported to be ready to begin removing the condemned property from the Dry Tortugas.[47] The contractor removed from the island whatever he thought was worth his while and left the rest as junk. The contractor departed from Dry Tortugas on September 23, 1914. On April 21, 1915, Boston Iron and Metal Company was notified that their deposit was forfeit for non-compliance with the terms of the contract.[48]

On January 15, 1914, the Secretary of the Navy, Josephus Daniels, notified the Bureau of Yards and Docks:

> It was not intended to use Dry Tortugas as a base for any operations.
>
> 2. Torpedo and other vessels may occasionally call there, but the conditions do not warrant any expenditures for repairs.[49]

---

44. R.G. 80, File 6538/72. On June 17, 1912, the Bureau of Yards and Docks had supplied the Secretary of the Navy with an estimate that it would cost $56,000 to place the coal plant in condition to operate at Dry Tortugas. To dismantle and put in condition for future use elsewhere would cost $121,000. The Bureau also recommended that the two piers be left in place to provide a landing for Government property, R.G. 71, Entry 10, File 7854/46.

45. R.G. 80, File 6538/73/1.

46. R.G. 80, File 6538/73/5.

47. R.G. 80, File 6538/73/7.

48. Ibid. Inspection report, dated Feb. 8, 1915, in R.G. 71, Entry 10, File 7854-52 describes the condition in which the contractor left the wreckage of the coaling plants and other items he was supposed to remove. The contractor had deposited $635.25.

49. R.G. 80, File 6538/77.

Despite this ruling, the Secretary occasionally authorized the expenditures of small sums for minor repairs. Thus in the period 1914-1916, the following repair projects were approved:

1. May 11, 1914: $ 55.00 to make repairs on the guttering and fresh water system of the Dry Tortugas Station.[50]

2. February 11, 1915: a request for funds to repair the piers at Dry Tortugas was rejected.[51]

3. September 8, 1915: the sum of $36.16 was approved to make repairs to the bridge over the moat at Fort Jefferson.[52]

The Public Works Officer's detailed inspection report, April 19, 1916, with regard to the condition of the piers and coal sheds at Dry Tortugas will be found in Appendix 4 of this report. Of the buildings, he noted:

11. ENLISTED MENS BARRACKS. These barracks were burned in 1912, and are of no further use. The brick in this building could be utilized to advantage for concrete aggregate at this Station whenever important work is undertaken. Several thousand brick have been removed from the kitchens connected to these barracks and used at the Key West Station at a cost which did not exceed $7.00 cleaned and delivered at site.

12. OFFICERS' QUARTERS.

(a) The slate roof is in good condition in general.

(b) The gutters at rear side of this structure are decayed beyond repair. Most of the downspouts are in fair condition. Rain water from this building is carried to the 92000 gallon cistern, and if a supply of rain water is to be maintained at the Fort, new gutters should be installed. It should be noted that the Custodian has ample water supply from another cistern supplied from gutters on front of these quarters, which are in good condition.

(c) Balconies are unsafe and are of no value.

(d) Interior rooms of first and second stories, south end, are in fair condition and are kept reasonably clean. The north end is of older construction and not in very good condition. The third story rooms are in delapidated condition on account of plaster having fallen, due to worm eaten lath and leaks previous to replacement of present roof. This condition has existed for years. The building in general shows that it is cared for.

---

50. R.G. 80, File 6538/78.

51. R.G. 80, File 6538/80.

52. R.G. 80, File 6538/80/1. Also in R.G. 71, Entry 10, File 7854/50/1.

13. Kitchens at rear of Officers' Quarters are not in good condition on account of leaking roofs and general old age.

14. SMALL QUARTERS.

(a) No. 13 is a two story brick building 31'-6" front by 20'-3" end, a lean to kitchen at rear 31'-6" by 11'-0", all wood construction. Main house is covered with slate. The roof is old and leaks in many places. Roof of kitchen is wood shingles, and leaks. This building is occupied by the Custodian and his family. Porch is decayed, and for comfort of occupant should be renewed and roofs repaired.

(b) Nos. 14 and 15 are small structures not worth attention. They are of brick but in very poor condition.

In conclusion, he wrote:

17. SUMMARY. No estimates for repairs have been made, because no funds are allotted for Dry Tortugas. Should the Department favor such repairs as suggested for safety, and comfort of the Custodian, estimates will be submitted. The inspection was casual, made from 5 P.M., April 15th to 7 A.M., April 16th, but all essential points are believed to have been covered. The Custodian appears to have done his duty, and to have made such repairs as are within his limited capacity, without additional help. The moat bridge was repaired during the year by men sent from this Station. Similar absolutely necessary repairs must be done in like manner as the necessity may arise. [53]

On June 3, 1916, the Commanding Officer of the U.S. Naval Station, Key West, wrote to the Bureau of Yards and Docks concerning a proposed project to salvage brick from Fort Jefferson, writing:

1. It has been estimated that there are one million brick in Marine Barracks, Fort Jefferson. There are about another million brick in the magazines and old buildings within the Fort enclosure. This does not include officers' quarters which should not be demolished as long as the place is inhabited.

2. The Fort proper contains many million of brick, great quantities of blue stone, paving squares, and granite blocks.

---

53. R.G. 71-Entry 10-File 7854-53.

3. In 1914 this Station salvaged 35,000 brick from the old kitchens at rear of Marine Barracks, and used them to erect a boiler at the central power plant. The cost to collect and load these brick on a barge was $3.07 per thousand. To unload and clean, including delivery at site of job, $3.20, total $6.27. This work was done by a small force, and included two days pay while enroute.

4. With a well organized and equipped outfit the price could be still further reduced. There would also be economy in a good crushing plant, the brick being suitable for crushed stone for ordinary use.

5. In this vicinity a good quality of brick costs $20.00 per thousand, and crushed stone or gravel $4.00 to $5.00 per cubic yard. Native stone costs $2.50 per cubic yard. It is reasonable to estimate that the maximum cost to recover, clean, and local brick at Fort Jefferson would not exceed $4.00 per thousand, and to crush and load material (with a good plant) would not exceed 80 cents per cubic yard.[54]

After checking into the possibilities of using the old brick from the Dry Tortugas at Key West, Charleston, and Pensacola, the Chief of the Bureau of Yards and Docks reported to the Secretary of the Navy on September 15, 1916: "The brick can be used to advantage at Key West for ordinary construction work in case any projects should arise of considerable magnitude. . . ." At Charleston and Pensacola no demand for brick was found and if crushed for concrete aggregate, the cost would be more than that of broken stone. He also found that the "use of this brick at (naval) yards farther north would be impracticable, due to the high freight rates and the lower rates generally prevailing for new brick in these localities."[55] These cost figures apparently saved large quantities of old bricks from Fort Jefferson being exported from the Dry Tortugas.

In September 1916, the Public Works Officer of the Key West Naval Station submitted an estimate of the cost of removing the steel south coal shed at the Dry Tortugas to the Navy Yard at Philadelphia, were it was proposed to use the columns, trusses, and purlins for the pattern storehouse at the Philadelphia yard. The weight of the material to be removed was estimated at 400,000 pounds and the cost at $3,000.00. This plan was approved by the Commanding Officer at Key West, provided that it was clearly established that the Boston Iron and Metal Company no longer had title to material that it had purchased on November 10, 1913, but failed to remove to date.[56]

The Naval records in the National Archives at Washington, D.C., relating to the Dry Tortugas end at this point, September 1916.

---

54. Ibid. File 7854-54.

55. R.G. 71-Entry 10-7854-54.

56. R.G. 71-Entry 10-File 7854-56-1. Report dated September 19, 1916, approved by C.I., Sept. 20, 1916.

Appendix A

Assistant Superintendent George W. Brown's report of June 24, 1901 on the condition of the moat at Fort Jefferson. Record Group 71-Enry 10-File 7854/16.

Dry Tortugas, Florida,
June 24, 1901.
1,475.

Sir:-

In reference to a letter from Captain T. C. Treadwell, U.S. M. C., and endorsements thereon; including yours of the 18th inst. in which you directed me to submit an estimate of the work required, and of the cost, in deepening the moat around Fort Jefferson; and in accordance with my endorsement on above letter bearing even date, I have the honor to submit the following:-

2. The moat surrounding Fort Jefferson is 70 feet wide by 3 to 5 feet deep at low water. Its outer limit is defined by brick and concrete wall about 9 feet high, and extending 5-1/2 feet above low water. The 6 angles of the wall are rounded, and towards these concave walls, and to within 28 feet of them, project beyond the curtains the 6 bastions of the fort; each 46 feet in width. The moat wall is washed by the sea, to the west of the fort, for nearly half its length. There were originally two openings from the sea into the moat, each about 28 feet in width, to a foot or two below low water. One opening is opposite the south east bastion of the fort, or between it and the quarantine wharf, and the other is in the northwest angle of the wall. In 1898 each opening was narrowed to about half its original width; and each was fitted with a gate which immediately became inoperative. The sand coming into the eastern gate and choking the moat, that gate was closed in 1898, and has since remained closed.

3. At some unknown period, and from conditions not now apparent, sand was carried from the sea into the western opening making a shoal which now practically closes the opening at low water. But no new filling has been noticed at this point during the last three years from erosion on the north spit. The filling of the moat by sand at the eastern entrance began some 5 years ago. Early in 1898 a steam launch could enter the moat at this gate, at half tide. But since the improvements were begun by the Navy Department the filling in this vicinity has been very rapid. Now the north and south spits of Garden Key have become united across the eastern entrance into the moat, by a bank about 100 feet in width by two and a half or three feet deep above low water.

4. In the moat, opposite the eastern gate, the sand shoal extends along the wall for a distance of nearly 100 feet, practically closing the moat at low water; when the sand over about 2/3 of this space, 70 by 100 feet, is exposed to the air. Inside the western gate the sand spit is somewhat higher; extending from the moat wall to the bastion for a distance of some 70 feet on either side of the angle. At the lowest tides the connection between the sea and the moat is absolutely cut off by this shoal. Outside of the gate, the water is not more than 1-1/2 feet deep for some 400 or 600 feet, but as I mentioned above, there is no indication of filling now taking place from the outside. Opposite the south bastion and along the southwest wall some filling has taken place from sand washing over the moat wall from the sea, leaving its surface exposed at low water.

5. By reopening the eastern gate, practically as good circulation of water could be obtained with a depth of 2 or 3 feet in the moat, as with a depth of 4 or 5 feet. To have a sufficient depth so that circulation would take place freely in either direction, and to deepen the moat so that no part of the bottom would be exposed or would catch floating objects, would, it seems to me, be all that could be done to it in a sanitary line. The deepening need not be general, and no excavation need be done below 3 1/2 feet at low water.

6. To accomplish this the following work will be necessary: About 770 cubic yards of material would be removed from the moat near the eastern gate, about 870 yards from inside of the west gate, about 220 cubic yards from near the south and southwest walls and about 100 yards from outside of the western gate. To maintain an opening between the moat and the channel at the eastern gate would require a pipe. For this purpose I would recommend a double line of 36 inch cast iron culvert pipe, of bell and spigot pattern, laid through the 100 foot sand beach, and practically below low water. The inner end of the pipes would be laid into a notch blasted into the foundation of the wall, which now forms the sill of the gateway. The opening would then be closed with concrete around, under and above the pipes. The line of pipe would be 120 or 130 feet long. Its outer end would be supported above the bottom, in deep water, by three pile trestles.

7. The sand taken from the moat could be thrown over the wall, without moving it to any considerable distance, except at the western entrance, from which the sand would have to be moved some 600 feet and deposited on the south spit beyond the radius of influence of southerly winds upon those sands.

8. There are no appliances here or in this vicinity, which would be suitable for this work. The excavation could best be done by hand, at a cost not to exceed 75¢ to $1.25 per yard, depending on location. Such other work, including the pile driving, as might be necessary, could be done by hand.

9. I estimate the cost of the work as follows:

Excavation inside of moat: under pipe line, and at western entrance of moat, to 3 1/2, 3 1/2 and 2 feet, 2400 yards,	$2600.
20 tons of 36 in. cast iron pipe, at $40,	800.
6 piles, coppered, and other fittings,	300.
Concrete,	100.
Blasting,	100.
Miscellaneous material, including timber.	100.
Contingent expenses, 12 1/2%,	500.
Total expense,	$4500.

Respectfully submitted,

Geo. W. Brown,

Asst. Supt. of Impts.

The Commandant,
Naval Station, Key West, Fla.

Appendix B

Copy to accompany letter No. 772-1911-Comdt., Civil Engineer to Commandant, April 10, 1911.

U. S. NAVAL STATION,

KEY WEST, Fla.

October 28th, 1910.

Sir:-

The following report is submitted upon the condition of the coal conveyors at Dry Tortugas:-

CONVEYORS ON NORTH PIER. EAST.

The machinery in the engine room is not damaged. The frame of the engine room is slightly damaged, cost about $15.00 to repair. Gear under engine room is all right. The car wheels have about six inches of one flange broken, but this will not interfere with their use. All cable gear of both conveyors in apparently good condition. One frame on front section is bent. Both hoisting gears for aprons are injured. Thirty feet of top of aprons can be used, the balance is bent. Mast for east conveyor is bent, both legs, near center. Could be repaired by splicing. Estimated cost, $30.00. Frame that carries apron at outboard end of bridge is out of shape slightly, and can be repaired for $75.00. Four legs of frame to top of house are in fair condition; the balance are all bent. Ladders can be repaired at an expense of $15.00 to $20.00. Scale house has lost glass in windows and doors, the balance is uninjured. Scale is not injured, so far as can be seen. Back braces for the derrick are slightly bent; can be repaired for $10.00. Coal hopper can be used as it is, but can be repaired for $5.00. Operator's house is in good condition except for glass missing, and one door. Operating gear seems to be all right. Rods can be straightened and used for $15.00. Small lattice strut that carries sheaves that raise the apron is uninjured in both conveyors. Twelve sections of the top walk are all right. The double channel cross struts supporting track are in good condition except three or four. The top chord is mostly good; the rods are bent in places. Thirteen or fourteen pieces of bridge chord are not bent; the rest are injured. Sag carrier is all right. Perhaps twelve channels of track can be used. Over half of the brace rods in bottom chord are bent and twisted. Top chord towers over back legs are all right. Rear legs of A frame and gear-strut are all right to the second cross frame; the balance is bent all out of shape except the head, which is uninjured. Gears and wheels at the bottom of the A frame are in good condition. Track clamps are usable, but broken. On the other or frost end, two are broken. Steam exhaust and stack are sundered at bridge. These conveyors fell towards

the sheds, and the top sections of towers are now in or near the water, and a mass of wreckage. Mr. Short reports both grab buckets as in the water between the pier and shed. Nearly all turn-buckles and tie rods can be used; many are bent, but will cost little to straighten. To utilize any of this material it would have to be removed in the same manner as that at Key West, and the expense would be about thirty percent more than at the latter place because of the isolation and lack of convenience at Dry Tortugas, and the additional cost of labor. The east track bridge from shed to pier is under the east conveyor, and in the water. This bridge takes a slight even curve as it lies on its side, and apparently is not injured except the bottom chord and braces, mostly on one side. All framework under scale house and above the bridge is in good condition. Also operator's house, except brace supports, which are bent.

CONVEYORS ON NORTH PIER. WEST.

Rear end cantilever demolished. Cable gears are good. Top chord towers, one uninjured, one bent. Wheels and gears at foot of A frame are all right. Castings for track clamps are broken. Struts are in good condition. One leg of A frame seems to be in good condition as far up as the second cross strut, the other is twisted. Six or eight feet of the top are in good shape. Balance of A frame demolished. About six sections of bridge and track can be used, the balance is twisted. Most of the double channel struts supporting tracks are all right. The trolley is bent. Probably can be repaired at small expense. Scale house, scale, and frame under house, uninjured. Operator's house frame uninjured. The windows and doors are wanting. Gear seems to be all right, the rods are slightly bent. Repairs here, $20.00. Tower legs are demolished above engine room. They are badly sprung from floor to the first struts. The top of the derrick is only part that can be used. The outer thirty feet of the apron can be used. Engine room frame can be repaired for $25.00. The machinery is in splendid condition, except slight flange break, gear and wheels under floor are all right. Ladders can be repaired for $20.00. The head of the bridge supporting derrick seems to be in bad shape.

CONVEYORS OF SOUTH PIER. NORTH.

The engine house and frame as high as the operator's house are not injured. The floor is tilted towards the shed so that the outward wheels are four feet above the deck of the pier. The machinery in the engine rooms is in good condition in both this and the south rig. Operator's house and equipment are not there. Above the floor of the operator's house the rig is a mass of twisted steel on the front. Very little of the bridge between the towers is injured except that there are four bends at the joints with the bridge chords. Both cantilevers are demolished. Coal hoppers and chutes are all right. Coal chutes and smokepipes were recommended for renewal before the storm, and an estimate has been submitted for this purpose. The top and bottom chords of this rig are in fair shape. Only four struts are bent. The rear towers

are all right, but all of the rigs are injured where the back legs pass through the bridge and are pinned to a slotted plate riveted to two large channels, the same construction that is employed in the rig of coal shed A at Key West. One back leg is in good shape as far up as the second cross strut. But the other legs of both conveyors are twisted. The heads are in good shape, but where the legs pass through the bridge is a mass of twisted steel. All back operating gears and wheels and one wheel strut are in fair condition. All hoisting gears for aprons are uninjured. Grab buckets stand on the pier, uninjured. All dump buckets are in the shed, also cars which are at Tortugas, others being in Key West. The apron is badly wrecked. Scales and scale house are not injured. All water tanks are all right. Both trolleys are in good shape. The front section of the bridge is in bad condition. All gears appear uninjured, except at the foot of the apron, where there is such a mass of wreckage that the current condition could not be determined. The flanges of two car wheels are broken on the inner track to an extent to require their renewal. Other gears and wheels under floor are in good condition.

CONVEYORS OF SOUTH PIER. SOUTH.

The two rigs on this pier traveled southerly until near the south end of that structure, and then tipped up, there being a space of about ten feet between the engine rooms. The south one stands with its outboard wheels twelve feet above the deck of the pier. One rail is missing, it evidently dropped overboard. Two inboard rails are crushed and twisted. The gears and wheels under the floor of the engine room are in good condition. The machinery is also apparently uninjured. Of the engine room not even the window glass is broken. All looks good to the floor of the operator's house; the balance is entirely wrecked. The north apron and derrick have fallen on top of this rig. The scale house is a wreck. The scale is injured. The operator's house and front end of bridge are demolished. The apron is apparently in good condition. It hangs top and down, and is buried in sand that has washed into the slip at the south end of the pier. Ladders can be repaired for $15.00. The derrick can be repaired for $30.00. It is broken in the middle. About one-half of this bridge and track to the rear tower is in good condition. The bottom chord is bent and twisted. The double cross channels holding track are all right. The cantilever is a wreck.

COAL CONVEYOR. GENERAL.

The dolphins of both piers appear to have been uninjured by the storm, both are more or less worm eaten and decayed. The jetty at the north pier is entirely gone, and the beach has been washed back towards the shed. At the south pier, the jetty wall still stands, but is broken in several places. Seven outside fenders of the south pier are missing. The approach to the north pier is washed away. The piers themselves, except for things before noted, are in excellent condition. Taken altogether, it is estimated that to repair the coal conveyors in place will require 50 per cent of their cost; but if removed elsewhere, at 35 per cent aside from the cost of taking them down, transporting, and erecting them.

COAL SHEDS PROPER.

These have been damaged in hatches and walks where the coal conveyors fell across them. Estimated cost of repairs, $500.00.

QUARANTINE PIER.

The deck seems to be in good condition. Many of the diagonal ties beneath are broken or corroded away. A steel pile at the north end is missing. The fenders along the face are worm eaten, and half worm in to, and some are broken off below the water surface. All should be renewed. The building on this pier needs but slight repairs. The approach awning is down, as is also the boat house.

OTHER BUILDINGS OUTSIDE THE FORT.

Pump House roof is partly gone. Blow off pipe from boiler is broken. Boiler hood and stack are off. The blacksmith shop is down, is not worth repairing. The storage shed is in apparent good order.

BUILDINGS WITHIN THE FORT.

Barracks. All the metal roof covering is gone. This is of zinc, which should be saved. Pieces blew over the parapet into the moat beyond.

Officers' Quarters. The two gable chimneys are gone. Some slate are gone from the south end.

Cottages. Leaked badly. Slight repairs needed.

The Weather Bureau signal tower is a twisted mass of wreckage, and lies in the parade. The signal lanterns are apparently uninjured except for the breaking of the chimneys.

CISTERNS.

The water in the 92,000 gallon cistern appears to be sweet, as is also that in the 48,000 gallon cistern outside the moat near the south coal shed. The 4" pipe leading from the pump house to quarantine pier is broken, and should be repaired as soon as possible. Were a proper outfit of tools provided, slight repairs such as these would be made at once on their occurrence, without the necessity for the delay in transferring men and tools from Key West.

BRIDGES OVER SPILLWAYS OF MOAT.

Both these are down, that at the rear of the fort entirely, that near the Quarantine Pier, partially.

SAND IN THE MOAT.

On the north side of the fort near the bridge at the northwest bastion, the moat has been filled with drifted in sand a couple feet or so above the water, which circulates through a small channel left next to the fort wall. On the opposite side of the fort, considerable sand has washed into the moat, but not to the same extent as on the north side.

Respectfully submitted,

(Signed) F. C. BROWN,

Sub-inspector, U. S. N.

The Commandant,

U.S. Naval Station, Key West, Fla.

Appendix C

U.S. Naval Station,

Key West, Fla.

IN REPLY REFER TO
No. 8-FOM-1912.

January 19th, 1912.

FROM: The Board appointed by Commandant's Order No. 8042-1912, of January 15, 1912; Civil Engineer Frank O. Maxson, U.S.N., Senior Member, Lieutenant E. A. Swanson, U.S.N., Member, and Chief Boatswain P. Emery, U.S.N. Member and Recorder.

TO: Commandant.

SUBJECT:-Report on Fire at Dry Tortugas, Fla., January 5th, 1912.

---

1. Complying with instructions of Commandant's Order No. 8042-1912, copy attached, the Board visited the Dry Tortugas, Fla., on the U.S.S. OSCEOLA, January 15th, 1912, and carefully inquired into the origin of, and the extent of the damage done by the fire of January 5th, 1912, and having completed its duty there, returned to this Station the same day.

2. The fire was first noticed in the out-door toilet of the Lighthouse-keeper's dwelling at about 2:30 a.m., January 5th, 1912. Its cause is unknown. From the first it was beyond control, and after involving all the out-buildings, spread to the dwelling itself. The wind was strong from the northwest, and as the fire increased, the dry grass and small growth on the top of the parapet of the fort ignited. Either through cinders over the parapet, or as thought more likely, by those blown through the sally port, which was in line of the wind, the bridge over the moat caught fire, but never to any great extent, though the fire smouldered for several hours before it was finally extinguished.

3. Owing to the construction of the fort, the strong northwest wind produced eddies in the angle of the casemates, and these carried burning cinders toward the marine barracks which stood nearly in the direction from which the wind was blowing. The galvanized roof of this building had been torn off in the hurricane of October 17th, 1910, leaving the wooden roof/sheathing exposed. Apparently this, dry as tinder from its age and long exposure, readily inflamed, fire being noticed first in the south end about 4:30 a.m. Efforts were made to put it out, but without success, it being hidden in the space between the roof covering and the ceiling of the rooms below. Through this space it crept until about 3:30 p.m., when it burst through the roofs of the three south sections. After this there was no hope, without fire apparatus, to save the building. The fire spread rapidly to the stories below, and advanced along the barracks, which were all burning together until 10:30 p.m., when the roof fell in and to some extent smothered the flames. Practically the entire building was gutted.

4. The rapid spread of the fire, along the roof was due to faulty construction. There were no fire walls, as such, the steel purlins of the six south sections, and the wooden ones of the four north sections being set practically flush with the tops of the dividing walls, over which the wooden rafters and sheathing were laid continuously. So long as these were protected by an unbroken covering of galvanized iron or steel, there was comparatively little danger of fire from cinders on the roof. But when this protective covering was removed, as it was by the hurricane, fire, once having caught, could pass from section to section with little difficulty, the falling cinders from the roof sheathing and rafters also setting fire to the ceiling joists beneath. It was in this manner, in the opinion of the Board, that fire communicated itself through the length of the roof.

5. The spread of the fire from the roof to the third story probably took place by the burning through of the ceiling joists and lathing which permitted the flaming cinders to fall upon the floor. As this, in the third story, was unfinished, being but the plastered top of brick arches between steel I beams, and as the walls of this story were plastered directly upon the brick, the fire would have stopped with the burning of the roof had there not been at the west end of each hall either an opening giving direct entrance to the floor below, or a recess floored with wooden joists and flooring, which readily caught fire, and burned through. Falling brick walls aided the descent of the fire, which caught in the floor and nailing strips, and in the furring and lathing of the second story, generally. Fire in the first story seems to have caught through the windows and doors from the blazing woodwork which fell alongside. The back buildings, which all burned except that second from the south end, and the latrine opposite the center of the barracks, evidently caught fire from the main building. Apparently, there was little if any spread of fire through the stair-wells, the iron stairs showing scarcely a sign of flames, though the wooden floors and nailing strips are burned or partly burned in the hallways.

6. The brick walls and granite trimmings show little effect of the flames except at the north end, where cracks previously existing, have been opened near the top of the wall to several inches in width, and at the south end, where the same effect is shown, but to less extent. Many of the partition walls in the third story, where there were broad recesses at the west end of the halls, have fallen. The fireproof floor supports of steel beams between which brick arches were thrown, with plaster filled in to provide a level surface, are undamaged. The wooden nailing strips and floors are generally burned. The furring strips and lath of the plastering of the side walls of the second and first stories are also generally burned. A number of windows had been blown out of their casings at the time of the hurricane of 1910, and the presence of these openings doubtless helped to spread the fire. In general the window and door frames, sash and doors have been destroyed though there are quite a number intact. The steel

purlins and tie beams at the south end of the barracks are badly bent, and some have fallen. Those towards the middle of the building are apparently in good order. The roof of the four north sections were entirely destroyed. The tops of the division walls are more or less badly broken, and will require resetting. In case of refitting the building they should be made to project at least two feet above the roof. The small chimneys on the walls between each pair of company quarters, are overthrown or damaged. It is roughly estimated that to refit the building will require 50% of its original cost. A close estimate can only be made after the debris is removed.

7. In the absence of proper appliances for fighting fire, it would appear that nothing could have prevented the destruction of the Lighthouse-keeper's cottage, or of the Marine Barracks when once these had caught fire. That the Barracks so caught was due to the unprotected roof from which the galvanized steel covering had been blown off; and to the proximity of the building to the cottage, so that the heat from this ignited some of the window frames of the barracks. This fire, though, seems to have been confined to the extreme south company room. The spread of the fire was through the roof, and, as described elsewhere in this report, through places where the generally fireproof construction of the building was omitted.

8. Nothing definite could be ascertained as to the origin of the fire except that it was discovered in the toilet of the Lighthouse keeper's dwelling about 2:30 a.m. As this toilet was detached, was used only for toilet purposes, and was visited by the Lighthouse keeper himself about 12 midnight, when no fire was visible, it is surmised that either he or some member of his family may have been indirectly and accidentally the cause through open candle or smoking.

9. Photographs showing the present appearance of the Marine Barracks and back buildings accompany this report.

10. The original report of Mate George C. Short has been returned to the Commandant's office. Copies are appended to this report.

Appendix D

UNITED STATES NAVAL STATION No. 44.
KEY WEST, FLA.

April 19th, 1916.

From: Public works Officer. (3 enclosures)
To: Commandant.

Subject: Inspection at Dry Tortugas in accordance with R 196.

Reference: (a) Commandant's first endorsement, September 2, 1913, Public Works Officer's letter No. 182, September 2, 1913.

1. The following is a report of inspection at Dry Tortugas, (Garden Key) for the calendar years 1915-16. Inspections were made April 16th and 17th, 1916, and while the inspections were not minute they are believed to cover essential points.

2. CONDITION OF PIER "D", SOUTH PIER

(a) Piles, caps, diagonal braces and I beams are in good condition but need cleaning and painting above water level.

(b) The lattice channel struts above water are rusted to such extent that cleaning and painting would not be advised; they will, no doubt, serve as struts for considerable time if the pier is not frequently used.

(c) The decking is decayed but useable; a few places are dangerous, but with the infrequent use of this pier for Government purposes, extensive repairs are not recommended. The most dangerous places should be covered with boards, or steel plates from the coal shed.

(d) The fender walls are in very good condition. Five are missing from face of pier. The fender clusters are in a dangerous condition. All of the creosoted piles forming each cluster are more than half destroyed by teredo and many of them entirely eaten away at the tide level.

(e) Three photographs were taken that in some degree shows the wrecked material left on this pier by the Boston Iron and Metal Co. All of it is rapidly deteriorating, especially the boilers, engines, and hoisting gear from the coal conveyors. This material has practically blocked Pier "D" for nearly two years.

3. COAL SHED "D".

(a) All of the side plating of this group of five bays have been cut loose from the rivets, and over half of the plates are left laying on floors of sheds, where dropped, and those standing are held in place by two bolts to each plate. All ventilating pipes and doors, coal valves, etc., cover the shed floors, a mass of wreckage left there by the Boston Iron and Metal Company. If all of the material purchased by the above company is not removed by the first of July, 1916, it is recommended that this Station salvage the side plates above-mentioned, also boilers and hoisting gear, the expense would be trifling compared to the value of the material saved. All of the I beams, side and end framing, roof trusses, and galvanized iron corrugated roof, wire glass, sky lights, etc., are still in place, and most of the wrecked conveyors that fell over this shed are still there.

4. PIER "C".

(a) Nine inch deck I beams, longitudinal 2-inch I beams, diagonal braces, cast caps, and 6-inch steel piles are in fair condition. All are rusted, and would be preserved for a greater length of time if cleaned and painted.

(b) The lattice channel struts above water level are badly rusted and cleaning and painting would not prolong the usefulness of the pier.

(c) All of the horizontal fender walls are in place and in good condition.

(d) The cluster pile dolphins are not in safe condition, they are not so dangerous as those at Pier "D" but many piles are entirely eaten in half at tide level and the balance are more than half destroyed. Should these cluster piles break in half at the tide level, and the top section fall into the channel, it would block the piers to vessels of deep draft, and it is believed an effort should be made to have them removed.

(e) Repairs are not recommended for this pier except renewal of the pile clusters.

(f) The Boston Iron and Metal Company removed the boilers and engines of conveyors on this pier and piled the material along the face of the pier. There are a few pieces of scrap on western end of deck, and two barrels of crude oil that have leaked to some extent, making a fire risk at this point.

5. COAL SHED "C".

(a) All lumber and ventilating pipes have been removed, but pipes, coal valves, etc., are scattered over the floors of shed.

(b) The steel structure is in good condition excepting the need of cleaning and painting.

(c) The roof and skylight glass is in fair condition, gutters and downspouts are mostly rusted away.

(d) The bridges of coal conveyors lay across top of this shed. No attempt has been made by the Boston Iron and Metal Co., to remove these conveyors, except as noted above.

6. BUOY SHED. This building is of wood and is in good condition, but the large wooden platform is entirely rotted away. A temporary walk is maintained to enable an approach to pier "D", and temporary downspout to cistern No. 2 is used to utilize the water from this roof.

7. Cistern No. 2 is the only cistern that is situated outside of the moat wall that supplies water to destroyers and other craft that occasionally base at this point. A temporary pipe line leades to pier "D". Roof of this cistern is in poor condition, but the cistern is in good condition.

8. A large brick cistern of 9200 gallons capacity is situated on the south side of and within the Fort grounds. A suction pipe to the Quarantine Pier, water is used from this cistern for destroyers. The cistern is nearly full. The Custodian reports that there are about 125000 gallons of water that is usable now stored at the Fort.

9. QUARANTINE PIER.

(a) The pier used by craft calling at Garden Key, situated directly opposite the Fort entrance, and connected by approach, two sheds enclosed, and an awning between covers this pier.

(b) The south shed is in good condition.

(c) The north shed has deteriorated, sills are rotted, about one-half of roof is destroyed by gales and age, floor beams and stringers are decaying rapidly. Deck plank are in fair condition.

(d) Piles (steel cylinder 10") are rusted above water and many diagonal brace rods are loose. All fender piles on face of pier are entirely or almost entirely eaten away by teredo. Several are hanging by the bolts that secure them to the pier. These fenders should be renewed, and a new set installed in their place, otherwise it will soon be unsafe for a vessel to tie up at this wharf. The landing platforms for small craft are unsafe, but the Custodian has orders to make repairs to these platforms.

10. FRESH WATER PUMP, WORTHINGTON.

(a) This pump was installed in connection with the steel tanks, etc., to supply water to ships. It has a 4-inch suction, 3-inch discharge and is in good condition. As the tanks and supply pipe lines have been removed to the Key West Station, and as this pump is of no use at Dry Tortugas, it is recommended that it and the connecting pipe and valves be removed to this Station where use may be made of the equipment, this to be accomplished as opportunity offers.

(b) The pumphouse is in poor condition but does shelter the pump.

11. ENLISTED MENS BARRACKS. These barracks were burned in 1912, and are of no further use. The brick in this building could be utilized to advantage for concrete aggregate at this Station whenever important work is undertaken. Several thousand brick have been removed from the kitchens connected to these barracks and used at the Key West Station at a cost which did not exceed $7.00 cleaned and delivered at site.

12. OFFICERS' QUARTERS.

(a) The slate roof is in good condition in general.

(b) The gutters at rear side of this structure are decayed beyond repair. Most of the downspouts are in fair condition. Rain water from this building is carried to the 92,000 gallon cistern, and if a supply of rain water is to be maintained at the Fort, new gutters should be installed. It should be noted that the Custodian has ample water supply from another cistern supplied from gutters on front of these quarters, which are in good condition.

(c) Balconies are unsafe and are of no value.

(d) Interior rooms of first and second stories, south end, are in fair condition and are kept reasonably clean. The north end is of older construction and not in very good condition. The third story rooms are in delapidated condition on account of plaster having fallen, due to worm eaten lath and leaks previous to replacement of present roof. This condition has existed for years. The building in general shows that it is cared for.

13. Kitchens at rear of Officers' Quarters are not in good condition on account of leaking roofs and general old age.

14. SMALL QUARTERS.

(a) No. 13 is a two story brick building 31'-6" front by 20'-3" end, a leanto kitchen at rear 31'-6" by 11'-0", all wood construction. Main house is covered with slate. The roof is old and leaks in many places. Roof of kitchen is wood shingles, and leaks. This building is occupied by the Custodian and his family. Porch is decayed, and for comfort of occupant should be renewed and roofs repaired.

(b) Nos. 14 and 15 are small structures not worth attention. They are of brick but in very poor condition.

15. MOORINGS. An allotment from Contingent has been made to remove all but one of these moorings and to renew buoys for the one retained. But one mooring buoy is afloat and that needs cleaning and painting. A buoy lies on the beach with broken shackle and is in a rusted condition. The Custodian was instructed to get this buoy and examine it, and if fit it will be brought to Key West and repaired. An attempt will be made to recover these moorings before July 1st, 1916.

16. HARBOR MARKS. There are steel spar markers on both sides of channel all painted with red lead and lettered. From casual inspection in passing all of these markers appear to be in good condition except the one marked "E" (near Quarantine dock) that leans well in towards the beach, and an other marker (2" pipe) has been set near that point.

17. SUMMARY. No estimates for repairs have been made because no funds are allotted for Dry Tortugas. Should the Department favor such repairs as suggested for safety, and comfort of the Custodian, estimates will be submitted. The inspection was casual, made from 5 P.M., April 15th to 7 A.M., April 16th, but all essential points are believed to have been covered. The Custodian appears to have done his duty, and to have made such repairs as are within his limited capacity, without additional help. The moat bridge was repaired during the year by men sent from this Station. Similar absolutely necessary repairs must be done in like manner as the necessity may arise.

Acting.

1st Endorsement.

April 21, 1916.

From: Commandant, Naval Station, Key West.
To: Bureau of Yards and Docks.

Subject: Inspection at Dry Tortugas in accordance with R 196.

1. Forwarded, APPROVED.

2. The Commandant does not at this time recommend that any repairs be undertaken; but later, when business here is less pressing, will visit Dry Tortugas and advise the Bureau further in the premises, with an estimate of cost to repair quarters of custodian.

BIBLIOGRAPHY

PRIMARY SOURCES

Washington, D.C. National Archives and Records Service.

Records of the United States Coast Guard. Record Group 26. Lighthouse Site Files. 1790-1939. Series 66.

Washington, D.C. National Archives and Record Service. Textual Records of the Office of the Chief of Engineers. Record Group 77.

Records of the Central Office

Correspondence, 1789-1942

"Miscellaneous Letters Sent." 1812-69. Series 4.

Letters Sent to Engineer Officers. 1812-69. Series 6.

Registers of Letters Received. 1826-70. Series 17.

Letters Received. 1826-66. Series 18.

Name and Subject Indexes to Series 30. Series 29.

Letters Sent. 1866-70. Series 30.

Register of Letters Received. 1866-67. Series 32.

Letters Received. 1866-67. Series 33.

Register of Letters Received ("A" File). Nov. 1867-Dec. 1870. Series 35.

Letters Received ("A" File). Nov. 1867-Nov. 1870. Series 36.

Name and Subject Indexes to Series 59. Series 58.

Letters Sent. 1871-86. Series 59.

Registers of Letters Received. 1871-86. Series 63.

Letters Received. 1871-86. Series 64.

Register of Letters Received Relating to Fortifications. 1886-87. Series 75.

Letters Received Relating to Fortifications. 1886-87, Series 76.

Letters Sent. 1886-89. Series 73.

Registers of Letters Received Relating to Fortifications, Administration and Explorations and Surveys, 1888-89. Series 86.

Letters Received Relating to Fortifications, Administration, and Exploration and Surveys ("File A"). 1888-89. Series 87.

Subject Indexes to Series 96. Series 92.

General Correspondence. 1890-1892. Series 96.

Name and Subject Index to Series 98. Series 97.

General Correspondence and Record Cards. 1893-94. Series 98.

Name and Subject Index to Series 103. Series 99.

General Correspondence. 1894-1923. Series 103.

Washington, D.C. National Archives and Record Service. Records of the United States Navy. Bureau of Yards and Docks. Record Group 71.

General Correspondence. 1898-1916. Series 10.

Card Index to Monthly and Weekly Reports of the Superintendent. Series 14.

Washington, D.C. National Archives and Records Service. Textual Records of the Office of the Quartermaster General, Record Group 92.

Correspondence. Letters Sent by Quartermaster General. 1818-1870. Series 9.

Special Files. "Consolidated Correspondence File." 1794-1890. Series 225.

Washington, D.C. National Archives and Records Service. Textual Records of the Chief of Ordnance. Correspondence, 1797-1941. Record Group 156.

Registers of Letters Received. 1827-1894. Series 20.

Letters Received. 1812-1894. Series 21.

Record Cards for General Correspondence. 1890-1903. Series 25.

General Correspondence. 1894-1913. Series 28.

Washington, D.C. National Archives and Records Service. Microfilm.

Letters Received by the Secretary of War and Adjutant General. Record Group 107.

Letters Received by the Secretary of the Navy from Officers Below the Rank of Commander, 1802-1884. Microcopy-148.

Letters Sent. Topographical Bureau. Microcopy M-66.

Register of Letters Received by Secretary of War. 1800-1860. Microcopy M-22.

Register of Letters Received. Topographical Bureau. Microcopy M-506.

Returns from U.S. Army Military Posts. 1800-1916. Fort Jefferson. Microcopy M-617.

East Point, Georgia. Federal Records Center. Records of the Engineer Districts. Jacksonville District. Record Group 77.

Fort Jefferson Annual Reports of Operations. (J-Ry). 1847-1859. Fiscal reports showing physical progress of construction.

Fort Jefferson Monthly Reports of Operations. (J-R-30). July 1846-August 1848, October 1848-April 1853, March 1853-March 1854, July 1854-December 1859, June 1860. Reports on application of force and physical progress.

Fort Jefferson Daily Reports (J-R DY). 1847-1860. Master mason's reports of operations.

Fort Jefferson Registers (J-Tr). 1846, 1860. Time Rolls.

Fort Jefferson Estimates (J-E). 1846-1850, 1852, 1854-1858, 1860. Estimates of funds on materials required.

Fort Jefferson Quarterly Returns (J-Rq). 3qr. 1846-4qr 1859. Reports compiled quarterly under the signature of the superintending engineer at Fort Jefferson: accounts current, general quarterly returns of materials and machinery, rolls of non-payment for services, provision returns, return of instruments, vouchers, etc.

Fort Jefferson Statements (J-S). 1848-1853, 1855-1860. Statement of expenditures, materials, and progress of work.

Fort Jefferson Materials (J-M). Materials received, 1849-1860; Materials Disbursed, 1847-1860; Material on hand, 1850-1860; Reports and inventories of materials received (shipping bills, bills of lading, cargo list, delivery slips, etc.); materials expended, lent, lost, or sold; lists and inventories of material on hand, Fort Jefferson Engineer Office.

Fort Jefferson Property (J-Py). 1854-1860. Lists, returns, and inventories of engineer property on hand at Fort Jefferson Engineer Office.

Fort Jefferson Agreements and Contracts (J-AC). 1847-1860.
Legal documents, agreements, contracts, powers of attorney, pertaining to Fort Jefferson construction.

Fort Jefferson Miscellaneous (J-Msc). 1847-1880.
Memoranda.

Fort Jefferson Ledger: Cash Book (J-Lgr 1). 1846-1853. 143 pp.
Cash balance book of detailed cash receipts, disbursements, and balances on hand; the United States in account with Lt. H.G. Wright, Agent for Fort at Garden Key.

Fort Jefferson Ledger: Day Book (J-Lgr 2). 1846-1855. 277 pp.
Day Book showing obligations incurred and cash payments on same. Posted to Accounts Payable Ledger.

Fort Jefferson Ledger: Cash Book (J-Lgr 3). 1846-1862. 279 pp.
Cash Balance Book showing detailed cash receipts, cash disbursements and cash balance on hand.

Fort Jefferson Ledger: Accounts Payable (J-Lgr 4). 1855-1862. 414 pp.
Record of accounts payable, manner, and date of payment; account of disbursements.

Fort Jefferson Ledger: Day Book (J-Lgr 5 ck). 1856-1857. 40 pp.
Shows obligations incurred and cash payments of same itemized bills.

Fort Jefferson Ledger: Day Book (J-Lgr 6). 1858-1859. 330 pp.
Shows obligations incurred and cash payments on same. Itemized bills.

Fort Jefferson Ledger: Cash Book (J-Lgr 7). 1858. 36 pp.
Capt. D.P. Woodbury in account current with Dr. D.W. Whitehurst.

Fort Jefferson Ledger: Day Book (J-Lgr 8 ck). 1858-1861. 48 pp.
Day Book showing obligations incurred and payments on same to persons on account with Fort Jefferson.

Fort Jefferson Ledger: Day Book (J-Lgr 9 ck). 1858-1864. 68 pp.
Day Book showing obligations incurred and payments on same to persons on account with Fort Jefferson.

Fort Jefferson Ledger: Accounts Payable (J-Lgr 10). 1858-1861. 360 pp.
Record of accounts payable, manner and date of payments, and accounts of disbursements.

Fort Jefferson Check Book (J-CK 16). 1854-1855. 93 pp.
Disbursements shown on check stubs.

Fort Jefferson Check Book (J-Ck 17). 1855. 52 pp.
Disbursements shown on check stubs.

Fort Jefferson Check Book (J-Ck 18). 1858-1859. 25 pp.
Disbursements shown on check stubs.

Fort Jefferson Register: Time Roll Book (J-Tr 19). 1846-1855. 296 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr 20). 1855-58. 288 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr 21). 1855-1856. 162 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr 22). 1857-1859. 372 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr-23). 1857-1859. 173 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr 24). 1858-1860. 200 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr 25m). 1859-1861. 284 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Register: Time Roll Book (J-Tr 26py). 1860-1862. 360 pp. Monthly time roll, application of services, wage rate, remarks.

Fort Jefferson Letter Book: Abstract Index of Letters Received (J-L 31). 1846-1864. 419 pp. Abstracts of letters on file in Fort Jefferson Collection, principally Corps of Engineers correspondence.

Fort Jefferson Letter Book: Abstract Index of Letters Received (J-L mar). 1847-1861. 102 pp. Abstracts of letters on file in Fort Jefferson Collection, principally Corps of Engineers correspondence.

Fort Jefferson Letter Book: Abstract Index of Letters Received (J-L 33). 1860-1862. 293 pp. Abstracts of letters on file in Fort Jefferson Collection, principally Corps of Engineers correspondence.

Fort Jefferson Letter Book: Letters Sent (J-L 34). 1858-1864. Letters and reports from post surgeon, Fort Independence, Boston Harbor, Massachusetts; 1861-1865, letters and reports from post surgeon, Fort Jefferson, Florida.

Fort Jefferson Letter Book: Letters Sent (J-L 35). 1862-1880. 621 pp. Copies of Fort Jefferson Engineer Office miscellaneous letters and reports.

Fort Jefferson Daily Report Book (J-R 55). 1847-1848. 245 pp. Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 56). 1848-1849. 290 pp. Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 56). 1848-1849. 290 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 57). 1849-1850. 217 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 58). 1850-1851. 284 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 59). 1851. 217 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 60). 1851-1853. 216 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 61). 1854-1856. 391 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Report Book (J-R 62). 1856-1857. 355 pp.
Number of men working, application of force, remarks.

Fort Jefferson Daily Hospital Report Book (J-R 63). 1857-1866. 426 pp.
Prescription and diet book for sick and wounded, Fort Independence, Boston Harbor, Massachusetts; 1866; identical for Fort Jefferson, Florida.

Fort Jefferson Daily Report Book (J-R 64). 1858-1859. 359 pp.
Number of men working, application of force, remarks, materials expended.

Fort Jefferson Daily Report Book (J-R 65). 1859-1860. 346 pp.
Number of men working, application of force, remarks, materials expended.

Fort Jefferson Daily Report Book (J-R 66). 1860-1861. 436 pp.
Number of men working, application of force, remarks, materials expended.

Fort Jefferson Material Book (J-M 91). 1846-1857. 193 pp.
Date materials received, from whom delivered, payment, kind, quantity, cost price.

Fort Jefferson Material Book (J-M 92). 1847-1860. 287 pp.
Daily expenditure of materials, abstracts of provisions issued quarterly.

Fort Jefferson Material Book (J-M 93). 1848-1851. 246 pp.
Materials and provisions received, date received, price, cost; amount on hand, amount expended. Indexed.

Fort Jefferson Material Book (J-M-95). 1851-1852. 224 pp.
Receipts, expenditures, and articles on hand each quarter.

Fort Jefferson Materials Book (J-M 94 Tr). 1847-1852. 132 pp.
Provisions issued.

Fort Jefferson Material Book (J-M 96). 1853-1860. 218 pp.
Material received, date of purchase, quantity, articles, date of payment, from who purchased, price, cost. Indexed.

Fort Jefferson Material Book (J-M 97). 1858-1860. 339 pp.
Day Book of provisions and material issued.

GOVERNMENT PUBLICATIONS

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1889. Washington, 1889.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1890. Washington, 1890.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1891. Washington, 1891.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1892. Washington, 1892.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1893. Washington, 1894.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1894. Washington, 1895.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1895. Washington, 1896.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1896. Washington, 1897.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1897. Washington, 1899.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1898. Washington, 1899.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1899. Washington, 1901.

Annual Report of the Supervising Surgeon-General of the Marine-Hospital Service of the United States for the Fiscal Year 1900. Washington, 1901.

Executive Documents of the Senate of the United States for the 2d Session of the 37th Congress, 1861-62. Washington, 1862. Serial 1118.

Journal of the Senate of the United States of America, Being the 1st Session of the 28th Congress.... Washington, 1843.

Message from the President of the United States to the Two Houses of Congress at the Commencement of the 2d Session of the 21st Congress, December 8, 1830. Washington, 1831. Serial 193.

Official Records of the Union and Confederate Navies in the War of the Rebellion. 31 vols. Washington, 1895-1929.

"Report of John Rodgers, July 3, 1829." Message from the President of the United States to the Two Houses of Congress at the Commencement of the 1st Session of the 21st Congress. Washington, 1830. Serial 192.

War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies. 70 vols. in 128 parts. Washington, 1882-1900.

PUBLISHED WORKS

Carter, Clarence E. (compiler)
The Territorial Papers of the United States, Territory of Florida, 1824-1828. Washington, 1956.

Carter, Clarence E. (compiler)
The Territorial Papers of the United States, Territory of Florida, 1839-1845. Washington, 1959.

Cullum, George W.
Biographical Register of the Officers and Graduates of the U.S. Military Academy of West Point, N.Y., From Its Establishment... to 1920. 6 vols. New York, 1879-1920.

Haskin, William L. (compiler).
The History of the First Regiment of Artillery, From its Organization in 1821 to January 1st, 1876. Portland, ME., 1879.

Rhodes, James F.
History of the United States From the Compromise of 1850 to the End of the Roosevelt Administration. 9 vols. New York, 1928.

Sanger, George P. (editor)
The Statutes at Large, Treaties, and Proclamations of the United States of America from December 5, 1859, to March 3, 1863.... Boston, 1863.

Warner, Ezra J.
Generals in Blue: Lives of the Union Commanders. Baton Rouge. 1964.

AUTOBIOGRAPHIES AND BIOGRAPHIES

Agassiz, George.
Letters and Recollections of Alexander Agassiz. Boston, 1913.

Audubon, James J.
Ornithalogical Biography. Published in Annual Report of the Board of Regents of the Smithsonian Institution 1917. Washington, 1919.

Durkin, Joseph T.
Stephen R. Mallory: Confederate Navy Chief. Chapel Hill, 1954.

Mudd, Nettie. (editor)
The Life of Dr. Samuel A. Mudd. New York, 1906.

Weigley, Russell F.
Quartermaster General of the Union Army: A Biography of M.C. Meigs. New York, 1959.

STATE AND LOCAL HISTORIES

Maloney, W.C.
History of Key West, Florida. Newark, 1876.

UNPUBLISHED MONOGRAPH

Manucy, Albert C.
"Construction History of Fort Jefferson, 1846-1874." Unpublished typescript. National Park Service. 1961.

NEWSPAPERS

Niles' Register.

ILLUSTRATIONS

Illustration 1.

Aerial View of Fort Jefferson, circa 1935.



Illustration 2.

View west across parade toward Bastion F and Front No. 5, circa 1867. Note kitchens, traverse magazines, and barbette tier armament.

Courtesy National Archives, 77-FF-74-79B.

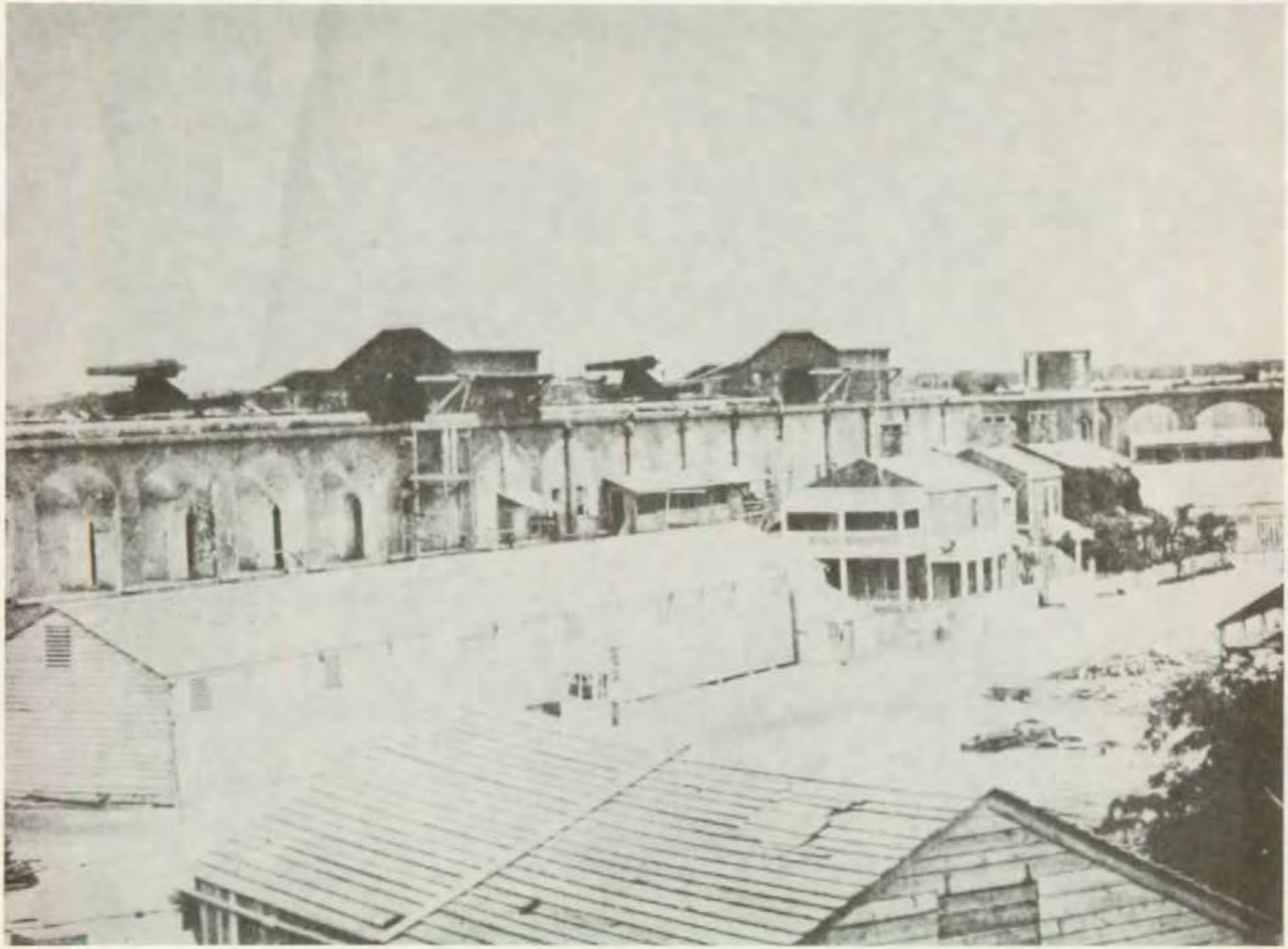


Illustration 3.

Looking northeast across Fort Jefferson parade toward Bastions A and B and Front No. 1. The Officers' quarters are on the left and the soldiers' barracks on the right, circa 1867.

Courtesy National Archives, 77-FF-74-79C.

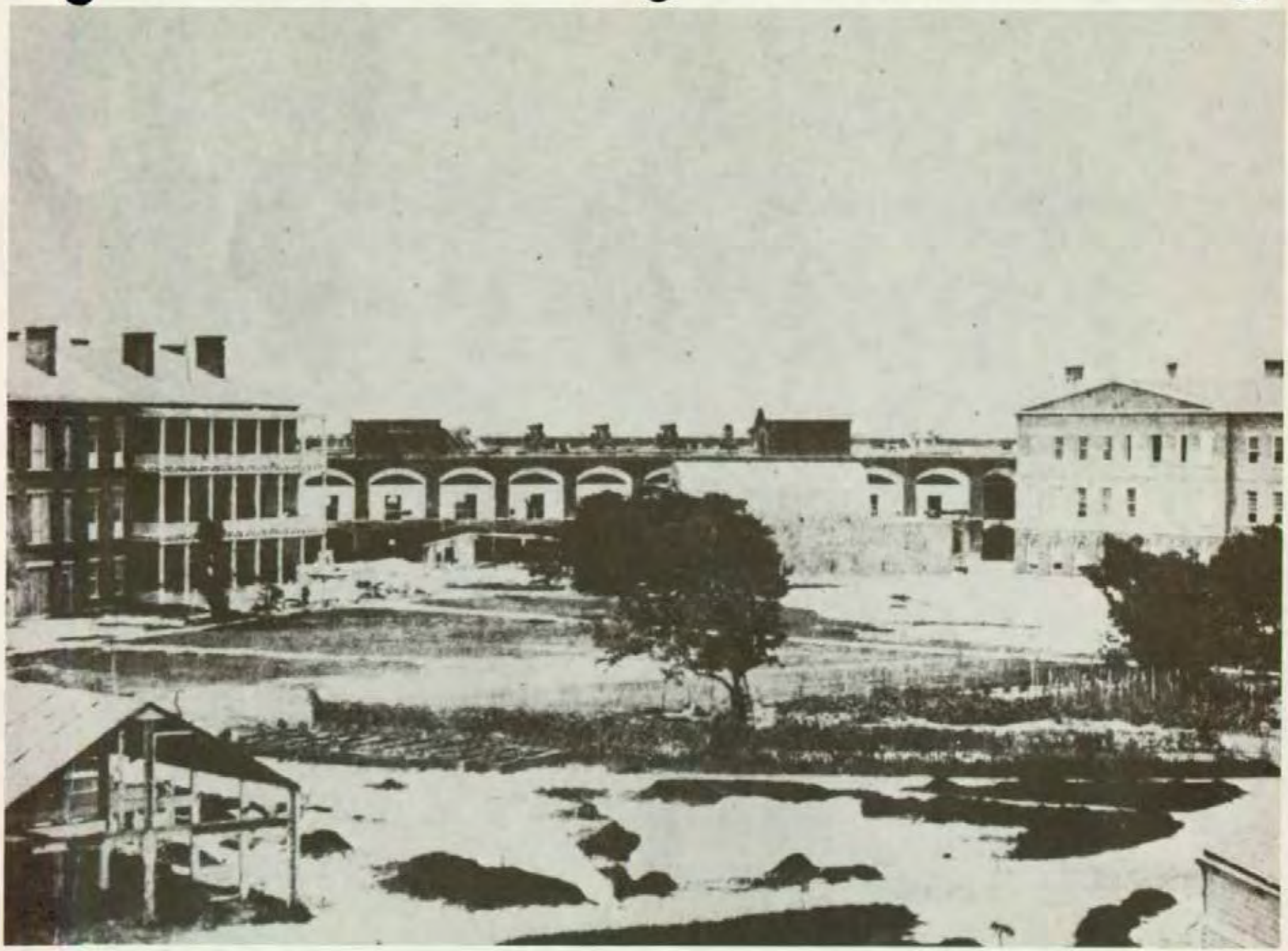


Illustration 4.

Interior of Fort Jefferson, showing parados of Front No. 3, through which sally port passes, and Bastion C, circa 1867. Note flagstaff, traverse magazines, and barbette tier armament.

Courtesy National Archives, 77-FF-74-79D.



Illustration 5.

Interior of Fort Jefferson, showing the parados of Bastion D and Front 3, circa 1867. Note vault of principal magazine, traverse magazines, and barbette tier armament.

Courtesy National Archives, 77-FF-74-79F.



Illustration 6.

Southeast curtain of Fort Jefferson, sally port in background, bastion C in foreground, circa 1899.

Courtesy National Archives, 2005-M-90-1-3.



Illustration 7.

Looking across Fort Jefferson parade toward soldiers' barracks and lighthouse tower, circa 1900. Corner of officers' quarters and several kitchens in foreground.

Courtesy National Archives, 2005-M-90-1-5.

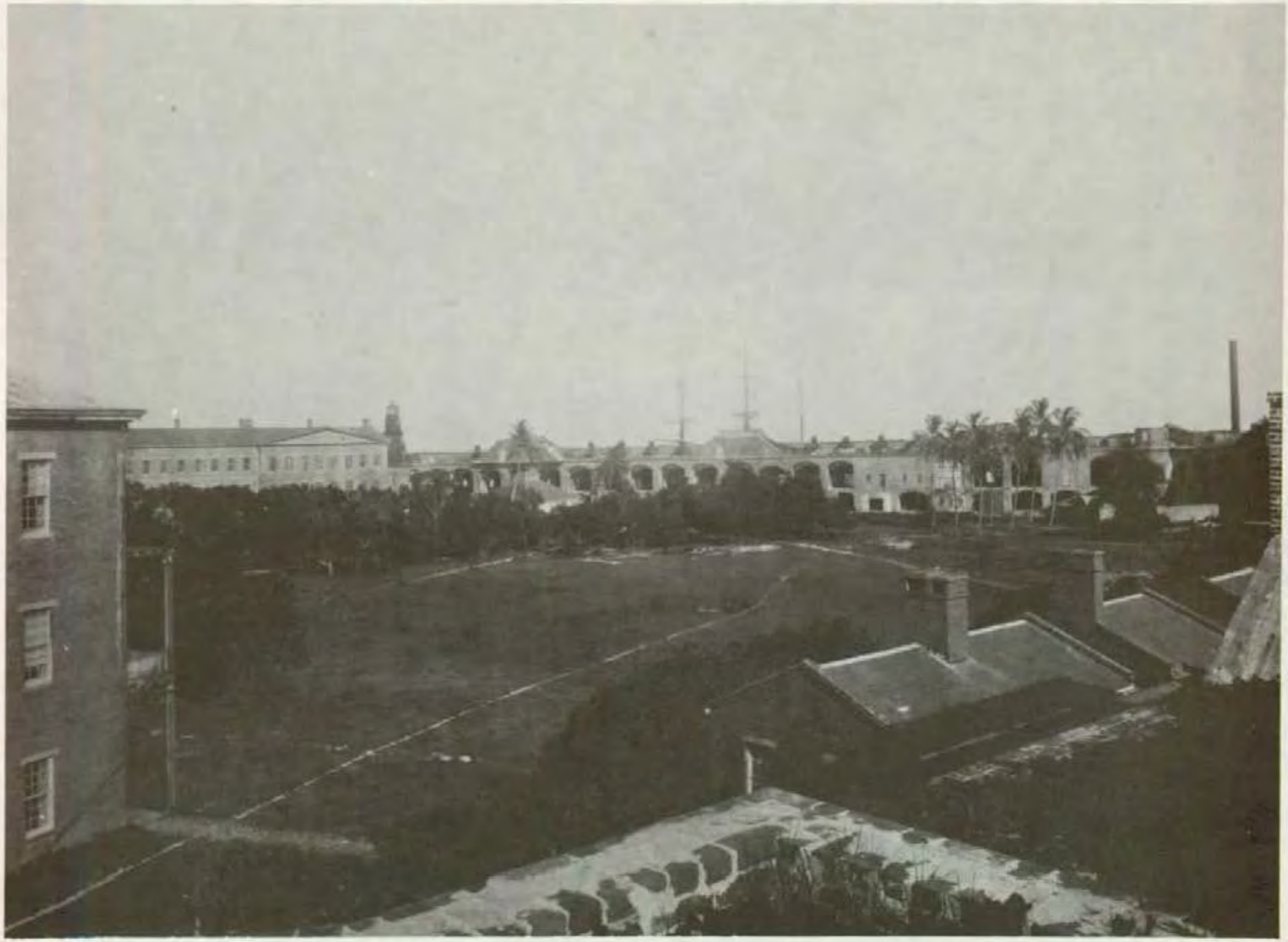


Illustration 8.

Fort Jefferson, 2d tier casemates, circa 1899.
Note multiple arches and absence of traverse rails.

Courtesy National Archives, 2005-M-90-1-10.

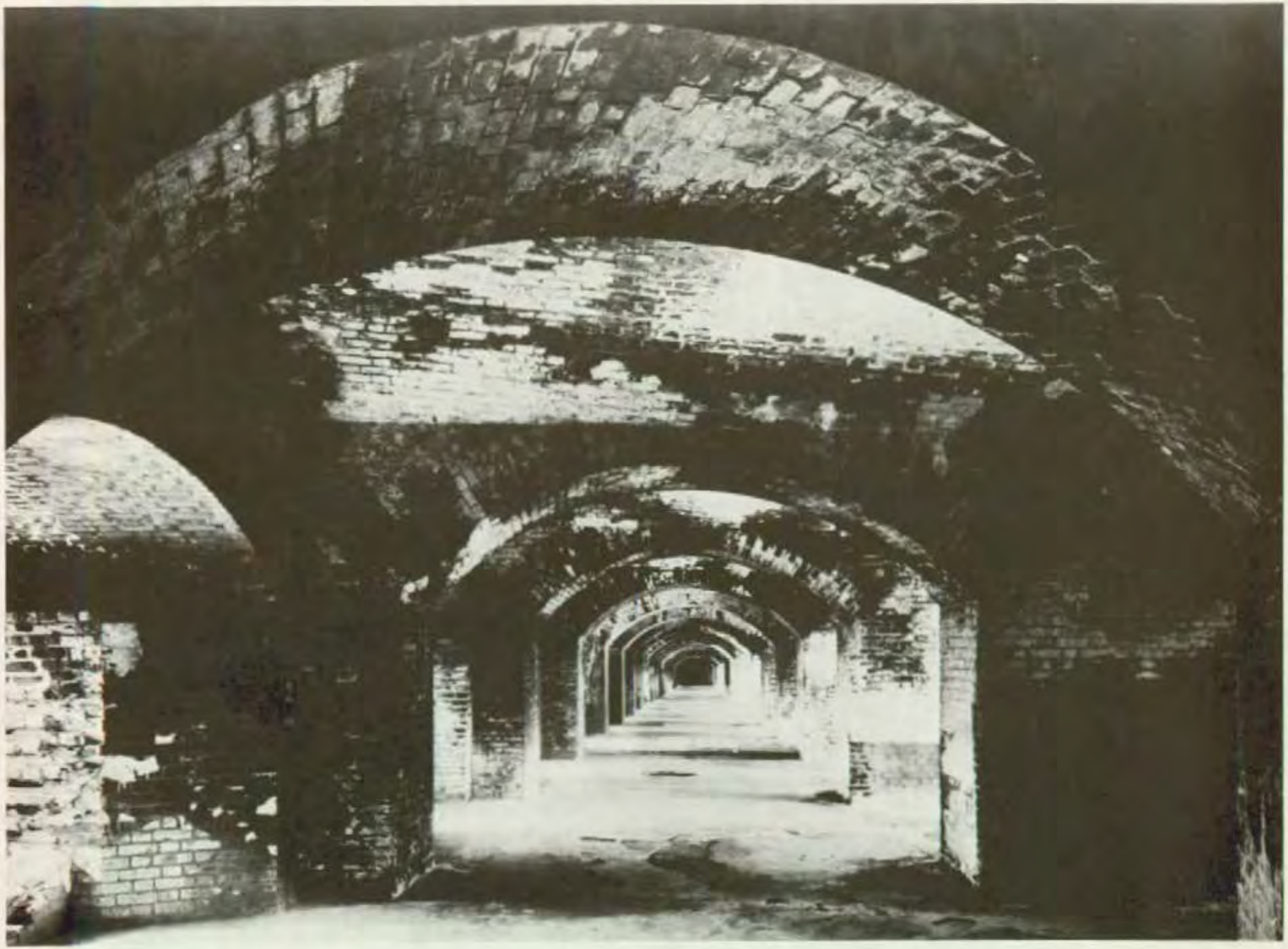


Illustration 9.

Second tier bastion casemates, circa 1900.
Note multiple arches.

Courtsey National Archives, 2005-M-90-1-11.



Illustration 10.

Fort Jefferson sally port, ditch, and bridge, circa 1899.

Courtest National Archives, 2005-M-90-1-28.



Illustration 11.

Distilling plant and southeast spit coalsheds. Fort Jefferson moat, counterscarp, curtain, and bastion in foreground, circa 1899.

Courtsey National Archives, 2005-M-90-1-29.

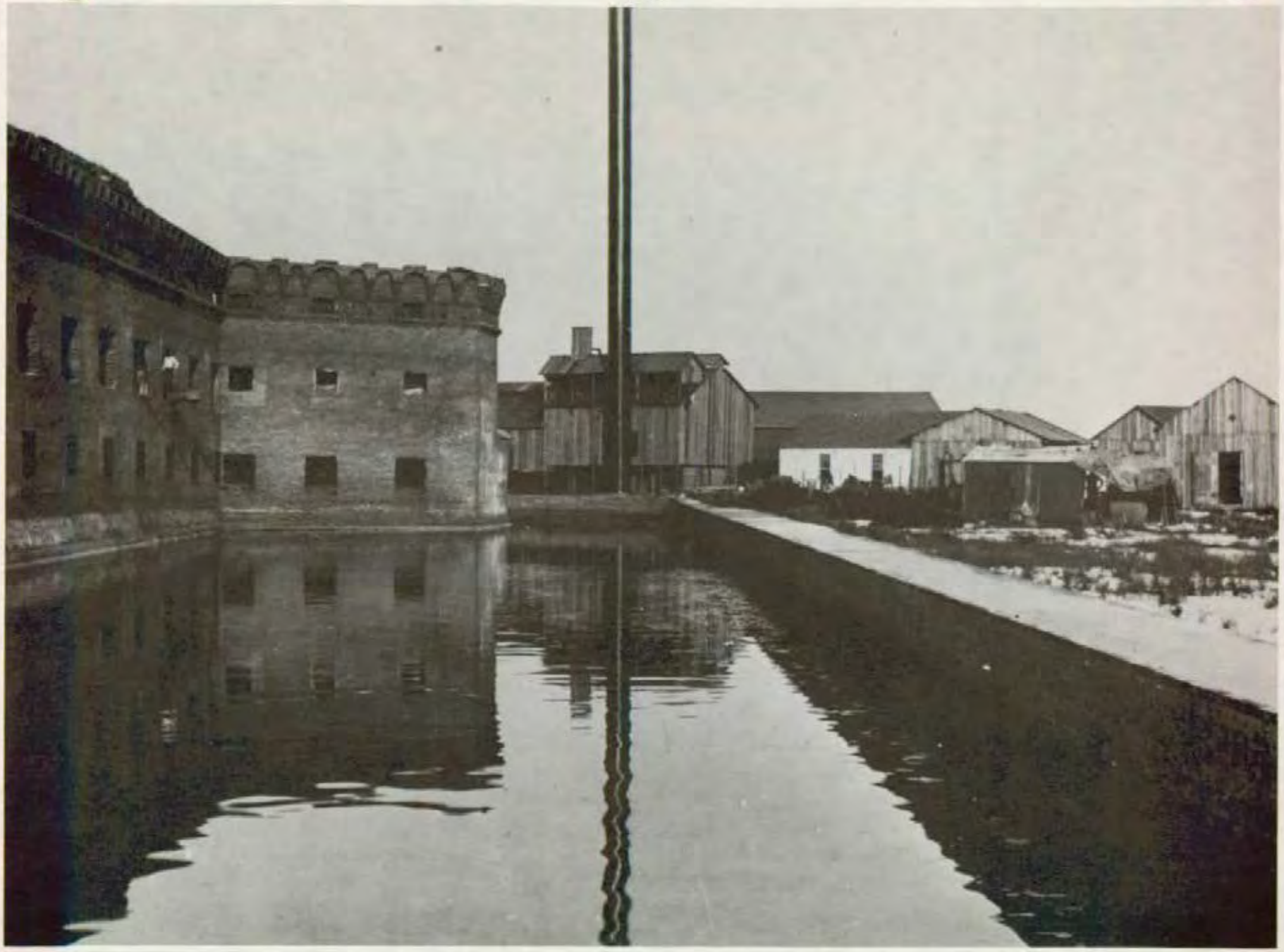


Illustration 12.

Soldiers in Quarantine at Fort Jefferson in the spring of 1899. This is the southwest curtain, between bastions D and E.

Courtsey National Archives, 2005-M-90-1-31.

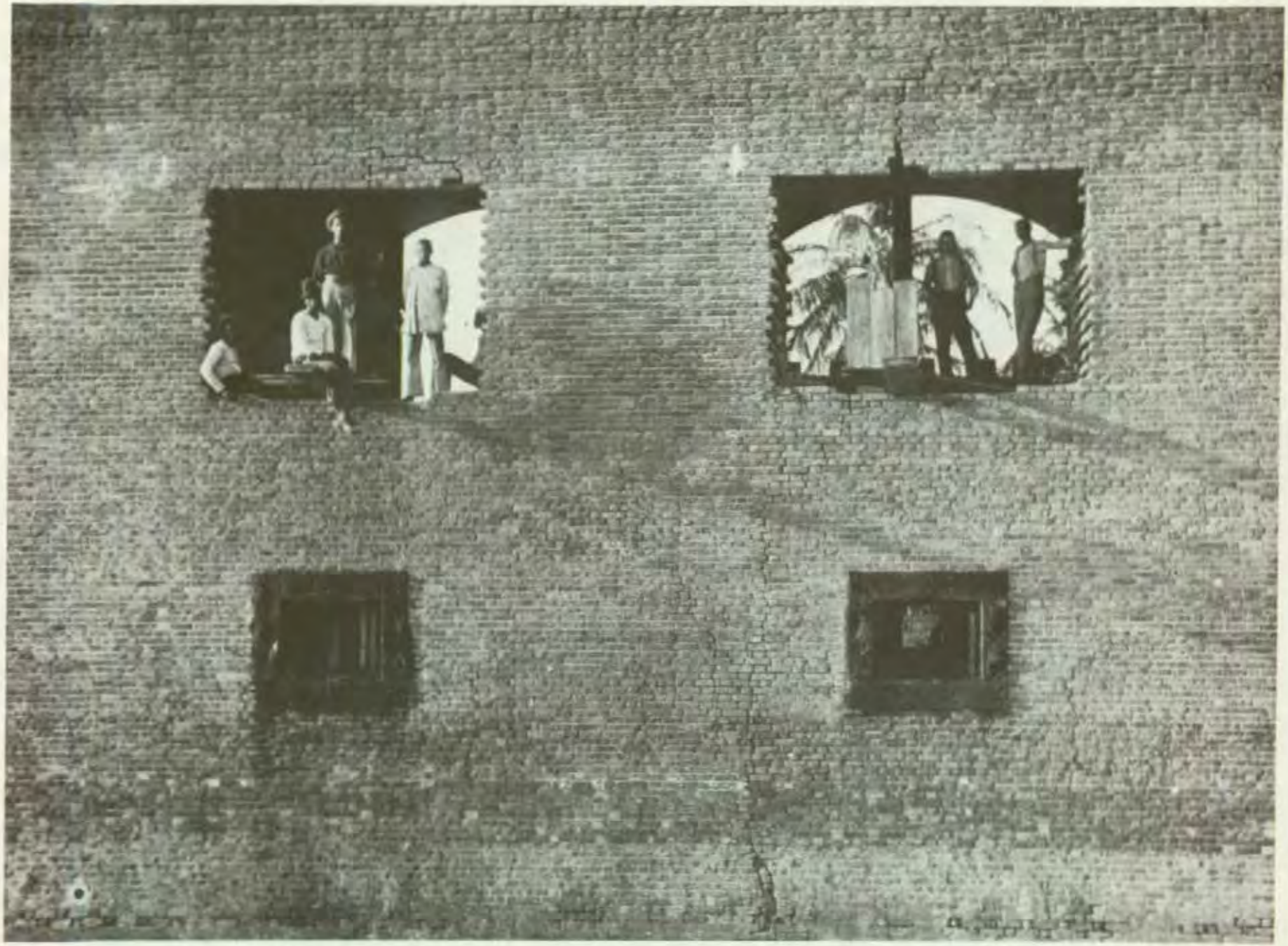


Illustration 13.

Naval coalsheds on southeast spit.
Note chimney of distilling plant,
Fort Jefferson curtain, counterscarp,
and bastion in foreground, December 3, 1899.

Courtsey National Archives, 2005-M-90-1-39.



Illustration 14.

10-inch Rodmans on iron casemate carriages. Note embrasures, traverse irons, and flagging, circa 1899.

Courtsey National Archives, 2005-M-90-1-43.



Illustration 15.

Barbette tier gun and traverse magazine at Fort Jefferson, circa 1899. Note parade and soldiers' barracks in background.

Courtesy National Archives, 1005-M-90-1-44.

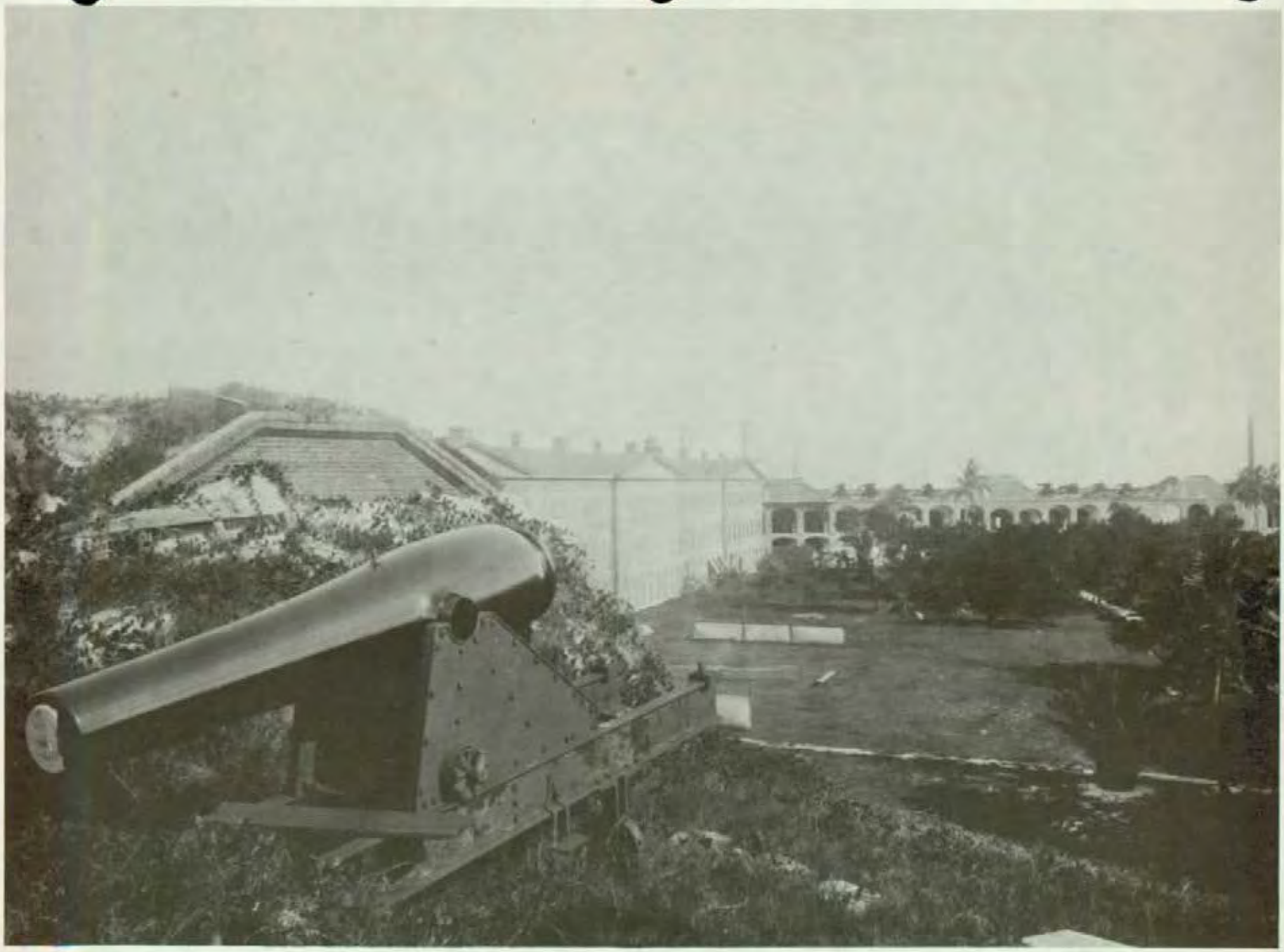


Illustration 16.

Barbette tier armament at Fort Jefferson, circa May, 1900. Note sod parapet superior slope, and lighthouse tower and soldiers' barracks in the background.

Courtesy National Archives, 2005-M-90-2-50.

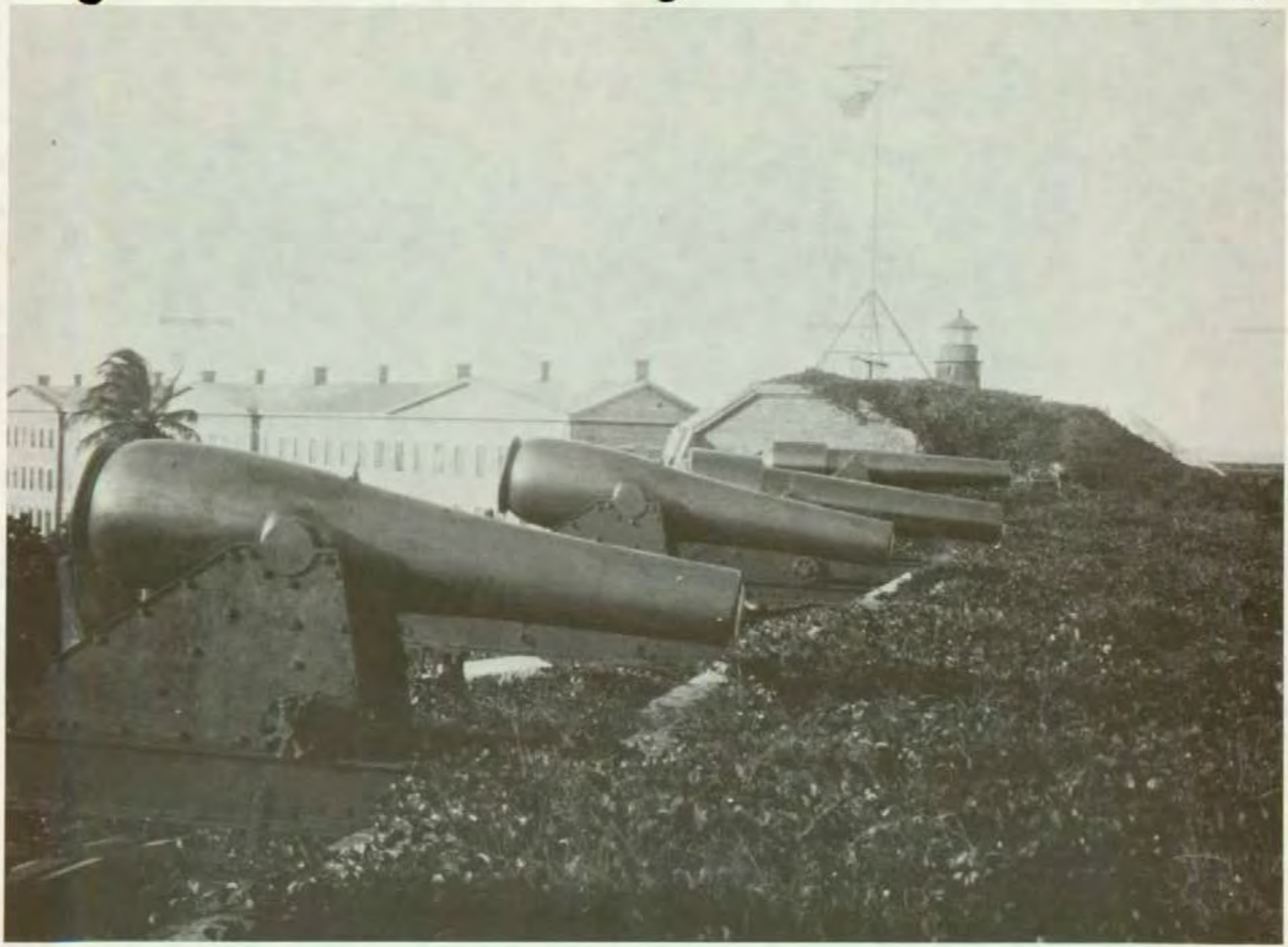


Illustration 17.

Company C, 5th U.S. Infantry, mustered and formed for inspection on Fort Jefferson Parade, May 1898.

Courtesy National Archives, 2005-M-90-34-53.

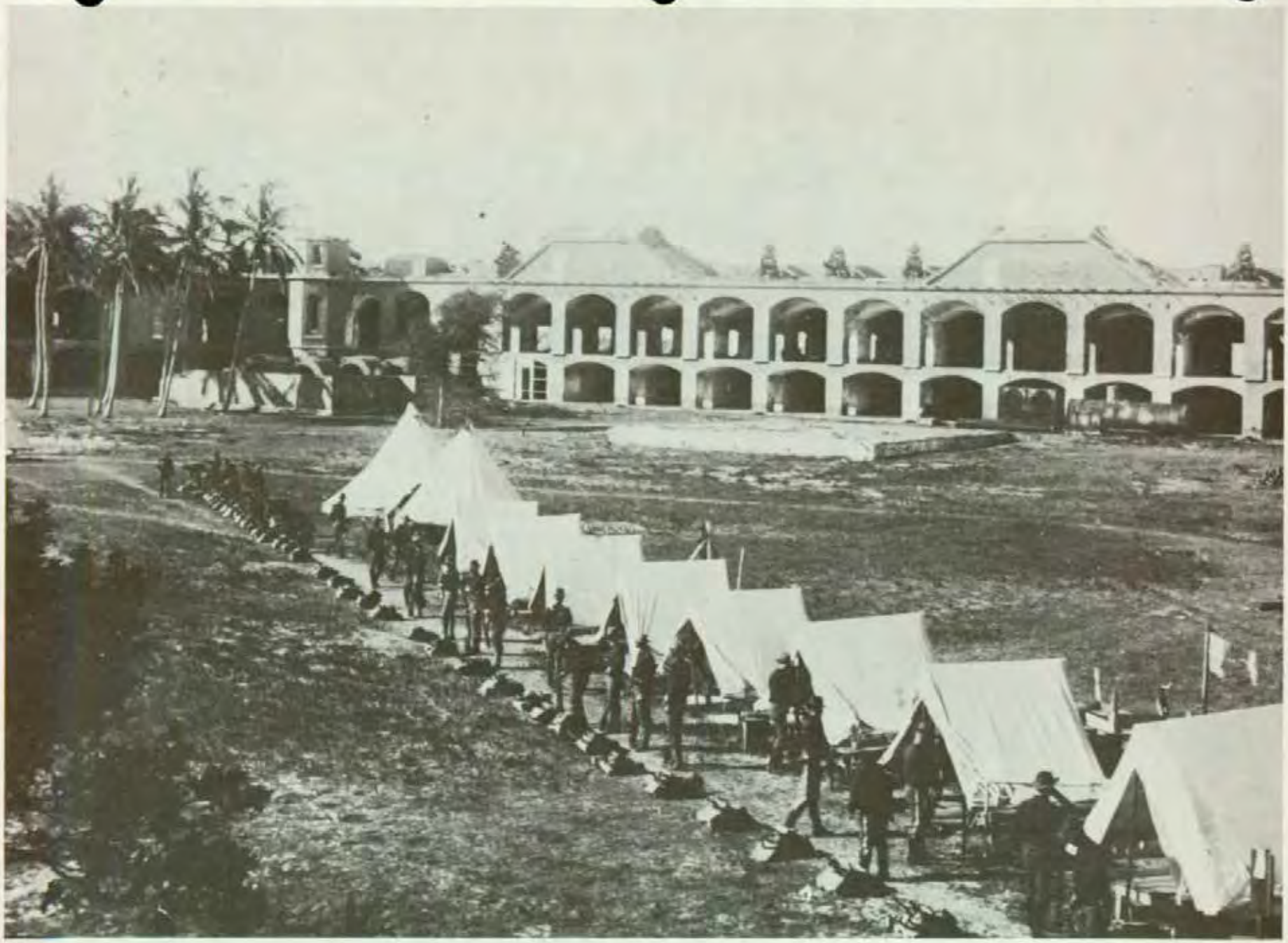


Illustration 18.

View across Fort Jefferson from officers' quarters piazza, circa May 1898.

Courtesy National Archives, 2005-M-90-3A-55.

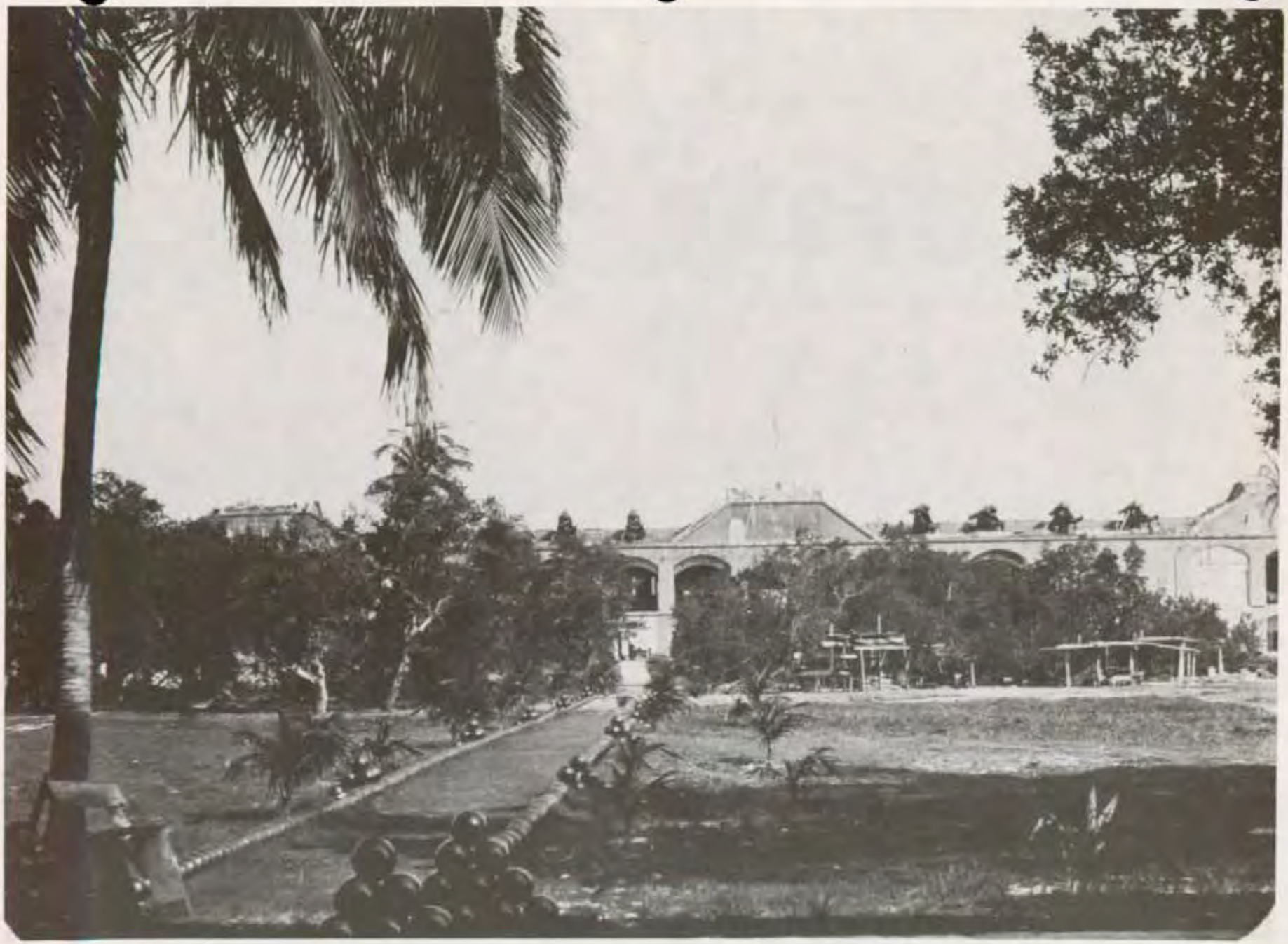


Illustration 19.

Fort Jefferson Officers' Quarters, southeast elevation. Note piazza and the vault of the principal magazine, circa 1898.

Courtsey National Archives, 2005-M-90-3A-69.



Illustration 20.

Dr. Samuel Mudd's Cell (Traditional).
Note two 24-pounder flank defense howitzers,
circa 1898.

Courtesy National Archives, 2005-M-90-3B-84.

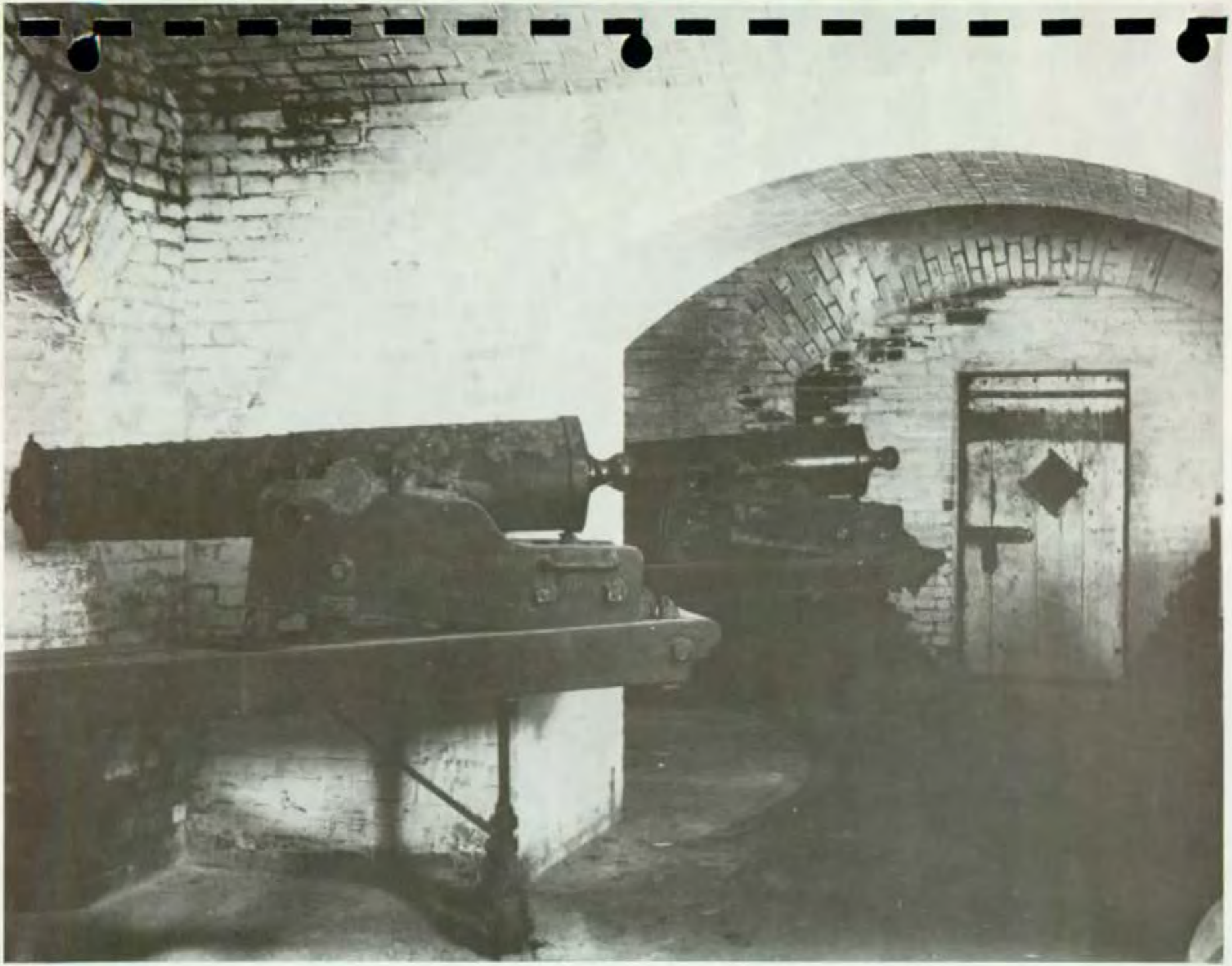
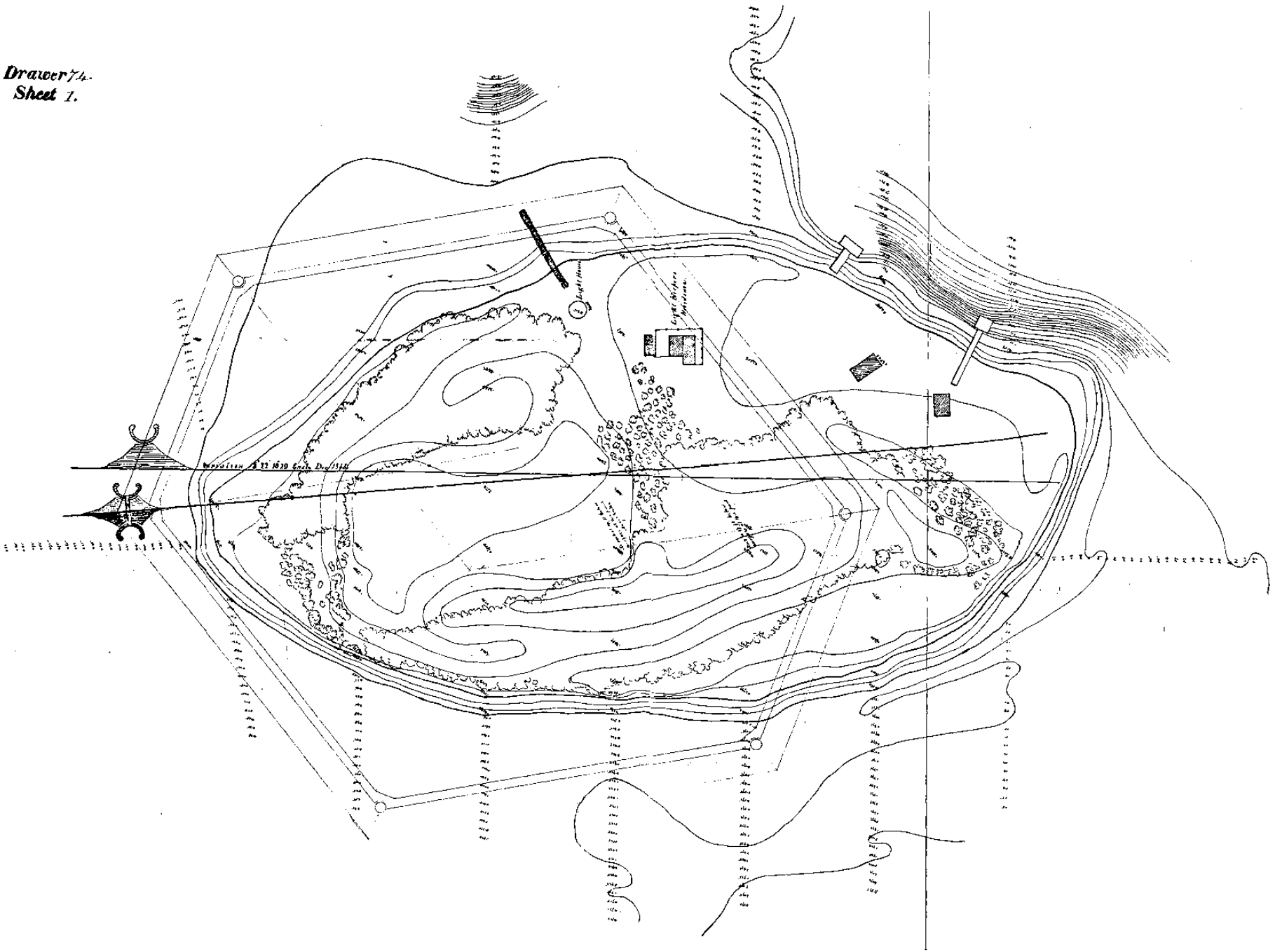


Illustration 21.

Counterscarp, ditch, bridge, and sally port, looking toward Bastion C, May 1898.

Courtesy National Archives, 2005-M-90-3B-86.

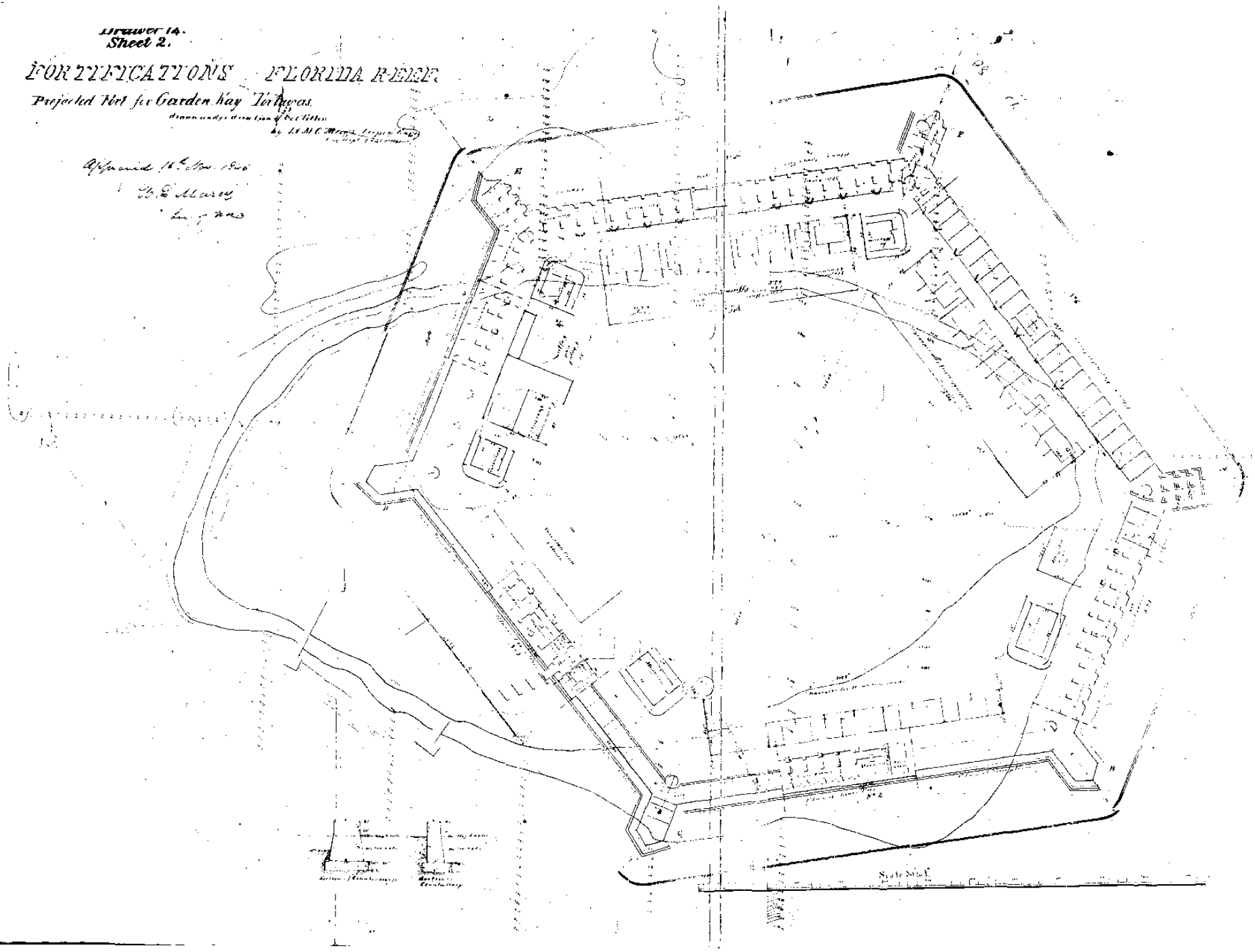
Drawer 74.
Sheet 1.

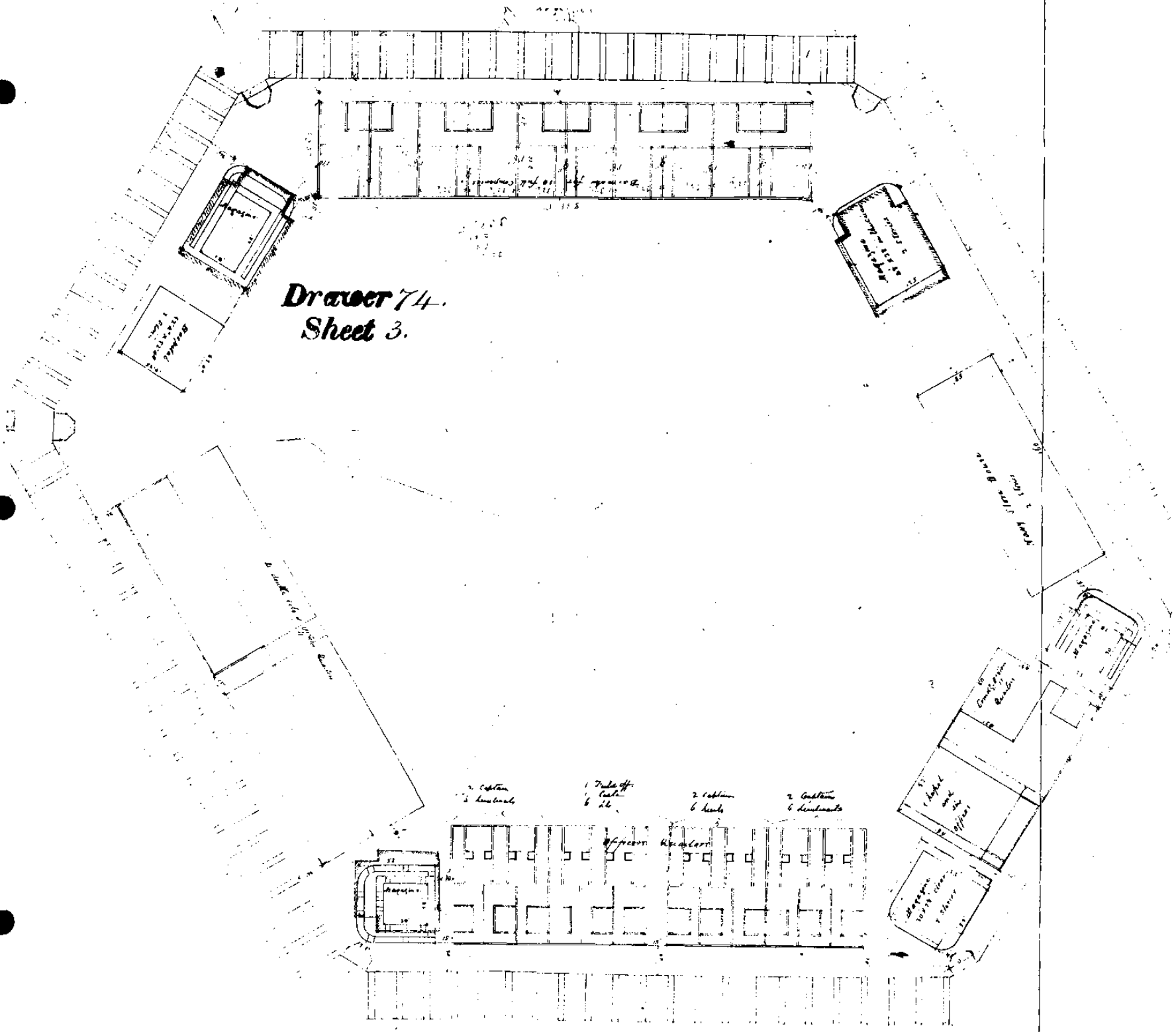


Drawer 14.
Sheet 2.

FORTIFICATIONS FLORIDA REEF

Projected Fort for Garden Key Tortugas.



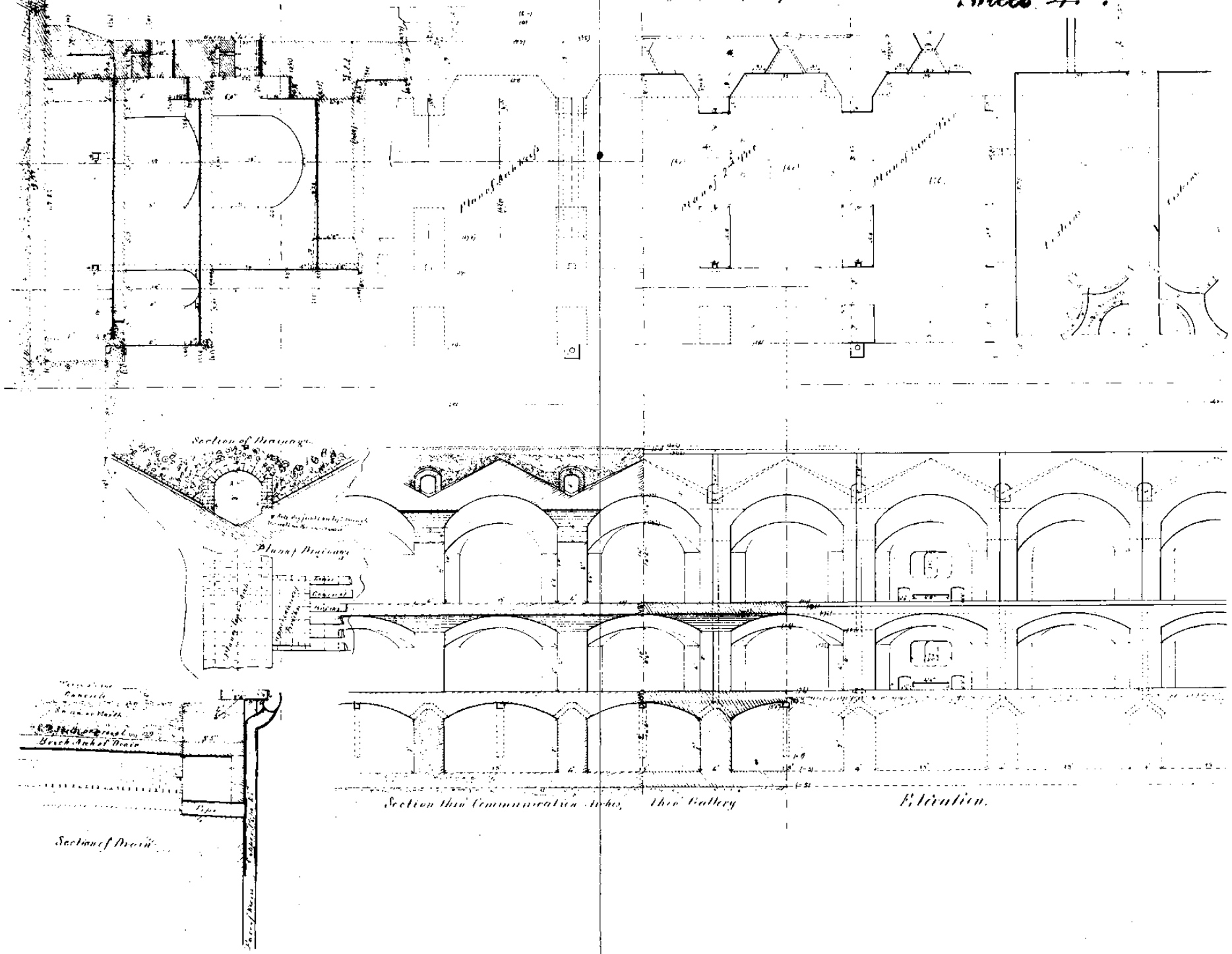

Drawer 74.
Sheet 3.

Sheet 2.

Tortugas

Casemates on Curtains of sheet Fronts.

Drawer 74
Sheet 4.



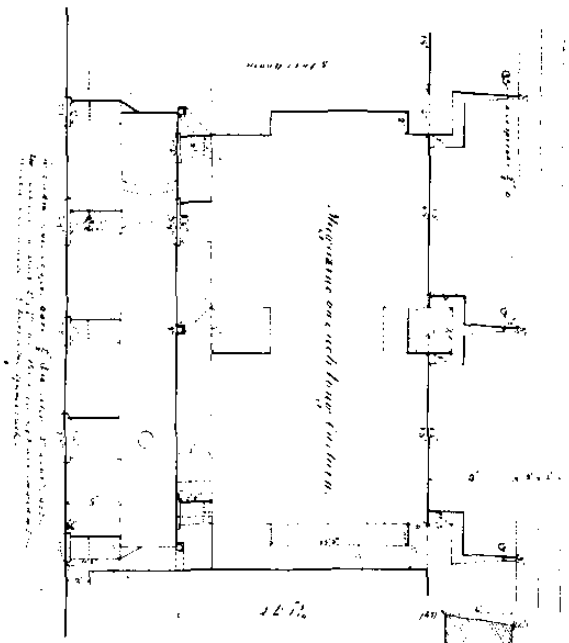
Sheet 5.

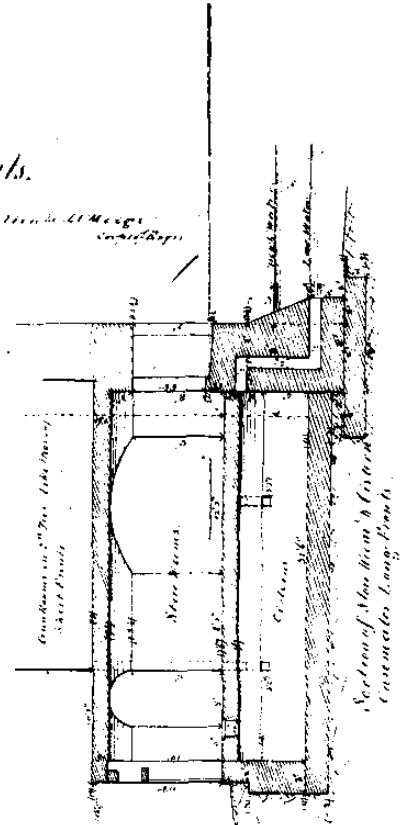
Tortugas. Casemates on Curtains of Longfronts.

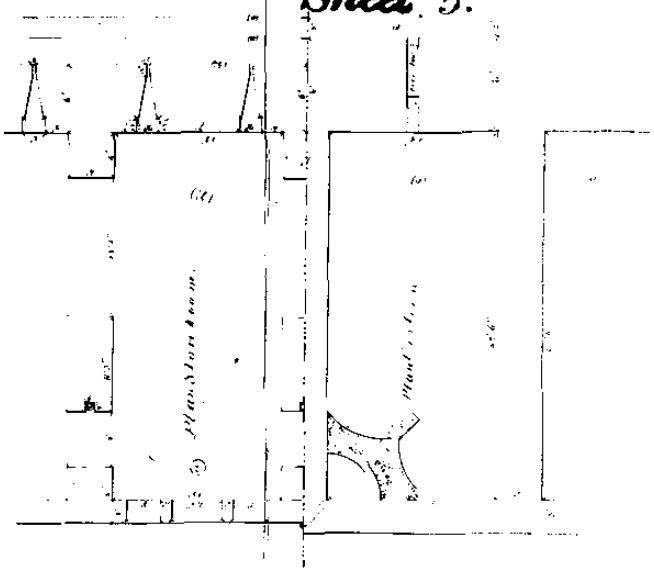
Scale 10 feet

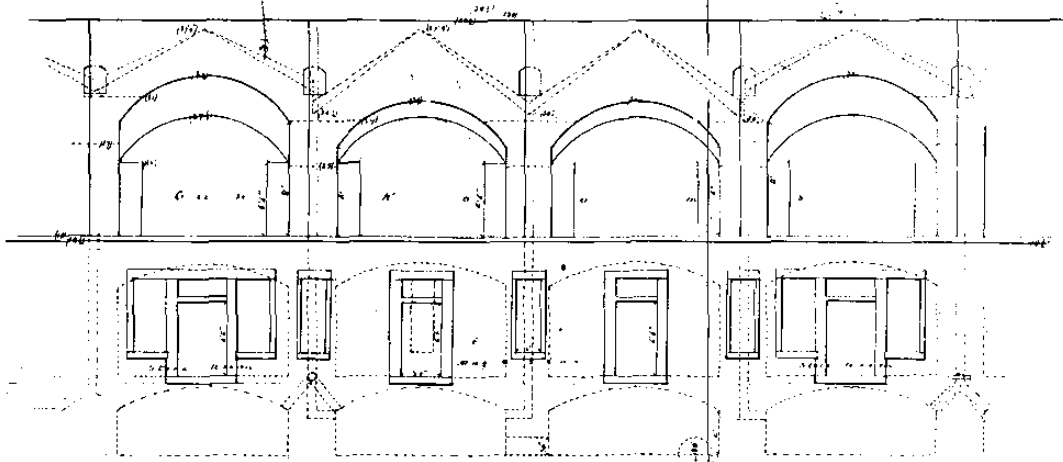
Drawn under direction of Lt Meigs

Drawer 74.
Sheet 5.









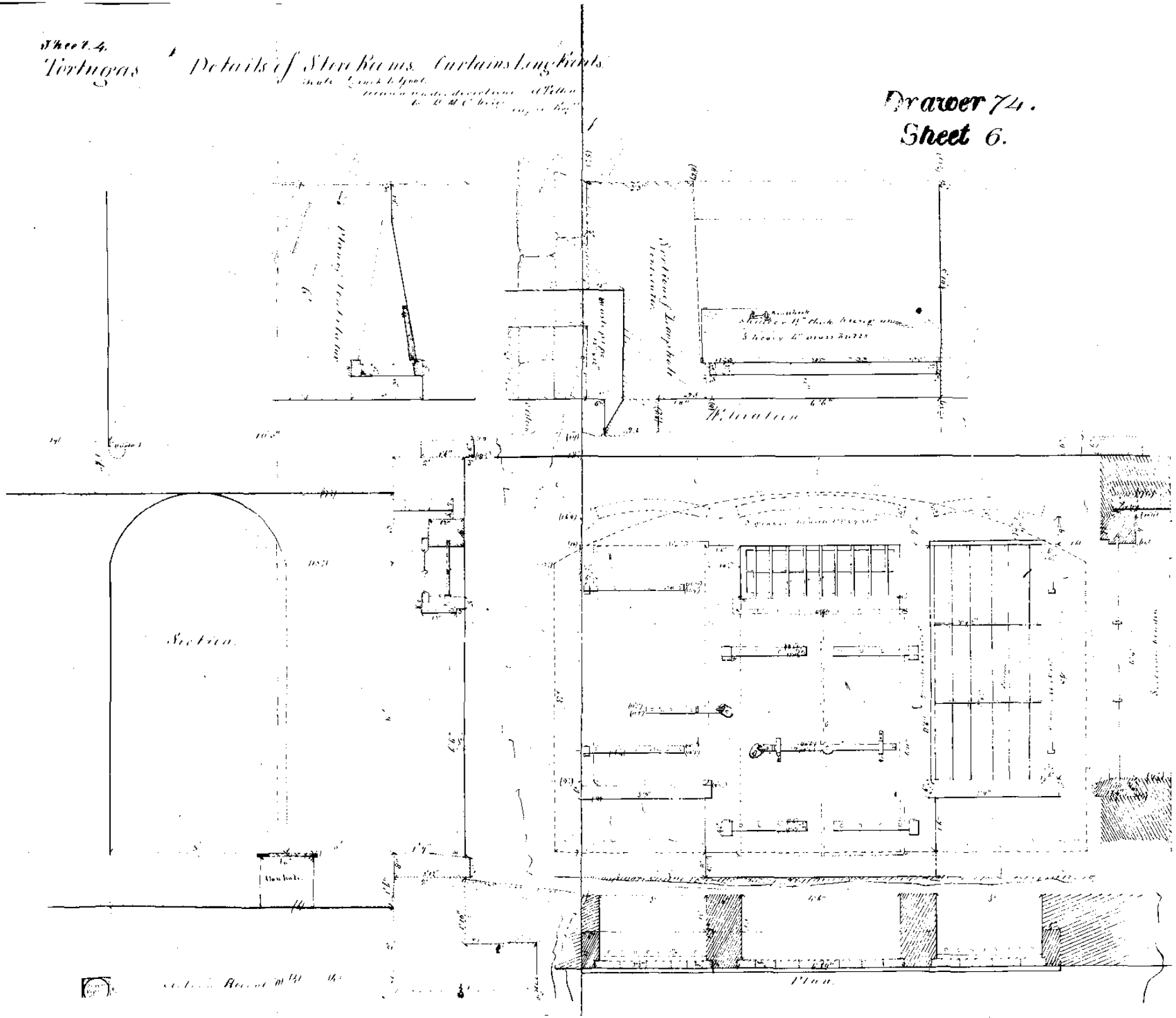
Elevation of Magazine and adjacent Casemates.

Sheet 4.

Tortugas

Details of Stockades Curtains Long Picket.

Drawer 74.
Sheet 6.



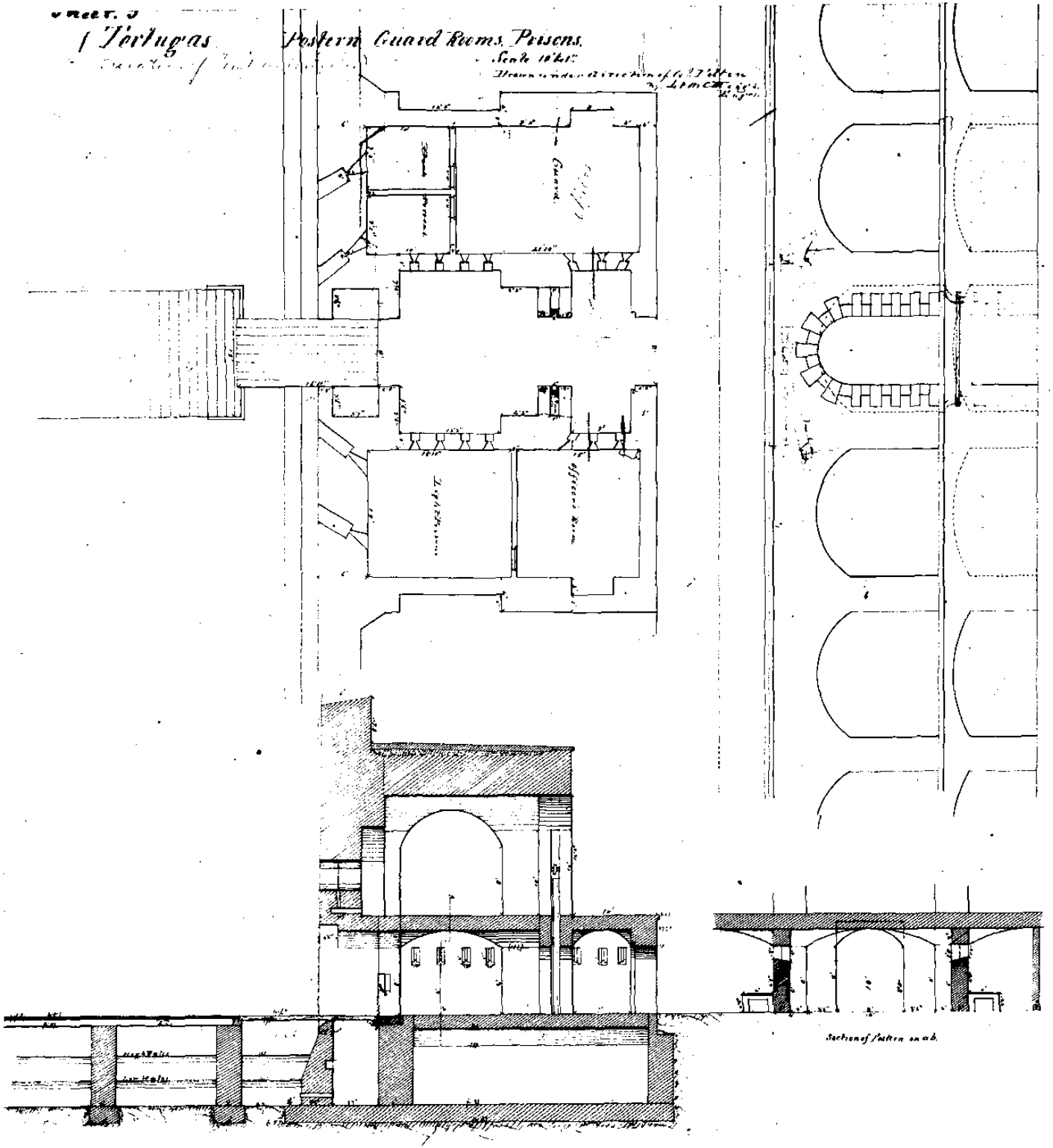
Sheet 3

Tortugas

Postern Guard Rooms. Prisons.

Scale 10 feet

Drawn under direction of Lt. Colonel [illegible]



Drawer 74
Sheet 7.

Sheet 8. 6

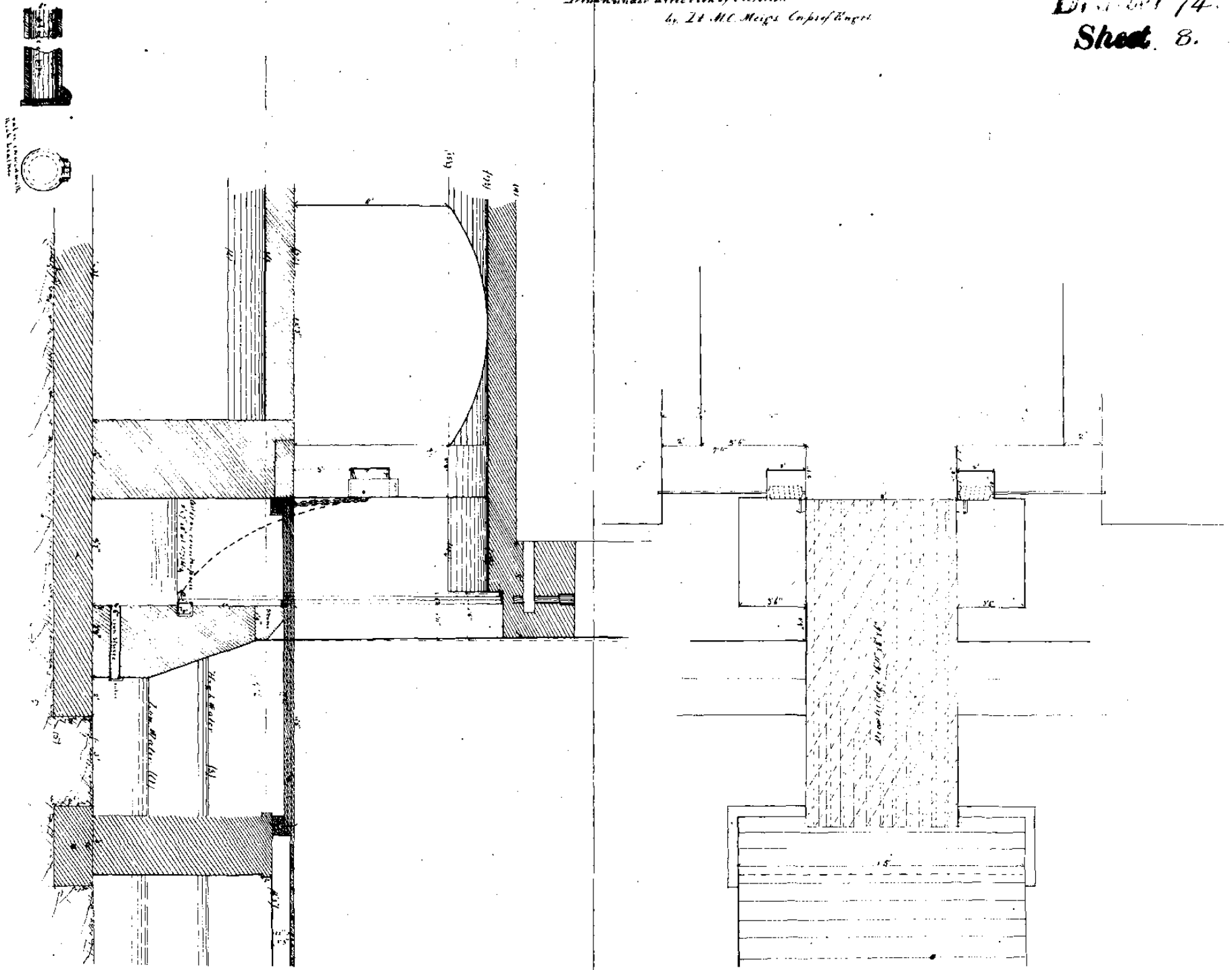
Portugal

Details of Deambridge.

Scale 1 Inch

Drawn under direction of Col Totten
by Lt M.C. Meigs Corps of Engrs

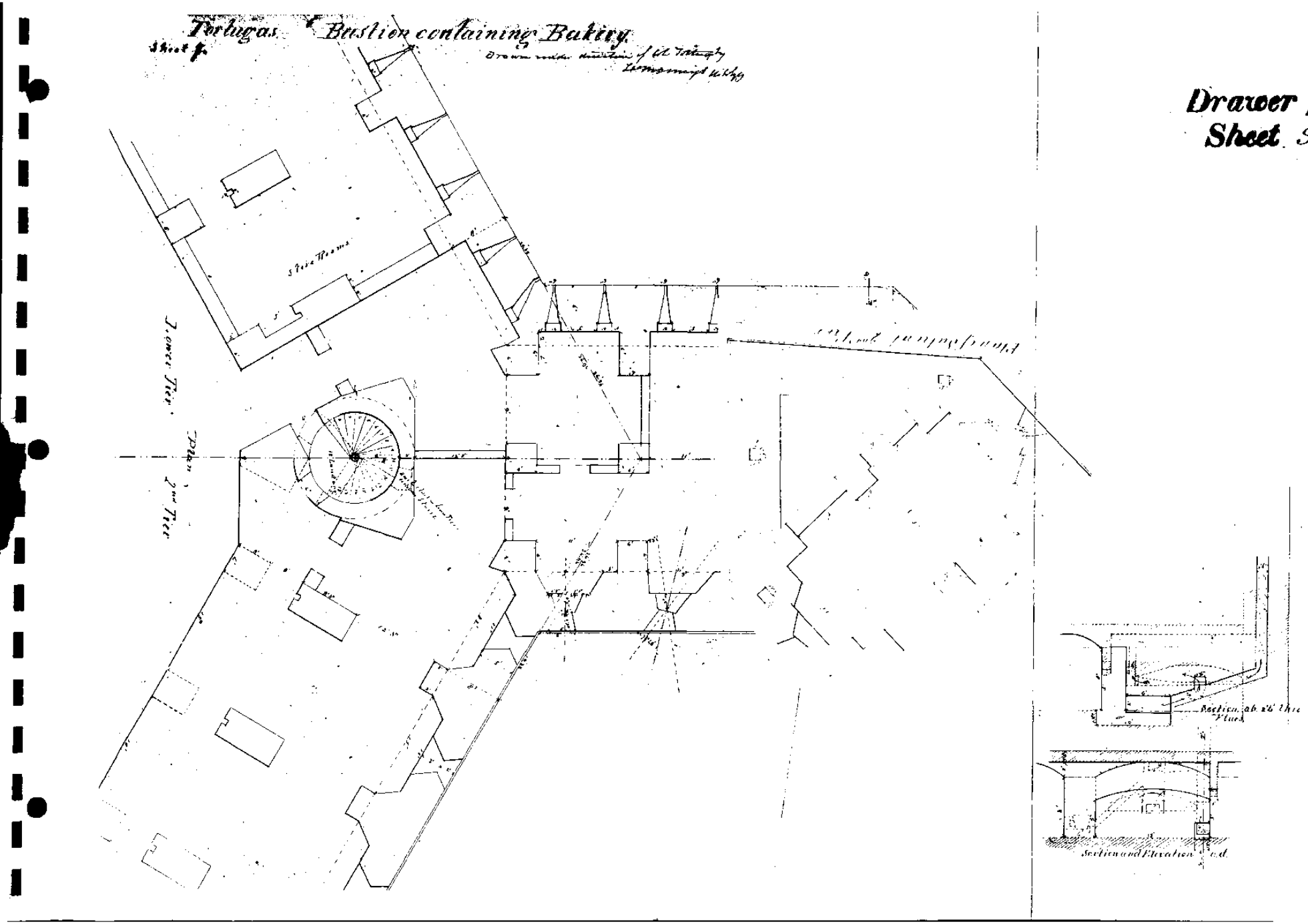
Drawer 74.
Sheet. 8.



Dry Tortugas

Bastion containing Bakery.

Sheet 9.

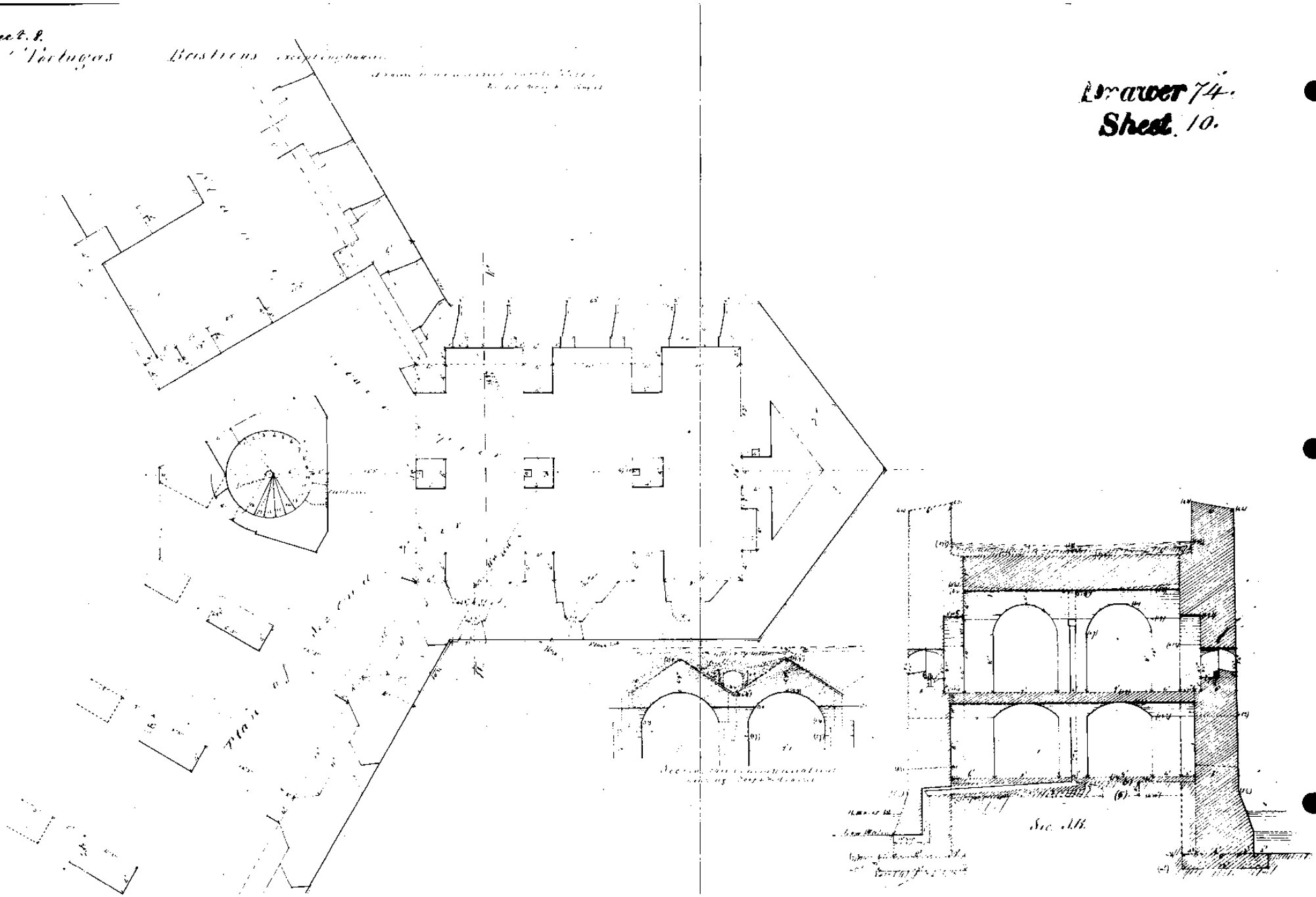


Drawer 74
Sheet 9.

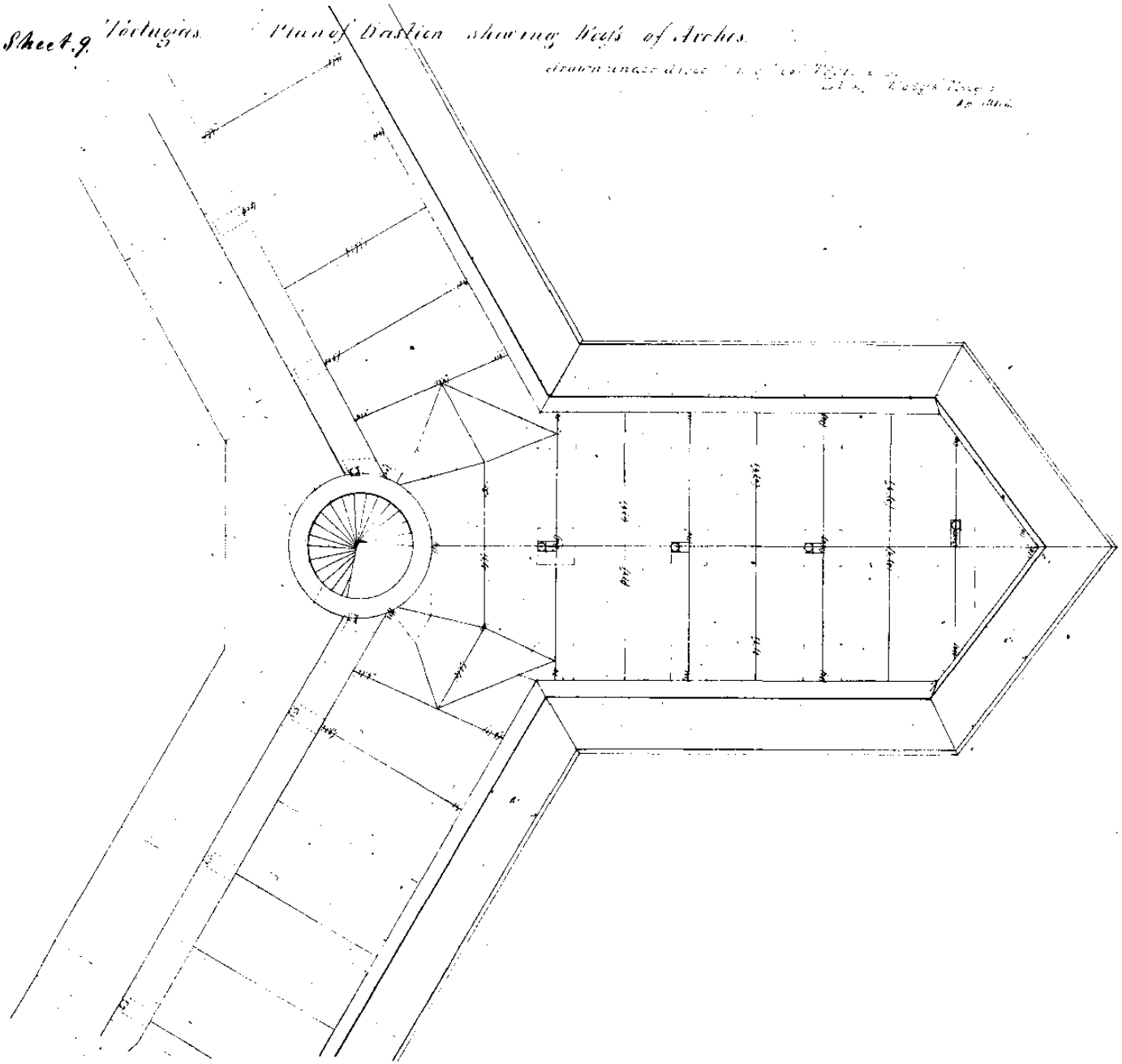
Sheet 8.

Portugues Bastions

Drawer 74.
Sheet. 10.

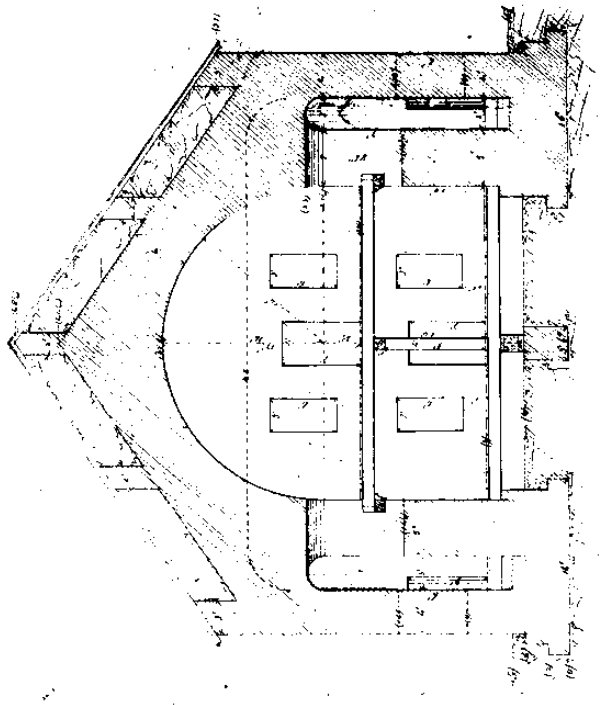


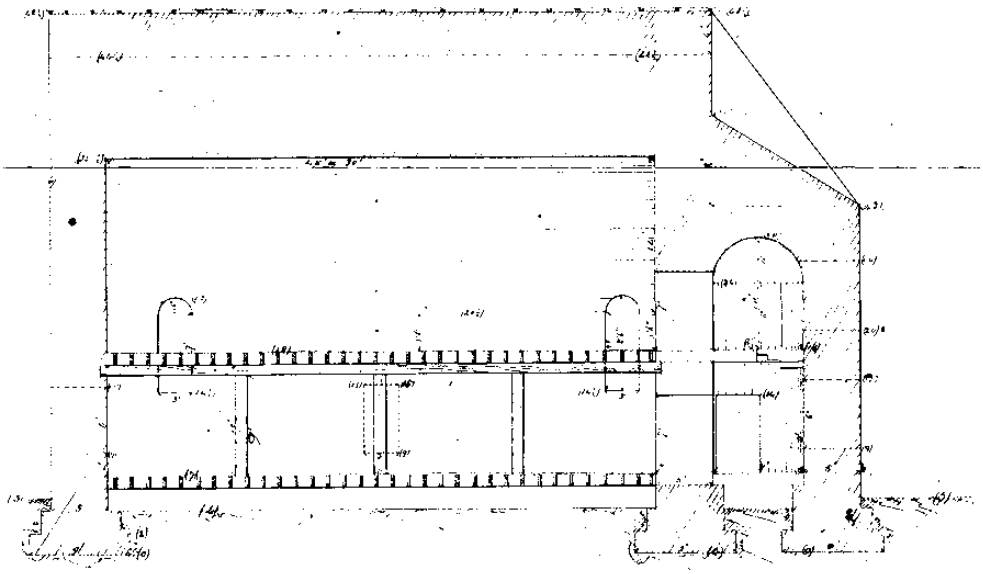
Sheet 9. Verlugens Plan of Bastion shewing Heights of Arches

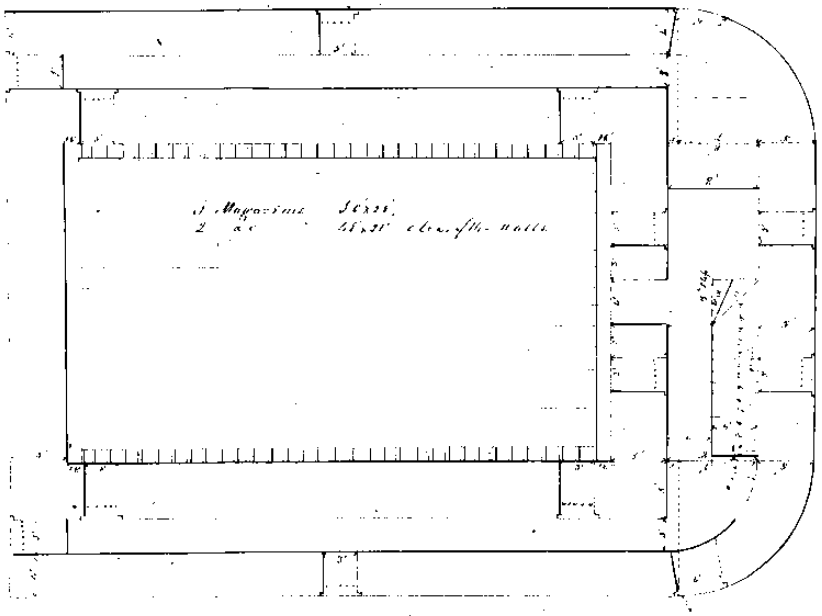


Drawer 74.
Sheet 11.

Drawer. 74.
Sheet. 12.

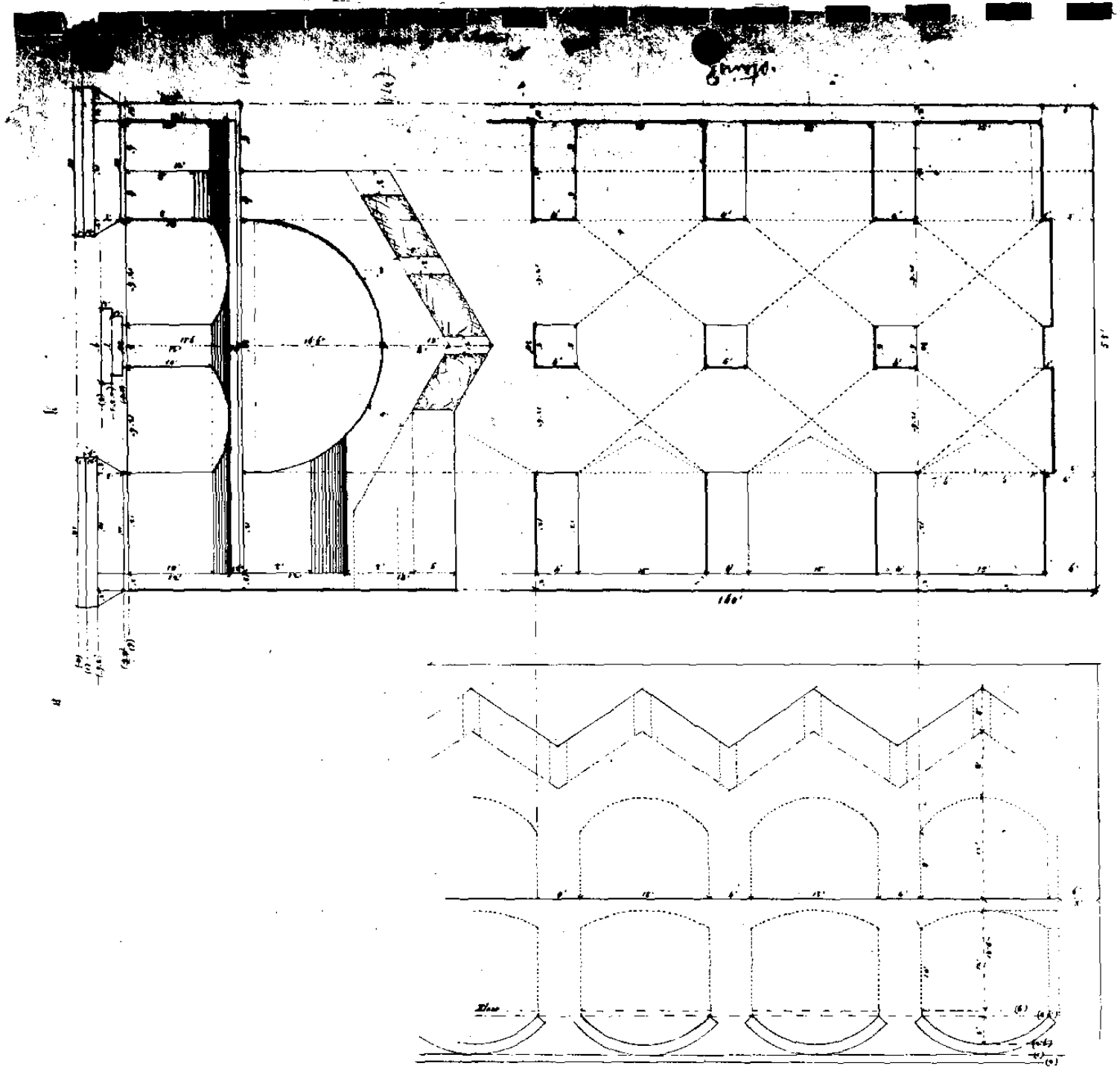








NATIONAL ARCHIVES DRAWINGS



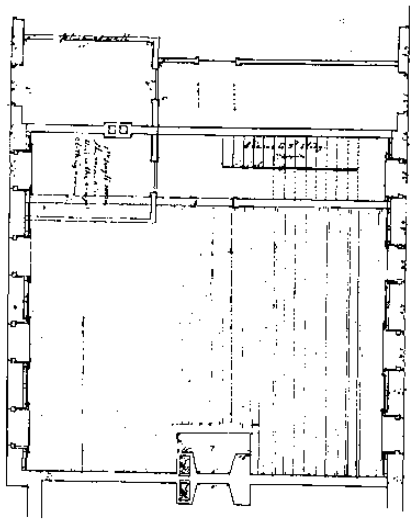
Cover. 74.
Sheet 13.

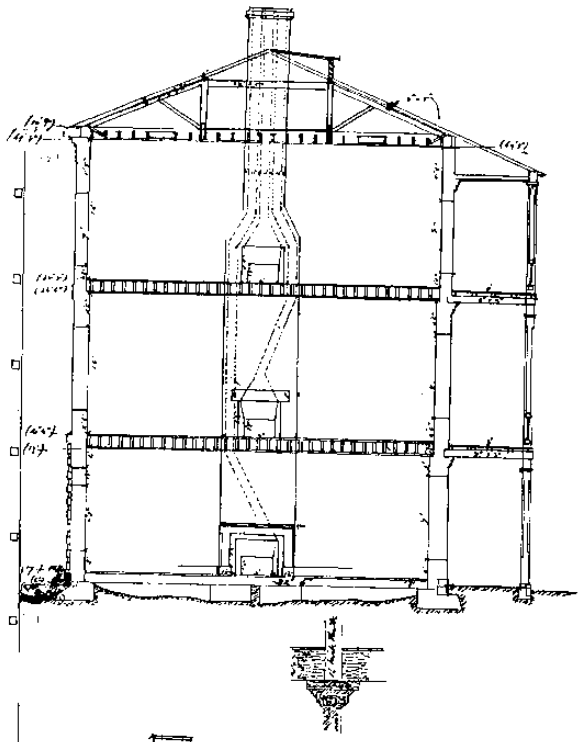
Garden Key – Tortugas Islands

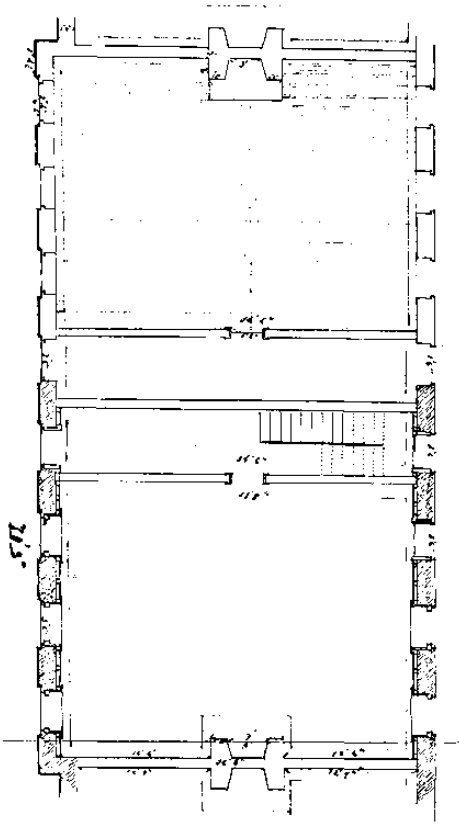
Plans and sections of Barracks and kitchen

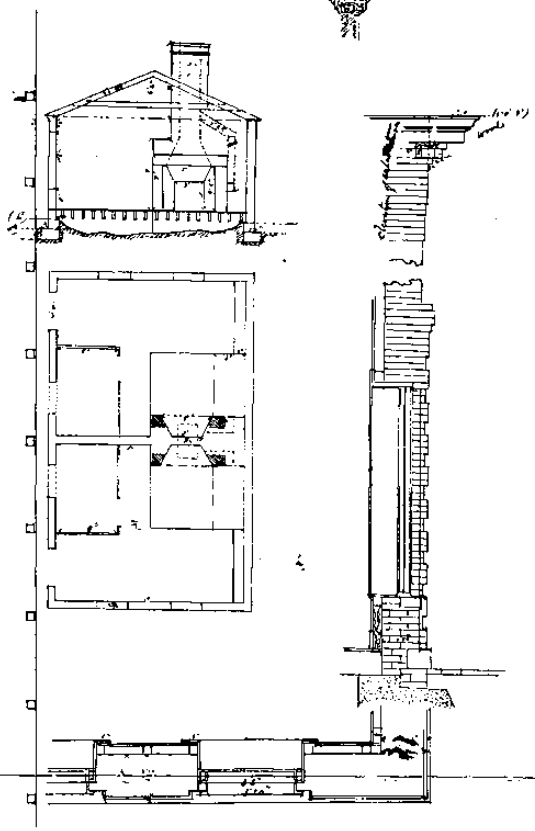
Scale

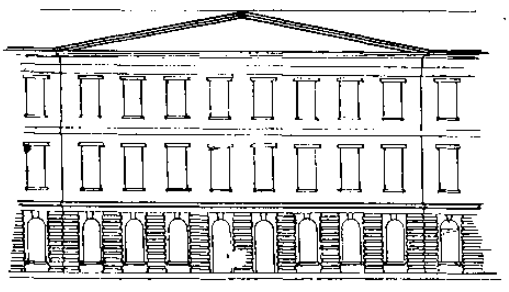
Drawer 74. No 15
Sheet 14.







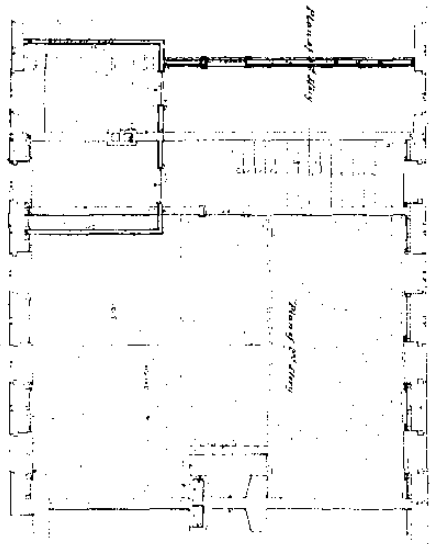


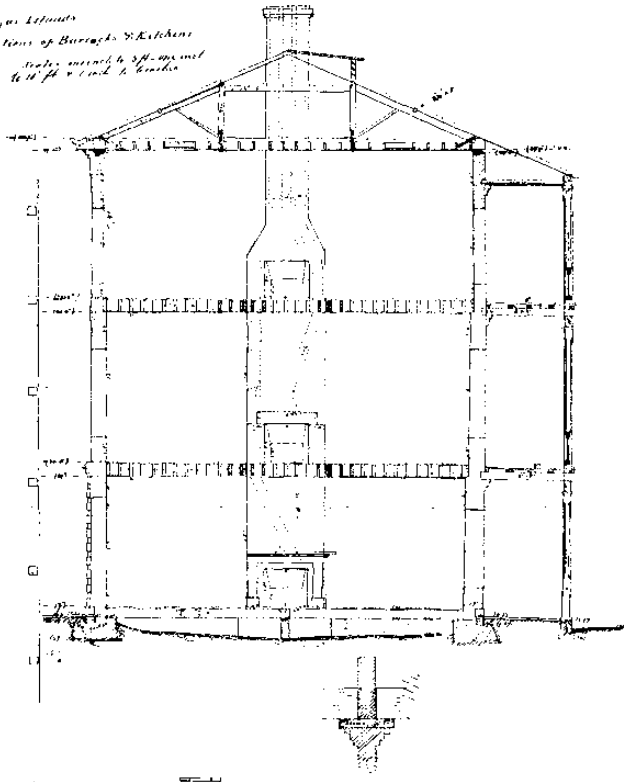


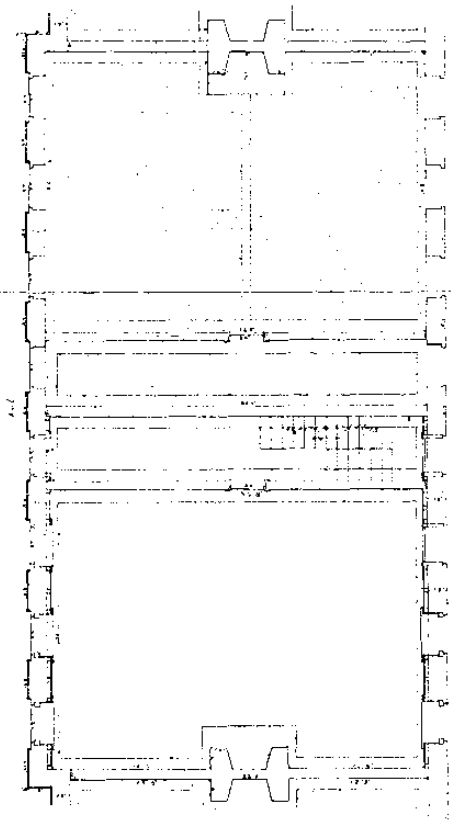
Drawer 74
Sheet 14

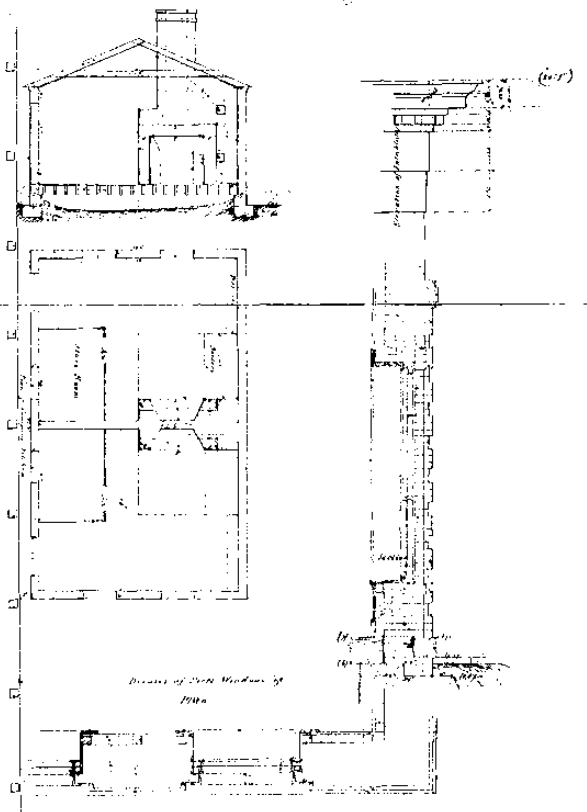
Garden Key Portuguese Islands
Plans Sections & Elevations of Barracks & Kitchens
Scales annexed to 3/8 in. and 1/16 in. to a foot

No 15

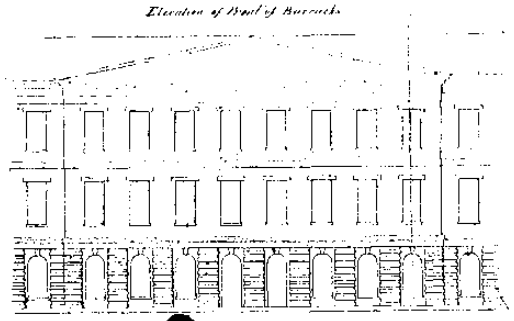








Elevation of Front of Barracks



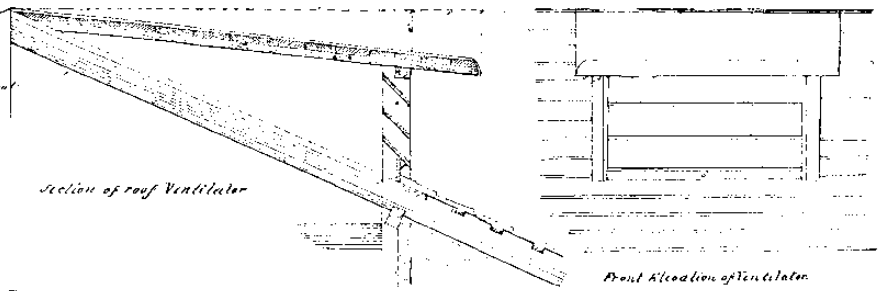
Garden Key Turtle Islands

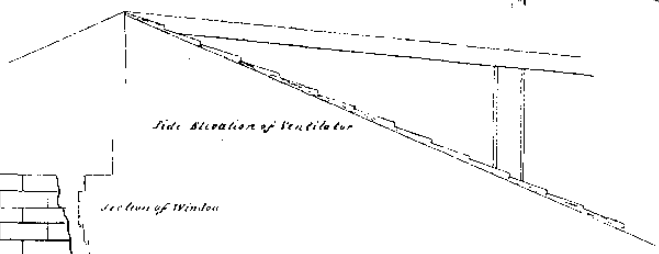
Details for Barracks

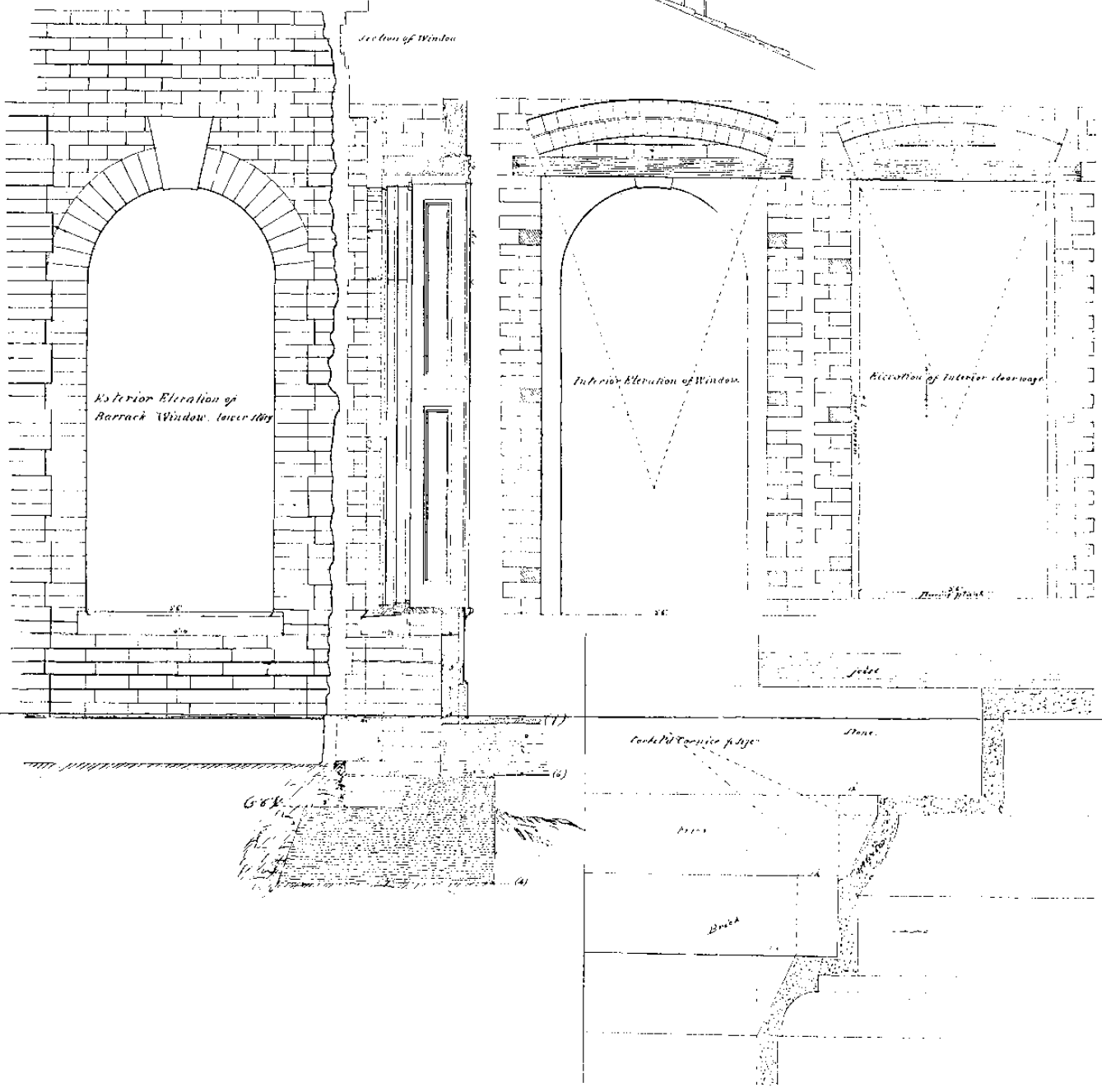
Scale one inch to the foot

~~No 16~~

Drawer 74.
Sheet 15.





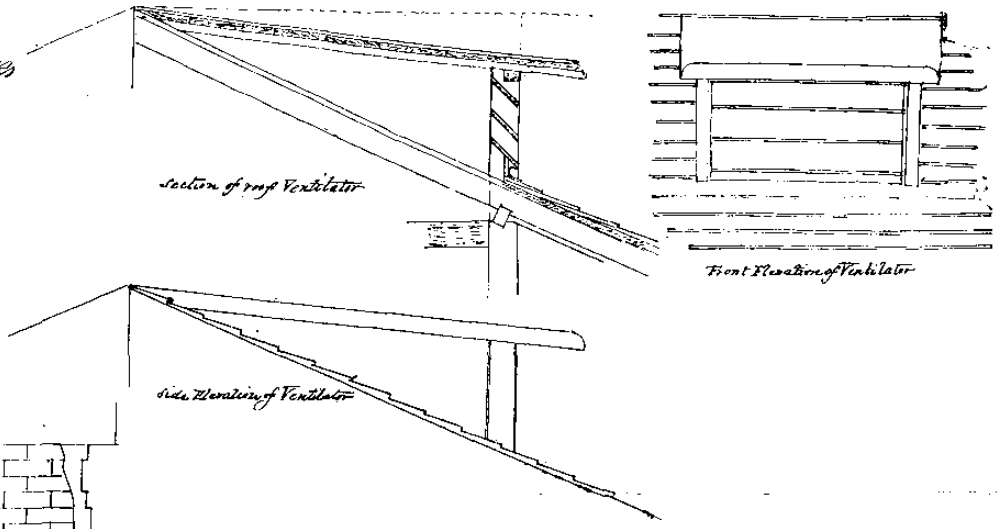


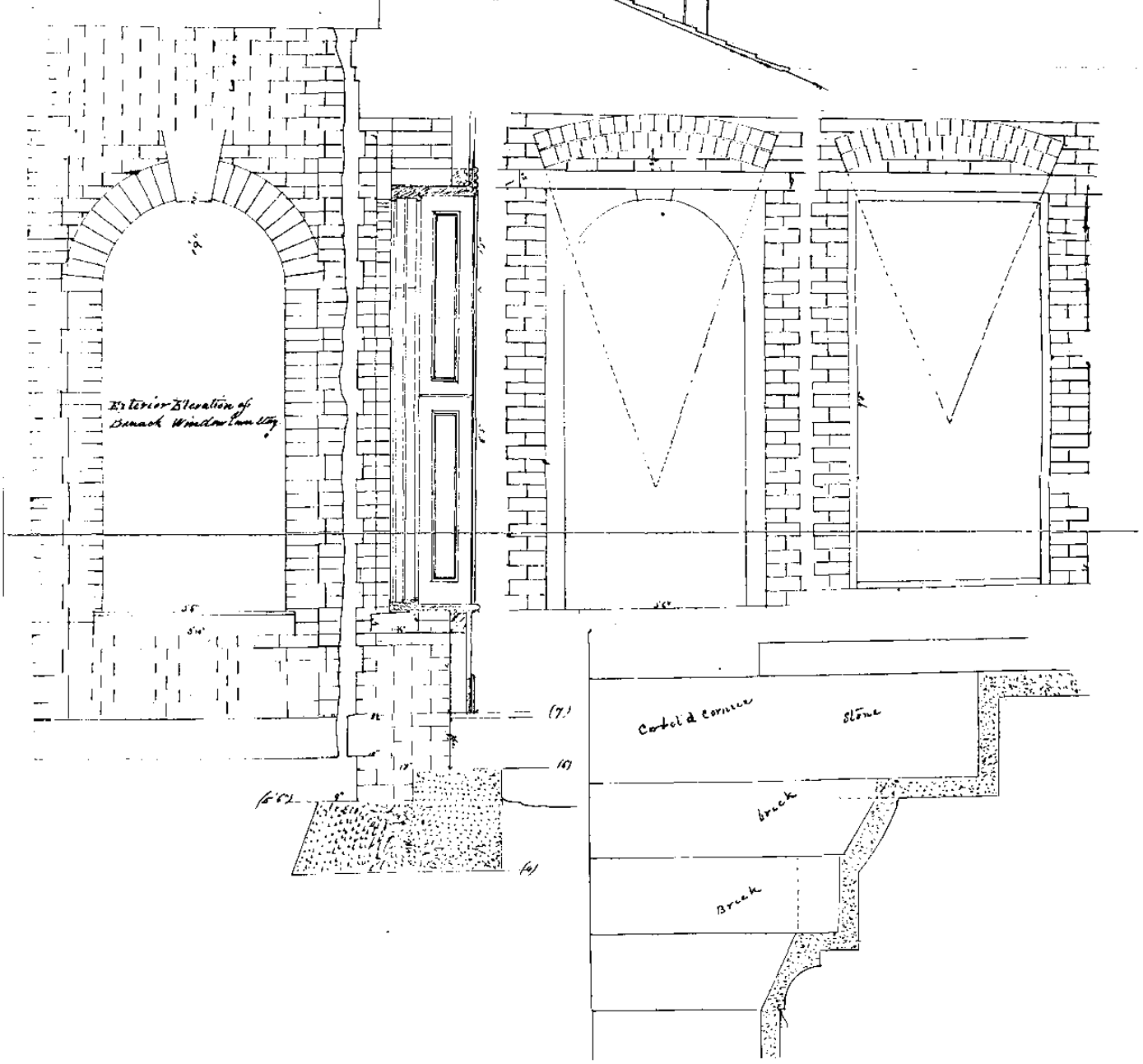
Gardenkey.

Details for Barracks

No 16

Drawer 74.
Sheet 15.





Garden Key Tortugas Islands

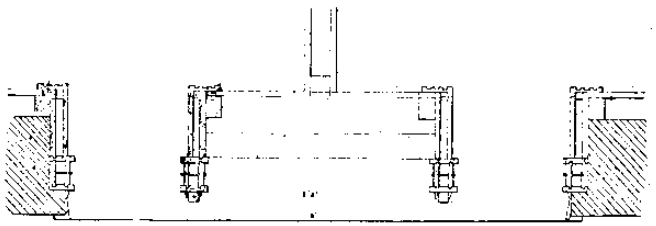
Plans and Sections of Officers Quarters and Kitchens.

Sketched by J G Foster Bvt 2nd Lt Engrs.

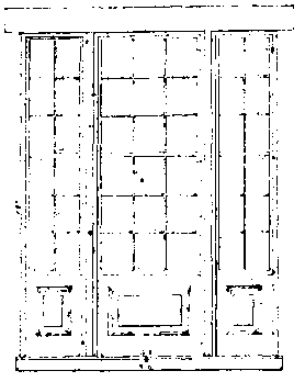
Washington Aug 15th 1846

Drawer 74.
Sheet 16.

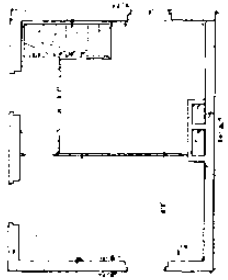
No 17

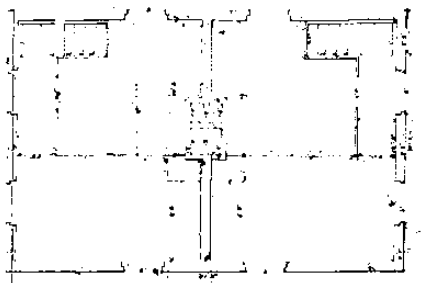


Plan of Venetian Window

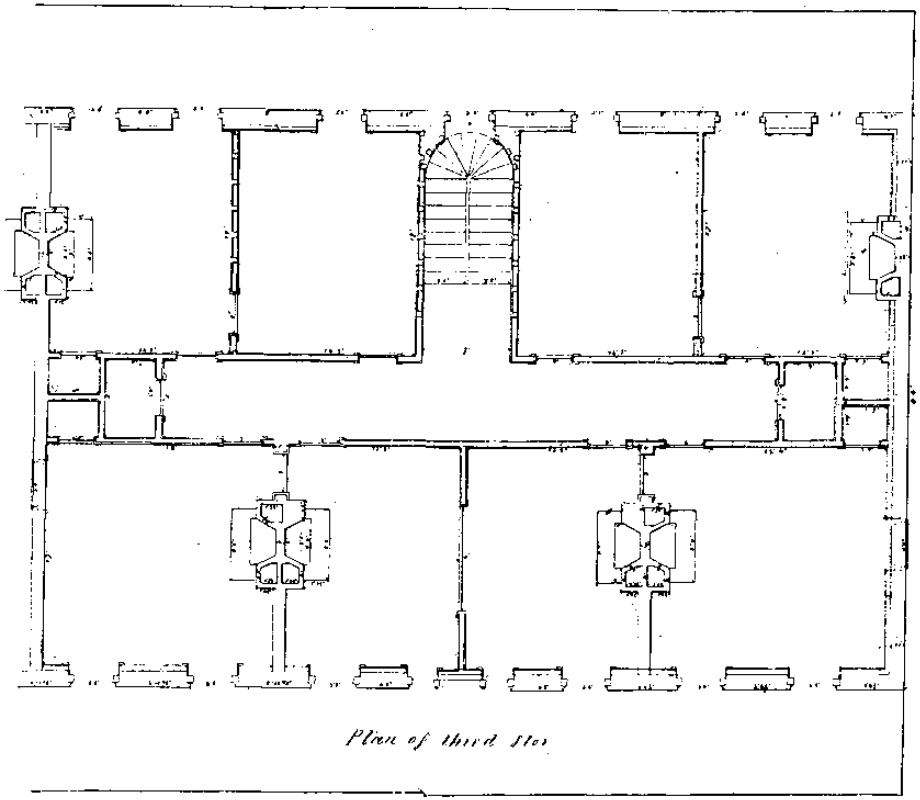


Elevation of Window

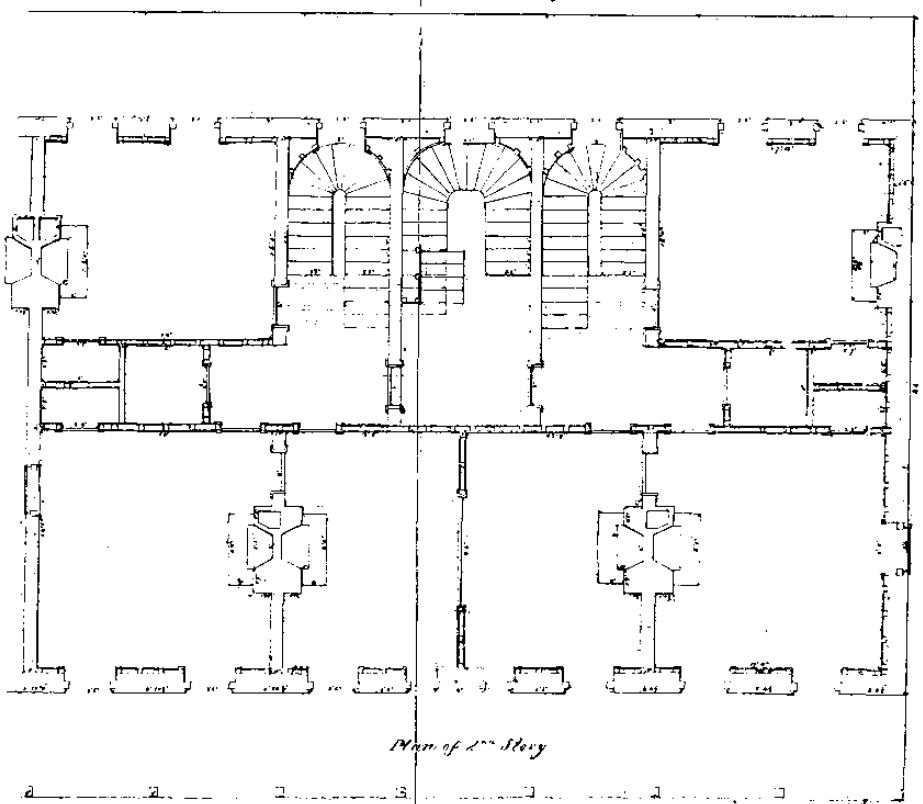




Plan of Kitchens 2nd Story



Plan of third Stor



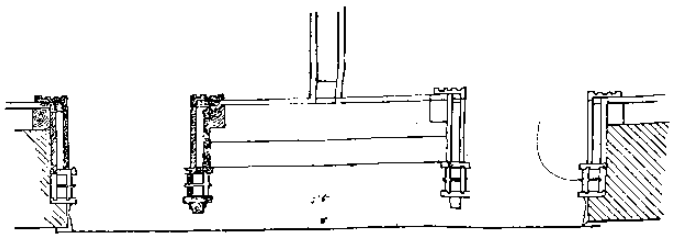
Plan of 2nd Story

Garden of Fortyseventh

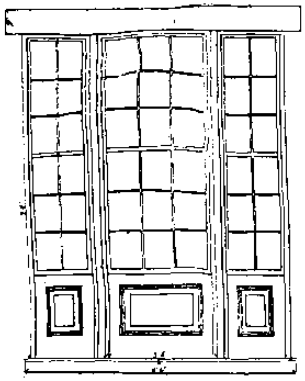
Plans and Sections of Officers Quarters and Kitchens

No 17

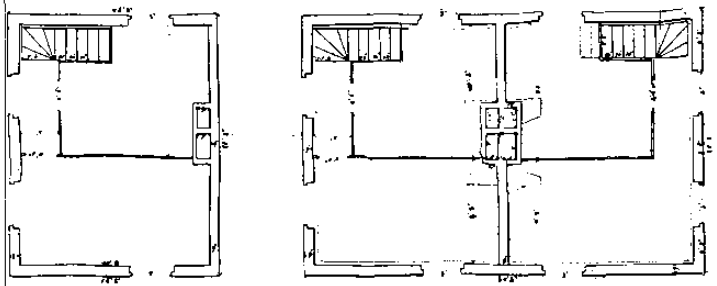
Drawer 74.
Sheet 16.



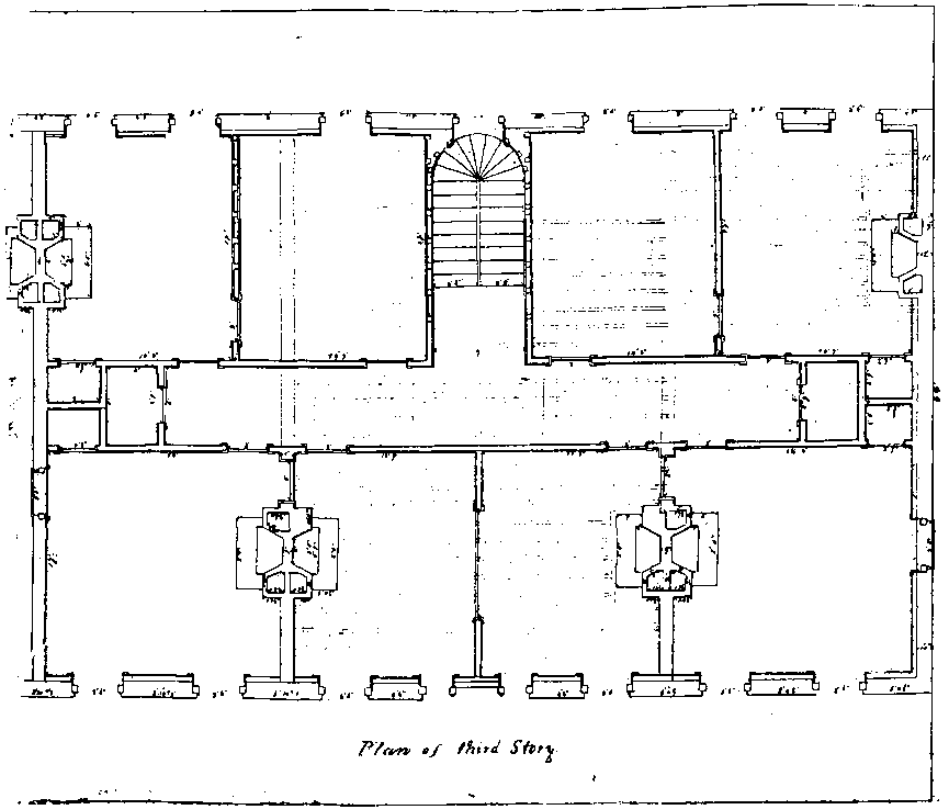
Plan of Venetian Window



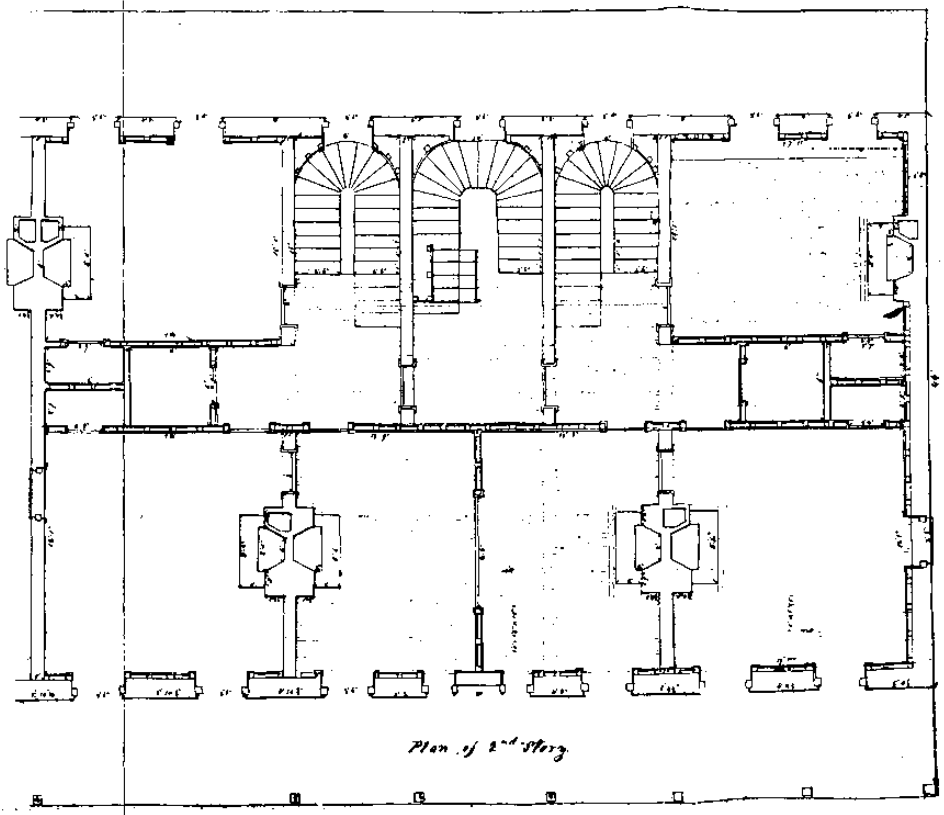
Elevation of Window



Plans of Kitchens 3rd Story



Plan of Third Story



Plan of 2nd Story

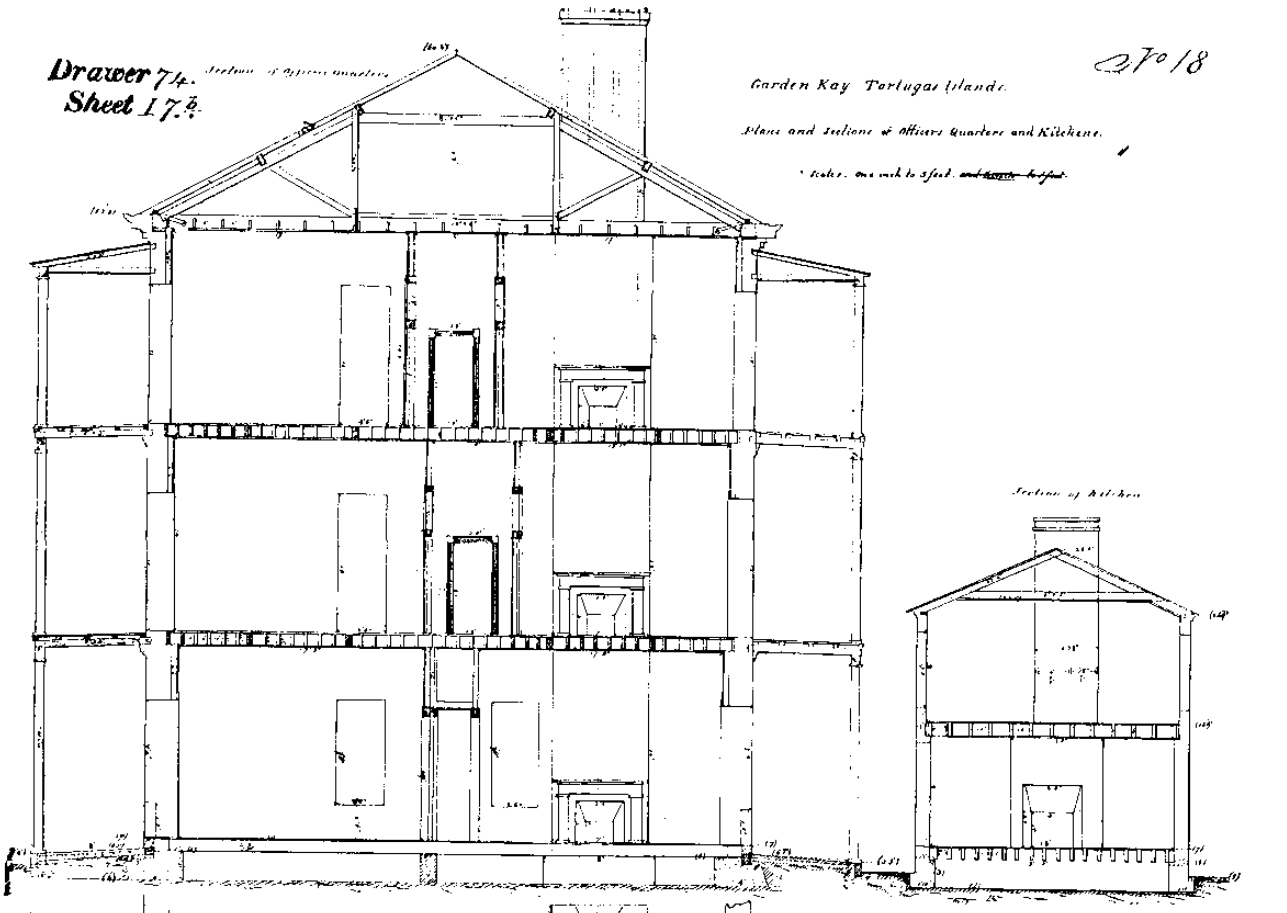
Drawer 74.
Sheet 17 ½

No 18

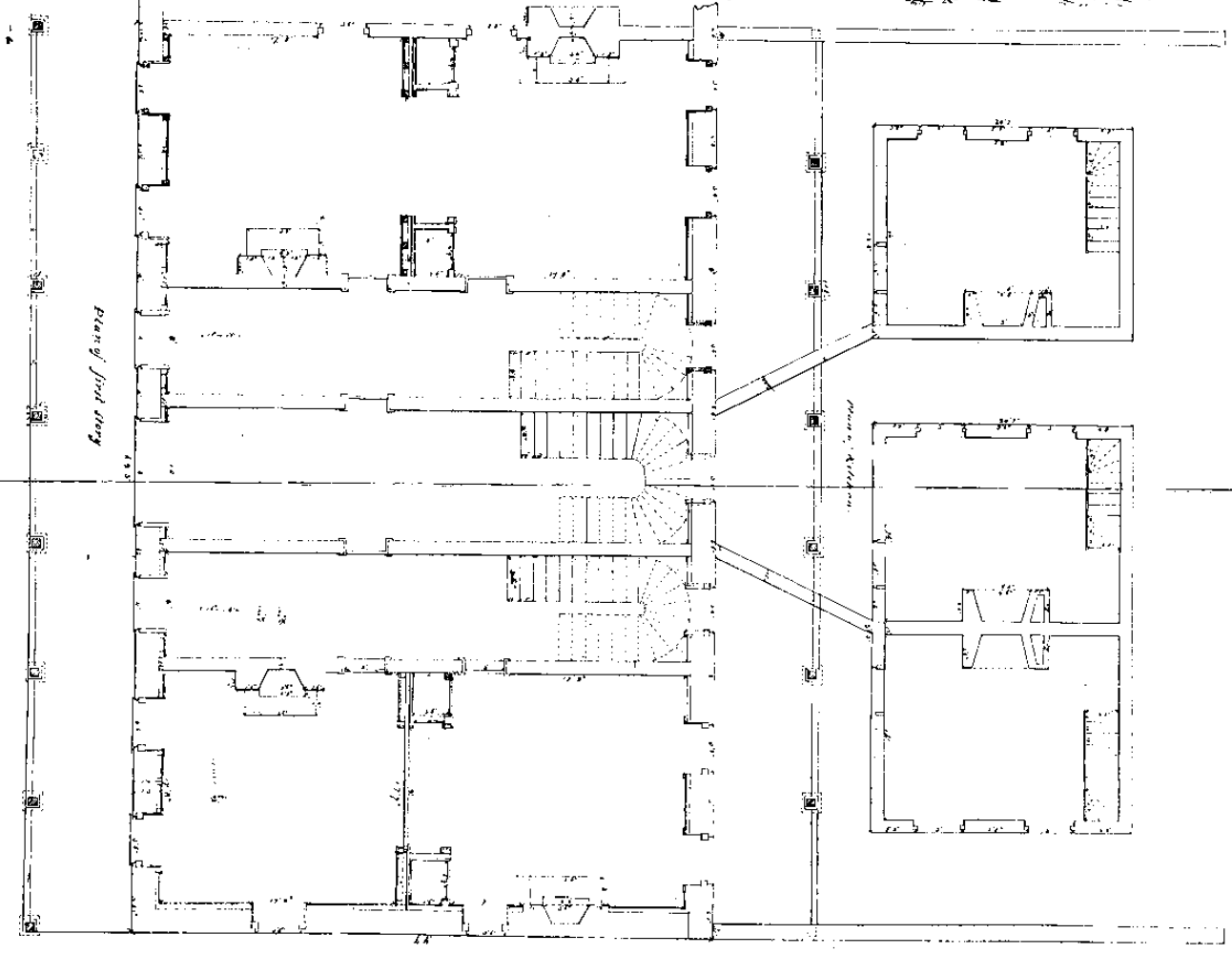
Garden Key Tortugas Islands.

Plans and Sections of Officers Quarters and Kitchens.

Scales. one inch to 8 feet.



Section of Kitchen



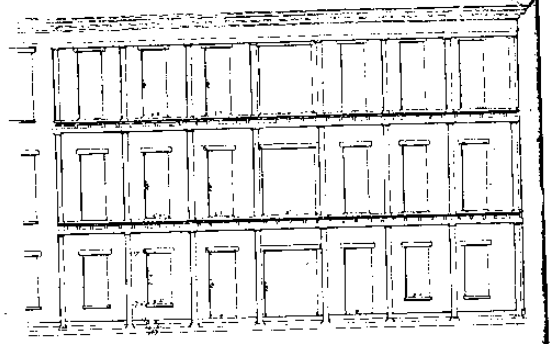
Plan of first Story

Garden Key Florida

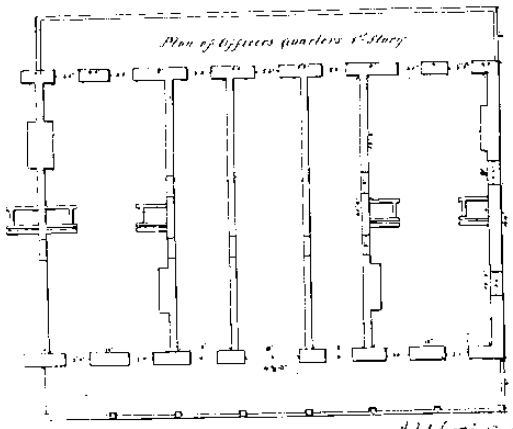
Drawer 74

No 19 Sheet 18.a

Front Elevation of Officers Quarters



Plan of Officers Quarters 1st Story



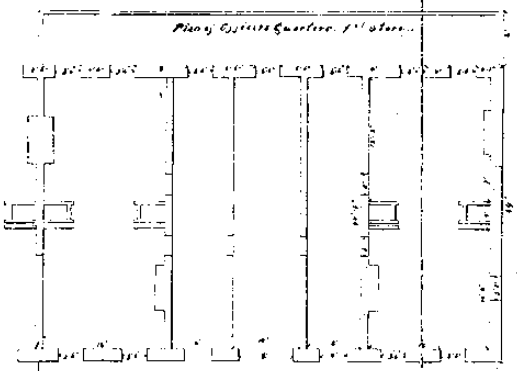
Drawer 74. Garden Key Florida

No 19 Sheet 18.

East Elevation of Officers Quarters



Plan of Officers Quarters 1st Story



Drawer 74.

Sheet 19.a

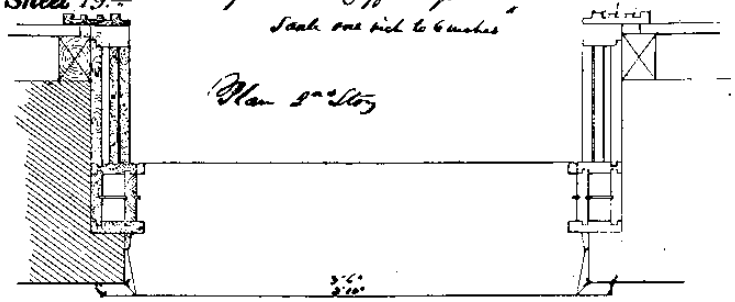
Garden Key. Tortugas Islands

Plans of Women's Officers Quarters

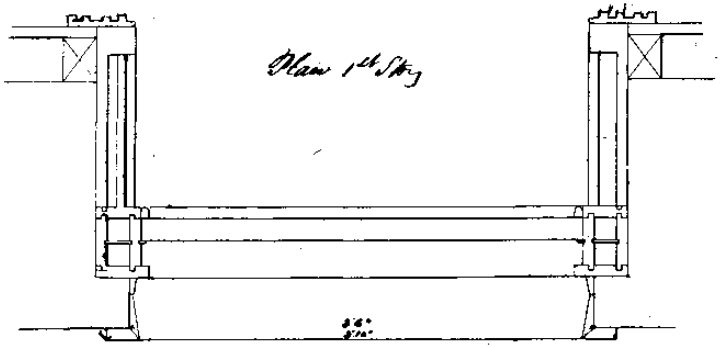
Scale one inch to 6 inches

No 20

Plan 2nd Story



Plan 1st Story



Drawer 74
Sheet 17.

Garden Key Tortugas Islands

Plans and sections of Officers Quarters and Kitchens.

Section of Officers Quarters

Section of Kitchen

Plan of first floor

Plan of Kitchens

16a

Drawer 74.
Sheet 17.a

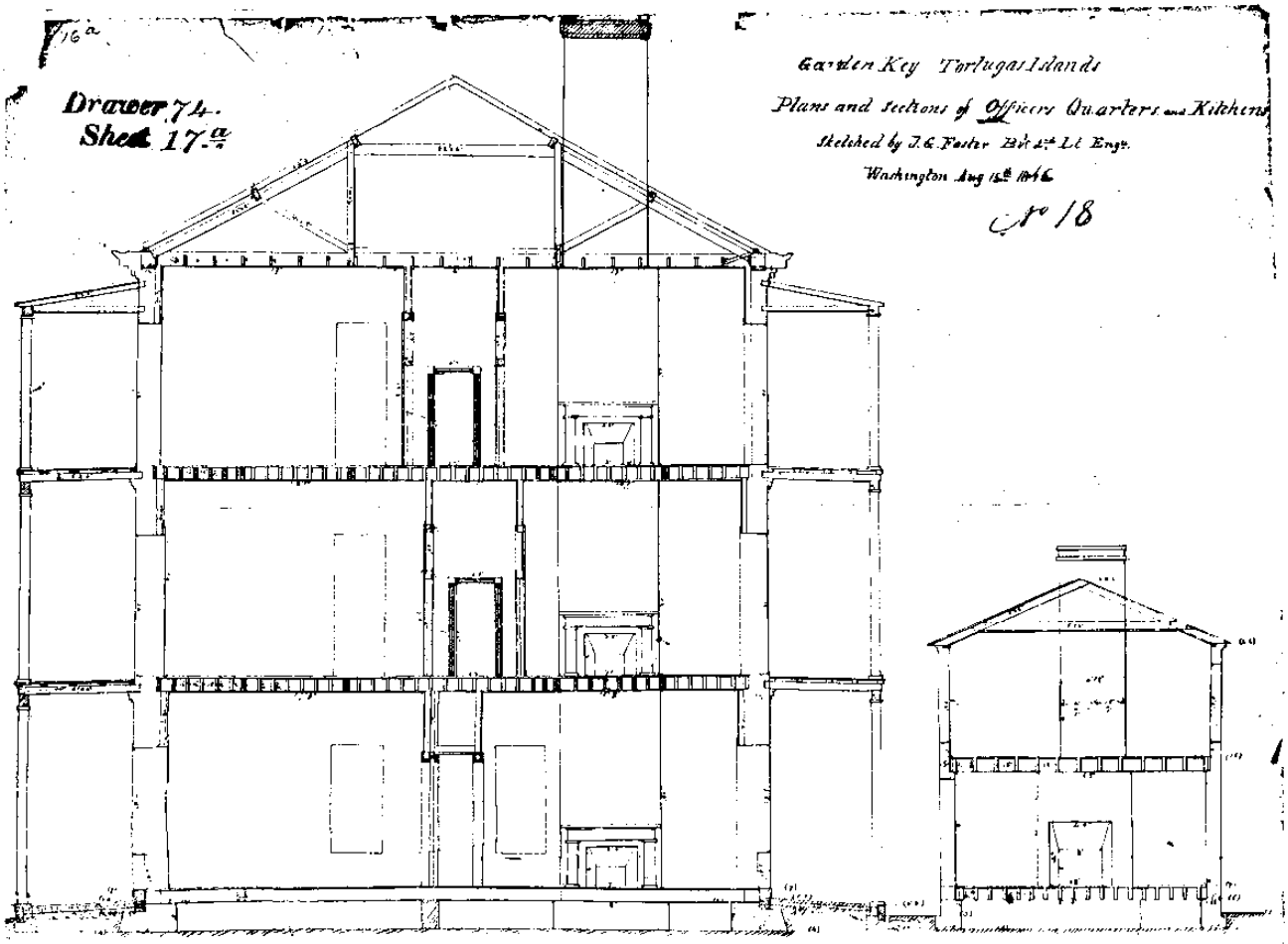
Garden Key Tortugas Islands

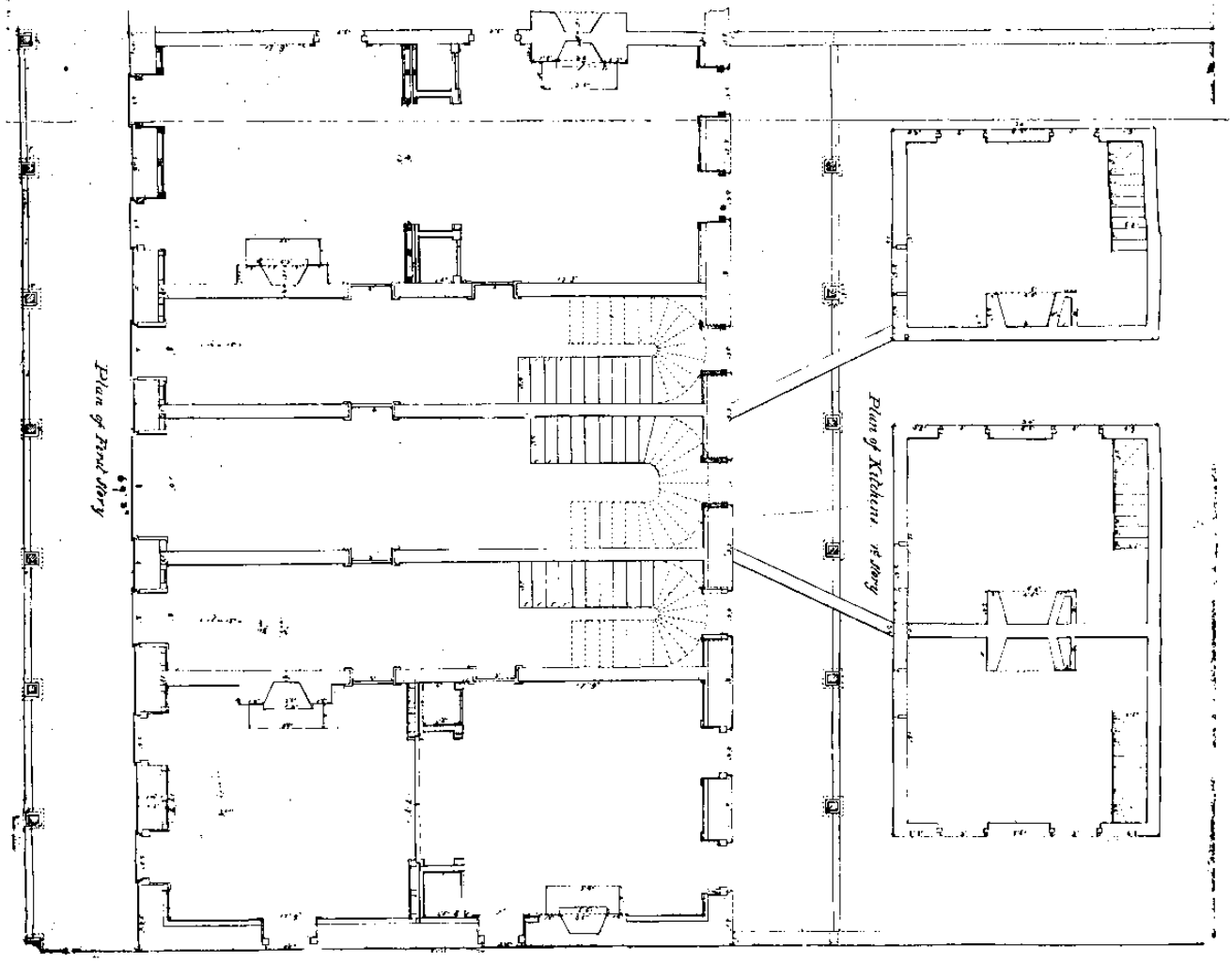
Plans and sections of Officers Quarters and Kitchens

Sketched by J.G. Foster Bvt 2d Lt Engr.

Washington Aug 15th 1846

№ 18





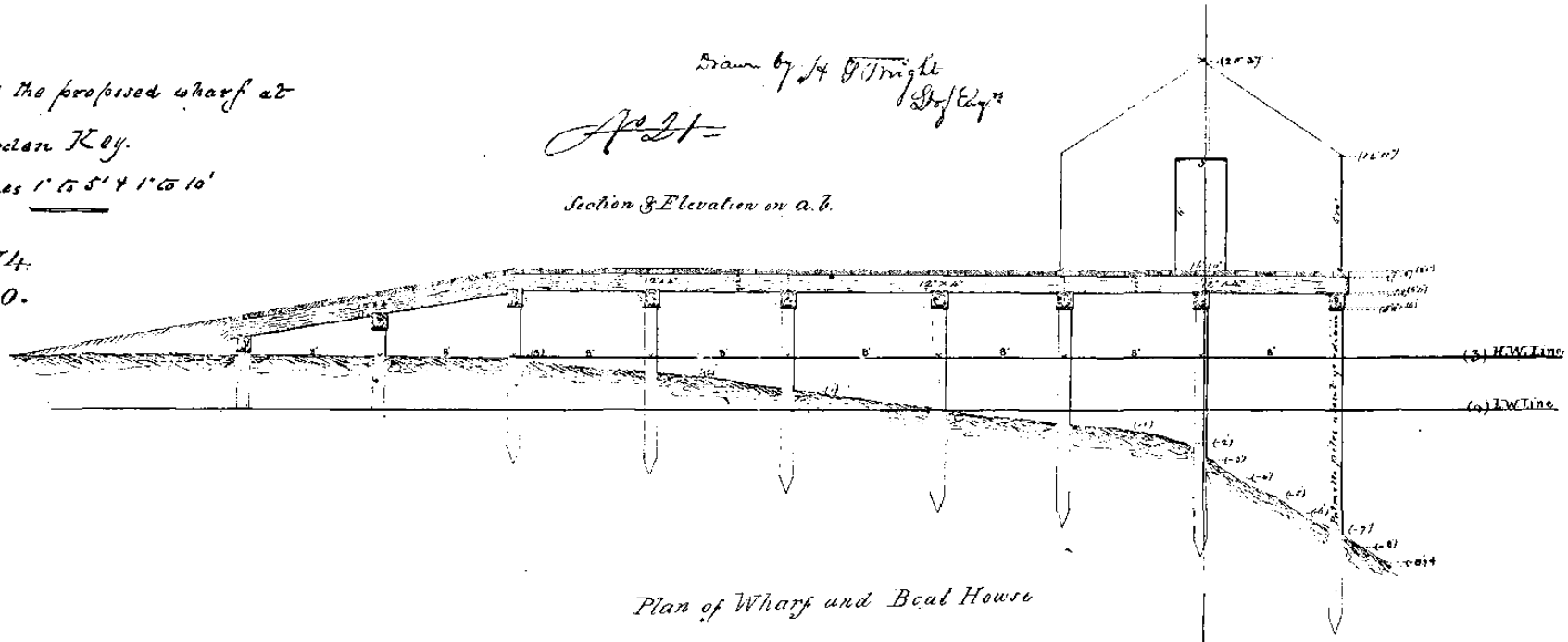
Sketch showing the proposed wharf at
Garden Key.
Scales 1" to 5' & 1" to 10'

Drawer 74.
Sheet 20.

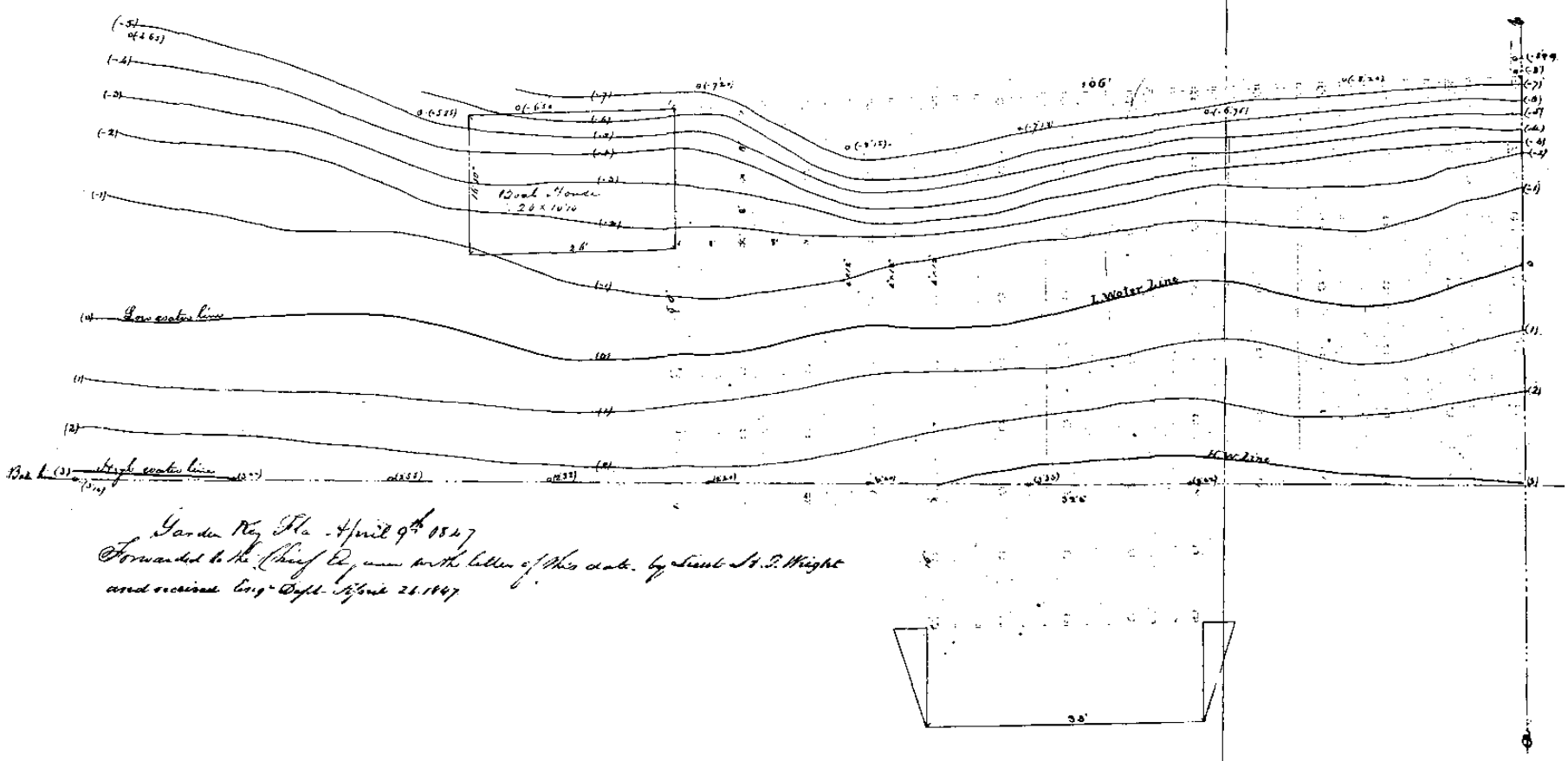
Drawn by Lt D. Wright
Dist Engrs

No 21

Section & Elevation on a.b.



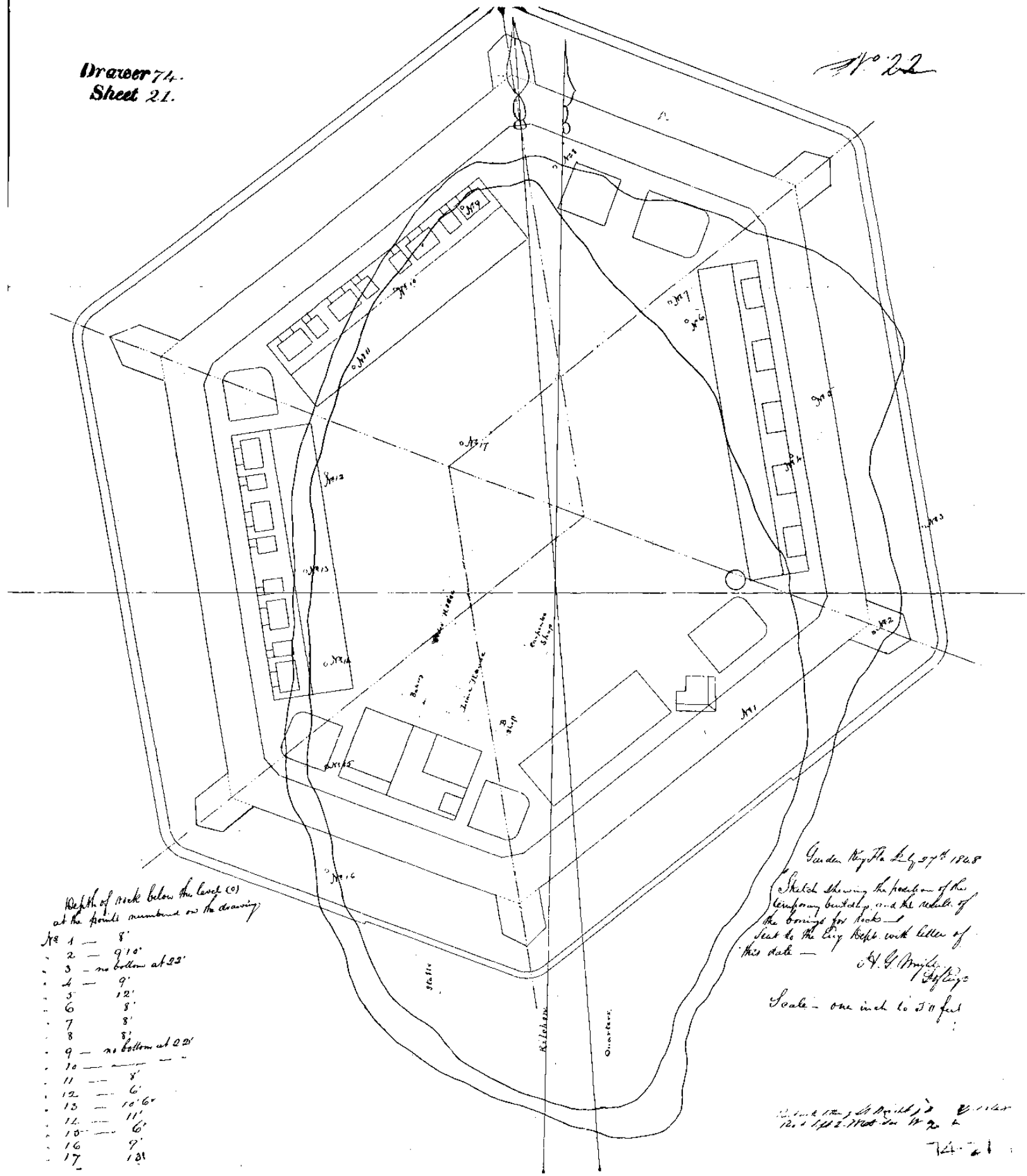
Plan of Wharf and Boat House



Garden Key Fla - April 9th 1847
Forwarded to the Chief Engr with letter of this date by Lieut D. P. Wright
and received Engr Dept Sept 26. 1847

Drawer 74.
Sheet 21.

No 22



Depth of Rock below the Level (0)
at the points numbered on the drawing

No	1	8'
	2	9'10"
	3	no bottom at 22'
	4	9'
	5	12'
	6	8'
	7	8'
	8	8'
	9	no bottom at 22'
	10	——
	11	8'
	12	6'
	13	10'6"
	14	11'
	15	6'
	16	9'
	17	13'

Garden Reg[t]n Office 27th 1848

Sketch shewing the position of the temporary buildings, and the results of the borings for rock —
Sent to the Civ[l] Sec[y] with letter of this date —

H. G. Smith
Sup[t] Engr

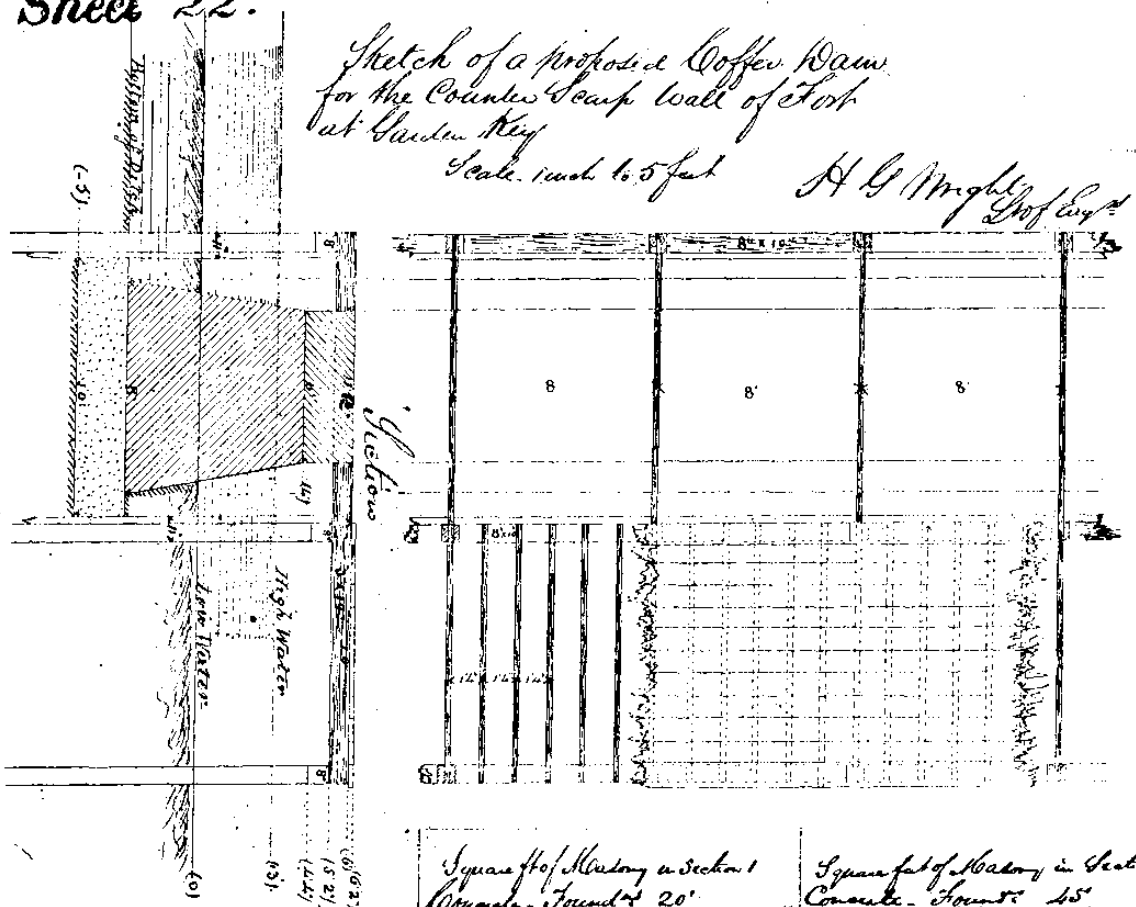
Scale — one inch to 50 feet

Drawer 74.
Sheet 22.

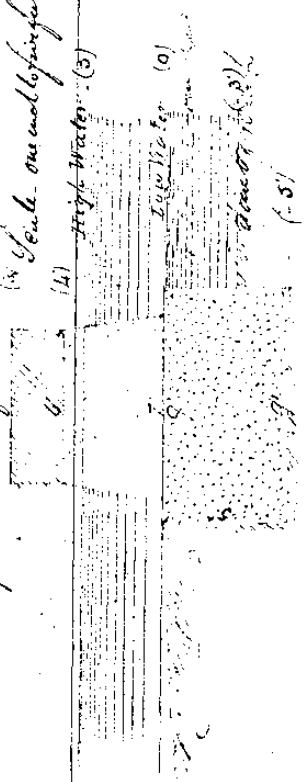
No 23

Sketch of a proposed Coffer Dam for the Counter Scarp wall of Fort at Garden Key
Scale 1 inch to 5 feet

H G Wright Sup Engr



Profile of Section for C.S. Wall
Scale one inch to 5 feet



Square ft of Masonry in Section 1	Square feet of Masonry in Section 2
Concrete - Foundn 20'	Concrete - Foundn 15'
Superstr 30 ft = 50 ft	Superstr 15 ft = 60 ft
13 inch Masonry - Faces of walls 18 ft	13 inch - Faces of walls 10 ft
Stone - Coping 12'	Stone - Coping 12'
Square feet of Masonry = 81	Square feet of Masonry = 83

Garden Ky. Fla. July 27th 1848
Forwards to Engr Dept with his letter of this date.

H G Wright
Sup Engr

Rec'd & ack'd W Wright to Letter 7 July 27 and Sub 2 Sec Nov 1848

22

Sketch of the Fort projected for Garden Key. Fla.

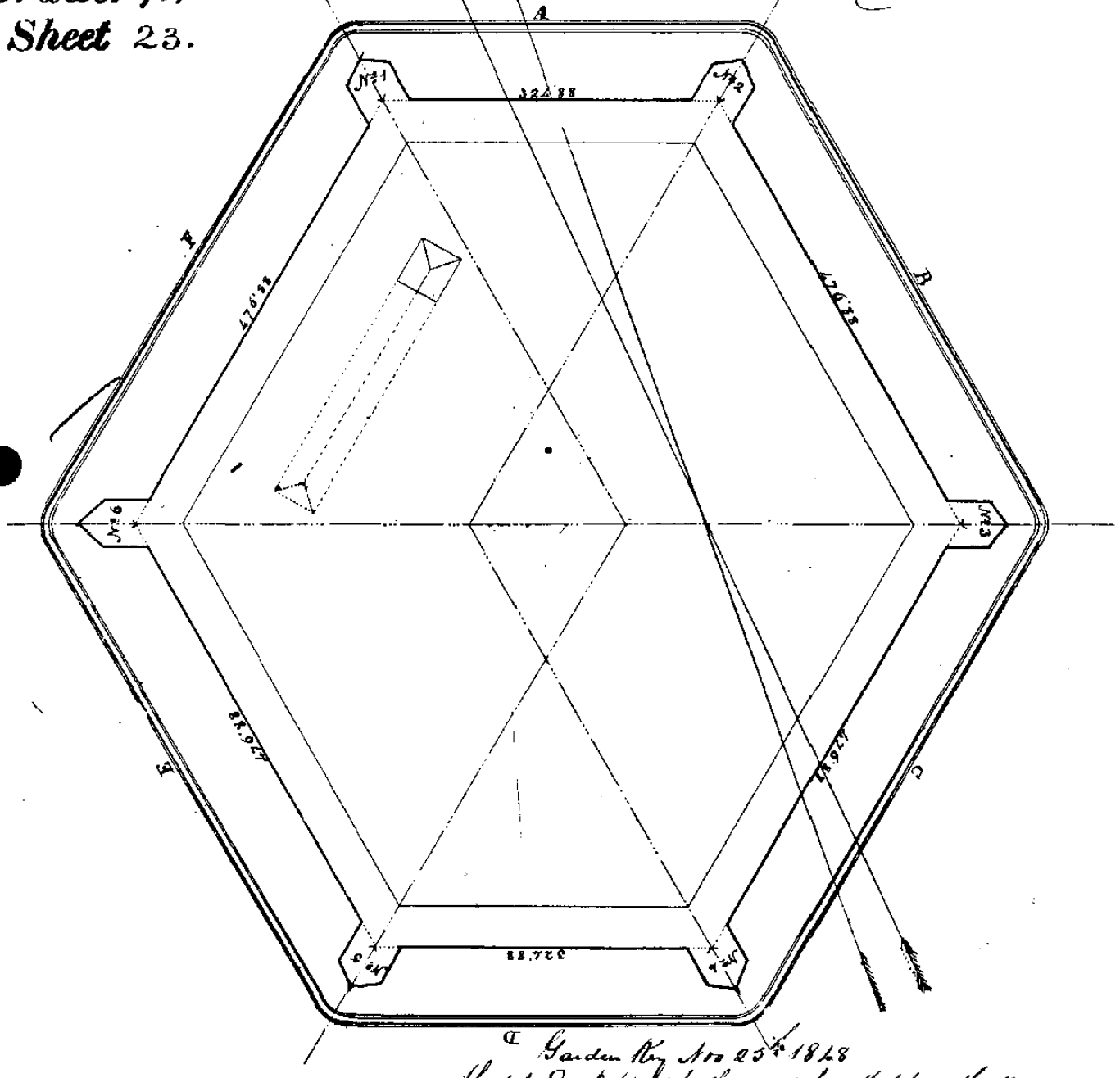
Scale - 1 inch to 100 feet

A 924

H. G. Wright
Fort Engr

Eng: Dept
Dec 15 1848
Rec'd with Lt H. G. Wright's letter of Nov 25 1848
W.

Drawer 74.
Sheet 23.



Garden Key Nov 25th 1848

Sent to Eng Dept with the request for a sketch with all the dimensions of bastion № 6 and of all the others which differ in plan from № 5

Garden Key. Tortugas

Drawer 74.
Sheet 24.

No 24

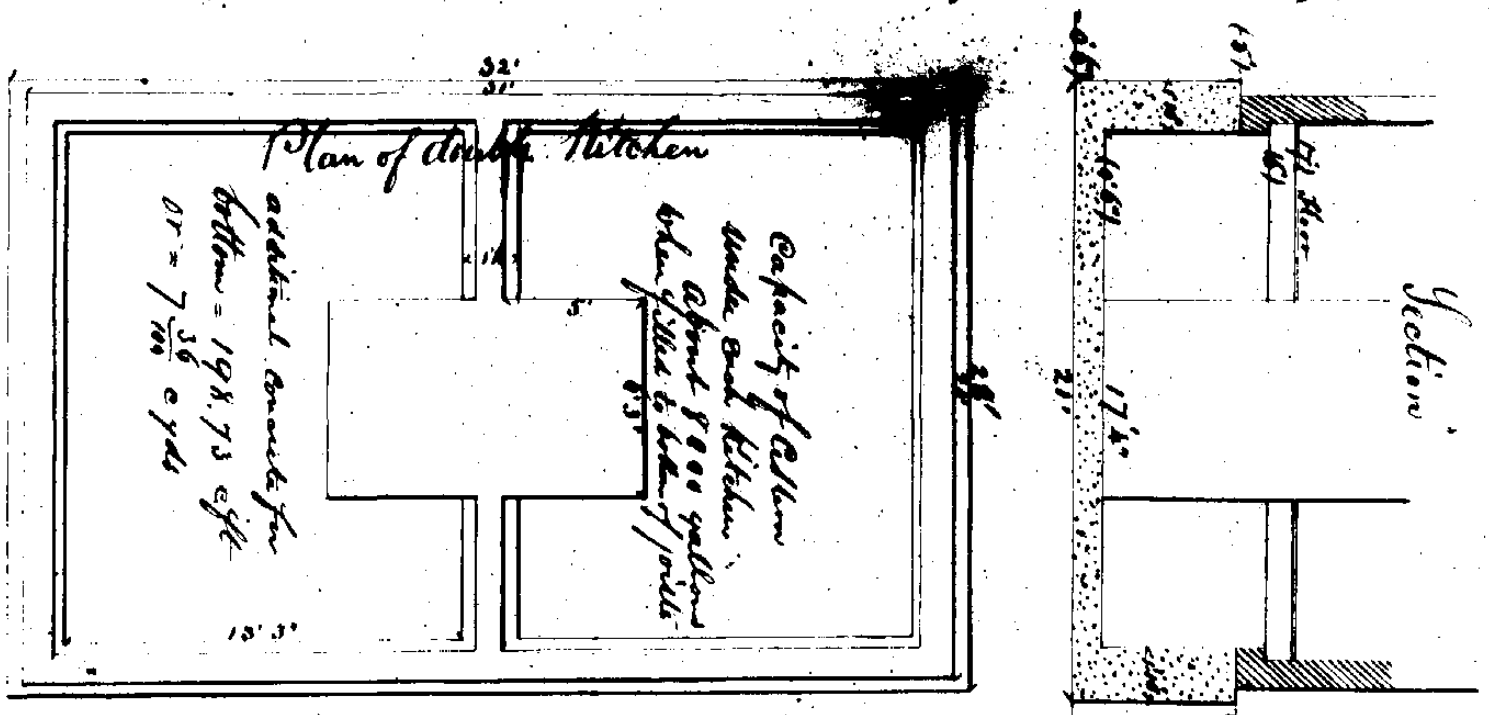
Engr Dept 15 Oct. 49
Rec'd with annual Report
under date of 2d Oct.
See N. 29.

Sketch of cisterns proposed to be built under the kitchens of Officers quarters when the remainder of them are constructed. Similar ones might be made under the kitchens of the barracks.

Scale - one inch to 5 ft

Garden Key Aug 14 1849

N. G. Bright
Asst Engr



Sent to Eng Dept with Annual Report for 1849—

N. G. B.

24.
Florida (W.S.)

Drawer 74.
Sheet 25.

Forts Key West & Tortugas

Fortifications No 28

Drawing shewing the Extent of Counterscarp Wall and Stone dam constructed during the 30th Sept 1849 — Scale one inch to 50 ft

Sent to Engineer Department with Annual Report for the year ending on the 30th Sept 1849

J. F. Wright
Lt Col

Section of Counterscarp
Scale one inch to 8 feet

Engd Sept 15 October 1849
Remarks with Annual Report
dated 2 Oct 1849

The full black lines show the operations of the first year: the red lines those for the succeeding year: the remainder of the Work will complete the Fort for the year 1850-51

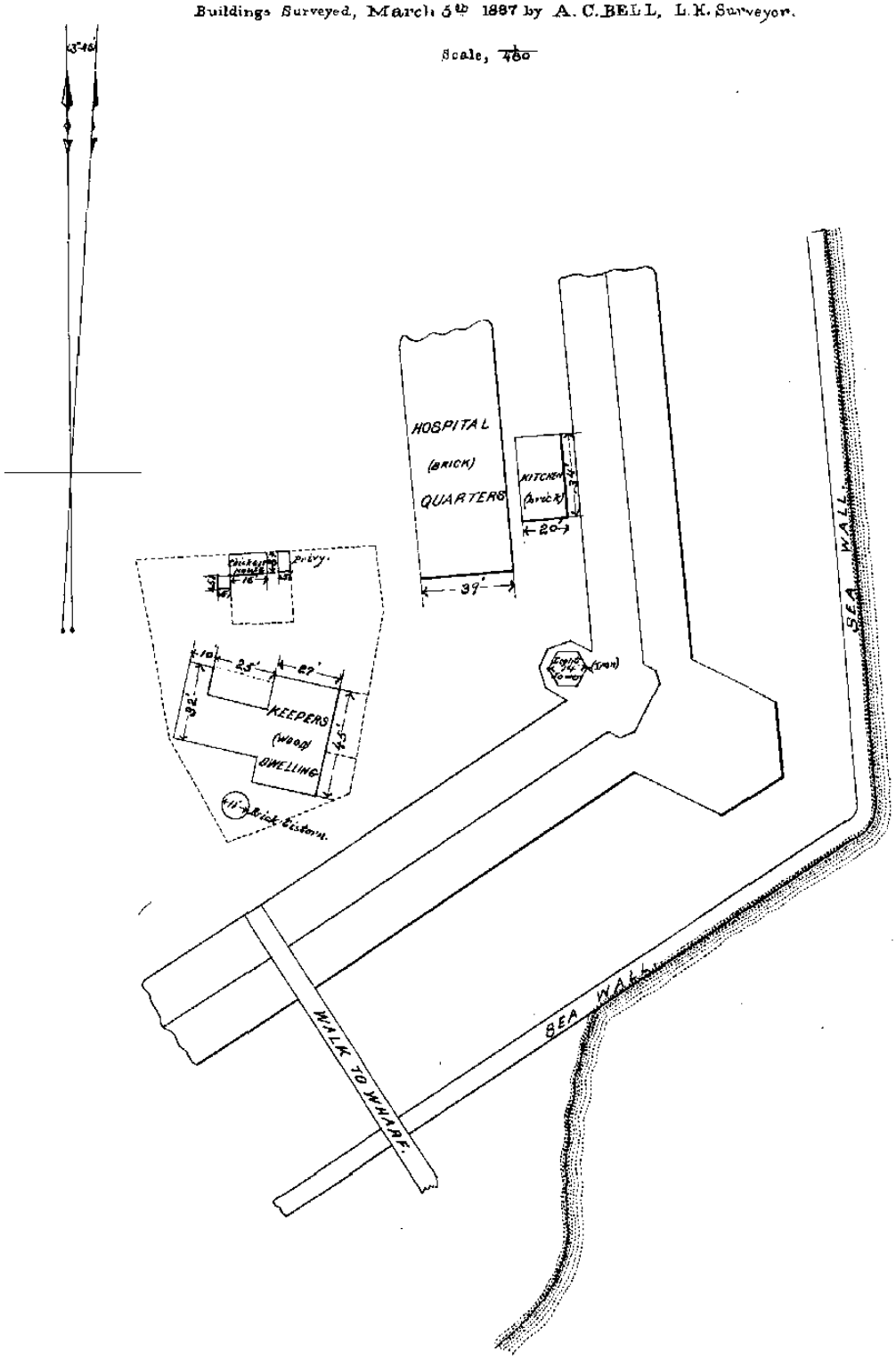
TORTUGAS HARBOR

LIGHT STATION,

FLORIDA.

Buildings Surveyed, March 5th 1887 by A. C. BELL, L.H. Surveyor.

Scale, 1/480



Feet 10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

A. C. Bell
L. H. Surveyor 7th & 8th Dists.

M. H. Kellar, Major of Engrs.,
Engr. 7th & 8th L.H. Dists.

OFFICE OF L.H. ENGR., NEW ORLEANS, LA. APRIL 22, 1887.

Fortifications

Garden Key Tortugas

Drawer 74.

Sheet 26.

Florida — № 27

Sheet № 1a.

Sketch shewing Plan, Section and position of a proposed Cistern and proposed points for Sluices through the Counterscarp wall. The full black lines show the portion of the foundation now laid. The wall is completed from its commencement on point № 1 to near the curve ... joining Points № 4 & 5 with the exception of the coping.

H. G. Wright
Asst Engr

Sketch of proposed Cistern. Capacity 1861.08 Gallons
Scale one inch to one foot

Section

Plan

Capacity 37 x 24 x 7.49 = 7281.12 Gallons

Capacity 37 x 24 x 7.49 = 7281.12 Gallons

Sluice

Garden Key Fla. May 23d 1850

Sent to Engineer Department with letters of this date.

Sig'd 14 June 1850 H G Wright
Asst Engr

Contract and Prices Tables
of 25th May 1850 (W 947.968)

Fortifications
Garden Key - Tortugas

Florida

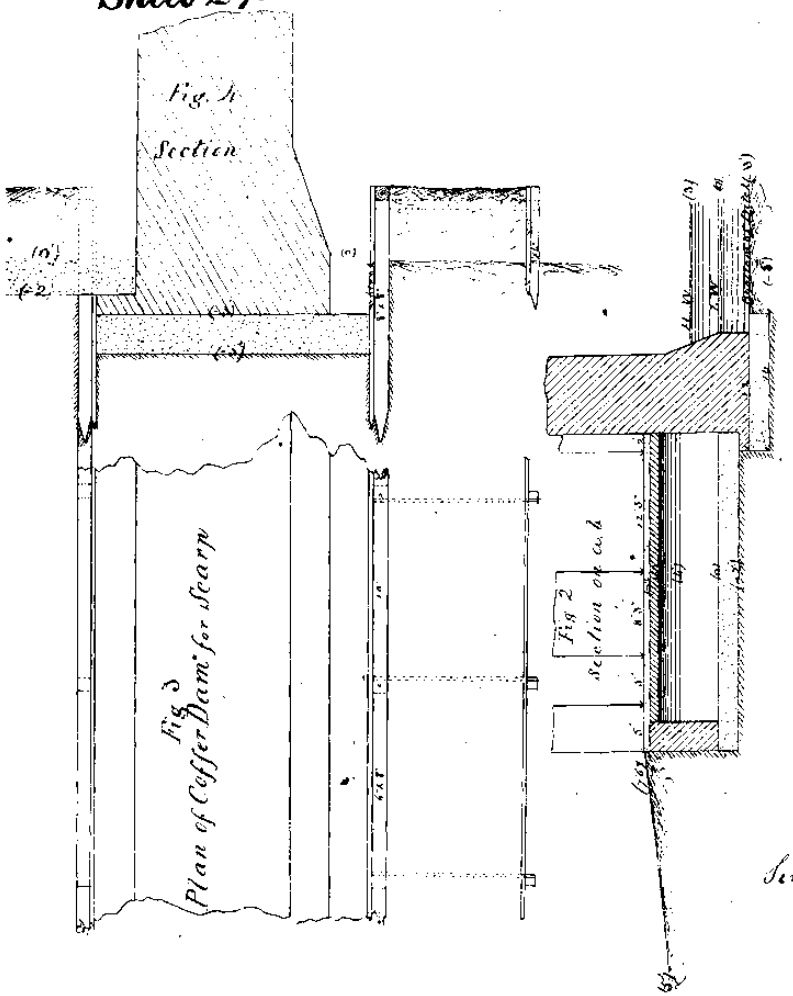
No 28

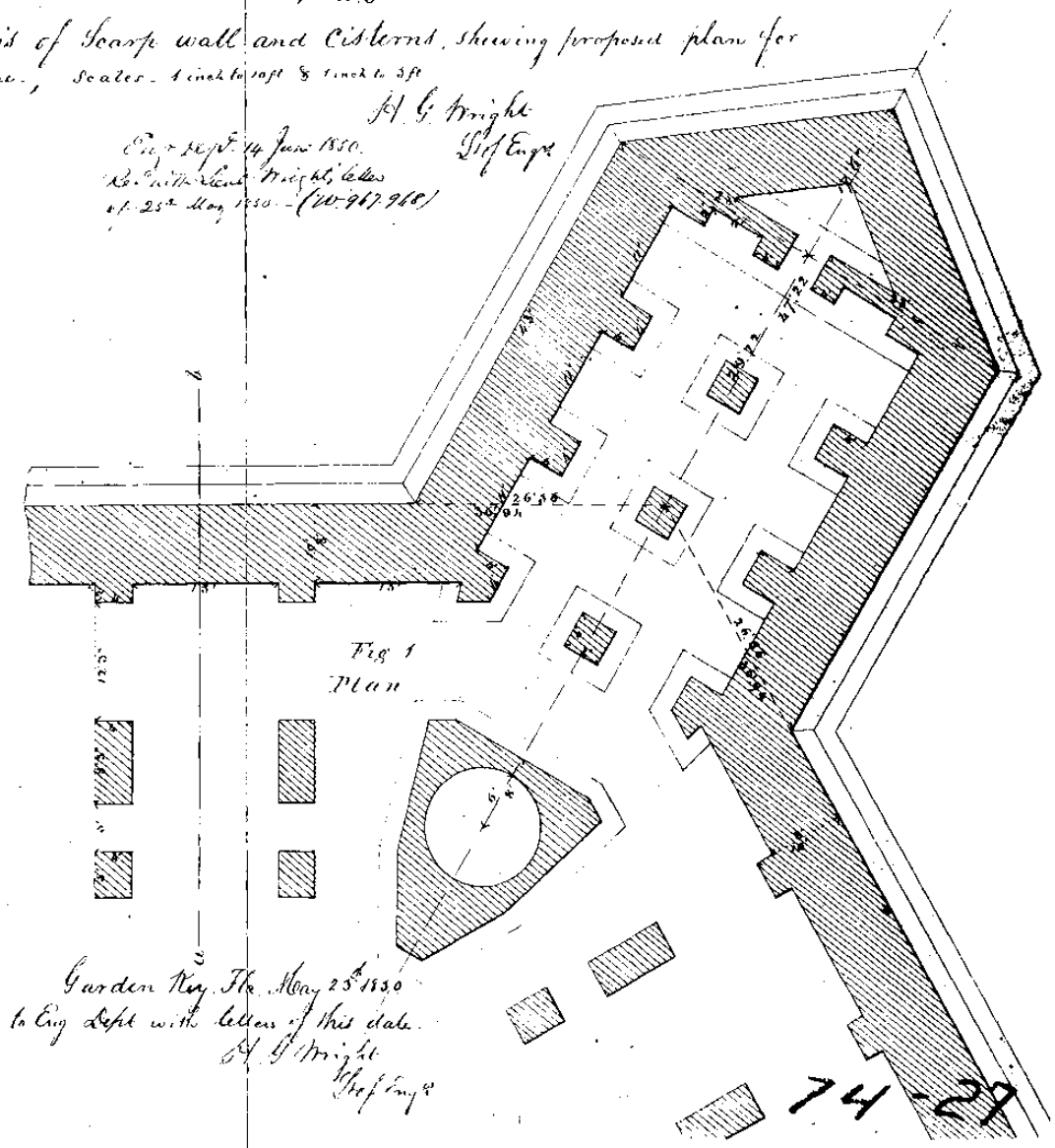
Plans & Sections of Scarp wall and Cisterns, shewing proposed plan for constructing the same, Scales - 1 inch to 10ft & 1 inch to 5ft

H G Wright
Chief Engr

Engr Dept 14 June 1850.
Respectfully submitted Wright's letter of 25th May 1850 - (W 947 948)

Drawer 74.
Sheet 27.



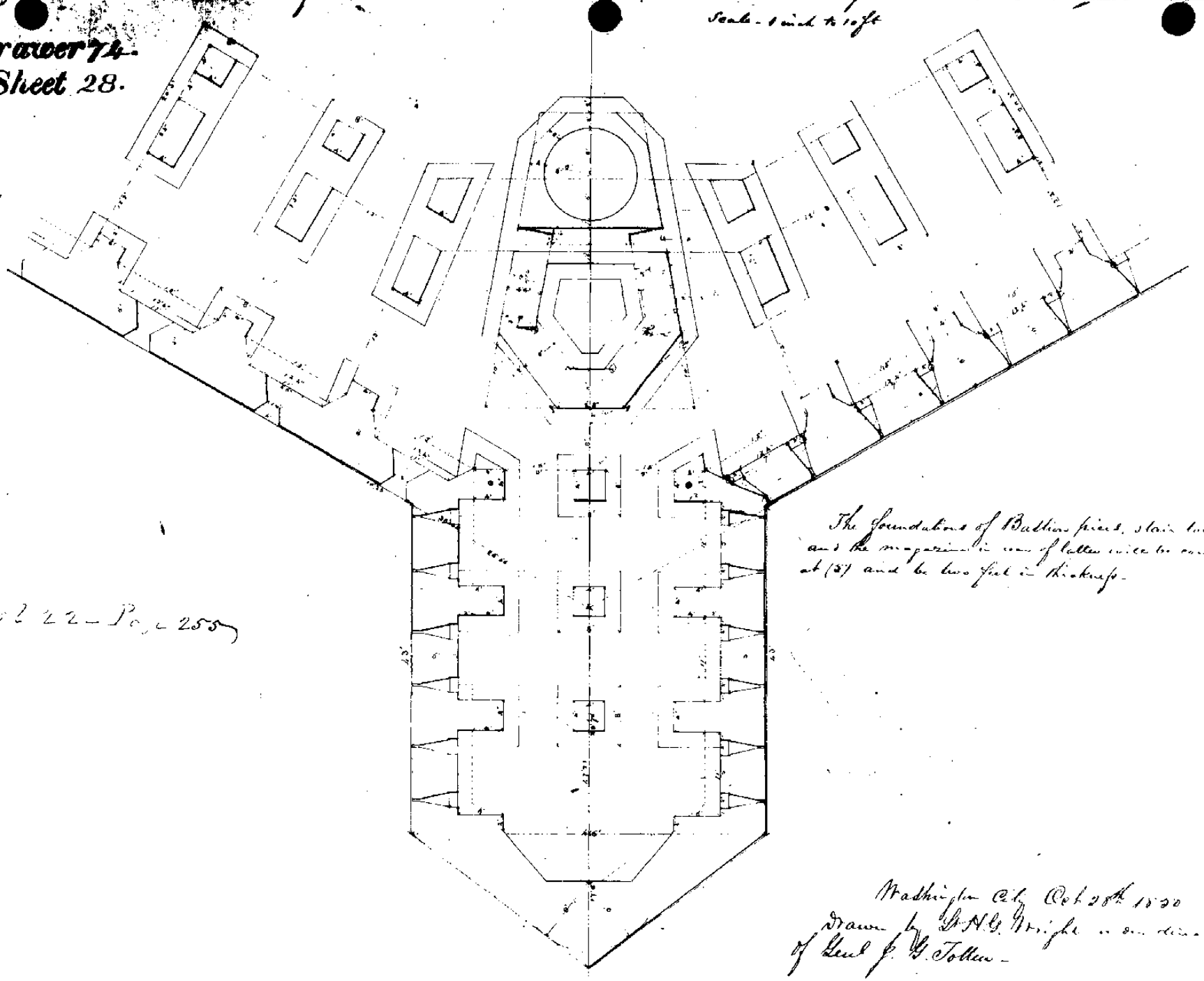


Garden Key Fla May 25th 1850
Sent to Engr Dept with letter of this date.
H G Wright
Chief Engr

74-27

Drawer 74.
Sheet 28.

Scale 1 inch to 10 ft



The foundations of Battion piers, stair towers and the magazine in rear of latter will be commenced at (B) and be two feet in thickness.

'60 2 22 – Page 255

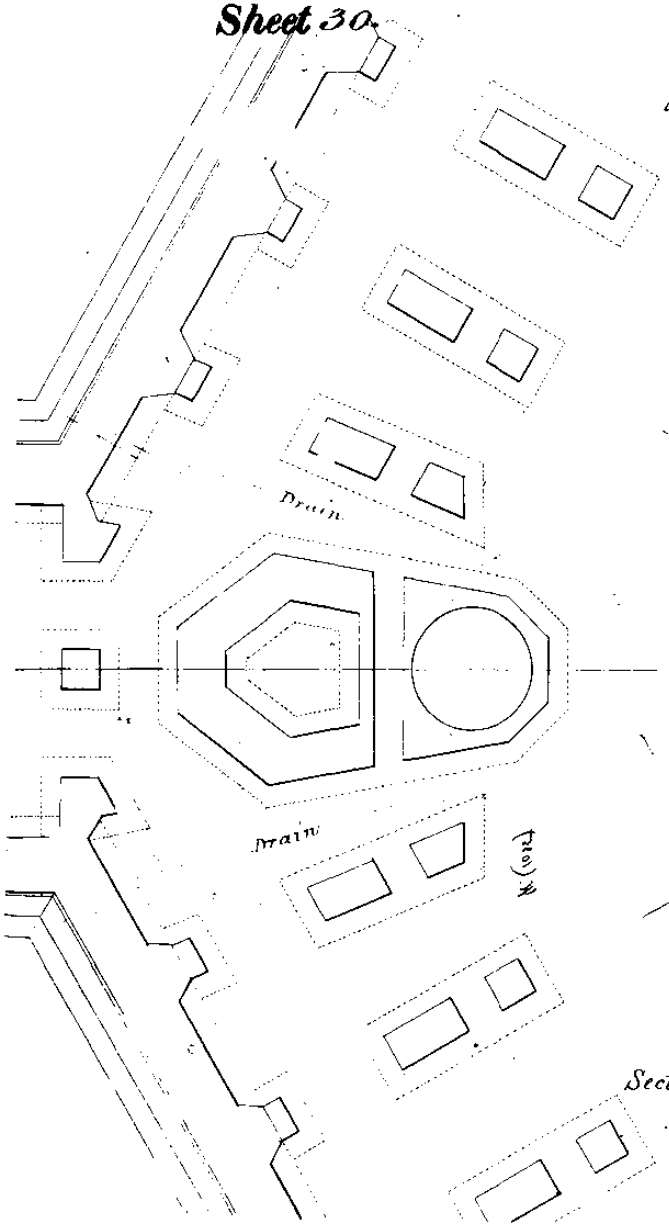
Washington City Oct 28th 1830
Drawn by G.H.G. Wright under the direction
of Lieut J. G. Totten

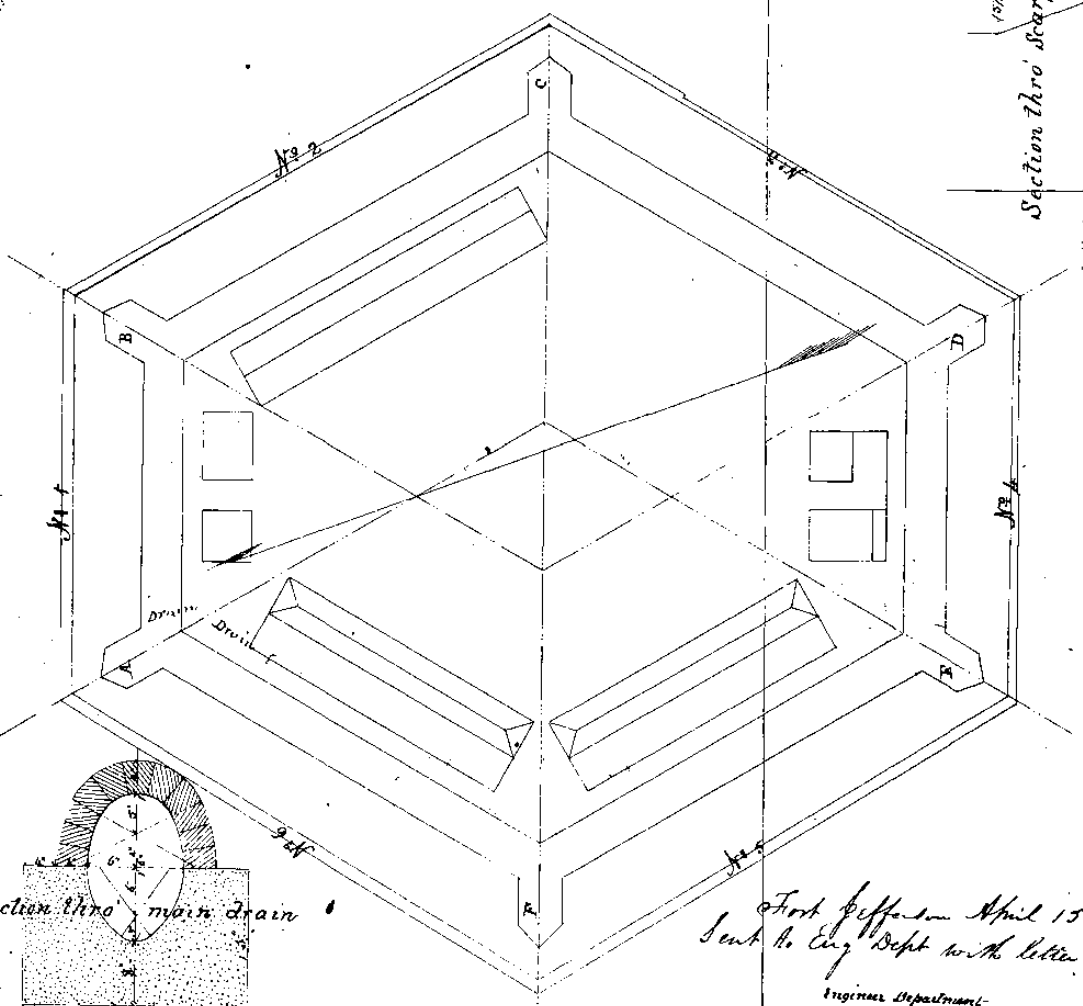
Drawer 74.
Sheet 30.

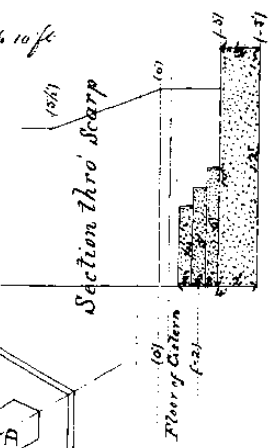
Fort Jefferson No 31

Sketch shewing proposed location and form of the main drains for the work.

Scales - one inch to 100 ft. one inch to 50 ft. one inch to 10 ft and one inch to one foot







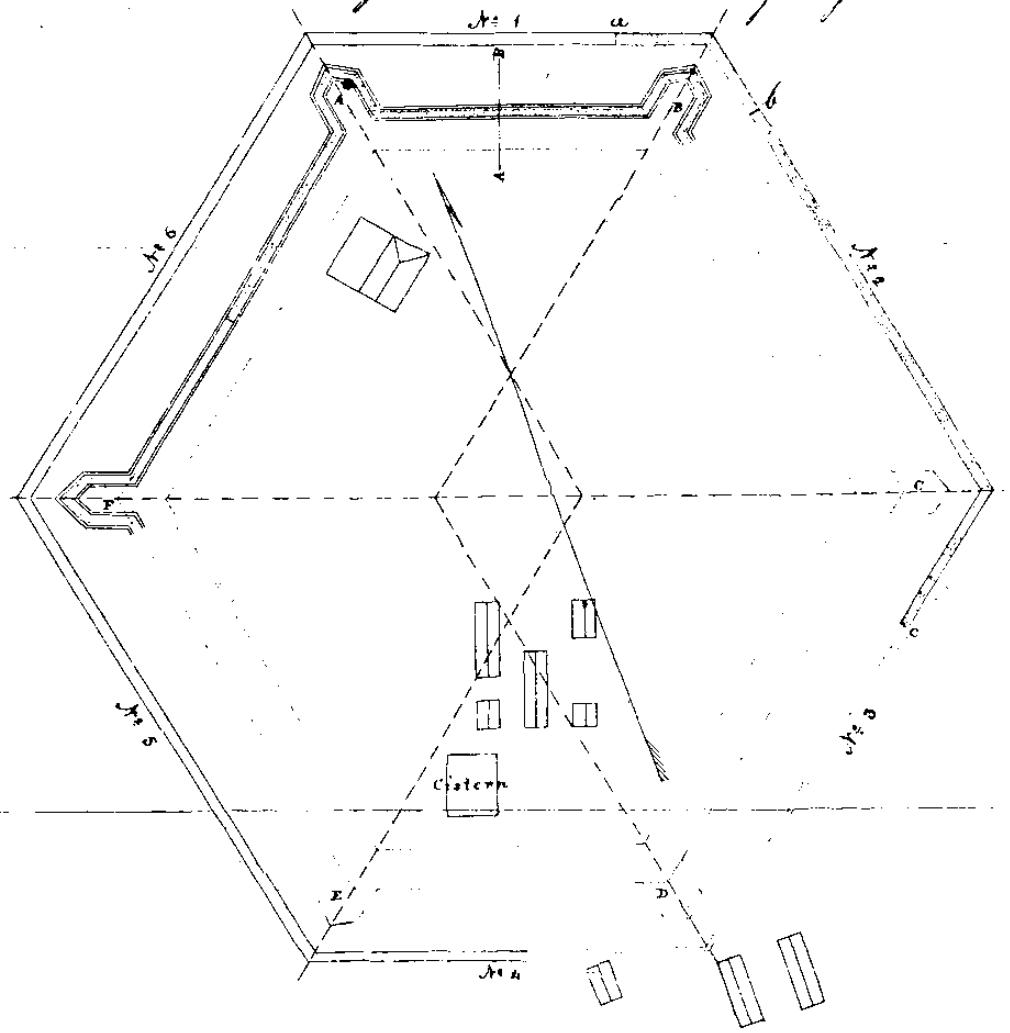
Fort Jefferson April 15th 1851
Sent to Eng Dept with letter of this date.
N. H. Wright
Asst Engr

Engineer Department
April 29 1851
Rec'd with Genl Wright's Letter
of 15th April 1851 (No 1035)

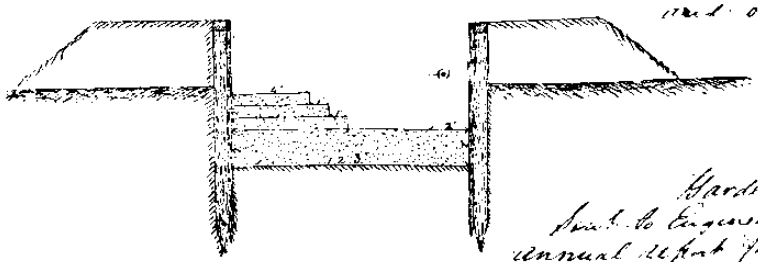
Drawer 74.
Sheet 31.

Fort Pickerson

Sketch shewing the condition, and the progress of the works. From a to b only the superstructure has been constructed this year, from b to c both foundation & wall have been built. The parts dotted in red show the portions where the masonry had been carried on during the year.



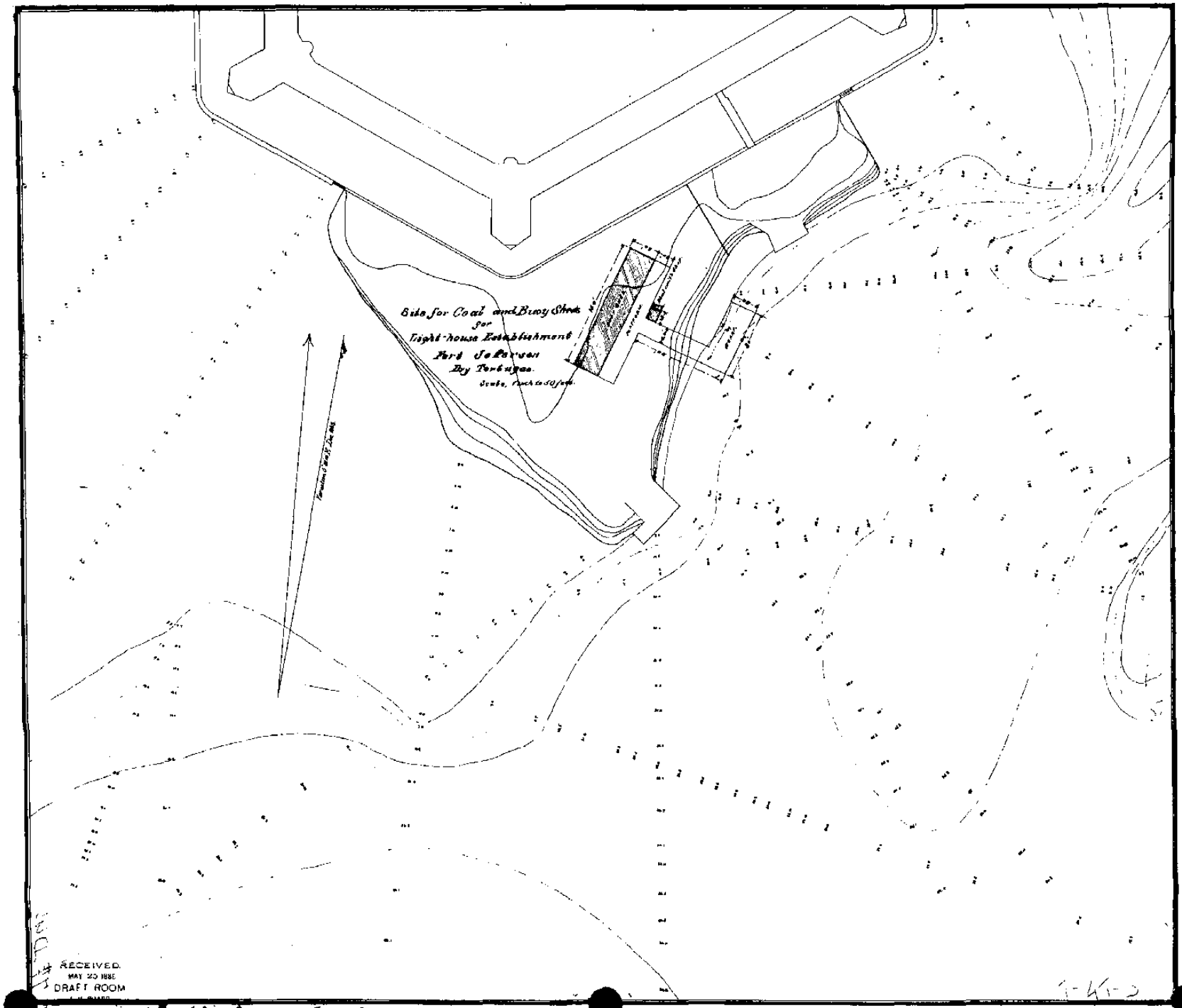
Section on AB



Scales - One inch to 100 feet, and one inch to five feet.

Fort Pickerson
Garden City Pa. Oct 3d 1881
Sent to Engineer Department with annual report for the year ending on the 30th Sept 1881.
G. E. Wright
Bvt Maj Corps

(W 1085)



RECEIVED
MAY 25 1888
DRAFT ROOM

Accompanying letter of Dist. Engr. dated May 15, 1888.

369/25901

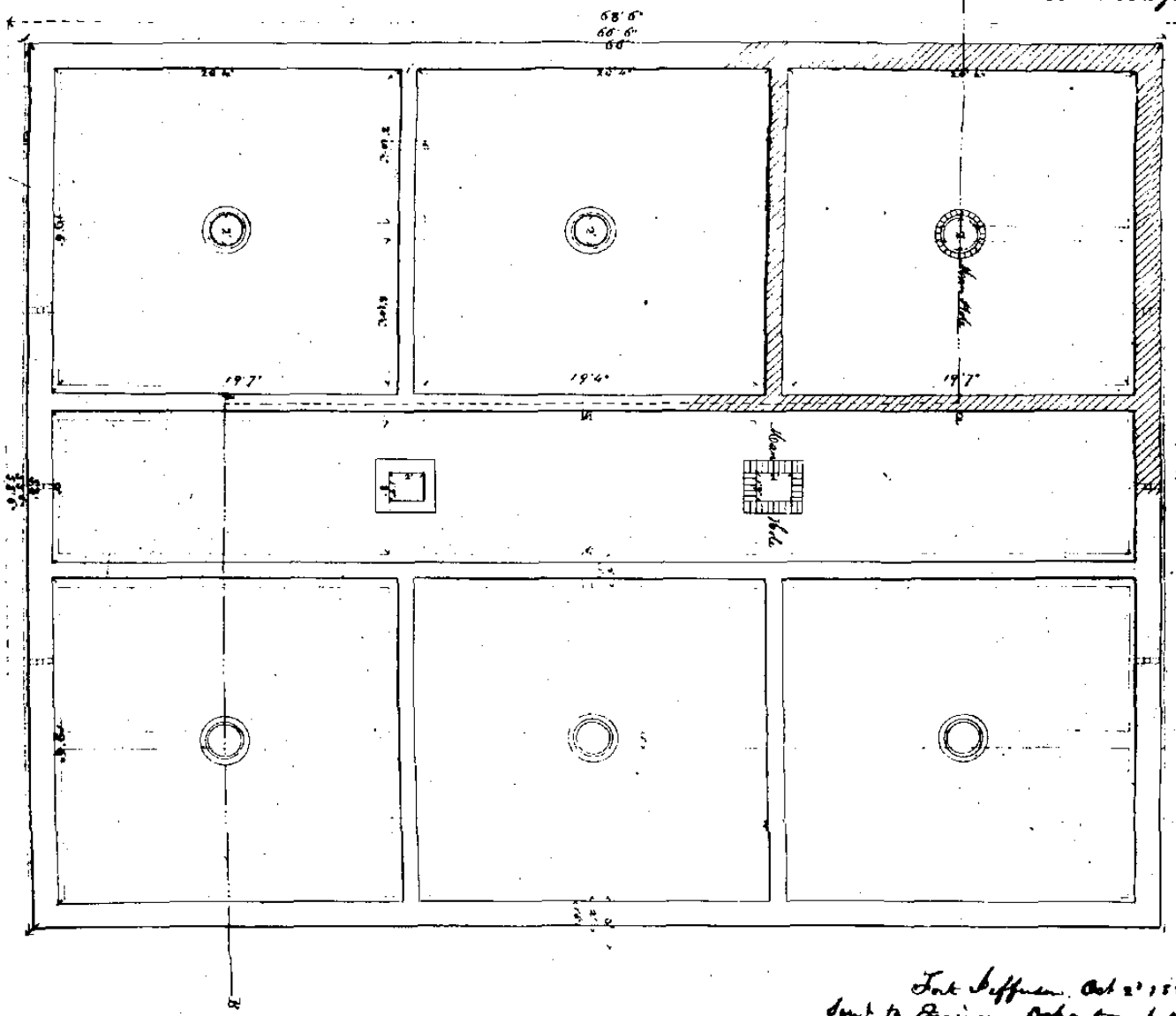
Drawer 74.
Sheet 32.

Fort Jefferson

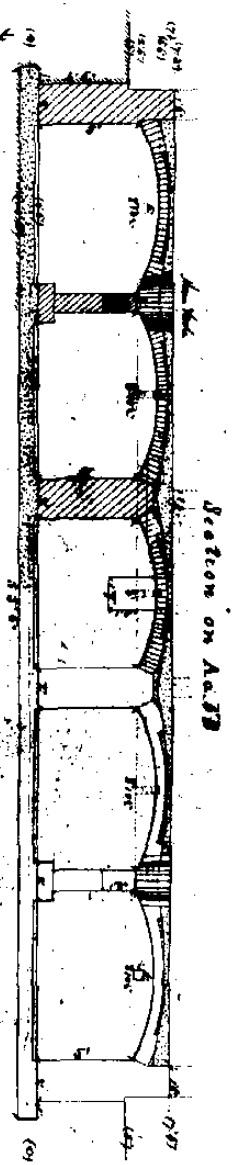
No 26

Plan & Section of Cistern under Offices & Chapel
Garden Key Fla. Sept 30th 1851
Drawn by
H. G. Wright
Lt of Engrs

Scale. One inch to four feet



Plan



Section on A.B.

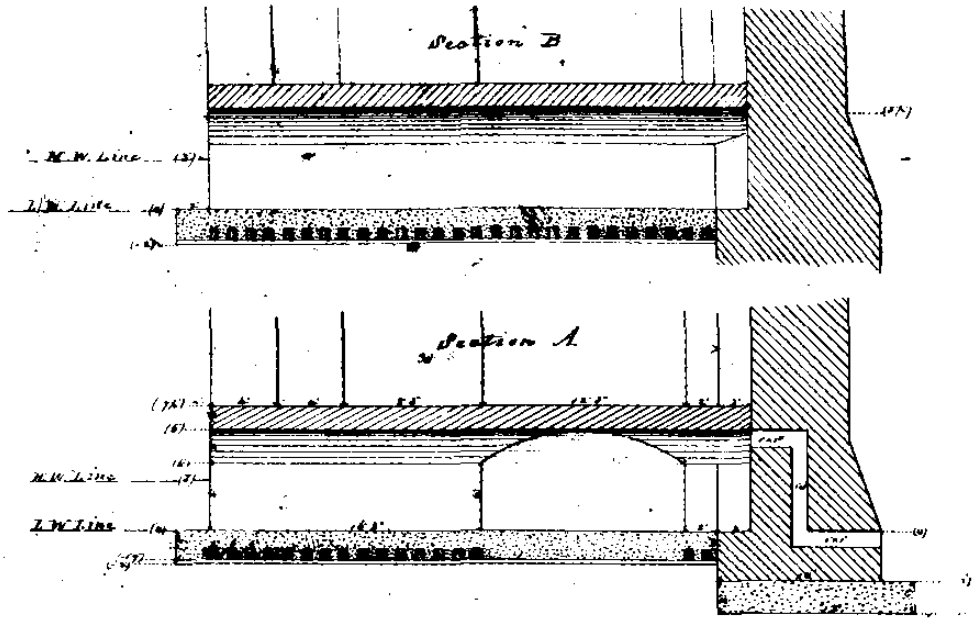
Fort Jefferson Oct 2d 1851
Sent to Engineer Department with Annual
Report for the year ending on the 30th Sept 1851
H. G. Wright
Lt of Engrs

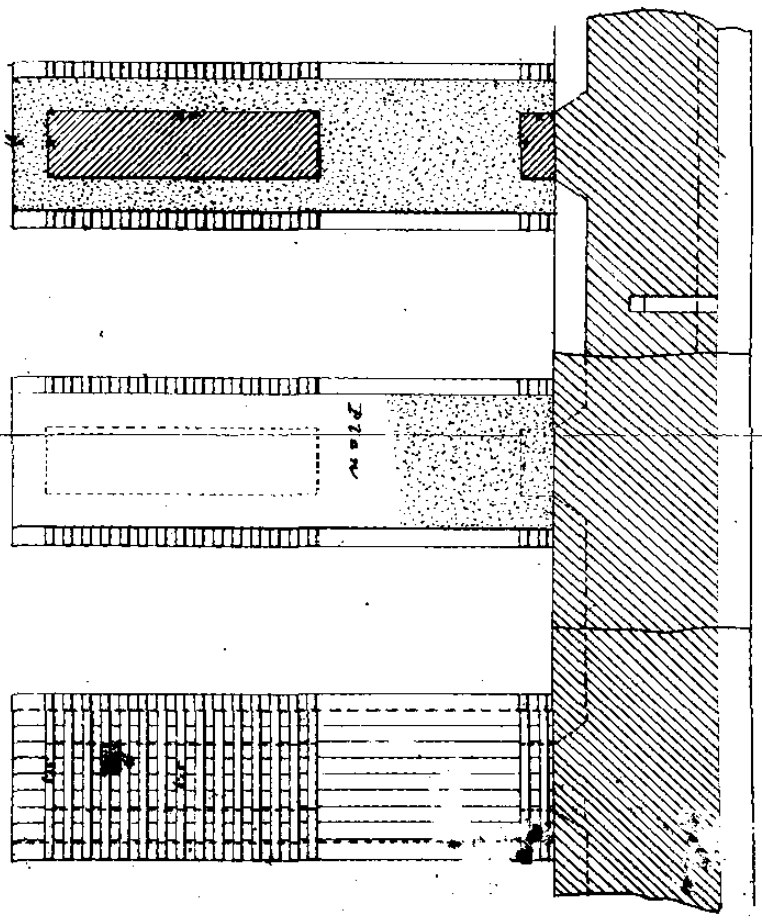
No 34

Fort Jefferson

Drawer 74.
Sheet 23.

Plan and Section of proposed gallery
Scale - one inch to 8 feet
Drawn by M. C. Wright
Asst Engr





Fort Jefferson Nov 4th 1873
Asst to Engr Offr with Plan of casemates
Bay Dble
Rec'd Nov 10 1873

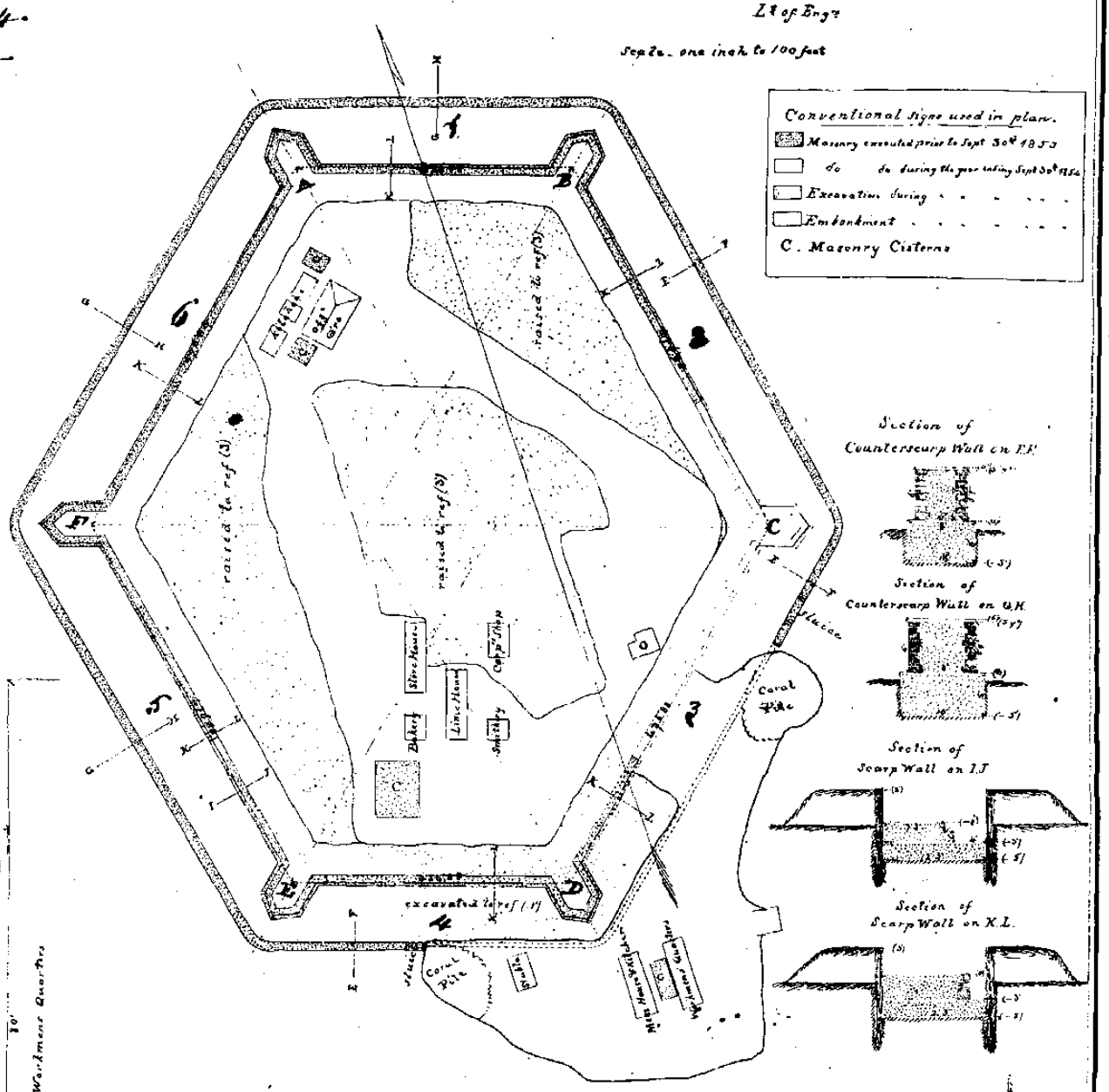
Fortifications — Florida — № 37

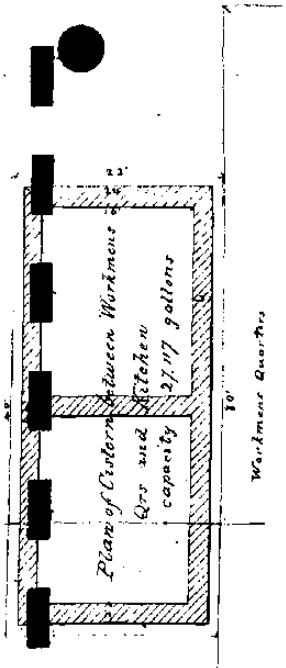
Tortugas Islands

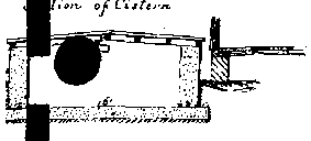
Drawer 74.
Sheet 34

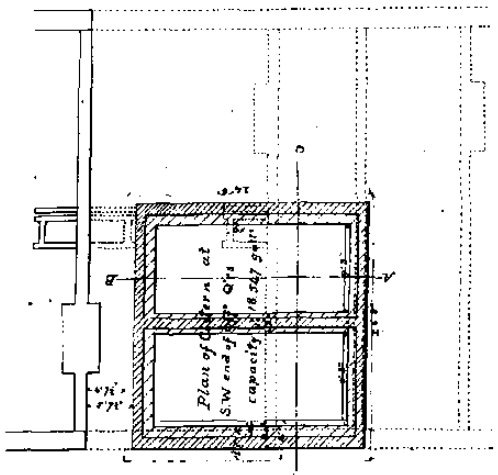
Plan of Fort Jefferson, Garden Key
exhibiting the condition of the work on the 30th Sept.r 1854
Drawn by H. G. Wright
Lt of Engrs

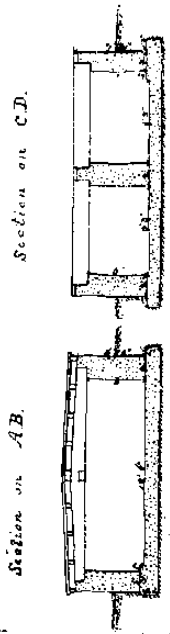
Scale. one inch to 100 feet











Sent to Engineer Department with Annual Report of Sept. 30th 1854 (W 1974)
H. G. Wright Lieut Engrs

Fortifications

Charleston

Sketch of a timber Wharf at
Fort Sumter. Scale 1/8 in. = 1 ft. 100 ft. = 12 ft.
Drawn by A. F. Smith Jr. Engr.

Plate 37.

Scale 1/8 in. = 1 ft.

Sketch of Coffer Dam. Fort Sumter. Scale 1/4 in. = 1 ft.
Sent to Engineer Department with Letter of the date
Engr. Dept. Fort Sumter S.C.
Fort Moultrie S.C.

C. S. Wall

Landing Bridge

Wharf

No 38

Scarp Wall

C. S. Wall

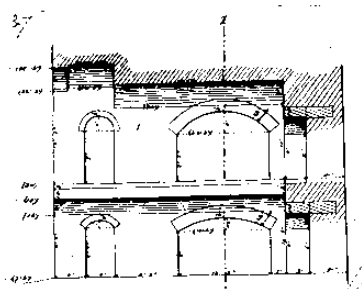
Drawer 74.
Sheet 38.

Fort Jefferson No 39

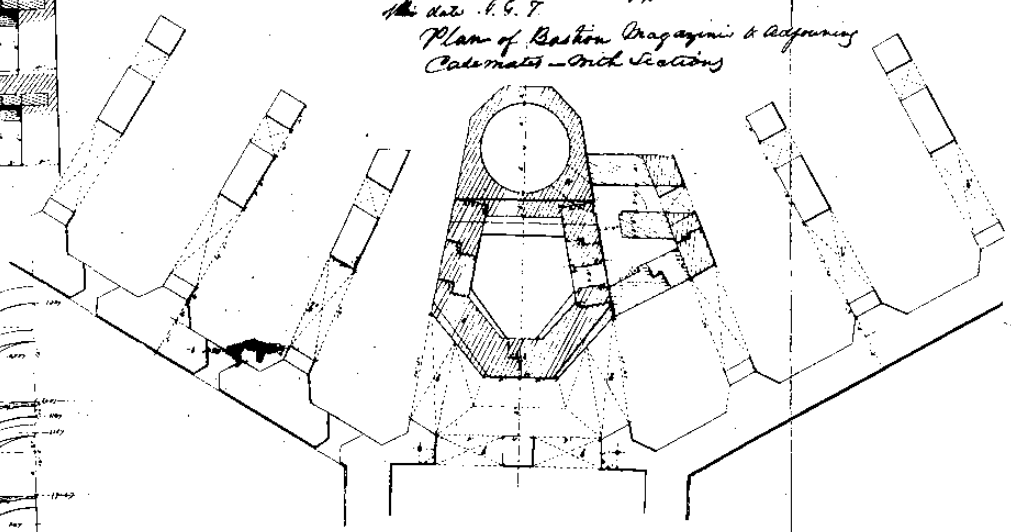
Engraved Dep. Note 1 1875

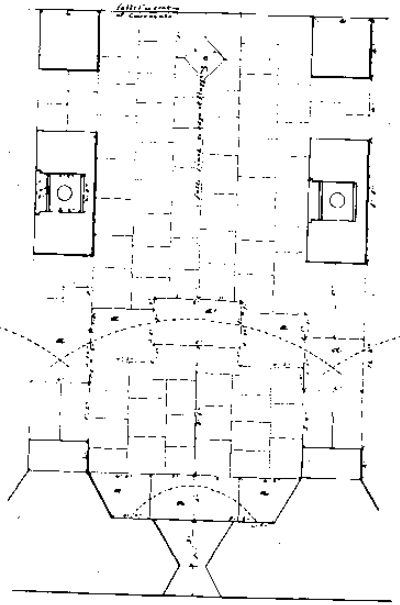
Copy sent to Lt Wright at Fort Jefferson with letter of this date. J.G.T.

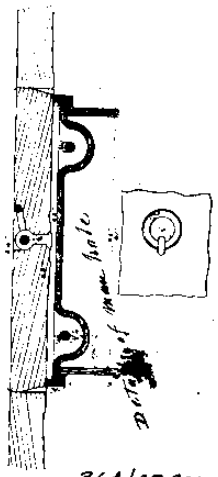
Plan of Boston Magazine & adjoining Casemates — Brick Scarping



Section on 1, 2.







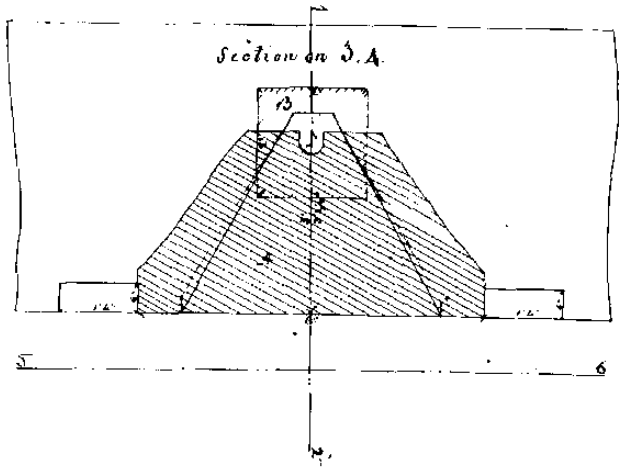
364/25,900
Sheet 17 of 28

Fort Jefferson

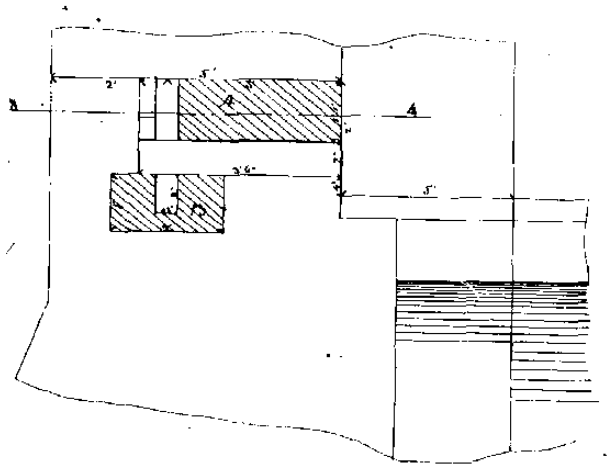
Drawer 74.
Sheet 39.

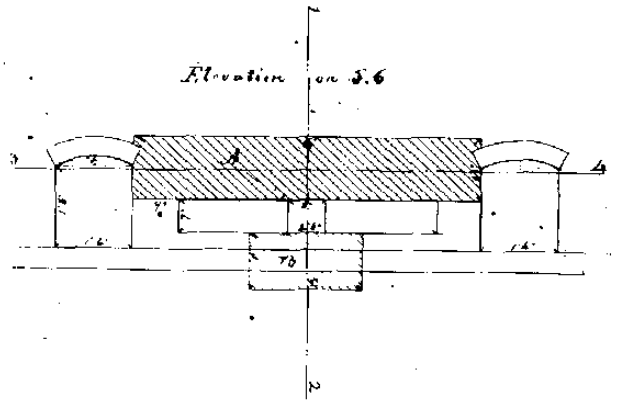
Sketch of pintle stones for embrasure guns
Scale 2 inch to 1 foot

Note. If it will materially diminish the cost. The lintel (A) may be made of two pieces instead of one



Section & Elevation on 1.2



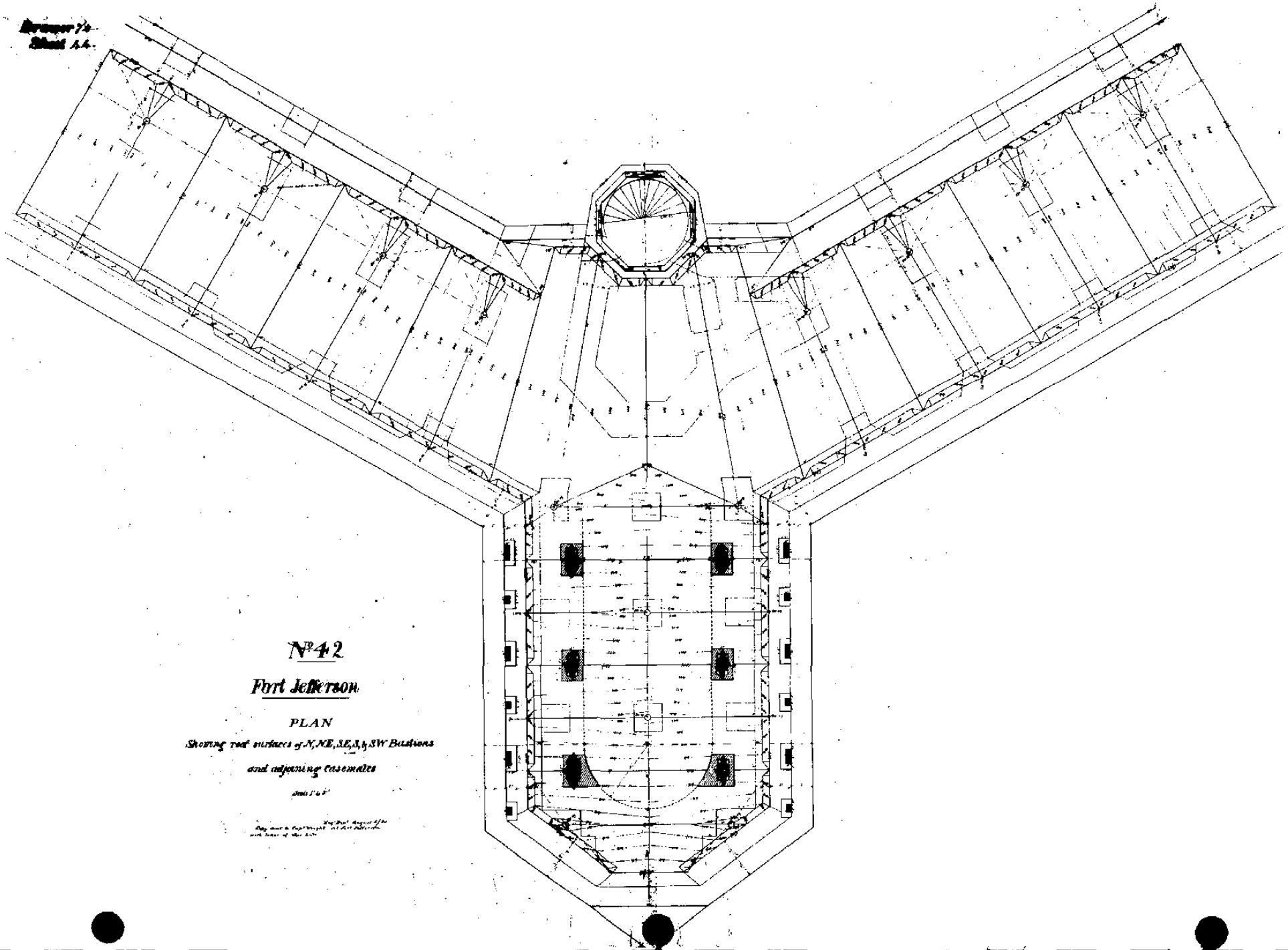


Fort Jefferson Fla. June 18th 1866
Sent to Eng Dept with letter of this date
M. C. Meigs
Brig Genl

(W 1098)

364/25,900
Sheet 5 of 28

Drawer 7/2
Sheet 44.



N° 42

Fort Jefferson

PLAN

Showing roof surfaces of N, NE, SE, S, & SW Bastions

and adjoining Casemates

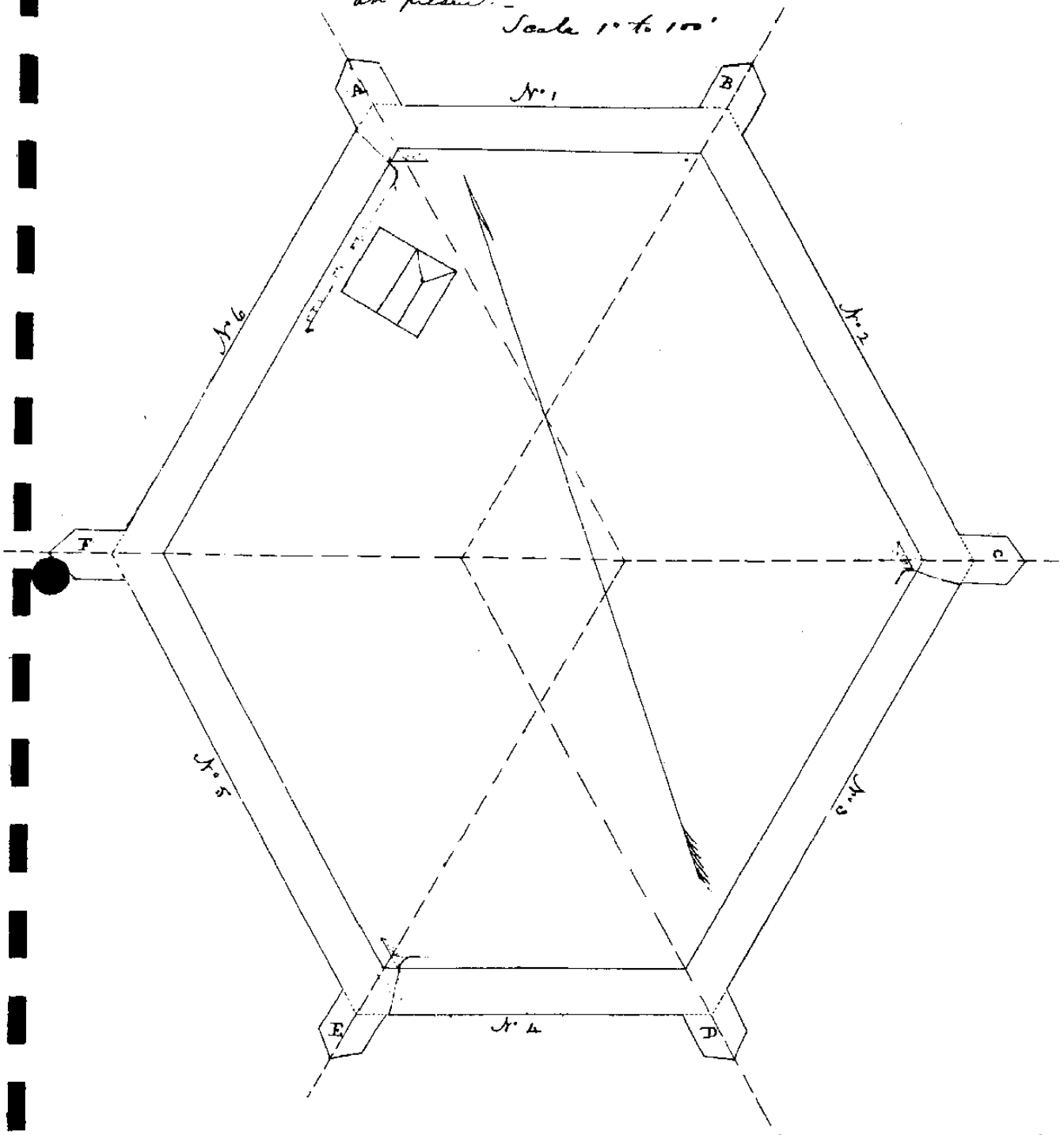
Scale 1/16 1'

Drawer 74.
Sheet 47.

Fort Jefferson

Plan shewing the extent to which it is proposed to construct the sewers at present.

Scale 1" to 100'



Fort Jefferson Aug 14th 1855.

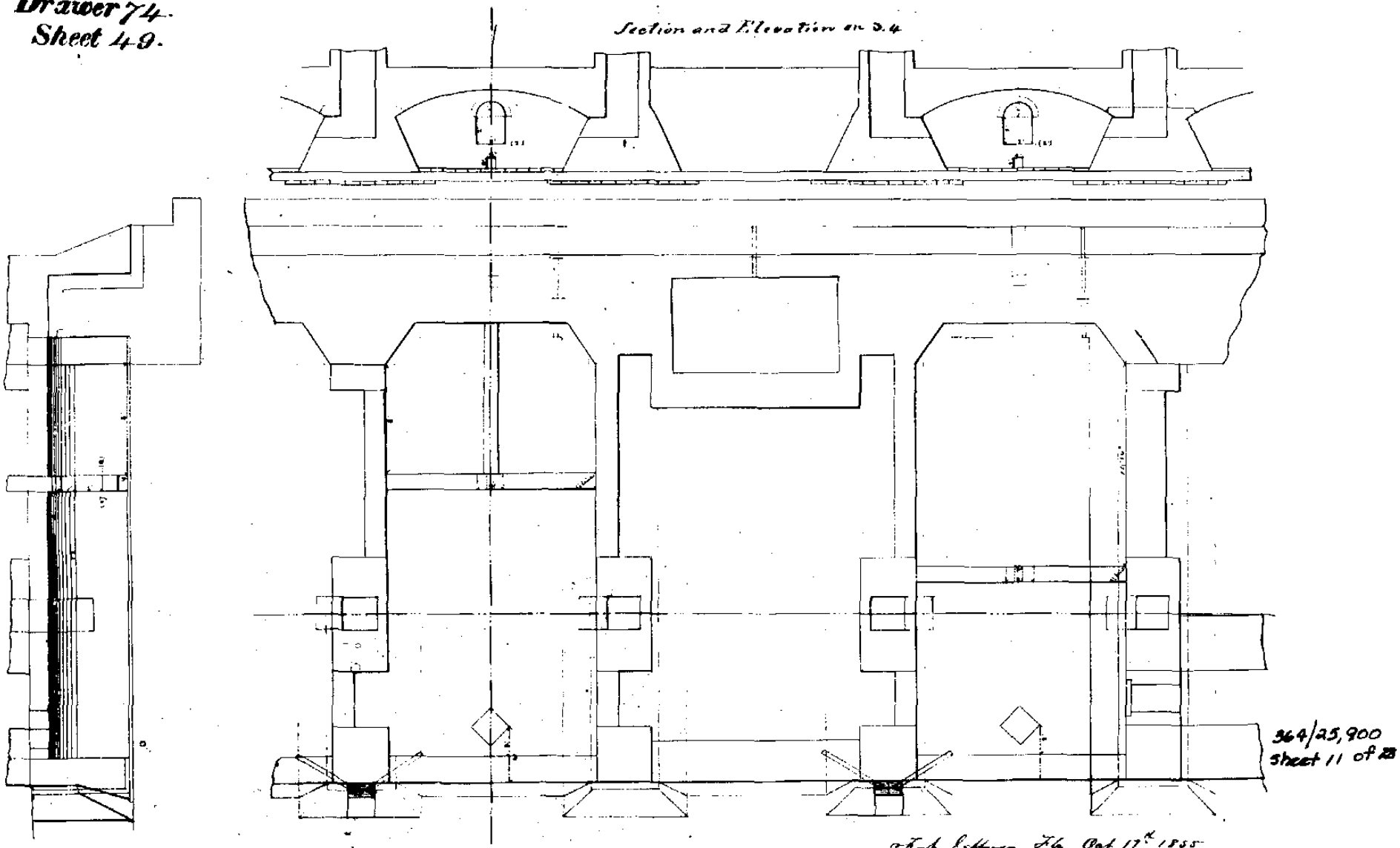
Sent to Eng Dept with letter of this date

(W. 1624)

H. G. Wright
Lieut Engrs

Eng. Dept.
Received Aug. 27. 1855.

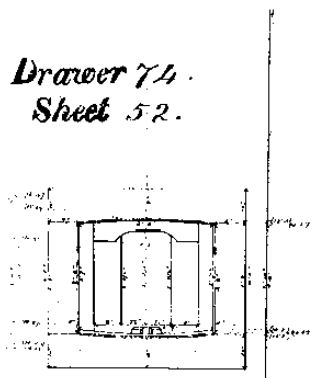
Drawer 74.
Sheet 49.



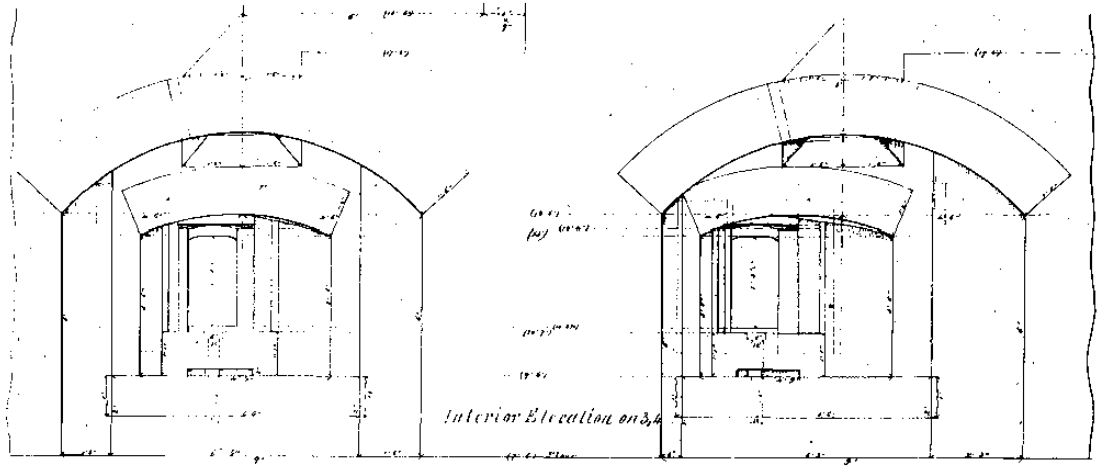
364/25,900
Sheet 11 of 28

Fort Jefferson Fla. Oct 17th 1855
Sent to Eng Dept with letter of date (W 1675) Rec'd Eng Dept Nov 11 1855
A. H. Wright Lieut Engrs

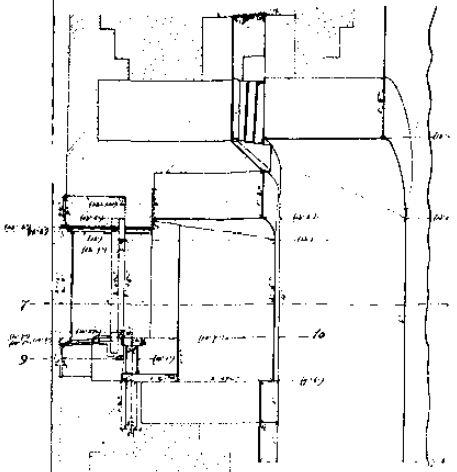
Drawer 74.
Sheet 52.



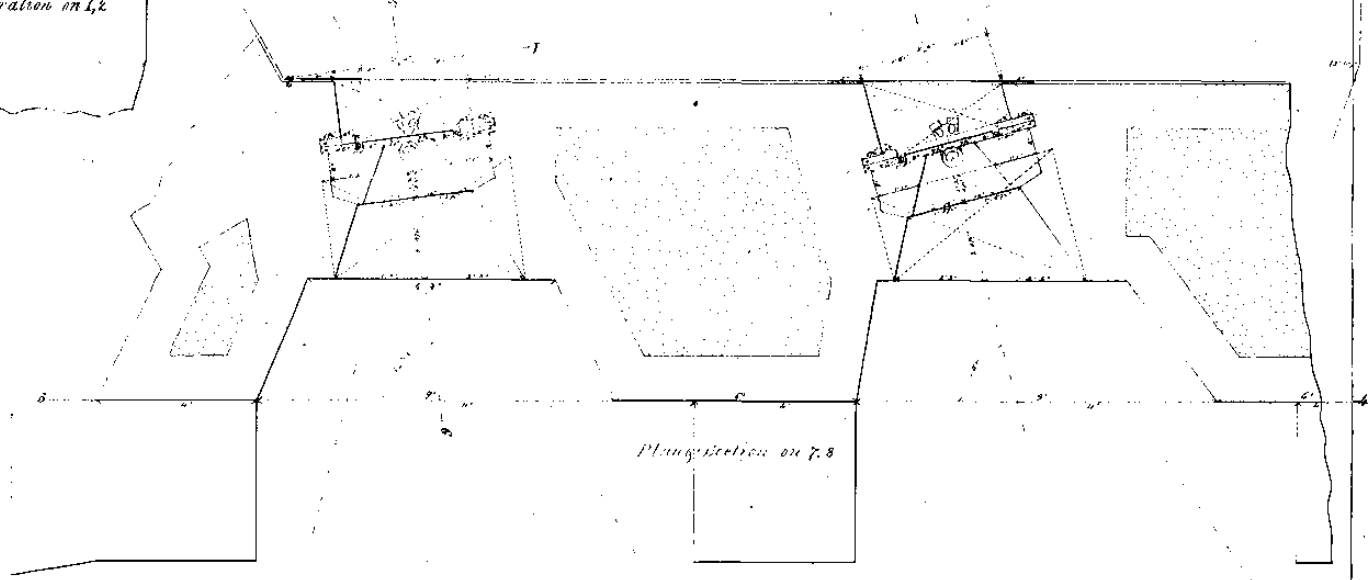
Exterior Elevation on 1,2



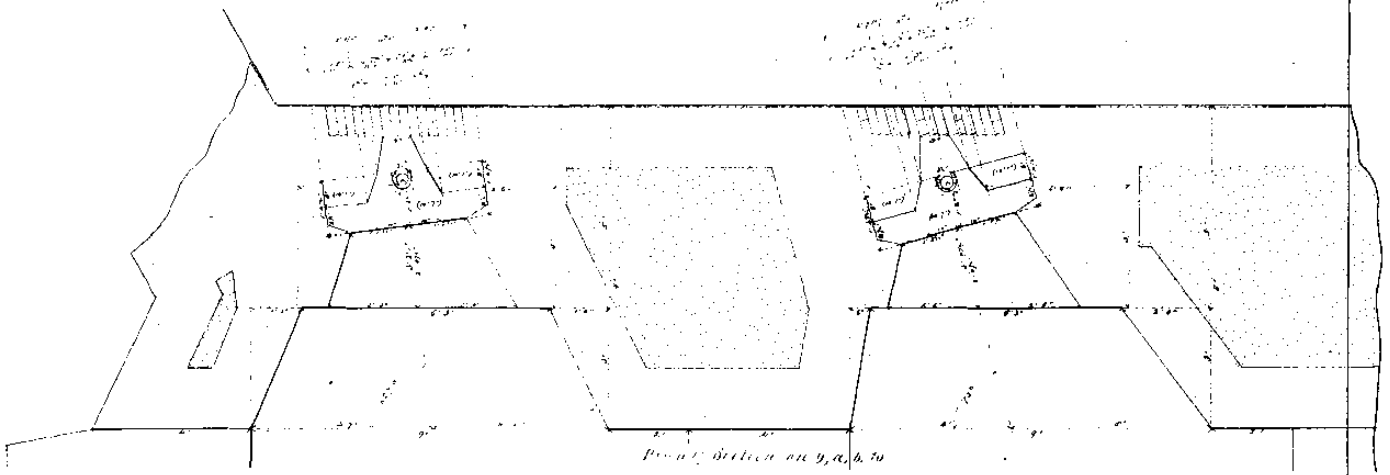
Interior Elevation on 3,4



Section on 5 6



Plan & Section on 7.8



Plan of Section on 9, a, b, 10

№ 47.

Fort Jefferson

Plans, Sections & Elevations
of
Howitzer Embrasures
in the Flanks of the Bastions,
Lower Tier

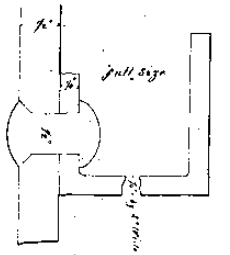
[illegible]

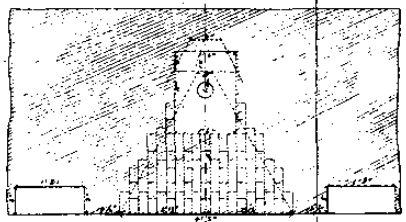
Note [illegible]

Drawer 74- No 48
Sheet 53-Fort Jefferson

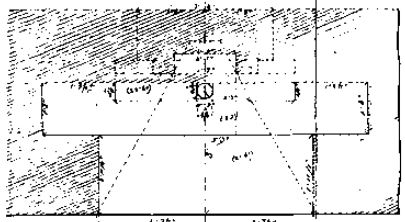
Plans Sections & Elevations
of
Gun Embrasures
in 2nd tier

Copy Kearney & Craig's drawing in possession
since June 1858—

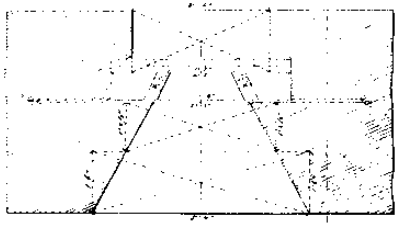




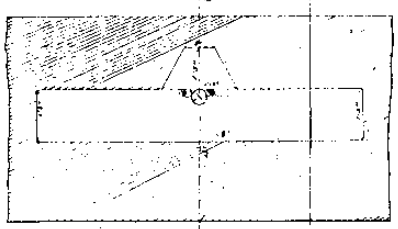
Section on e,f



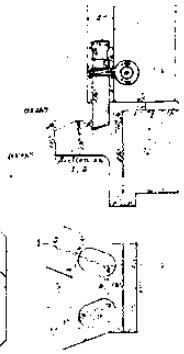
Section on g,h i,k l,m

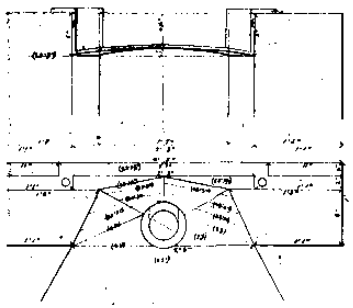


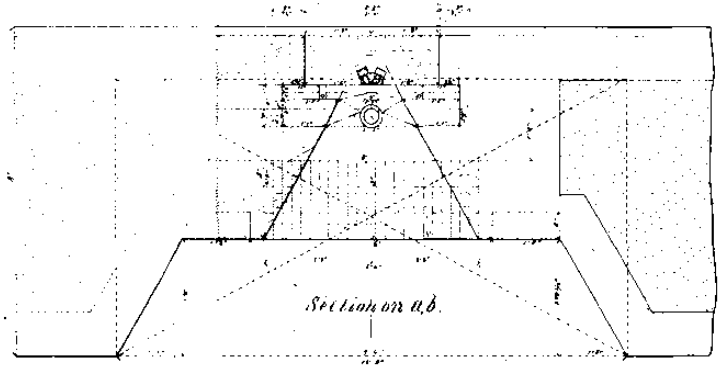
Section on n,o p,q r,s



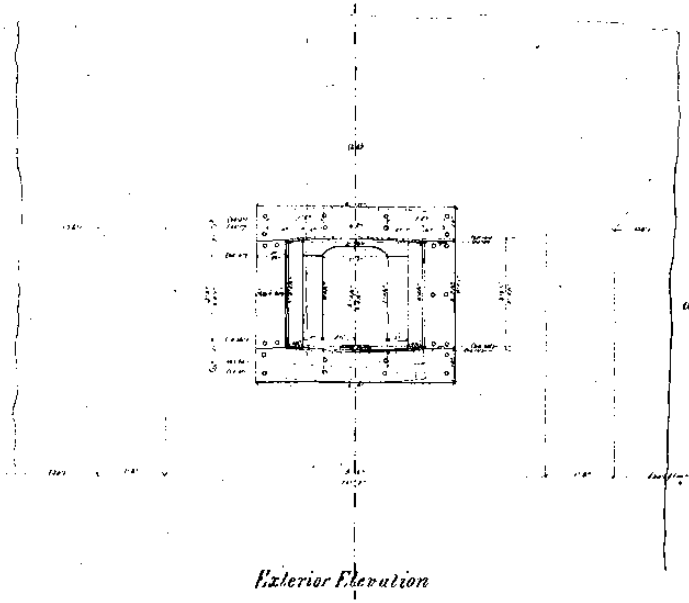
Section on t,u



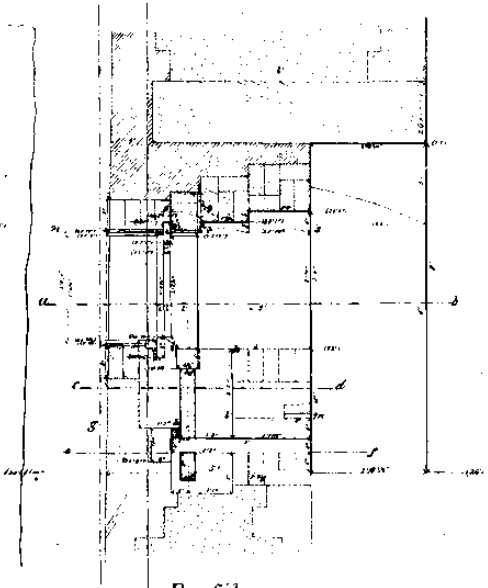




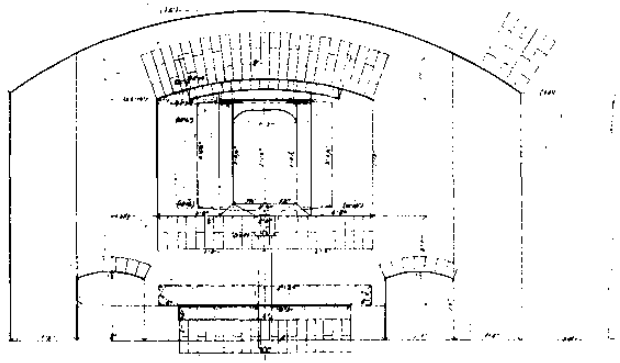
Section on a,b.



Exterior Elevation



Profile

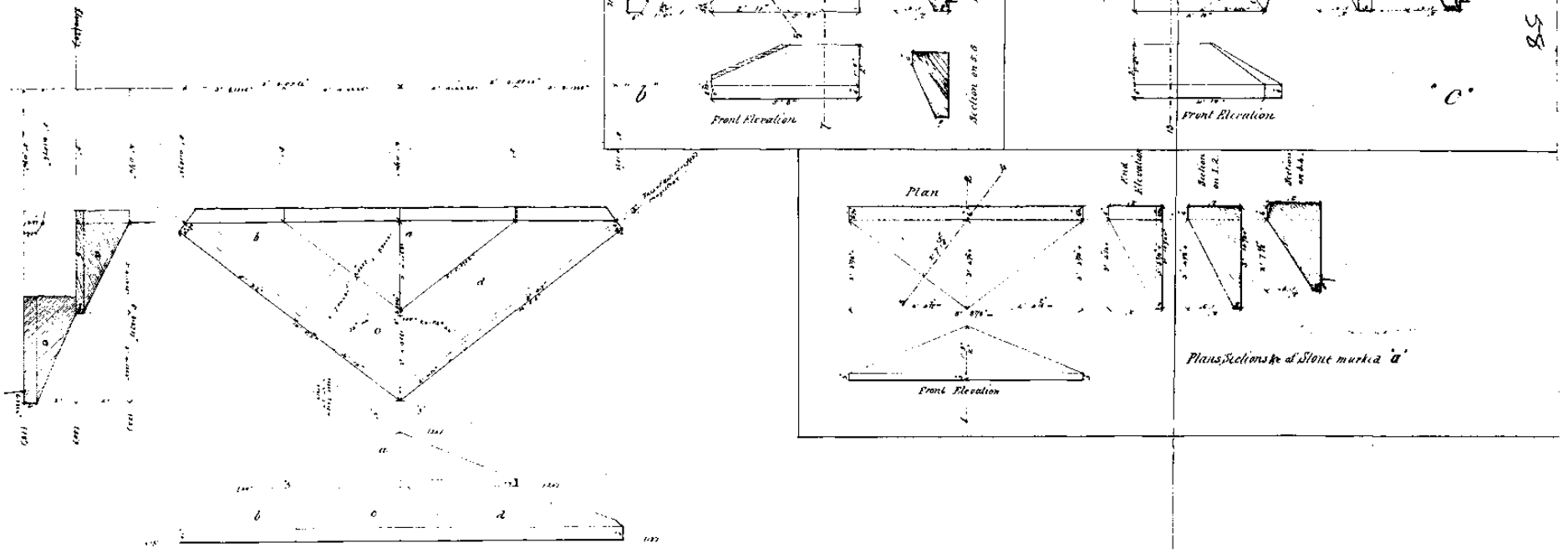


Interior Elevation

Drawer 74.
Sheet 54.

Details of Pans Coupé for the Bastions of Fort Jefferson

Engr Dept Washington
Drawn under the direction of Capt. H. Prentiss Maudsburg, and a copy furnished him Sept 29. 1848



58

Drawer 74.
Sheet 55.

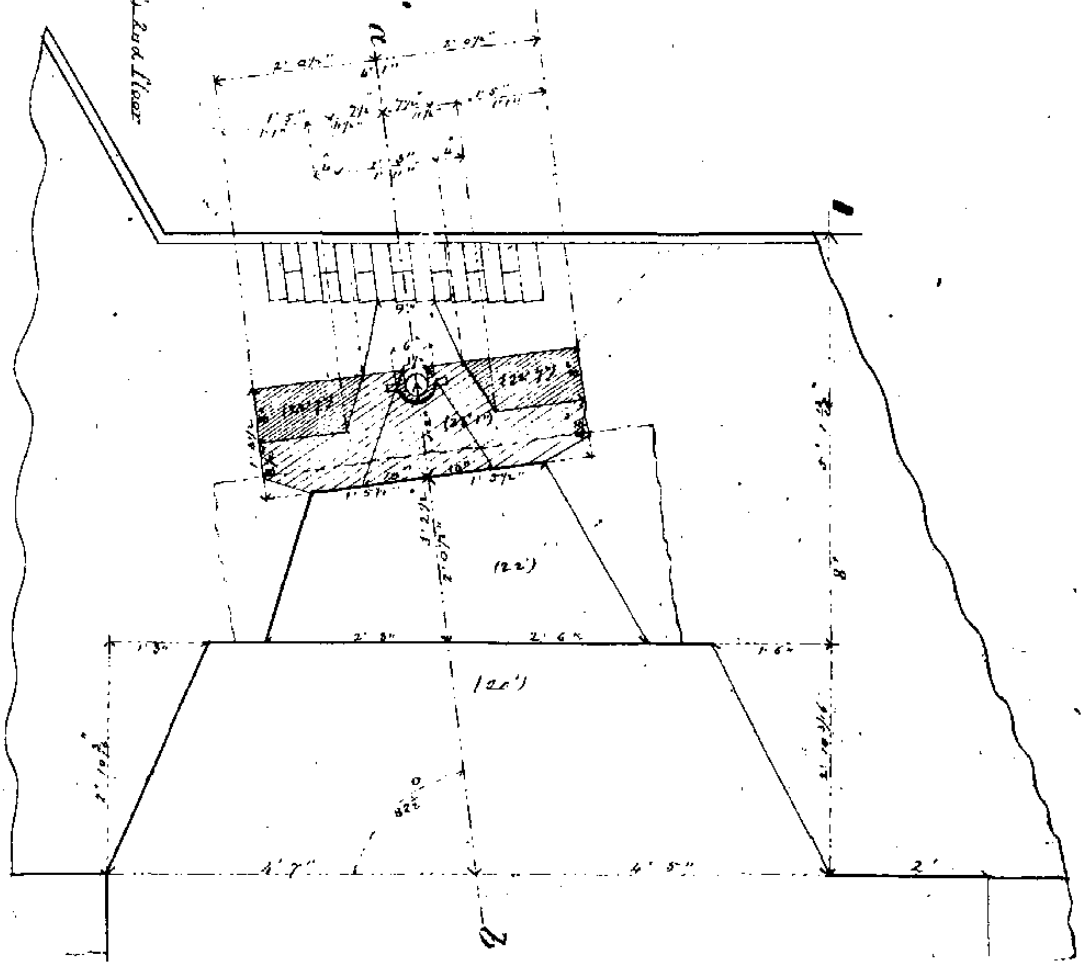
Section on a b.

Fort Jefferson

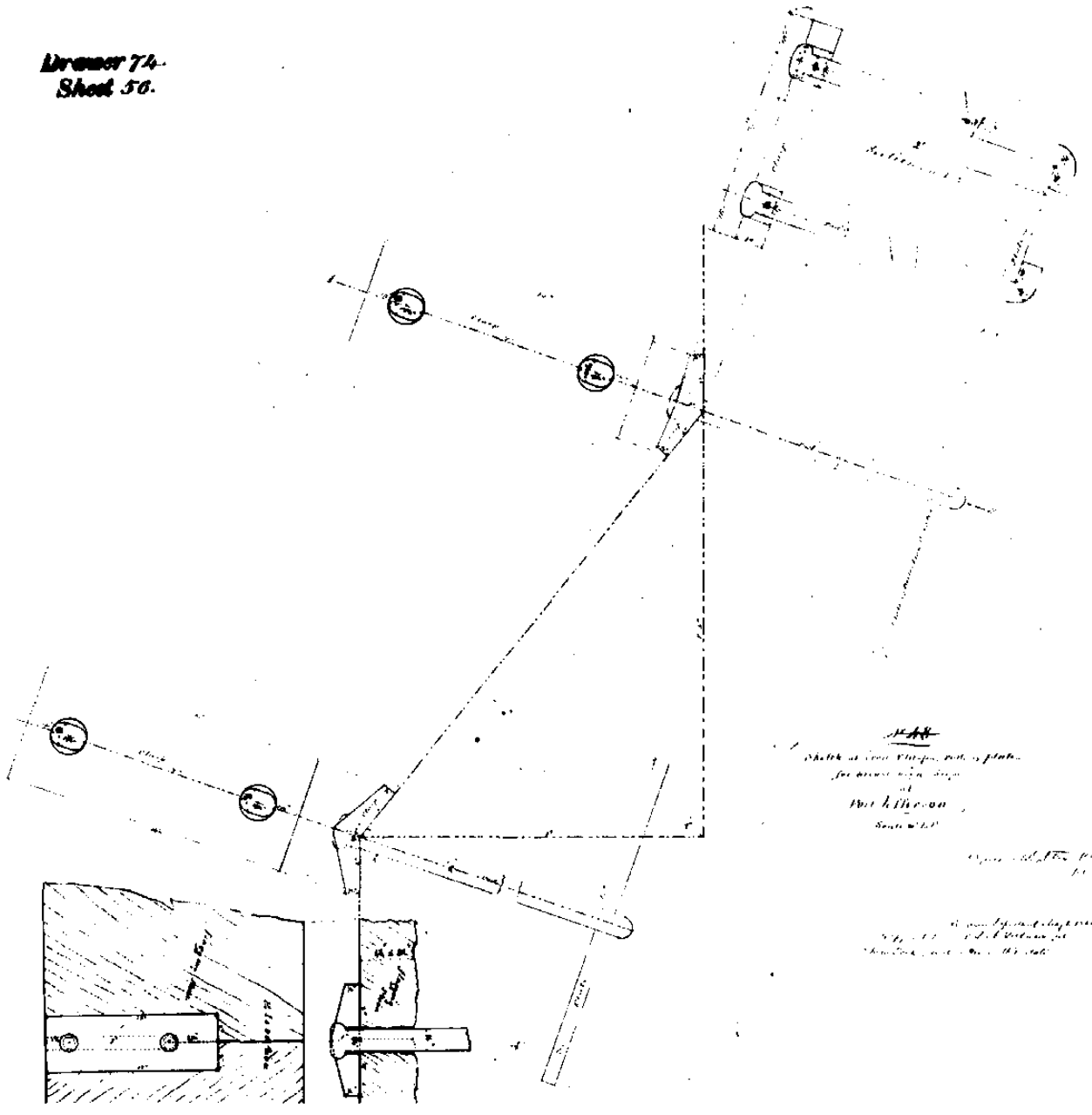
Plan & Section of the Howitzer Embrasures in the Flanks of the Bastions 2nd Tier

These Embrasures, above (22') will be similar in form & dimensions to those immediately below them, in the 1st Tier

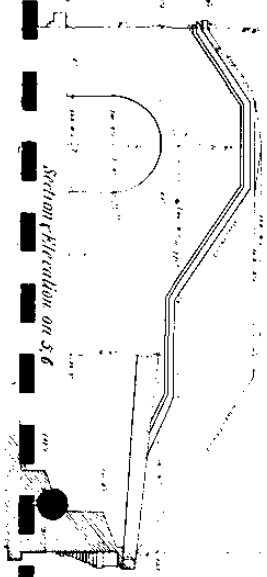
Engineer Department Nov 1858
Copy sent to Fort Jefferson, with letter of this date

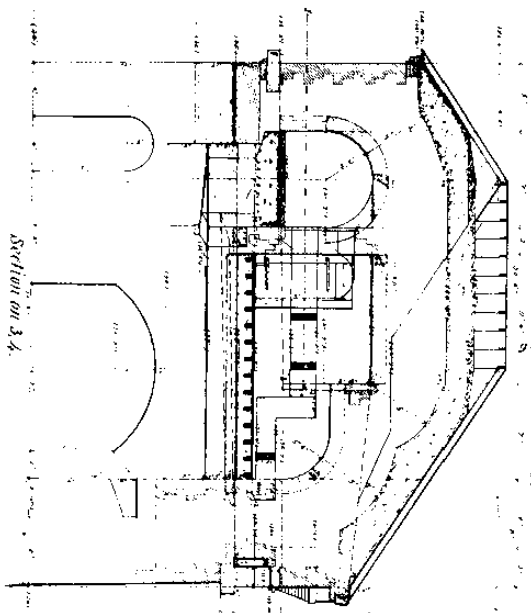


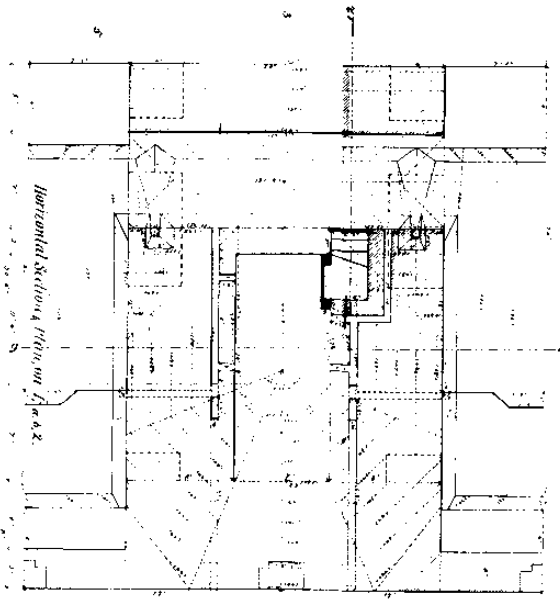
Drawer 74.
Sheet 56.

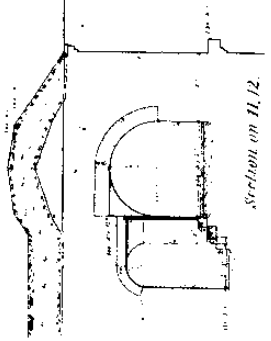


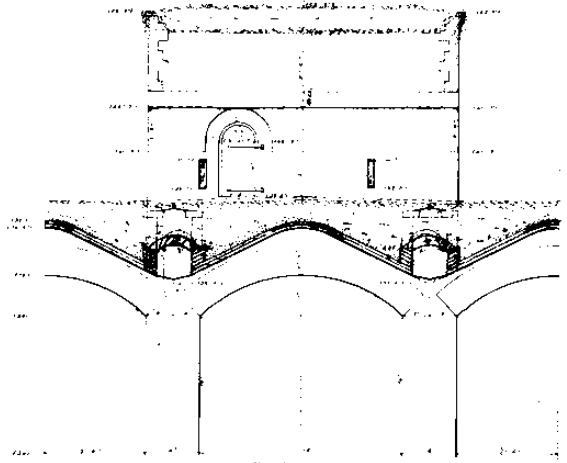
Drawer 74.
Sheet 57.



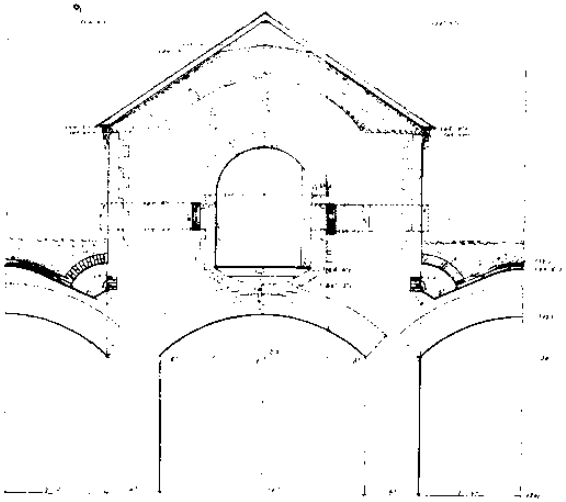








Section on 7. 8.



Section on 9 10.

V^o 49.

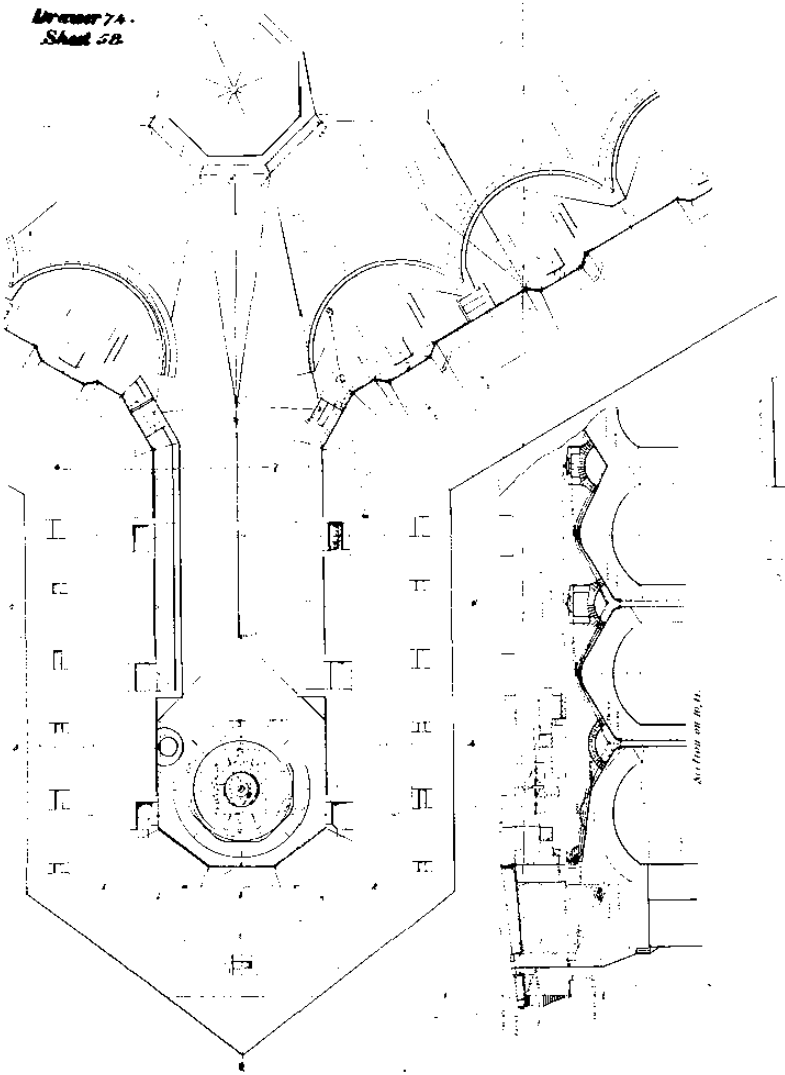
Fort Jefferson

Plan, Sections &c
of
Barbette Magazine Traverse

Scale 1/8 5'

Copyrighted by Lieut. Marlon at Fort Jefferson
with [illegible]

Drawer 74.
Sheet 52.



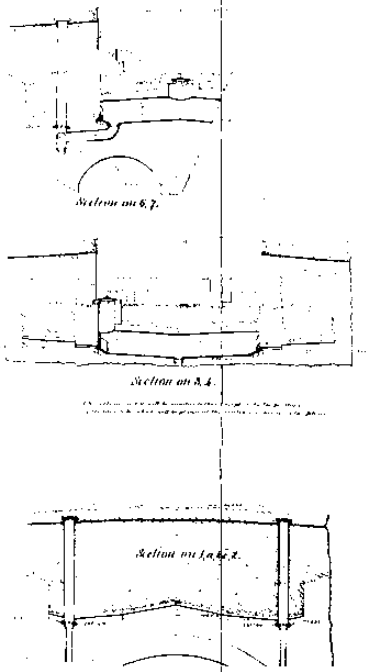


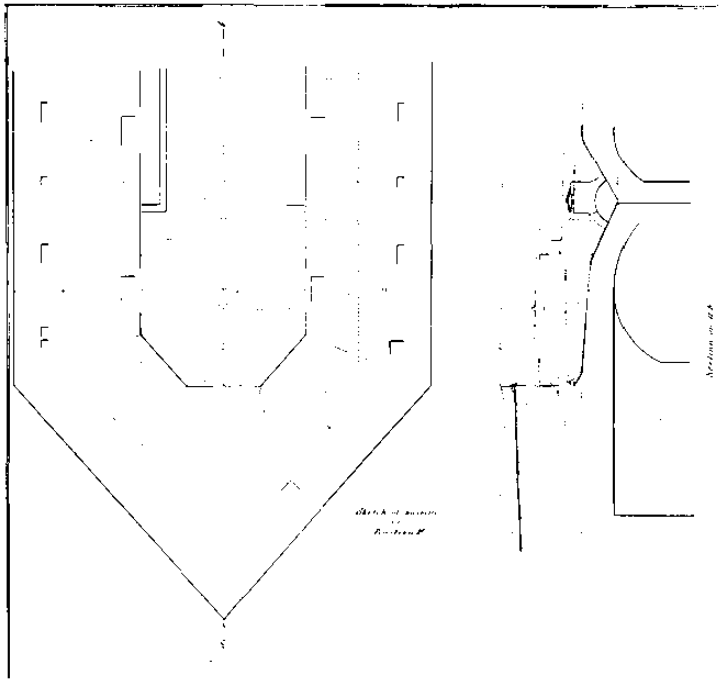
N°51.

FORT JEFFERSON

PLAN & SECTIONS GIVING DETAILS OF

ROOF DRAINAGE, BARBETTE PLATFORMS OF THE BASTIONS





Drawer 74.
Sheet 59.

FORT JEFFERSON.

Sketch

showing the

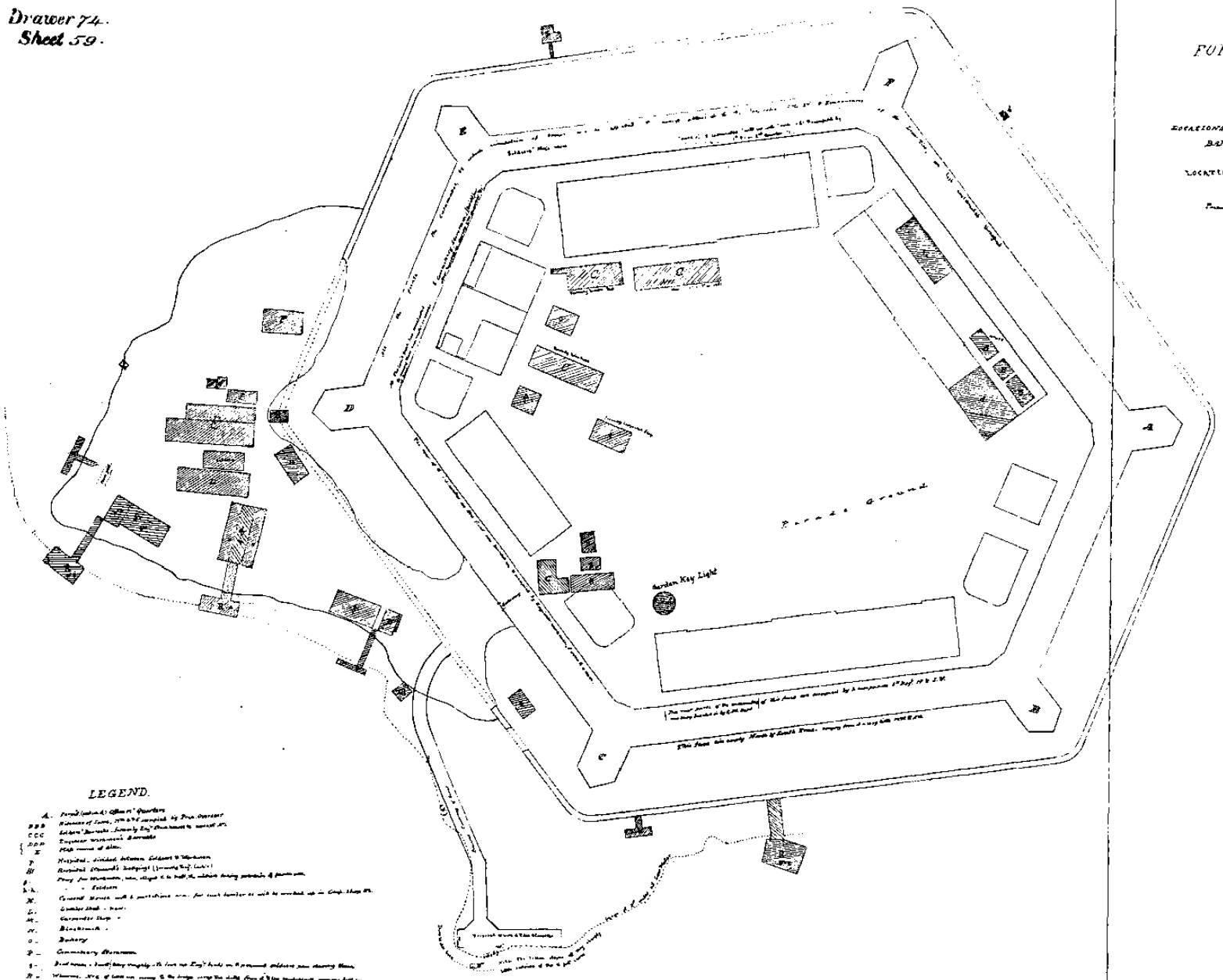
LOCATIONS of the PERMANENT & TEMPORARY

BARRACKS STOREHOUSES &c;

also the

LOCATION PROPOSED for a PERMANENT

WHARF.



LEGEND.

A. Permanent Officers' Quarters
BBB Barracks for Troops
CCC Engineer Workmen's Barracks
DDD Mess rooms &c.
E Hospital
F Quarters
G Commissary Storehouse
H Blacksmith's
O Bakery
P Commissary Storehouse
Q Wharf

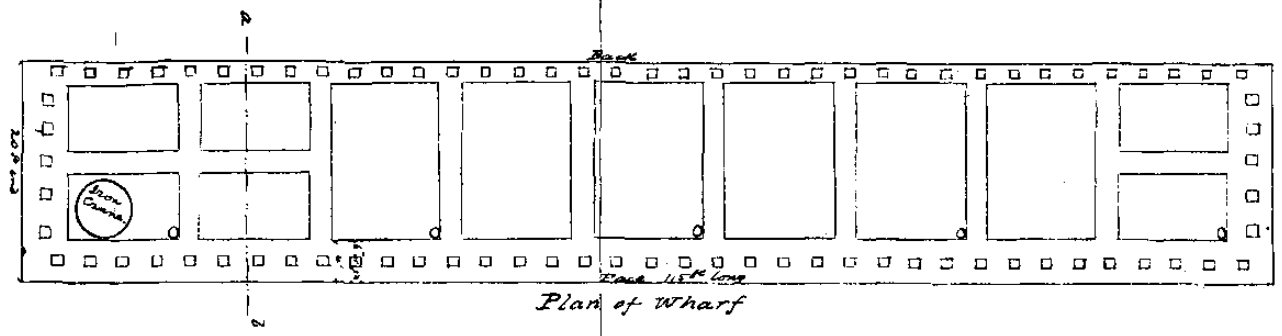
Engineer Department
June 4, 1861.
Rec'd with 4th Monthly
Return of July 2/61
(No. 2941)

Drawer 74.
Sheet 60.

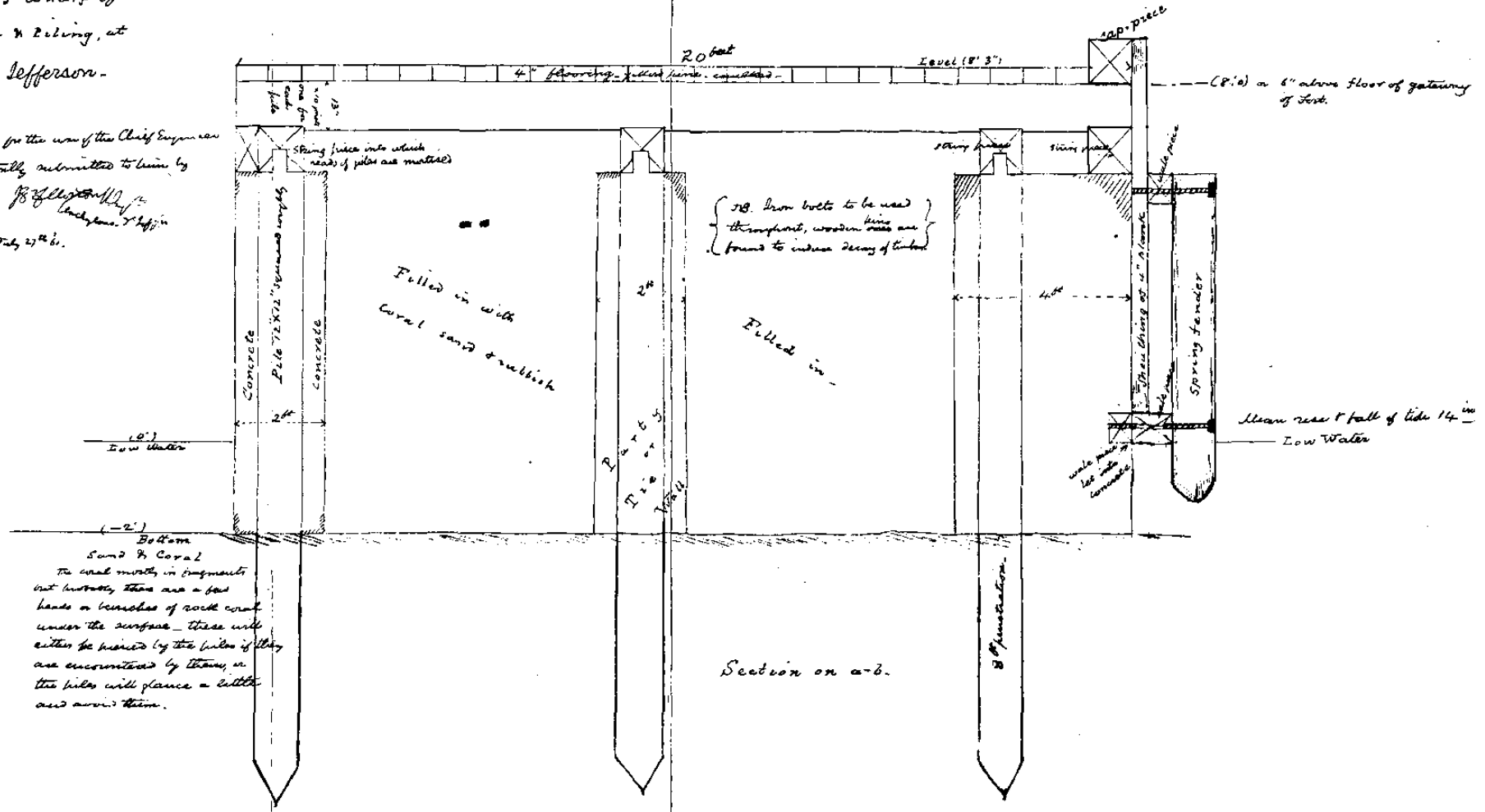
Engineer Department
Aug. 6, 1861
Rec'd with letter from
Lt. Prentiss, dated July 27/61
(M 3931)

Suggested
Plan & Section
of
Proposed Wharf of
Concrete & Piling, at
Fort Jefferson.

Prepared for the use of the Chief Engineer
& respectfully submitted to him by
J. B. Ellis
Asst. Engr. Fort Jeff'n
Fort Jeff'n. July 27th 61.



Plan of Wharf



The coral mostly in fragments but hereby there are a few heads or knuckles of rock coral under the surface - these will either be pierced by the piles if they are encountered by them, or the piles will glance a little and avoid them.

Drawer 74.
Sheet 61.

FORT JEFFERSON FLA.

SKETCH

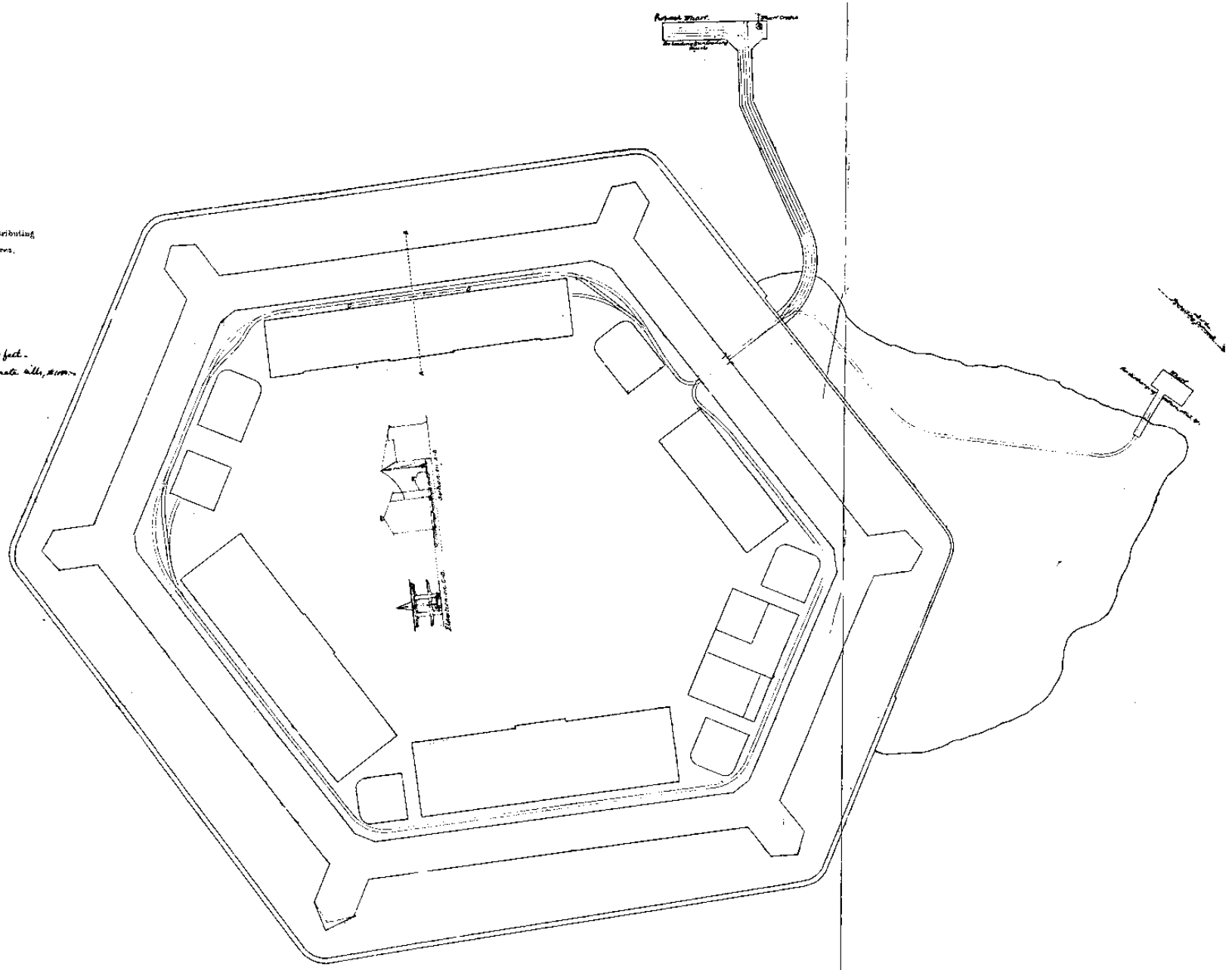
Shewing proposed arrangement for receiving and distributing Ordnance, Commissary and Quartermaster' stores, and building materials' and for collecting and discharging the Kitchen and other refuse of the place.

Scale 50 to 1"

Length of the lines of rail, 4150 feet.

Cost of 10m cubic feet of concrete alls, $10m.

Sent to the Engineer Department with letter of this D.S. (M 4649)



Drawer 74.
Sheet. 82.

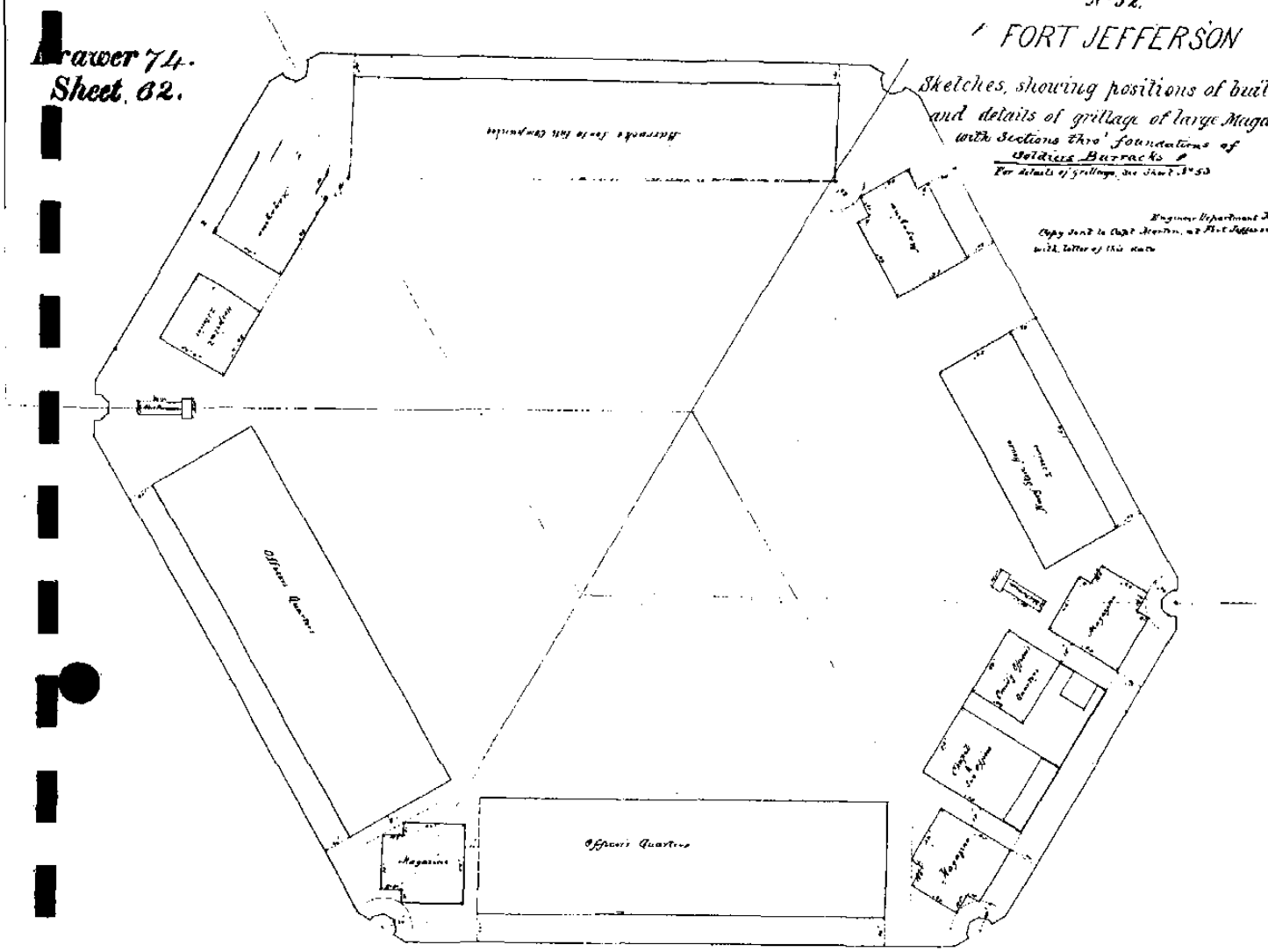
N°52.

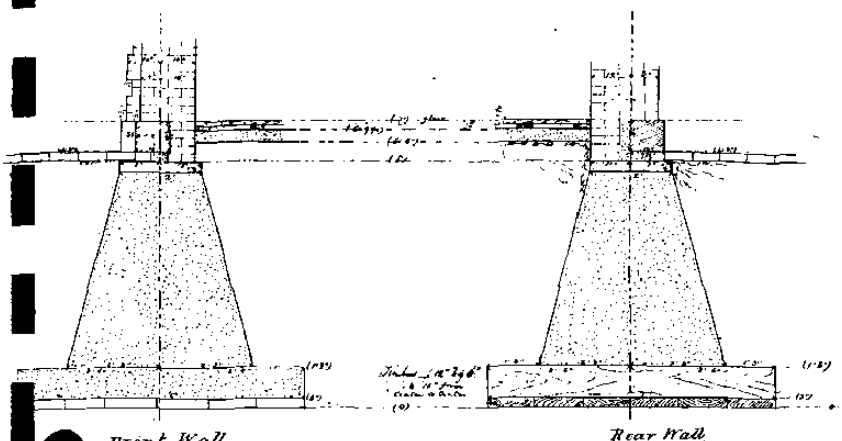
FORT JEFFERSON

Sketches, showing positions of buildings and details of grillage of large Magazines, with Sections thro' foundations of Soldiers Barracks

For details of grillage, see Sheet N°53

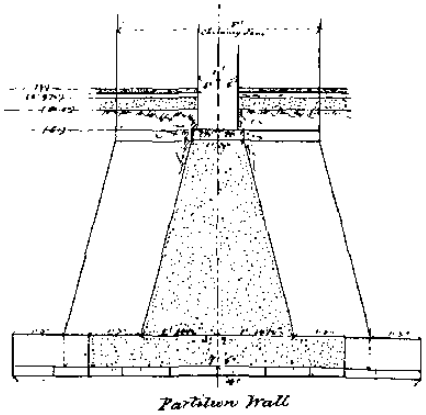
Engineer Department June 6, 1862.
Copy sent to Capt Newton, at Fort Jefferson with letter of this date





Front Wall

Rear Wall



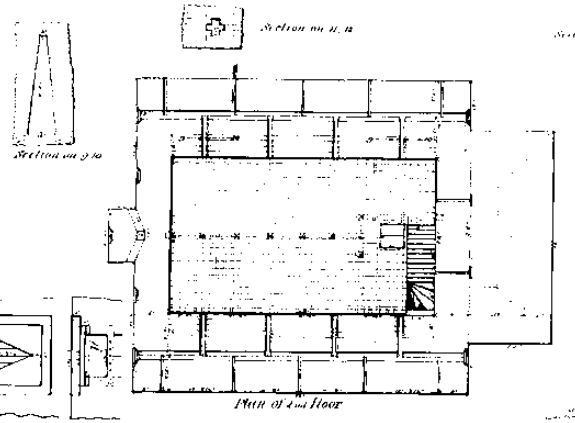
Partition Wall

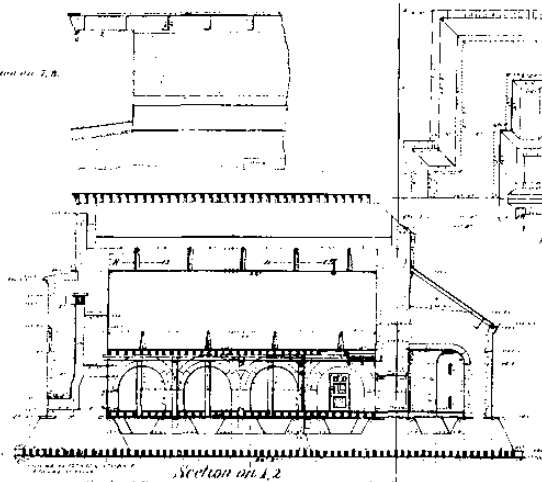
Drawer 74.
Sheet 63.

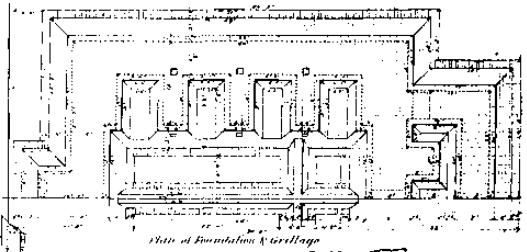
No 53.

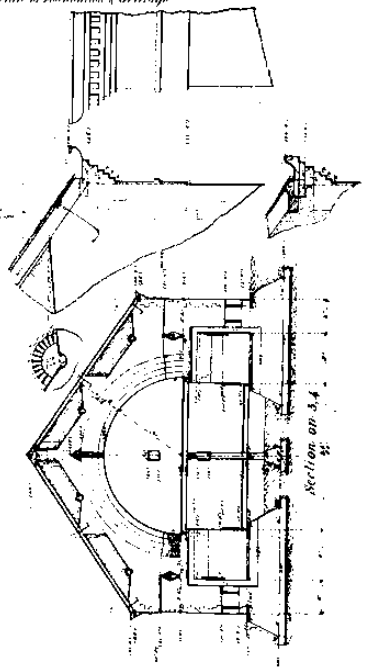
FORT JEFFERSON

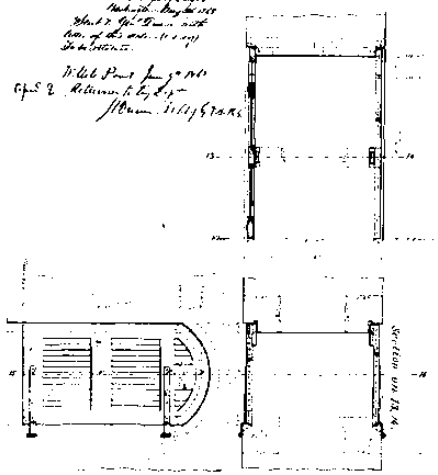
PLANS SECTIONS AND ELEVATIONS
of
DETACHED MAGAZINE

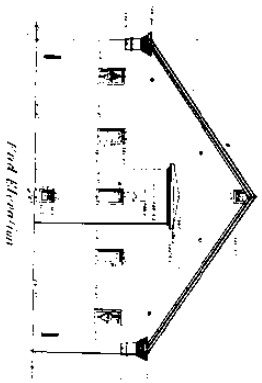


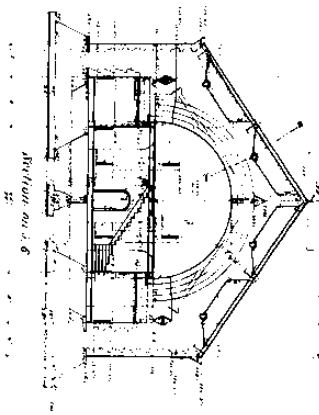


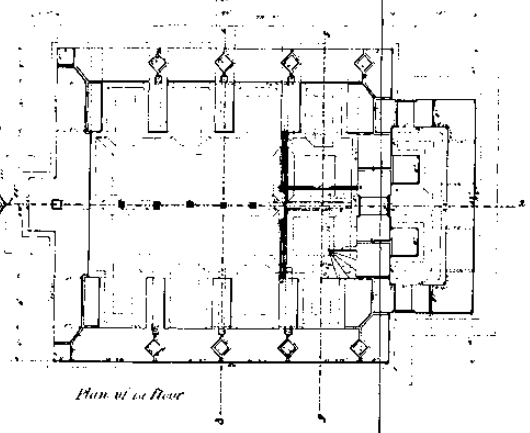










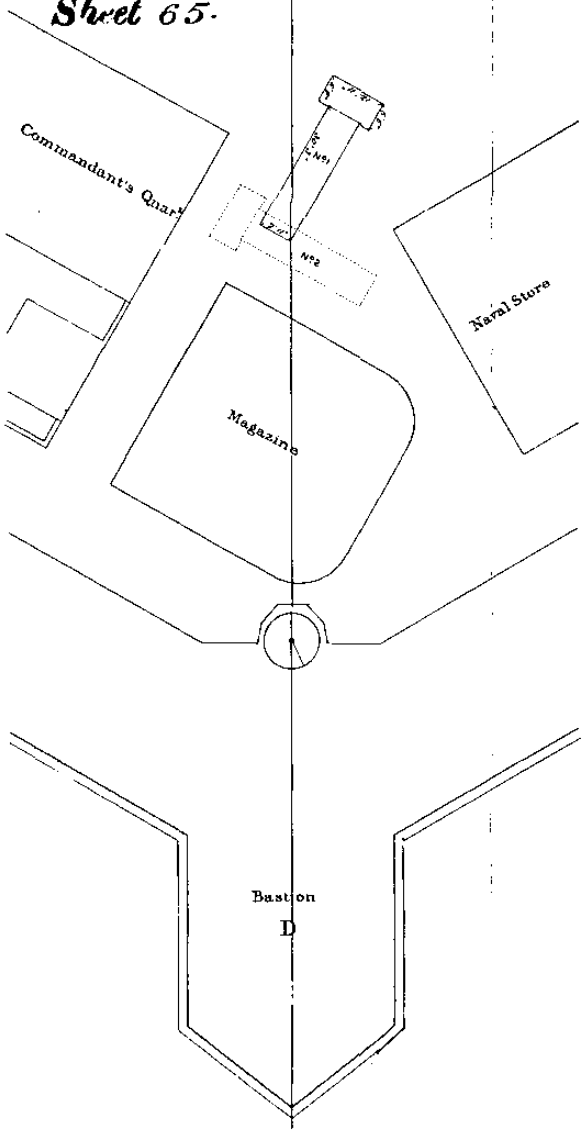


Fort Jefferson, Fla.

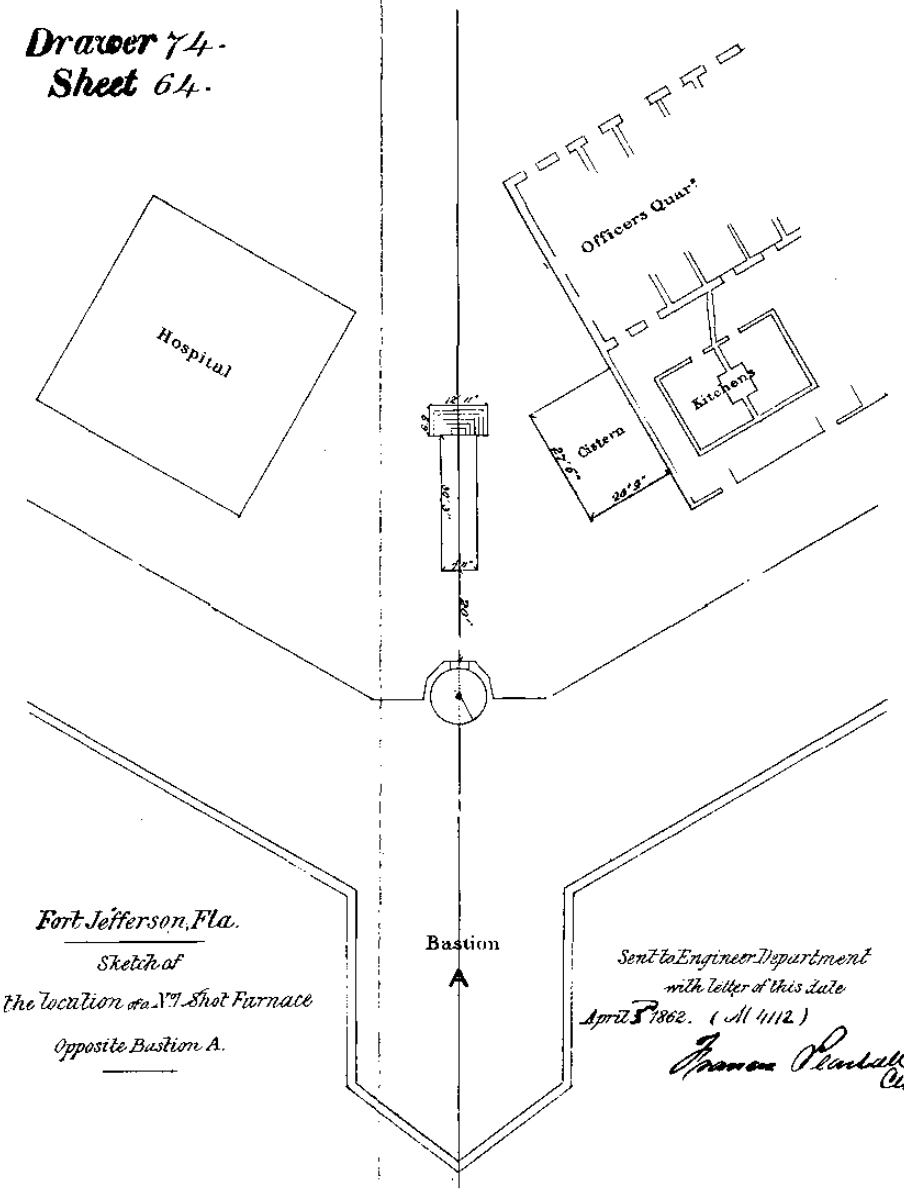
Sketch
Shewing the location of a No 1
Shot Furnace
Opposite Bastion D.

Sent to Engineer Department with letter of this date.
April 5 1862. (M 4114)

Drawer 74.
Sheet 65.



Drawer 74.
Sheet 64.



Fort Jefferson, Fla.

Sketch of
the location of a No 1 Shot Furnace
Opposite Bastion A.

Sent to Engineer Department
with letter of this date
April 5 1862. (M 4112)

James Barnard Chf. Engr

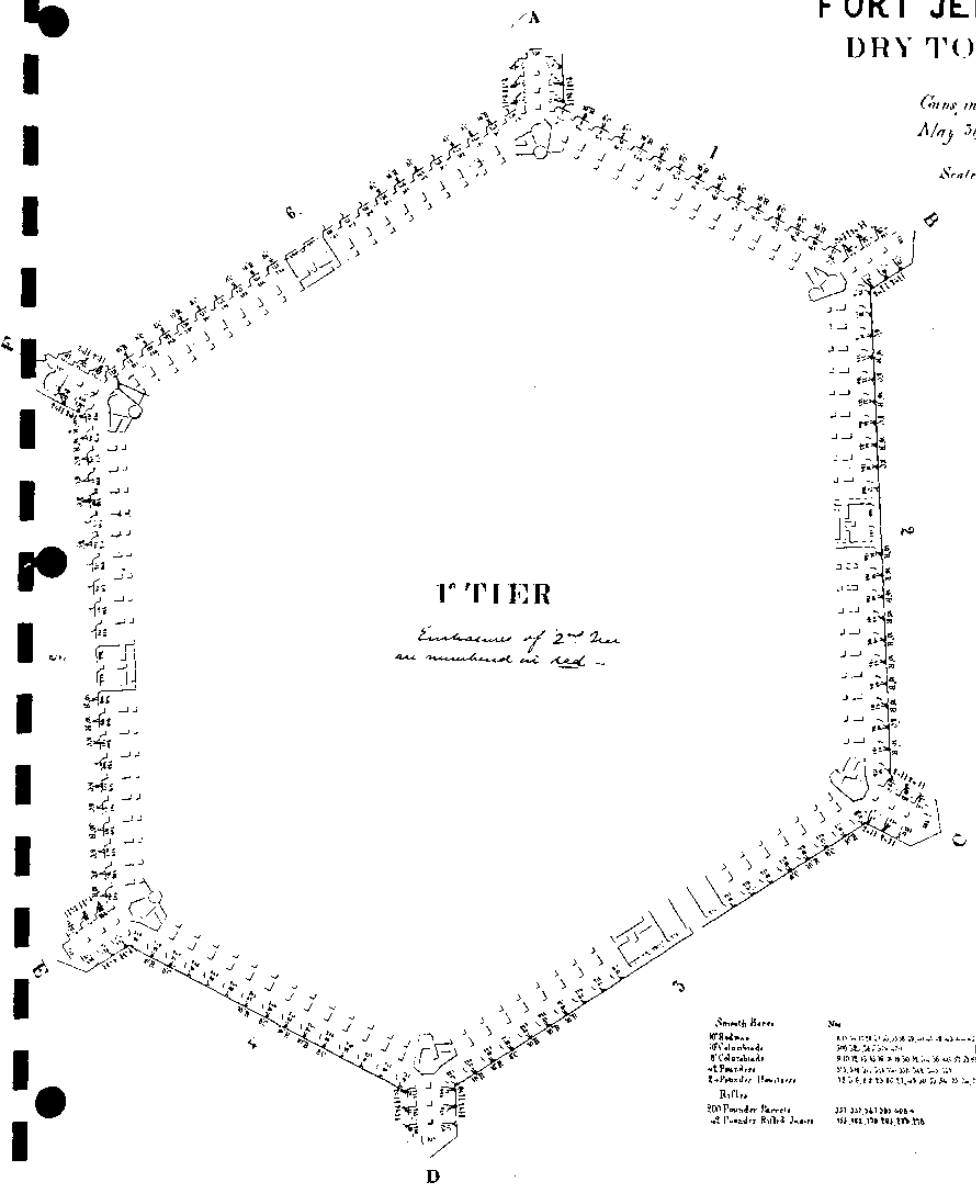
Number 74.
Sheet 78.

FORT JEFFERSON
DRY TORTUGAS

Guns in position
May 31st 1867.

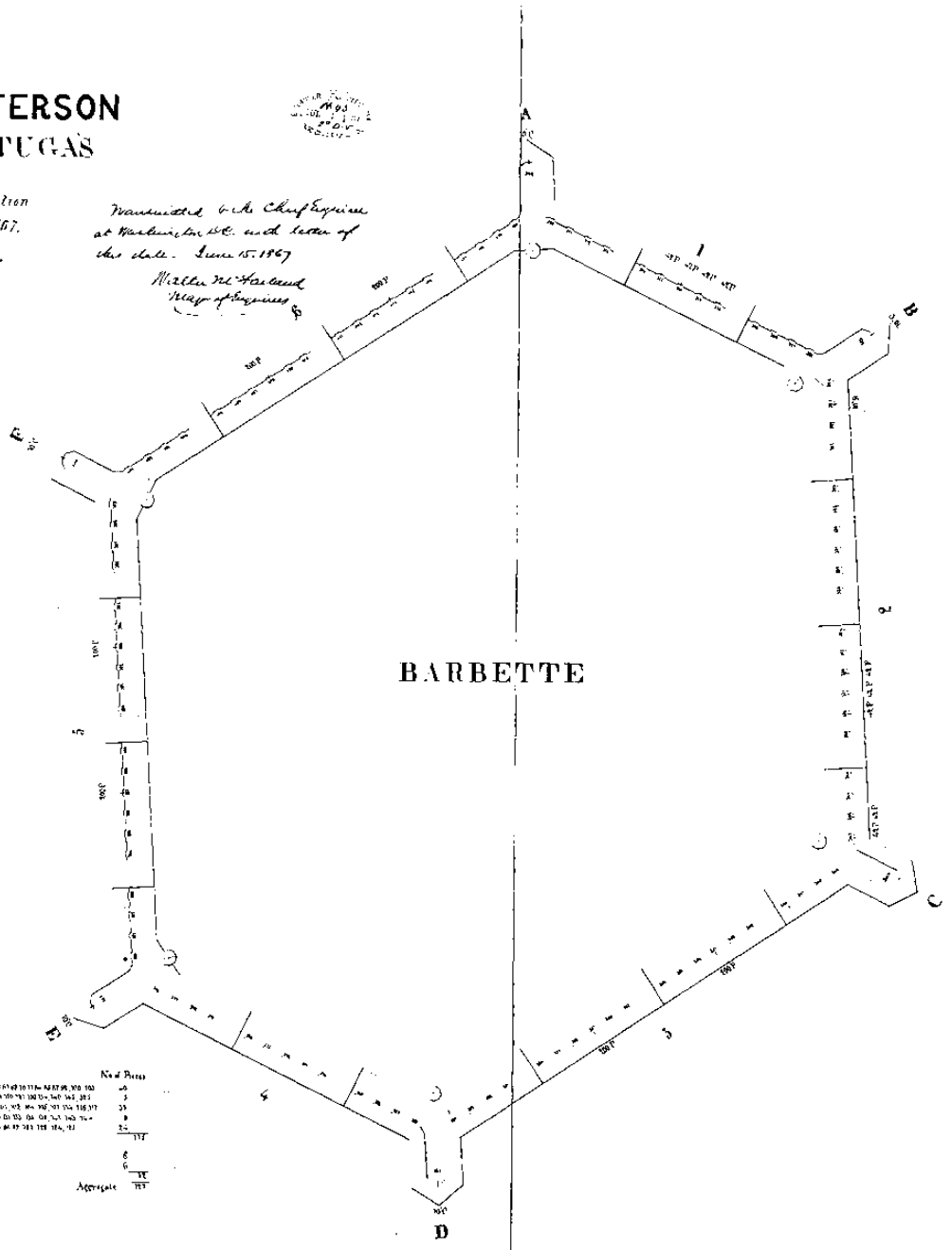
Scale 50 ft = 1"

Transmitted to the Chief Engineer at Washington D.C. with letter of this date. June 15. 1867
Miller McFarland
Asst Engineer



1st TIER

Embrasures of 2nd Tier are numbered in red.



BARBETTE

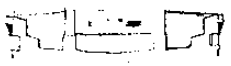
Smooth Bores	No.	No of Pieces
10" Columbiads		6
8" Columbiads		3
8" Columbiads		25
42 Pounders		9
24 Pounder Howitzers		32
		75
Rifles		
200 Pounder Parrotts		6
42 Pounder Rifled Guns		6
		12
	Aggregate	87

Drawer 74
Sheet 80.

FORTIFICATIONS

PROFILES
Scale 10=1'

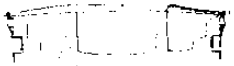
BASTIONS AF



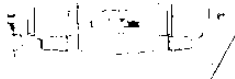
BASTION B.



BASTION C.



BASTIONS DE



CURTAINS 12



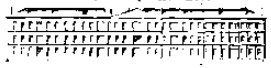
CURTAINS 56.



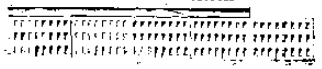
CURTAINS 34

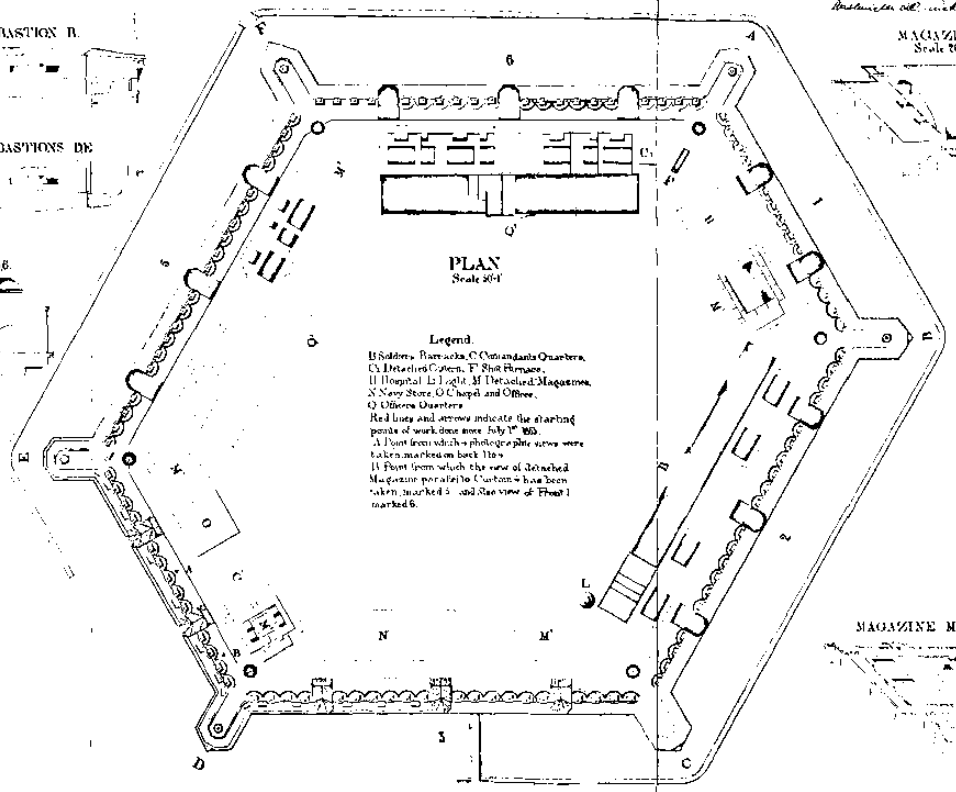


OFFICERS QUARTERS



SOLDIERS BARRACKS





PLAN
Scale 30-1

Legend.

B Soldiers Barracks, C Commandants Quarters,
D Detached Cistern, F Shot Furnace,
H Hospital I Light, M Detached Magazines,
N New Store, O Chapel and Offices,
Q Officers Quarters
Red lines and arrows indicate the starting points of work done since July 1st 1865.
A Point from which photographic views were taken, marked on back Plan
B Point from which the view of detached Magazine parallel to Curtain 6 has been taken, marked 5 and Side view of Front 1 marked 6.

FORT JEFFERSON
DRY TORTUGAS FLA

Sketch showing Condition of Works June 30th 1867, to accompany annual report.

MAGAZINE M'
Scale 20-1'



MAGAZINE M'



Drawer 74.
Sheet 77.

RTIFICATIONS

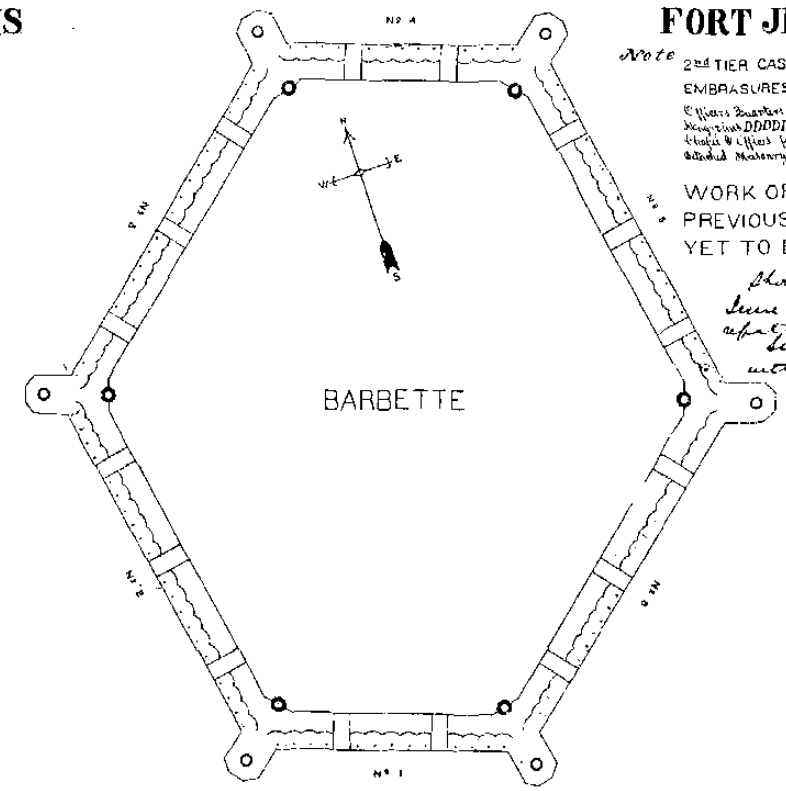
FORT JEFFERSON FLA

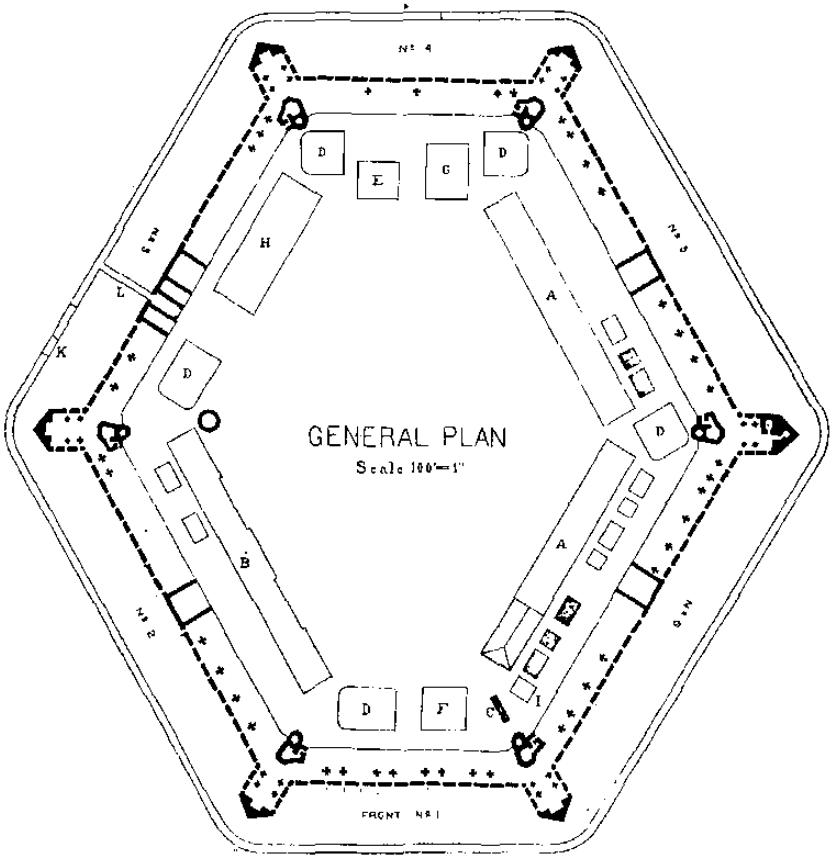
Note 2nd TIER CASEMATES LACK ONLY COMPLETION OF EMBRASURES FLOOR SURFACES & TRAVERSE ARCS

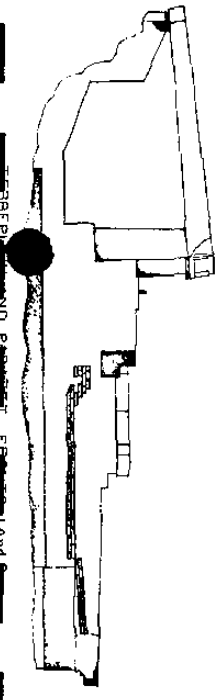
C Officers Quarters AA_ Officers Barracks B_ Chief Engineer C_
Magazine DDDDD_ Bomb Proof E_ Hospital F_
Cistern & Officers Quarters G_ Magazine Traverse H_
Cistern & Masonry Cistern I_ Cistern K_ Cross Bridge L_

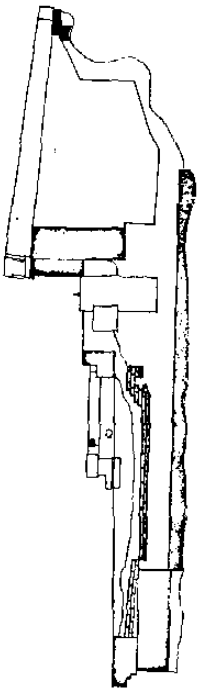
WORK OF YEAR IN CARMINE
PREVIOUSLY DONE GRAY & VEN RED
YET TO BE DONE LINE DRAWING

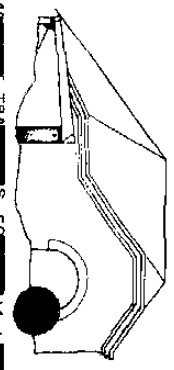
Showing condition of the work
June 30th 1864 - to accompany memoir
of Genl & Engineer Department
with letter of Nov. 1st 1864.
Walter McFarland
Captain Engineers
(M. 4932)
Rec'd at Eng. Dept.
Nov. 3. 1864.

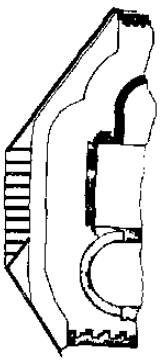





TERREPLEIN AND PARAPET. FRONTS No 3 4 5 6
Scale 5'—1"


TERREPLEIN AND PARAPET. FRONTS No 3 4 5 6
Scale 5'—1"

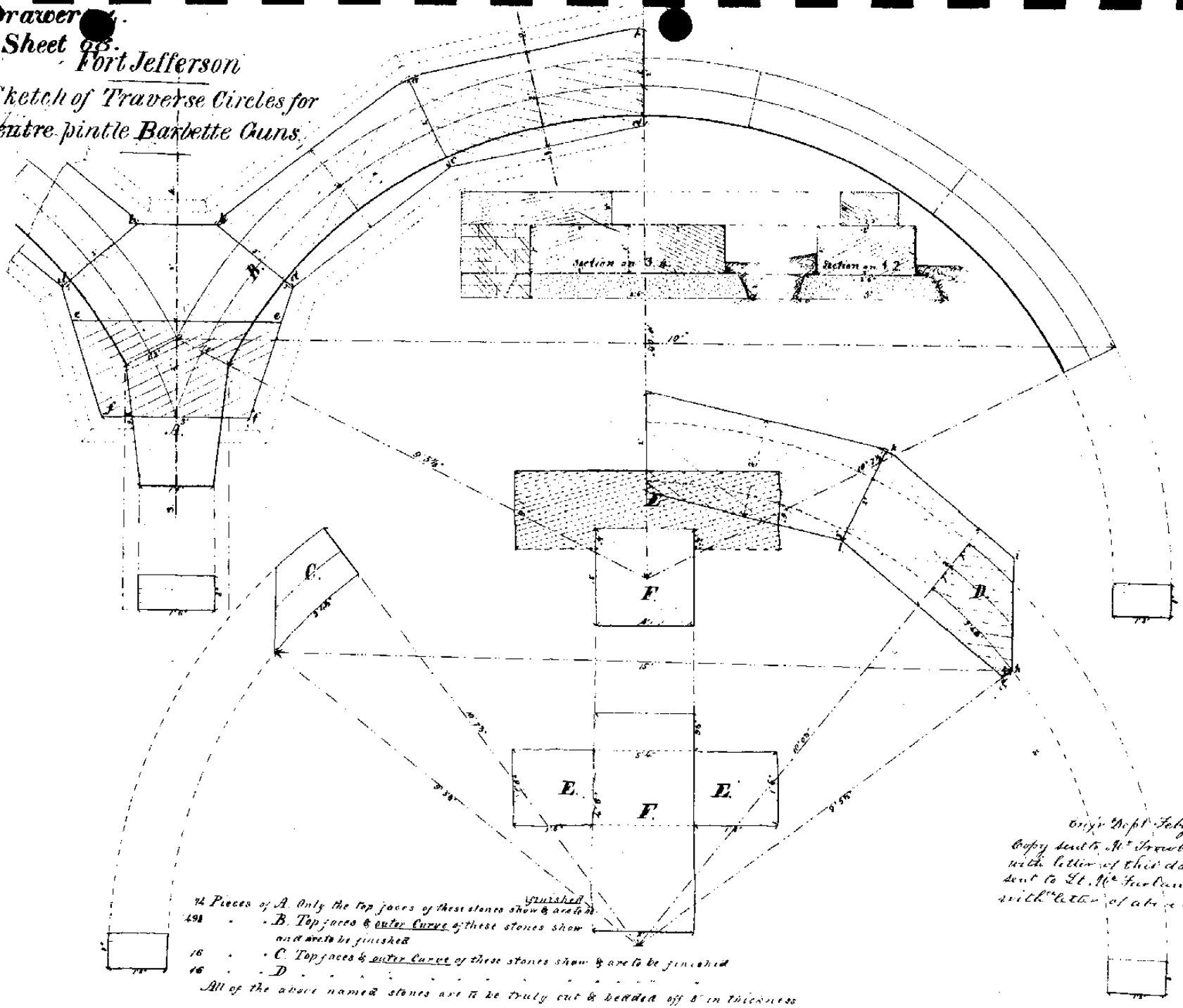

MAGAZINE TRAVERSES. FRONTS No 3 4 5 6
Scale 10'—1"


MAGAZINE TRAVERSES. FRONTS No 3 4 5 6
Scale 10'—1"

Drawer [illegible].
Sheet 98.

Fort Jefferson

Sketch of Traverse Circles for Centre pintle Barbette Guns.



74 Pieces of A. Only the top faces of these stones shown & are to be finished
491 " " B. Top faces & outer Curve of these stones shown and are to be finished
16 " " C. Top faces & outer Curve of these stones shown & are to be finished
16 " " D " " " " " " " " " "

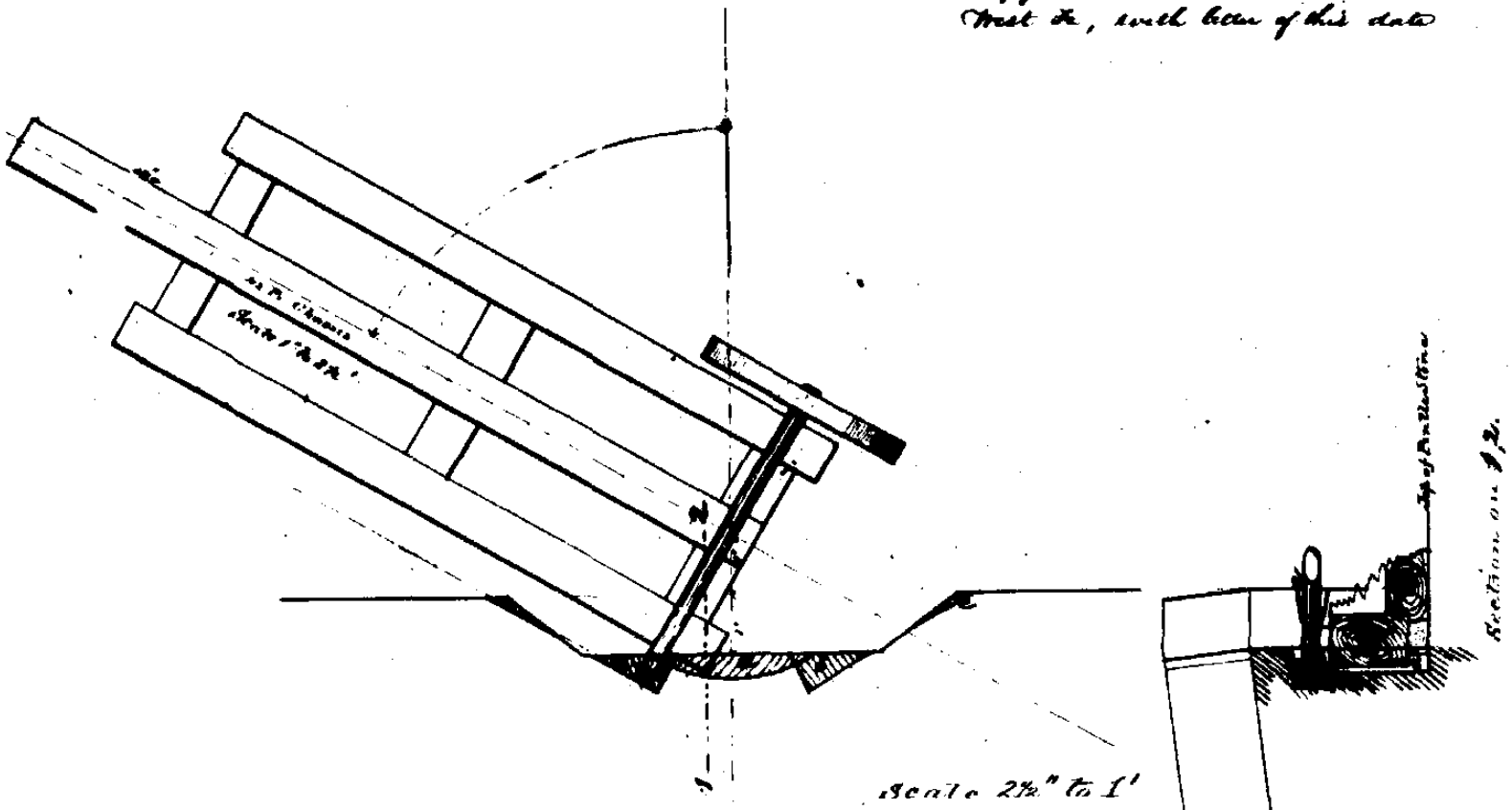
All of the above named stones are to be truly cut & bedded off 6" in thickness

Orig. Dept. Feby 19th 1863
Copy sent to Mr. Trowbridge at New York with letter of this date; and a copy sent to Lt. Mc. Furbush at Key West with letter of above date.

Drawer 74.
Sheet 60.

Fort Jefferson

Engineer Department Dec 28. 1863
Copy sent to Captain McFarland at Key West &, with letter of this date



Scale 2½" to 1'

Drawer 74.
Sheet 70.

RTIFICATIONS

FORT JEFFERSON, DRY TORTUGAS FLA

Sketch showing condition of the work, June 20th 1863 – with the progress made during the year shown in red. –

Transmitted to the Engr. dept. January 25th 1864 – with letter of the same date. – [illegible]

Walter McFarland
Captain Engineers

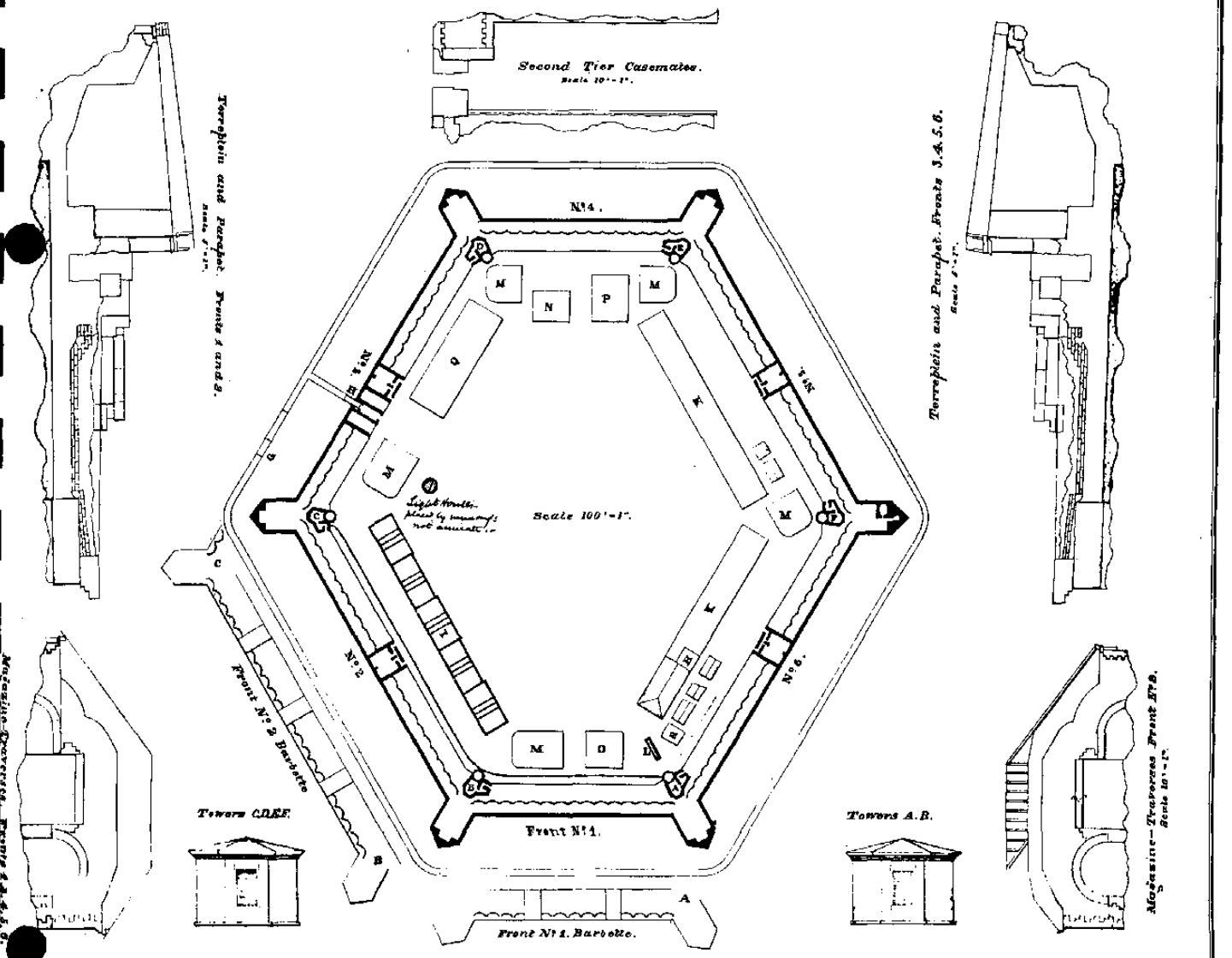
Engineer Department
Navy Yard, Key West, Fla.

WORK DONE DURING YEAR – IN CARMINE
DO PREVIOUSLY DONE – IN OTHER COLORS
DO YET TO BE DONE – IN LINE DRAWING.

PARTS SHOWN IN PLAN.

Kin traverse area of First tier – and Barbette gunplatforms
Exterior Ditch – Counterscarp Wall – Stones G – Drawbridge H
Soldier's Barracks I – Officers Quarters K K – Shot Furnace L
Magazines MMMMM. – Commandant's Quarters N – Hospital O
Chapel and Offices (foundation constructed) P – Navy Store House Q
Detached Masonry Cisterns R R R – Permanent Buildings erected.

N.B. The Barracks are in only an early stage of progress – ventilators laid but walls commenced.



Drawer 74.
Sheet 71.

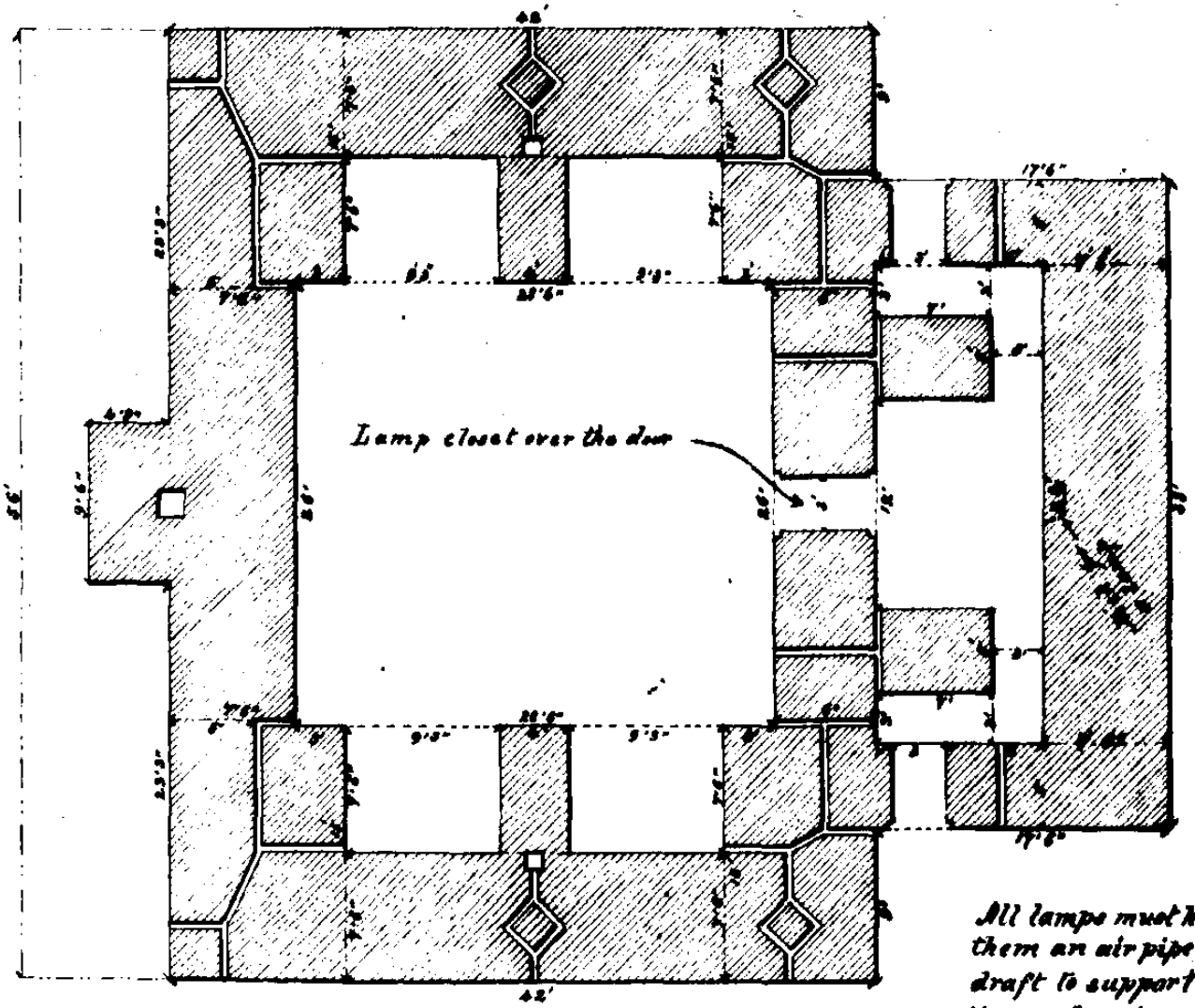
No 53a

Fort Jefferson.

Plan of a small Detached Magazine.

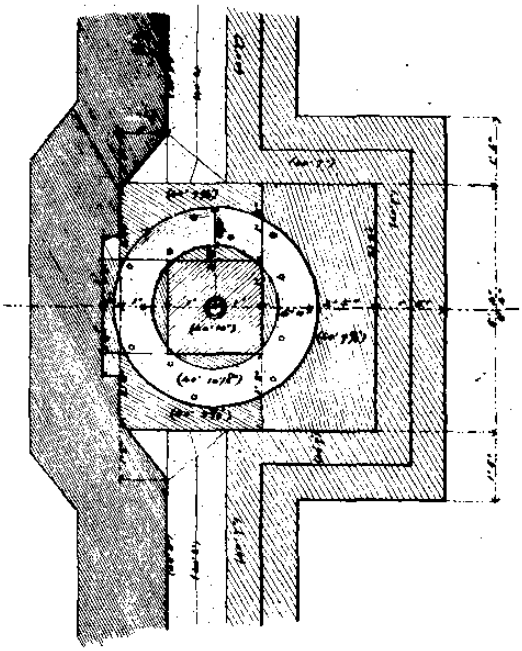
Orng. Sept. [illegible]

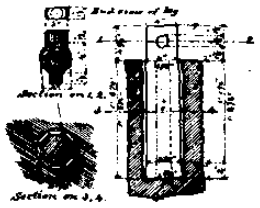
Copy sent to Capt. McFarland with letter of this date.



All lamps must have above them an air pipe to create draft to support combustion – these pipes to have elbows as the ventilating

Drawer 7 b
Sheet 82.



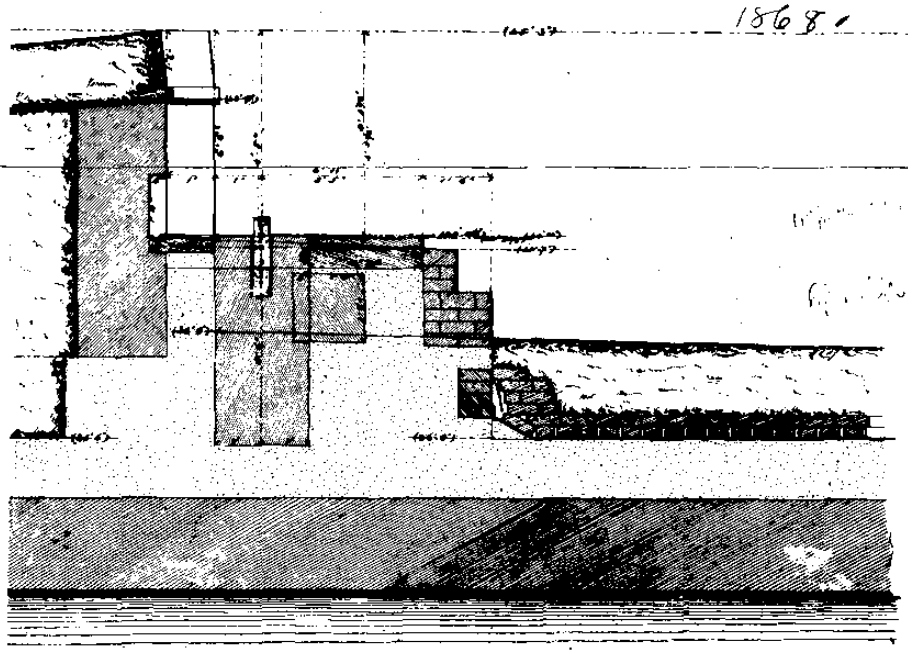


Details of Pintle

Fort Jefferson

Sketch, showing alterations to be made in the Gun Platforms to adapt them to the Iron Carriages for 10" 8" Rodman guns

1868



FORTIFICATIONS

Drawer 74
Sheet 83.[illegible]

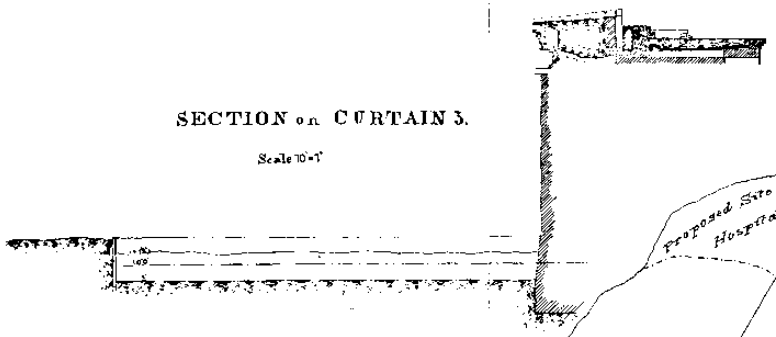
FORT JEFFERSON
DRY TORTUGAS FLA.

Sketch showing condition of works June 30th 1868. To accompany annual report
Sent to Department October 16th 1868
[illegible]
Colonel Engineers
Bvt Brig General U.S.A.

1868

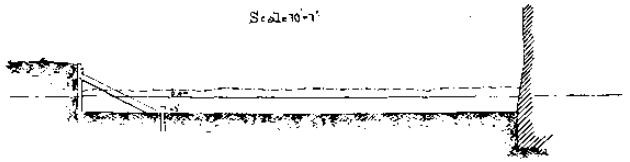
SECTION on CURTAIN 3.

Scale 10'=1"



SECTION on CURTAIN 4

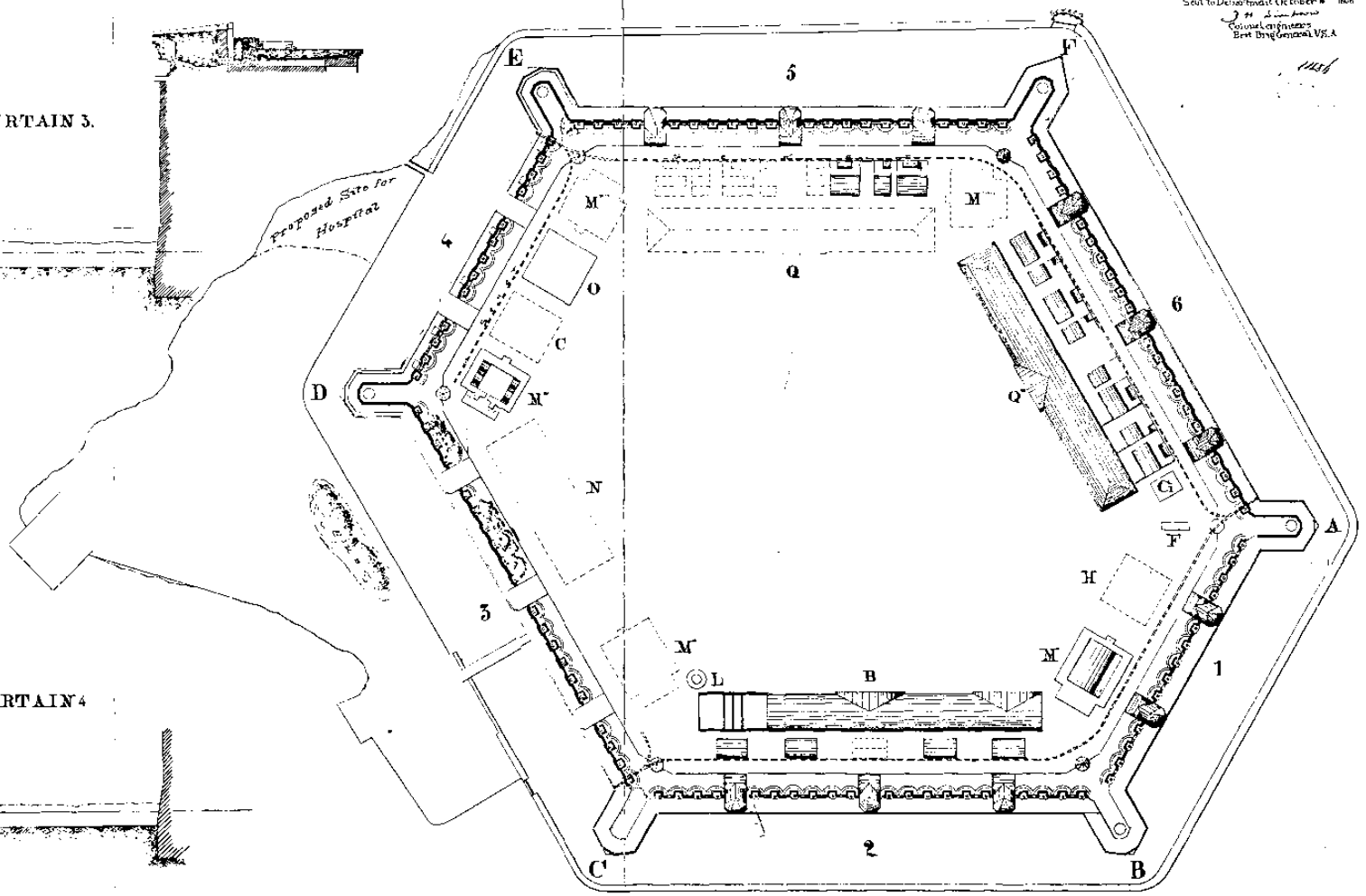
Scale 10'=1"



Legend

B Soldiers Barracks
C Commandants Quarters
C Detached Cistern
F Shot Furnace
H Hospital
L Light
M Detached Magazines
N Navy Store
O Chapel and Offices
Q Officers Quarters

Red Lines, arrows &c indicate the starting points of work done since June 30th 1867.



FORTIFICATIONS

Drawer 74.
Sheet 24.

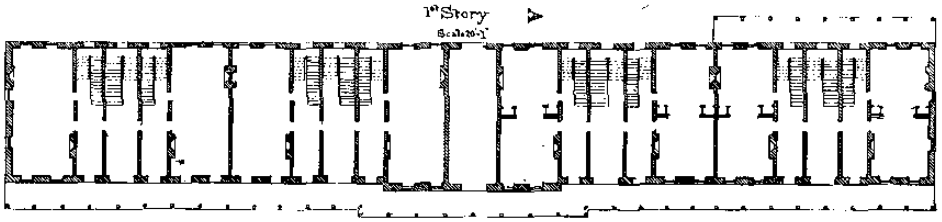
FORT JEFFERSON
DRY TORTUGAS FLA.

Sketch showing condition of works
June 30th 1868. To accompany annual report
Sent to Department October 16th 1868.
J. M. Scofield
Colonel, engineers
Brvt. Brig General USA

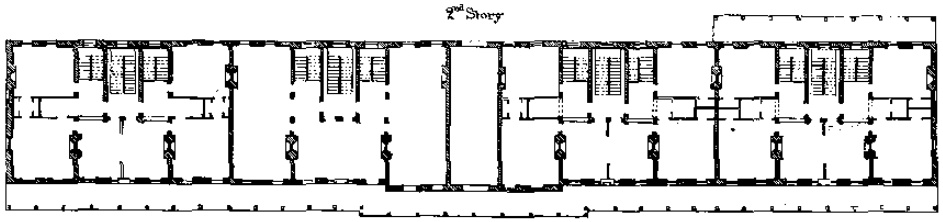
1486

OFFICERS' QUARTERS

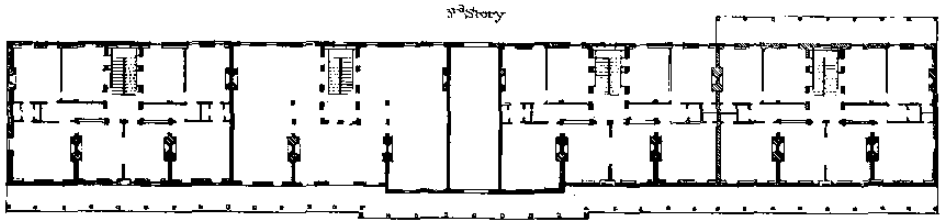
1st Story
Scale 20 ft 1"



2nd Story

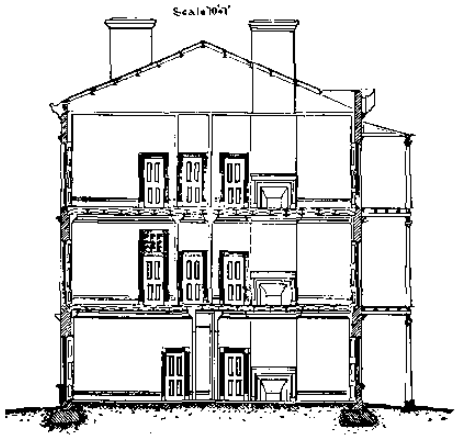


3rd Story

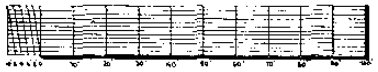


B
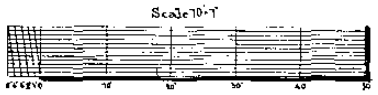
Section on AB
Scale 10 ft 1"



Scale 20 ft 1"



Scale 10 ft 1"



Legend.

Brick Iron Concrete Wood Granite Sand

Sheet 85.

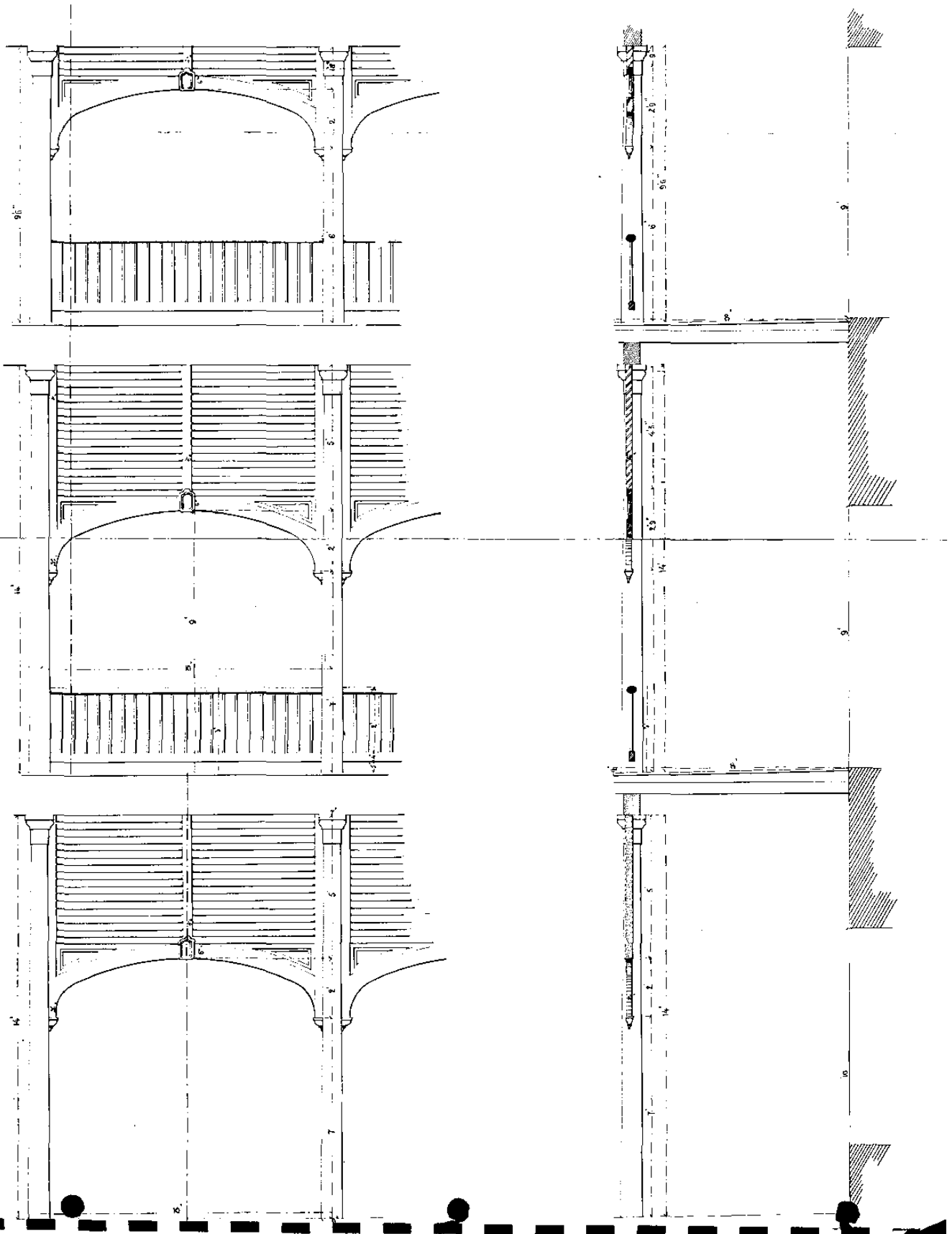
FORT JEFFERSON
DRY TORTUGAS FLA.

No 1.

Sketch of proposed
LATTICE WORK
for Bazzas of Officers Quarters
Scale 1"-1'

U.S. Engineer Office Key West Fla
April 19. 1869
Sent to Engineer department
with letter of this date.
C. E. Blunt
Lt. Col. Engrs. Bvt Col

2231.

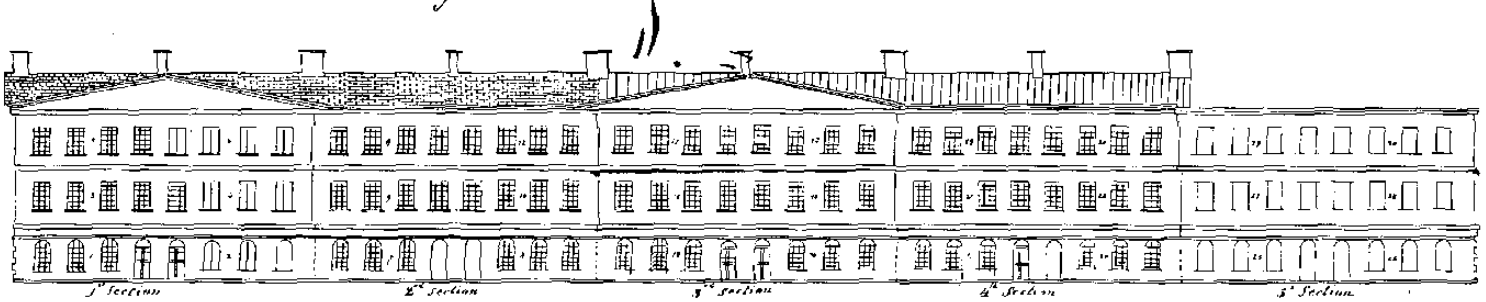


Drawer 74.
Sheet 87.

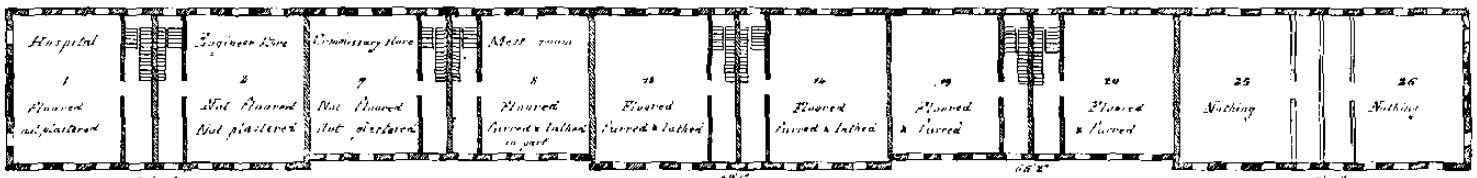
Fort Jefferson, Fla.

2425

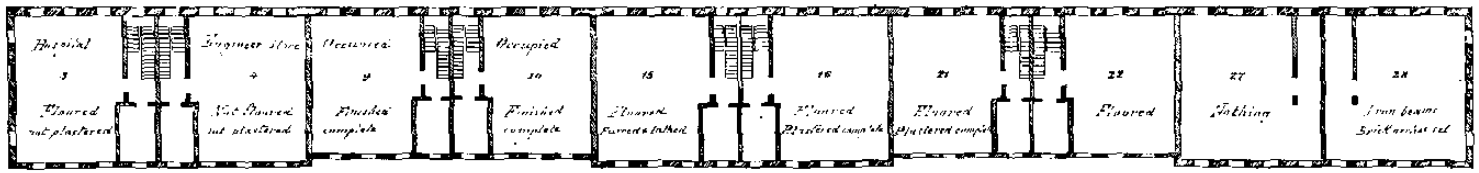
Sketch showing condition of Soldiers Barracks June 30th 1869



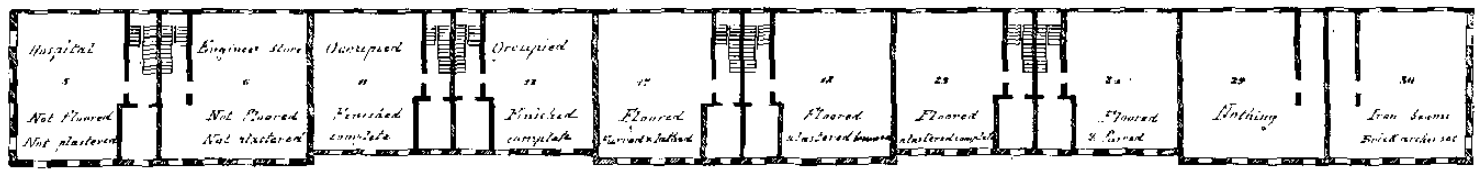
Front Elevation



Ground Floor



Second Floor



Third Floor

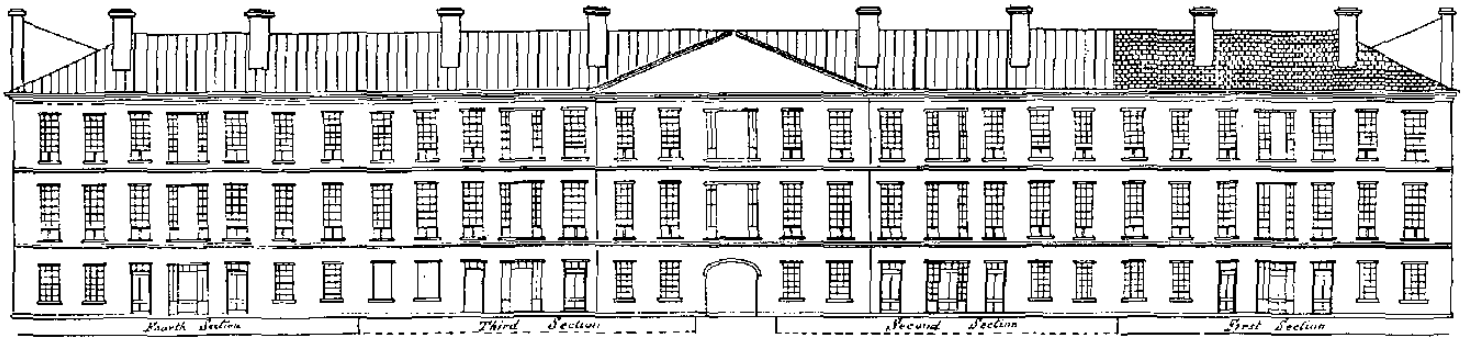
Scale 1" to 20'

Fort Jefferson ~ Fla

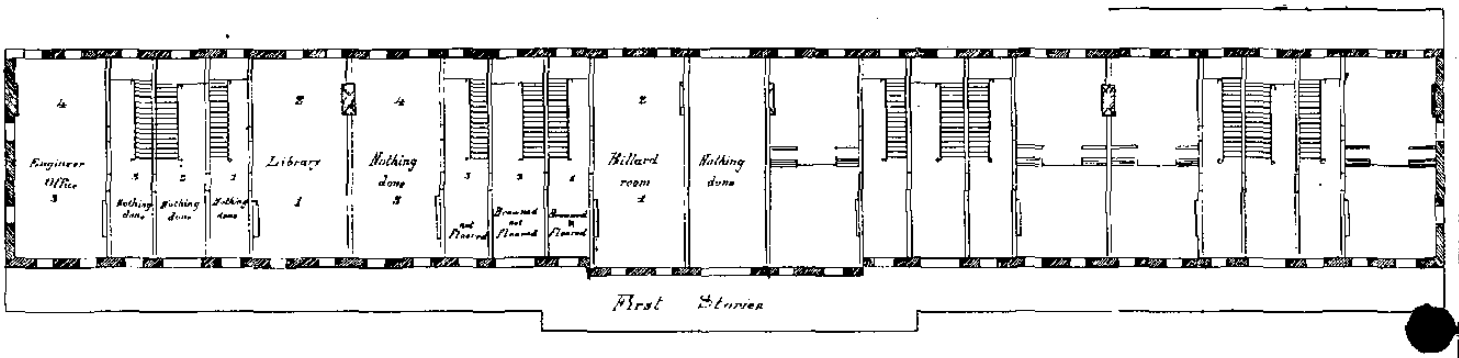
Fort Jefferson, Fla.

SKETCH SHOWING CONDITION OF OFFICERS QUARTERS JUNE 30 1869

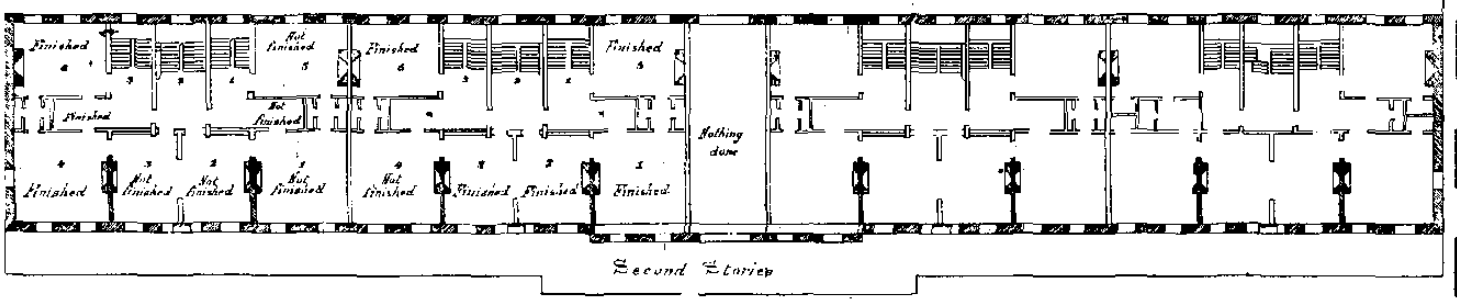
2425



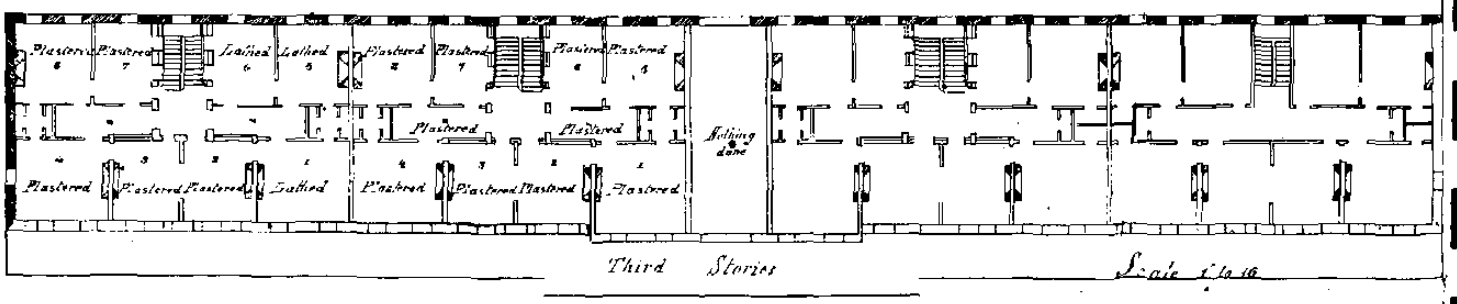
Front Elevation



First Stories



Second Stories



Third Stories

Scale 1 to 16

FORT JEFFERSON FLa

Drawer 74.
Sheet 90.

SHEET 2

PLAN AND SECTIONS
OF
FORT JEFFERSON
DRY TORTUGAS FLA
SHOWING MODIFICATIONS PROPOSED BY THE
BOARD OF ENGINEERS FOR FORTIFICATIONS

FRONT 3

FRONT 1

SECTION A B

SECTION C D

SECTION E F

SECTION G H

SECTION K L

Approved, subject to usual changes as details by the Chief of Engineers as to Sec. 11 of Act of Congress approved June 6, 1900.

Approved, subject to usual changes as details by the Chief of Engineers as to Sec. 11 of Act of Congress approved June 6, 1900.

A

B

Drawer 74
Sheet 91

[redacted]

SHEET II

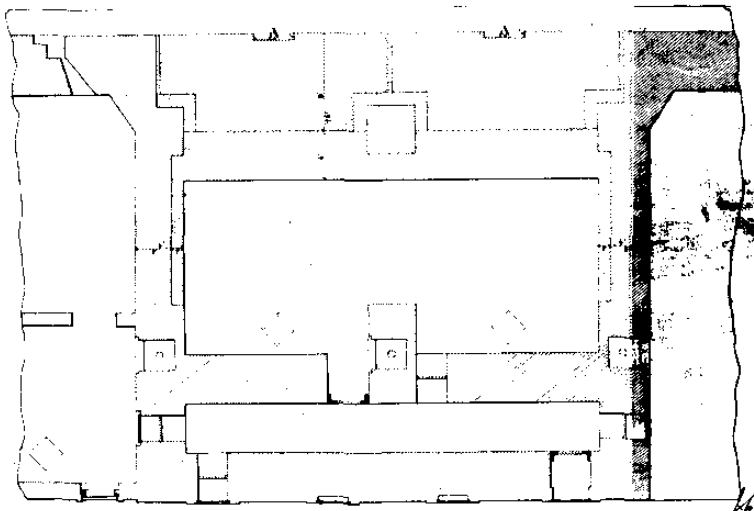
[redacted]

Office of the Chief of Engineers
Washington, January 6, 1872.
Respectfully submitted to the Hon. Secretary of War, and recommended for approval.
A.A. Humphreys
Brig. Gen'l & Chf of Engrs.

Approved, subject to such changes in details by the Chief of Engineers as in the course of construction may be found advisable
Jno. M. Belknap
War Dept. January 6, 1872. Secty of War.

1871

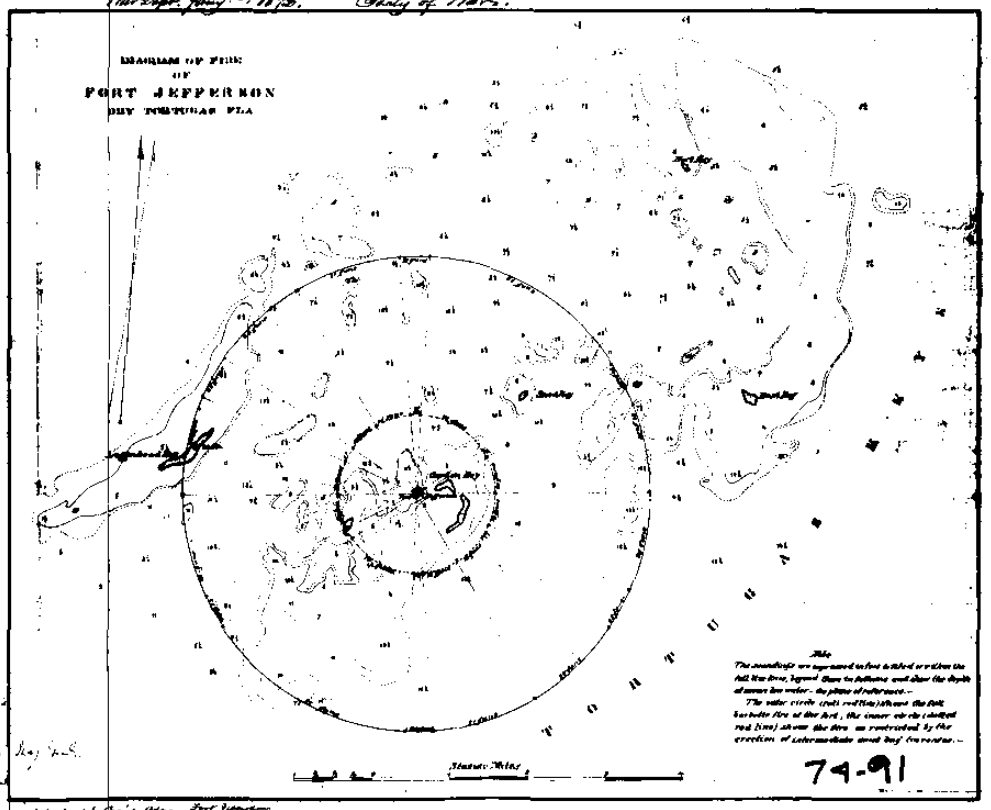
HORIZONTAL SECTION THROUGH MAGAZINES OF CURTAIN
OF
FORT JEFFERSON
DRY TORTUGAS FLA
SHOWING MODIFICATIONS PROPOSED
BY THE
BOARD OF ENGINEERS FOR FORTIFICATIONS



Old masonry
New masonry
A, A represent Wood embrasures

Scale 2Ft to 1 In.

DIAGRAM OF FIRE
OF
FORT JEFFERSON
DRY TORTUGAS FLA



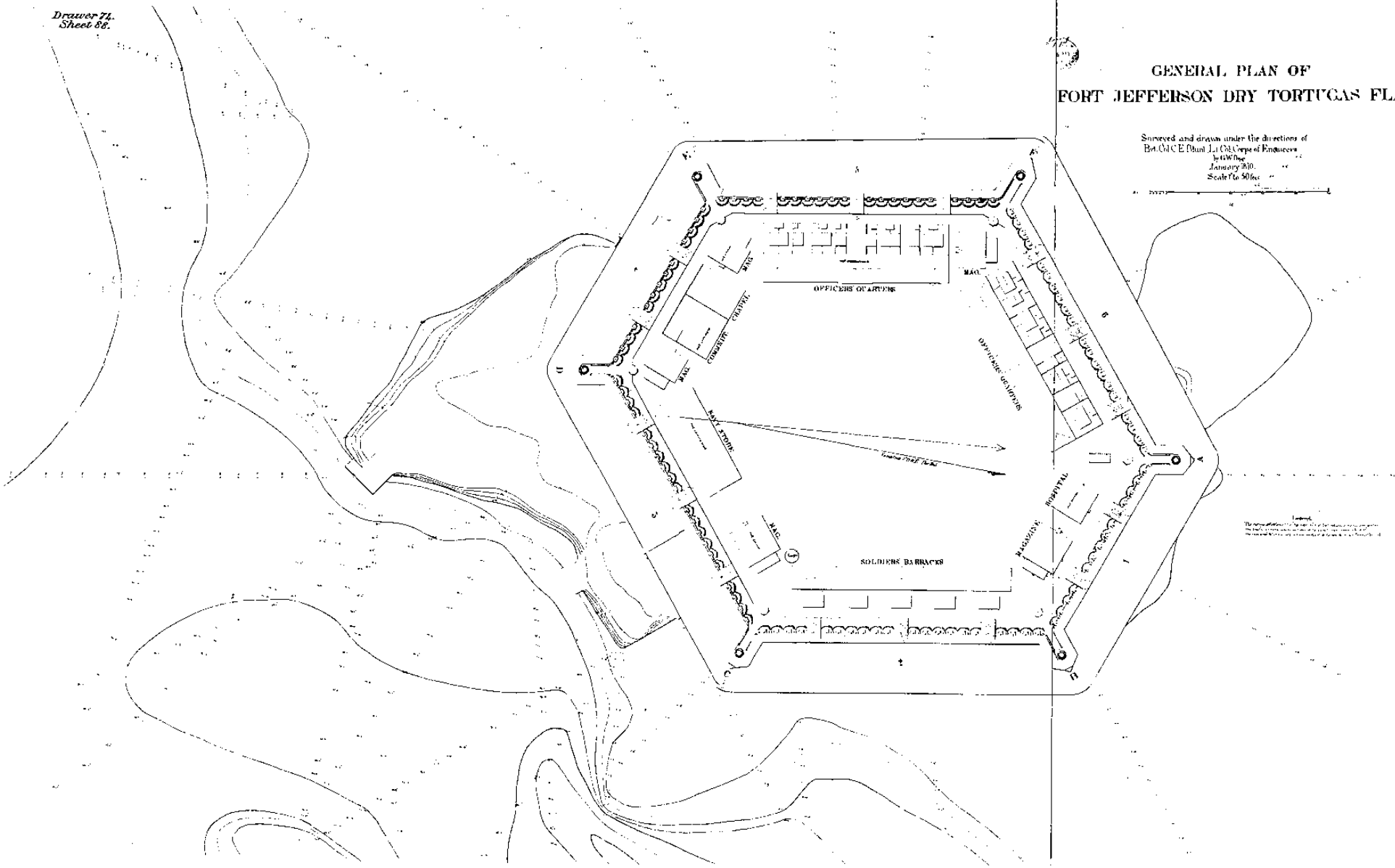
Note
The soundings are expressed in feet & tabled at or below the full line, beyond them to fathoms and show the depth at mean low water, the plane of reference.—
The outer circle (red) radius) shows the fort to the fire of the fort, the inner circle (dotted red line) shows the fire as restricted by the erection of intermediate wood buy (no water.—

74-91

Drawer 74.
Sheet 88.

GENERAL PLAN OF
FORT JEFFERSON DRY TORTUGAS FLA.

Surveyed and drawn under the directions of
Bvt. Col. C.E. Lieut. Col. U.S. Corps of Engineers
by G.W. Hoge
January 1850.
Scale 1 to 50 feet



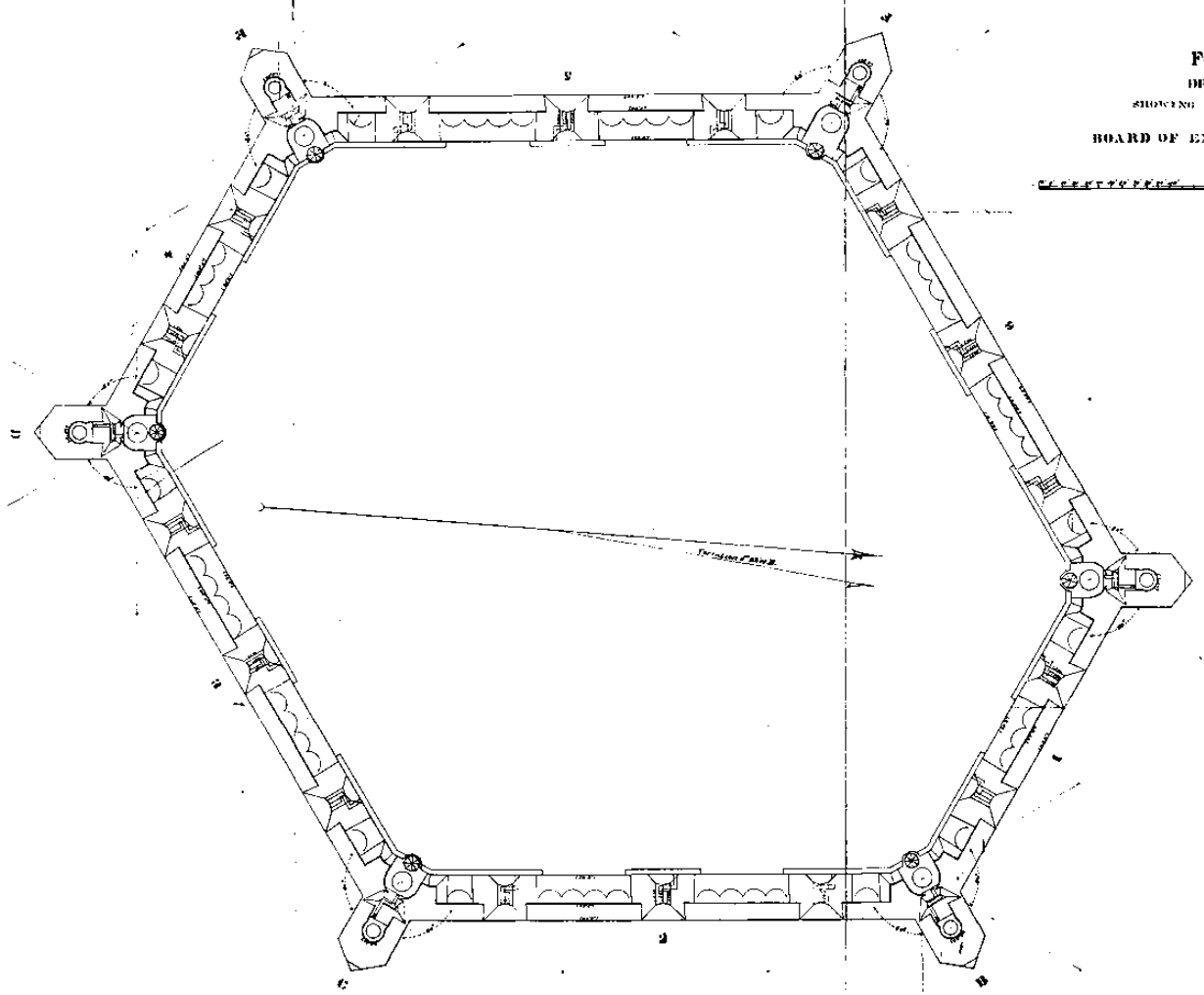
Drawer 74.
Sheet 89.

SHEET 1.

470 F 1871

PLAN
OF
FORT JEFFERSON,
DRY TORTUGAS, FLA.
SHOWING MODIFICATIONS PROPOSED
BY THE
BOARD OF ENGINEERS FOR FORTIFICATIONS.
January 1871

Scale 16 to 1"



J. G. Barnard
Lt. Col. Corps of Engrs. Brvt. Maj. Genl.

Geo. W. Cullum
Col. & Asst. Adjt. Genl. Brvt. Brig. Genl.

Jno. N. Macomb
Lt. Col. Corps of Engrs. Brvt. Maj. Genl.

H. G. Wright
Lt. Col. & Chief of Engrs. Brvt. Maj. Genl.

C. E. Blunt
Lt. Col. Engrs. Brvt. Col.

Office of the Chief of Engineers
Washington January 6, 1872.
Respectfully submitted to the Hon. Secretary of War, and recommended for approval.
A. A. Humphreys
Brig. Gen'l & Chf. of Engrs.

Approved, subject to such changes in details by the Chief of Engineers as in the course of construction may be found advisable.
Wm. W. Belknap
Secty of War.
War Dept
January 6, 1872.

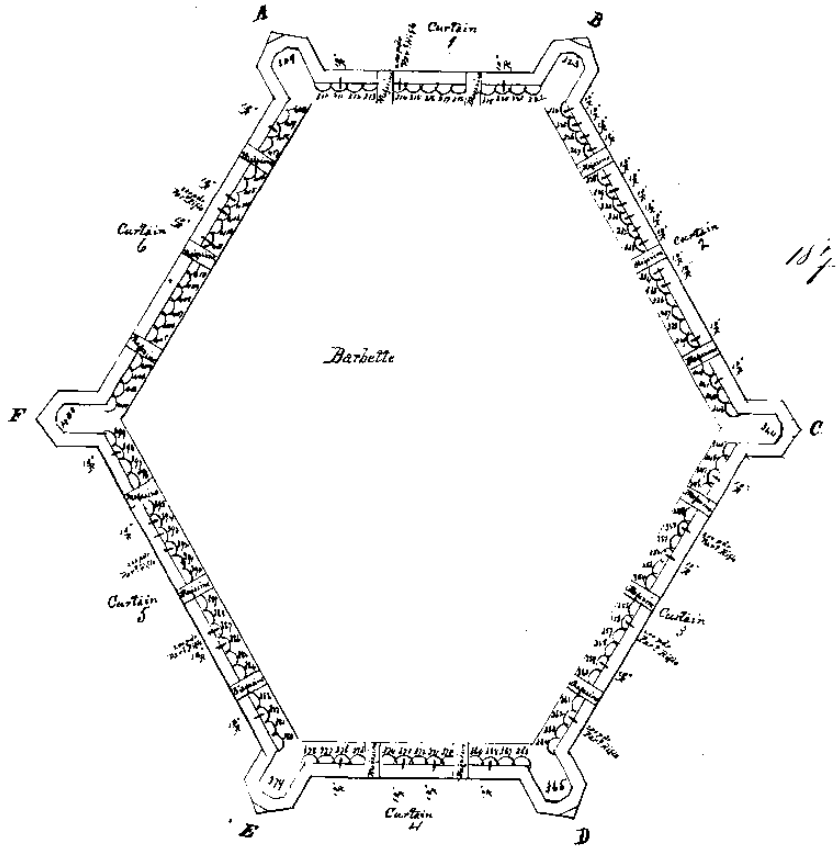
Office of the Chf of Engrs
Washington January 12, 1872
Copy sent to Col Blunt, Insp
Genl of this date.

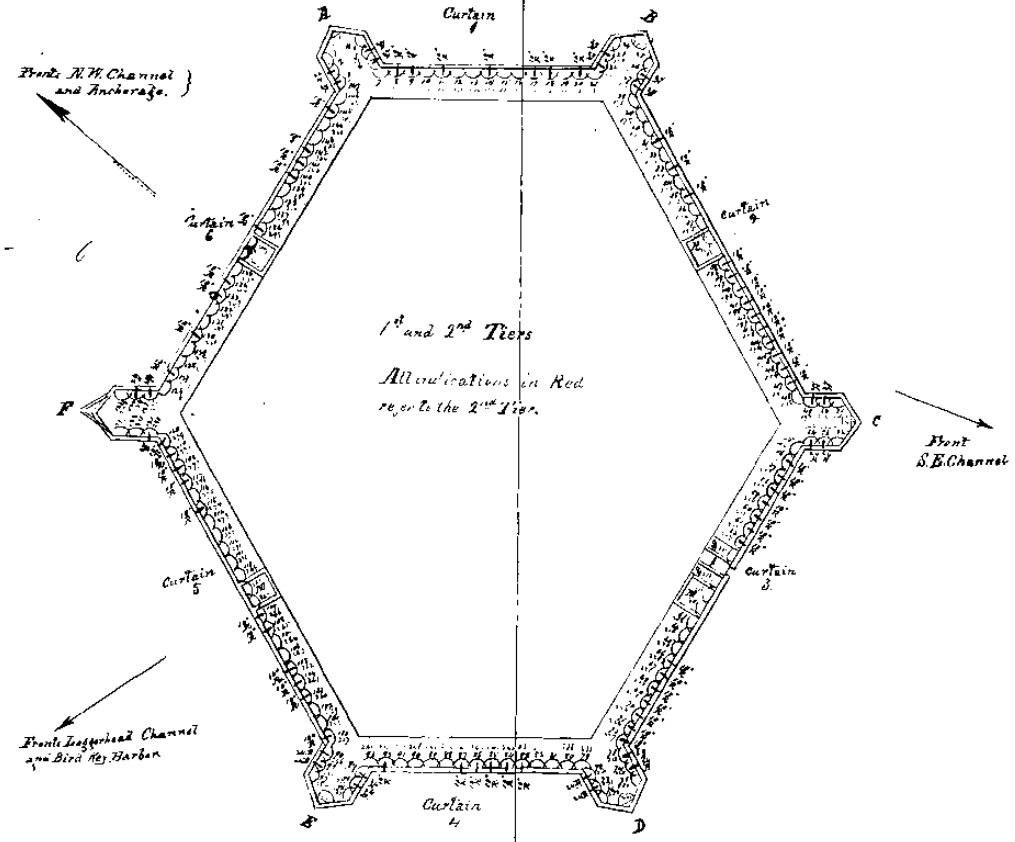
Drawer 74.
Sheet 92.

Fort Jefferson, Dry Tortugas Fla

Showing condition of Armament. March 1st 1872.

Scale 100' to 1"



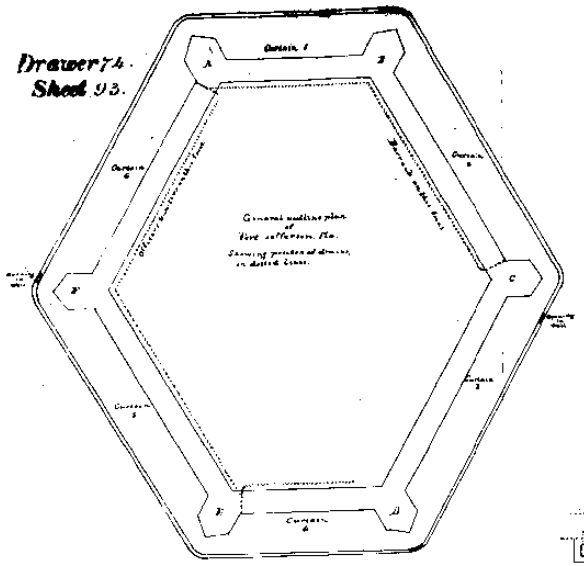


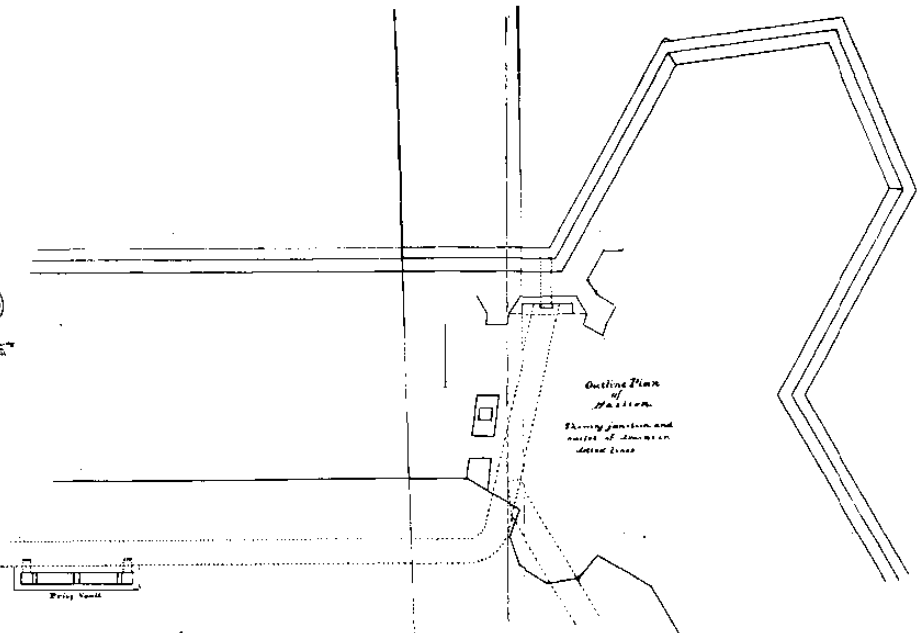
				No of Pieces
Casemate, mounted	Smooth Bores	10" Rodman	Nos	60
Barbette				30
Barbette		24 pdr. Howitzers.		24
Barbette	Rifles	200 pdr Parrott.		7
			Aggregate	121

C. E. Blunt
Lt Col Engrs

March 1. 1872

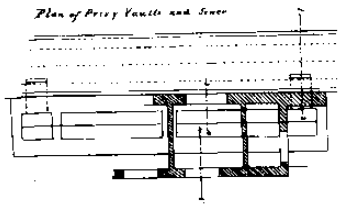
Drawer 74.
Sheet 93.

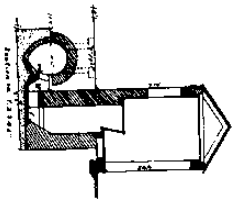


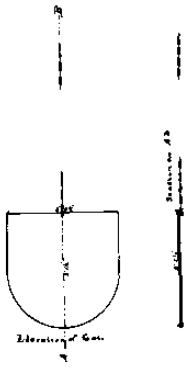


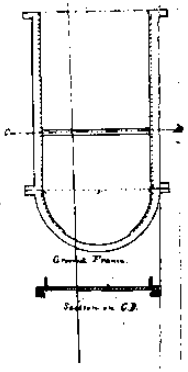
1874

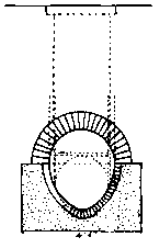
U.S. Engineer Office
Key West Florida
April 13th 1874
Sent to the Chief of Engineers Washington
With letter of date
Chief Clerk
Asst. U.S. Engineers

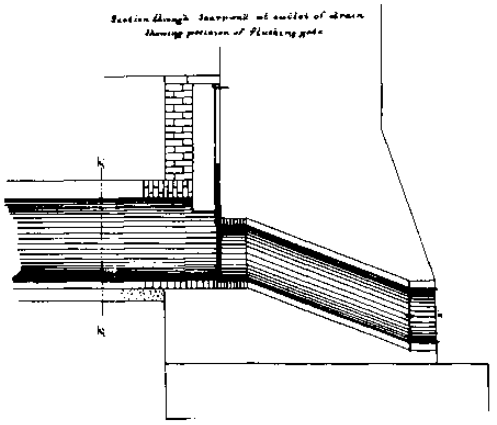








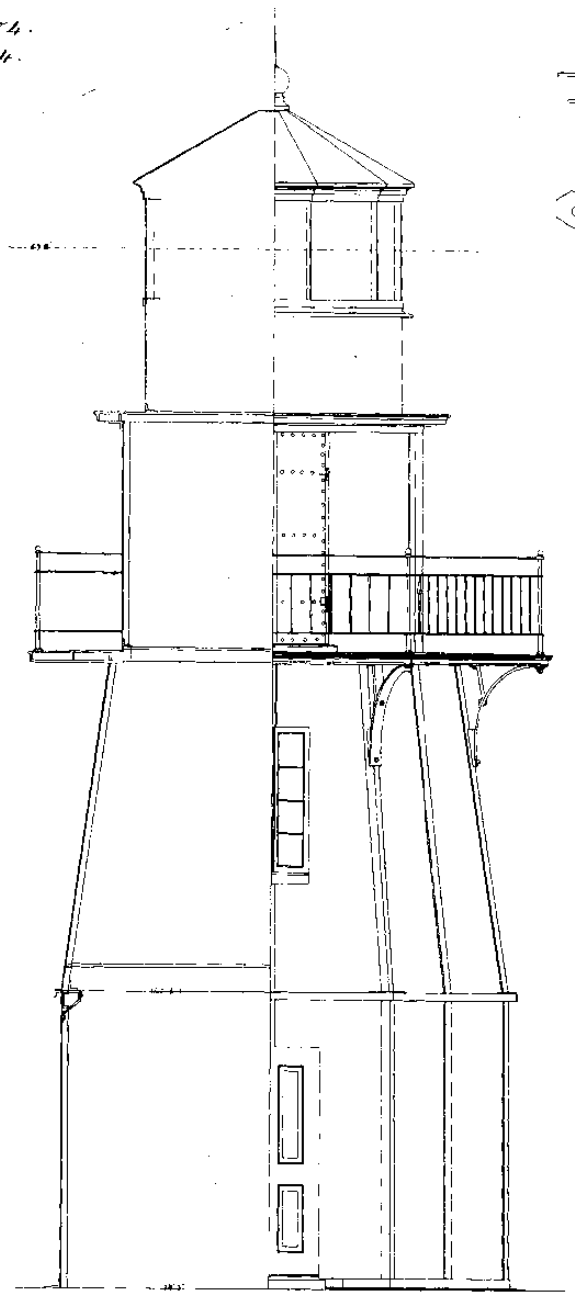


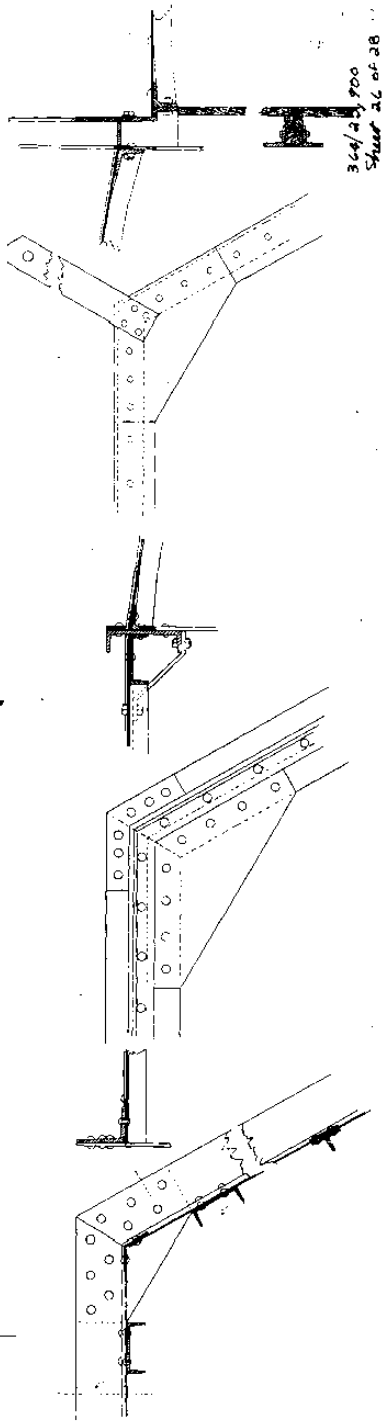


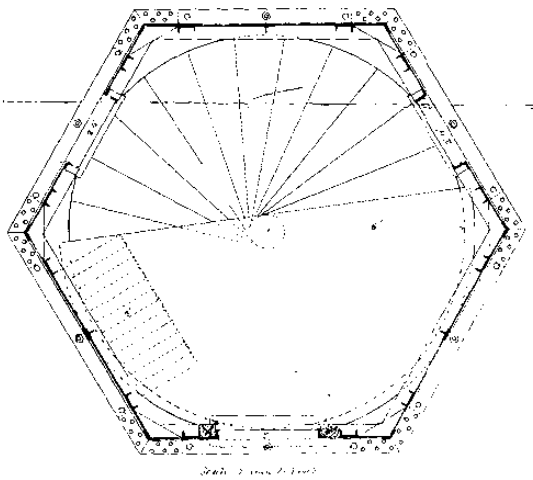


Drawer 74.
Sheet 94.

364/25,700
Sheet 26 of 28







Office of Light House Engineer
Seventh District
New Bedford Mass
November 6th 1875

Forwarded to Chief of Engineers
Washington
with letter of this date
Jared A Smith
Major Engineers
Light House Engineer

453

Approved Nov 10. 1875.

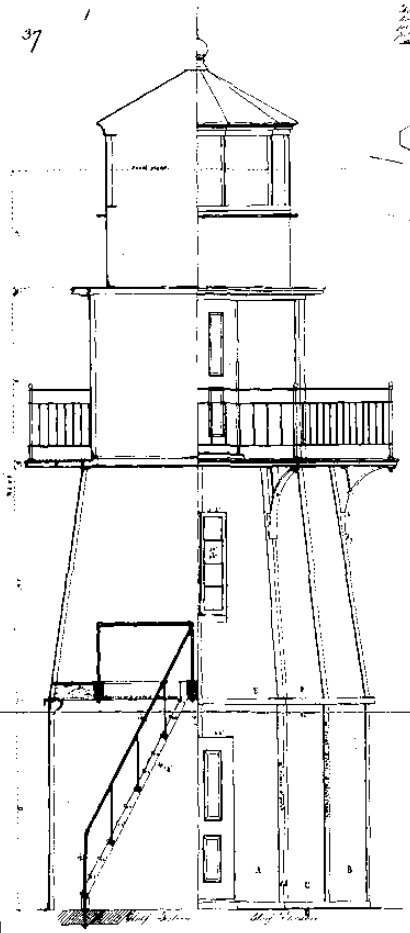
Drawer 74.
Sheet 95.

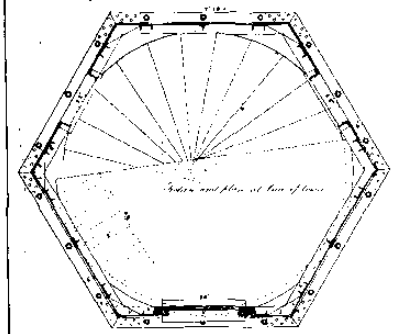
DETAILS
OF AN
IRON LIGHTHOUSE
to be placed
Dove Shoal Reefs of Section G on Port Jefferson Fla.

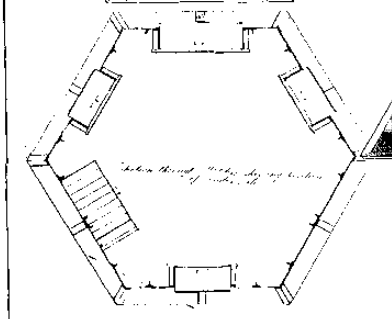
OFFICE LIGHT HOUSE ENGINEER 7th DISTRICT
KEY WEST FLA.
January 30th 1876

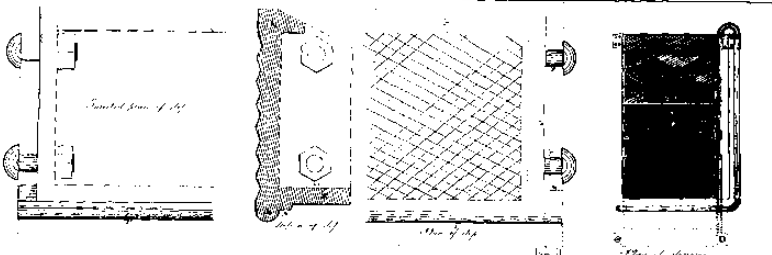
Sent to Chief of Engineers U.S. Army
with letter of this date.
Jno. L. Smith
Maj. Corps of Engrs U.S.A.
Engineer 7th L.H. District

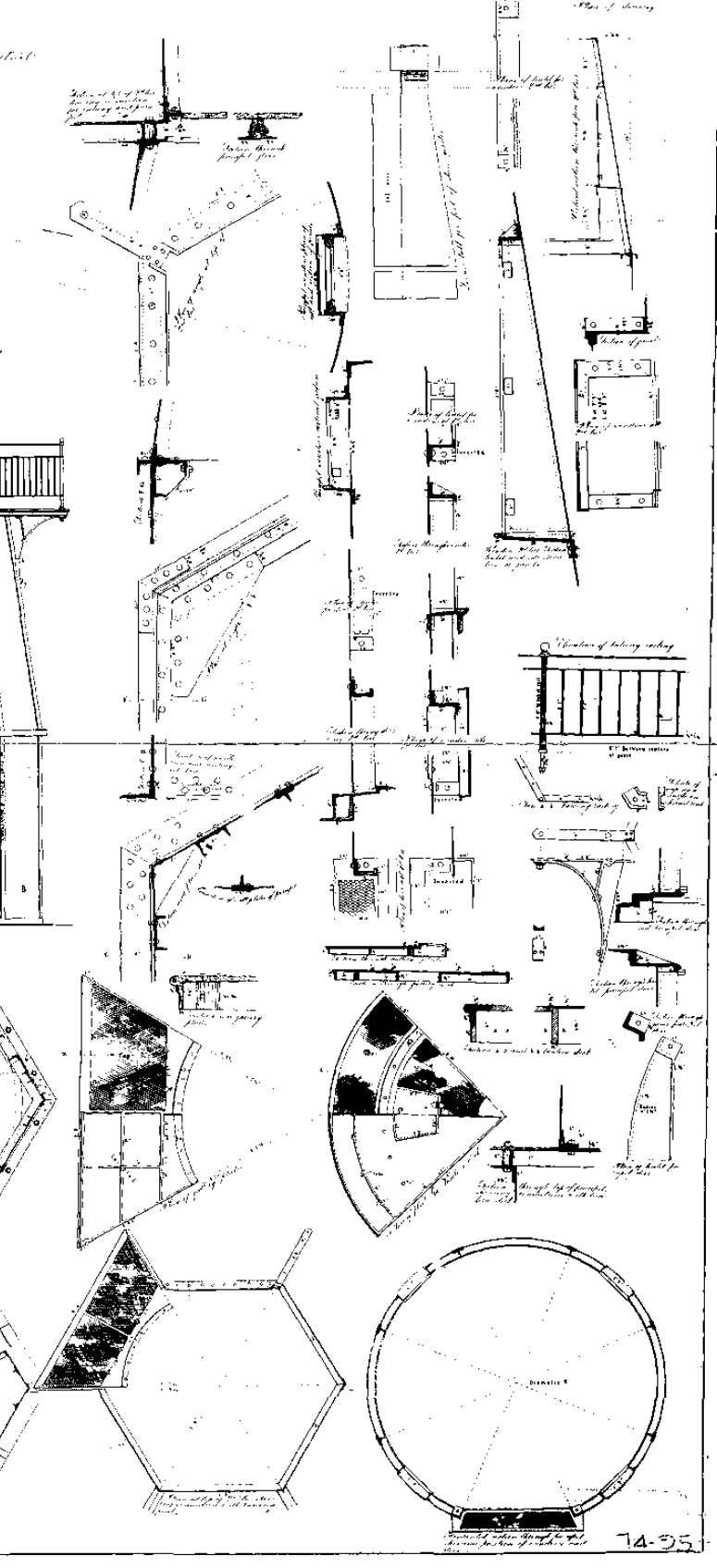
37











74-95

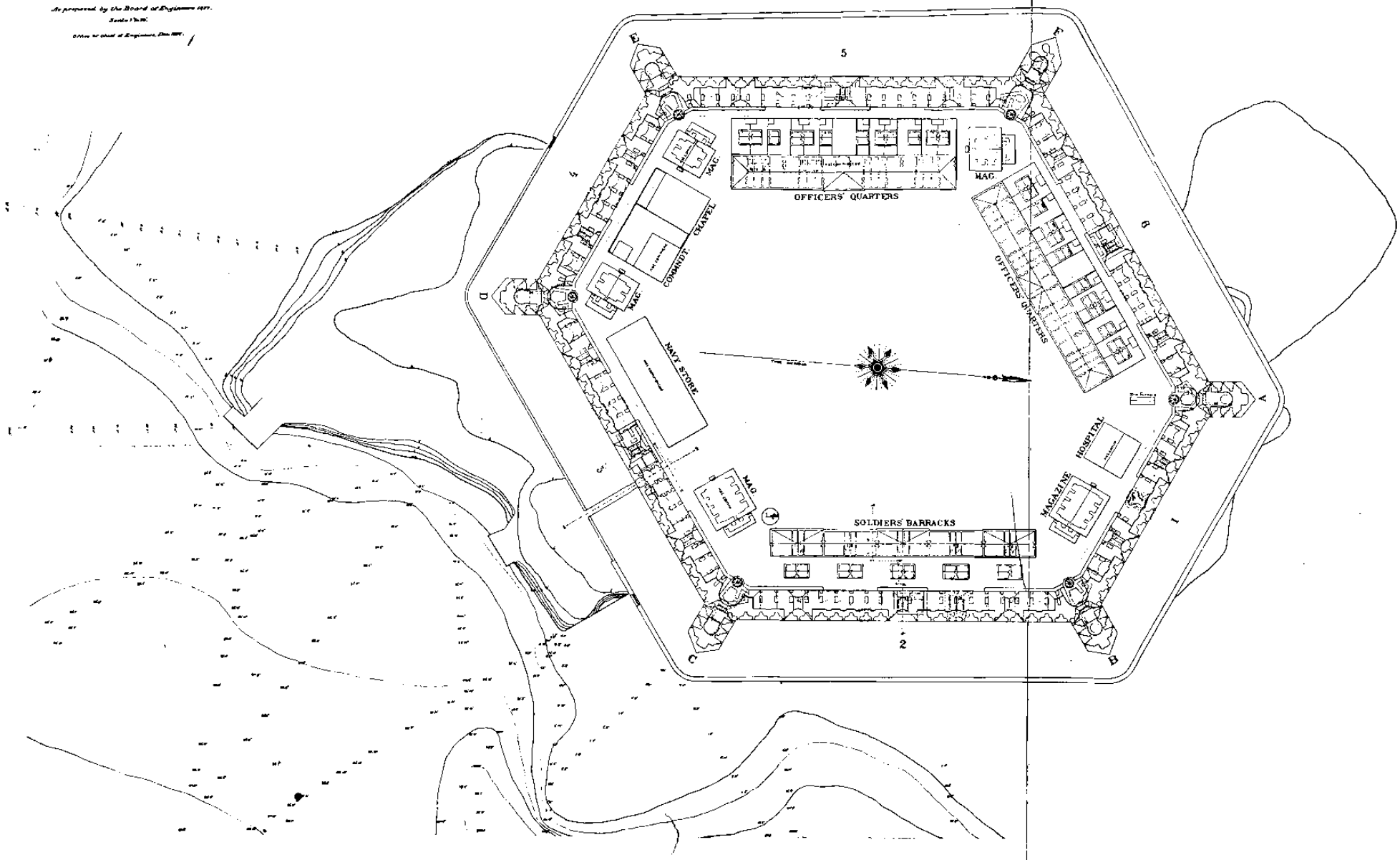
Sheet 1

Fort Jefferson

As prepared by the Board of Engineers 1877.

Scales 1 Inch.

Office of Chief of Engineers, Dec. 1877.



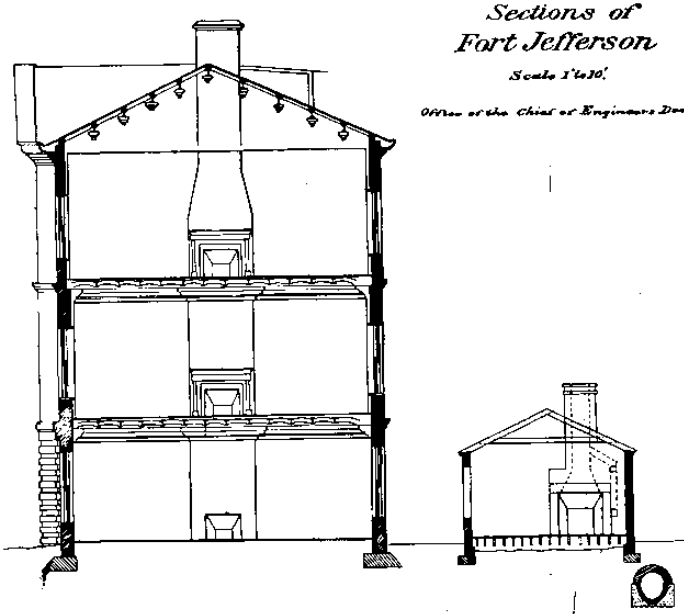
7

1 Sheet 2.

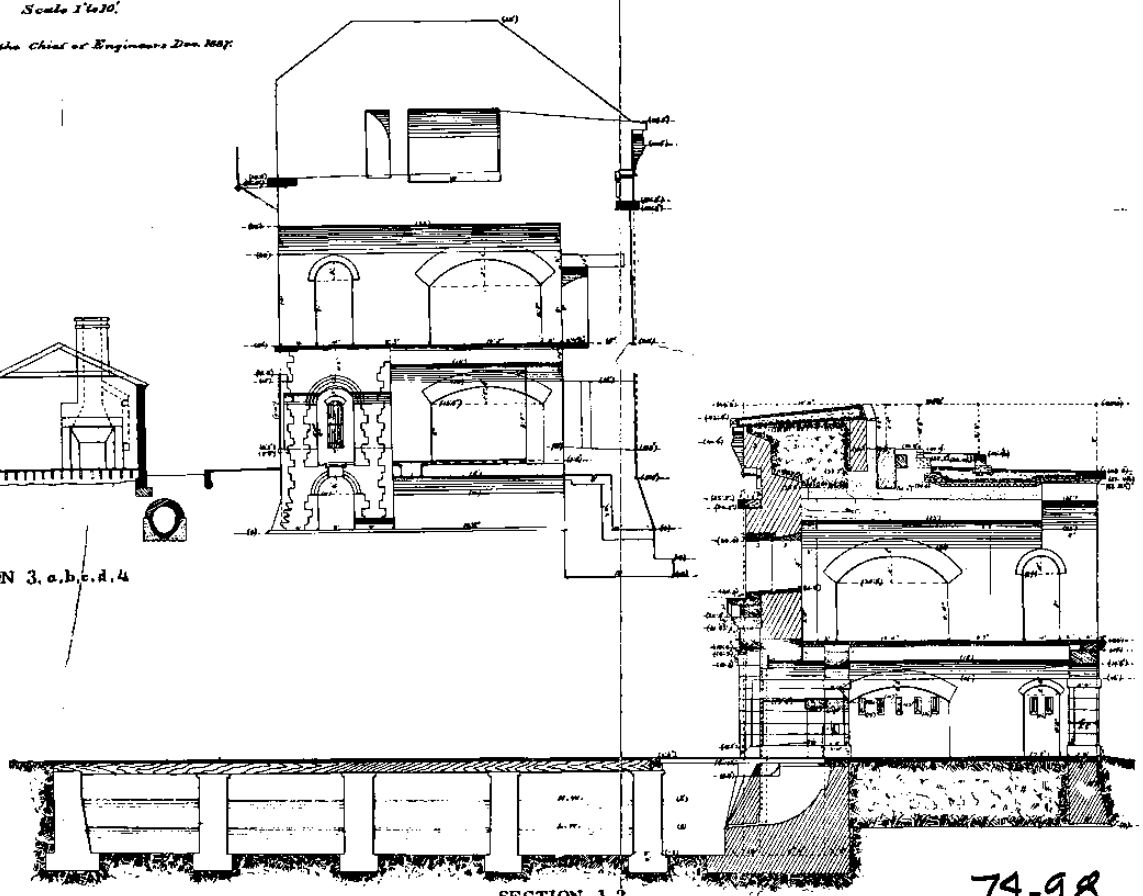
Sections of Fort Jefferson

Scale 1'=10'.

Office of the Chief of Engineers Dec. 1867.

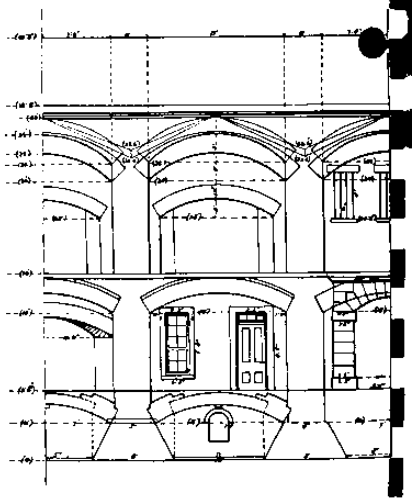


SECTION 3, a, b, c, d, 4



SECTION 1, 2

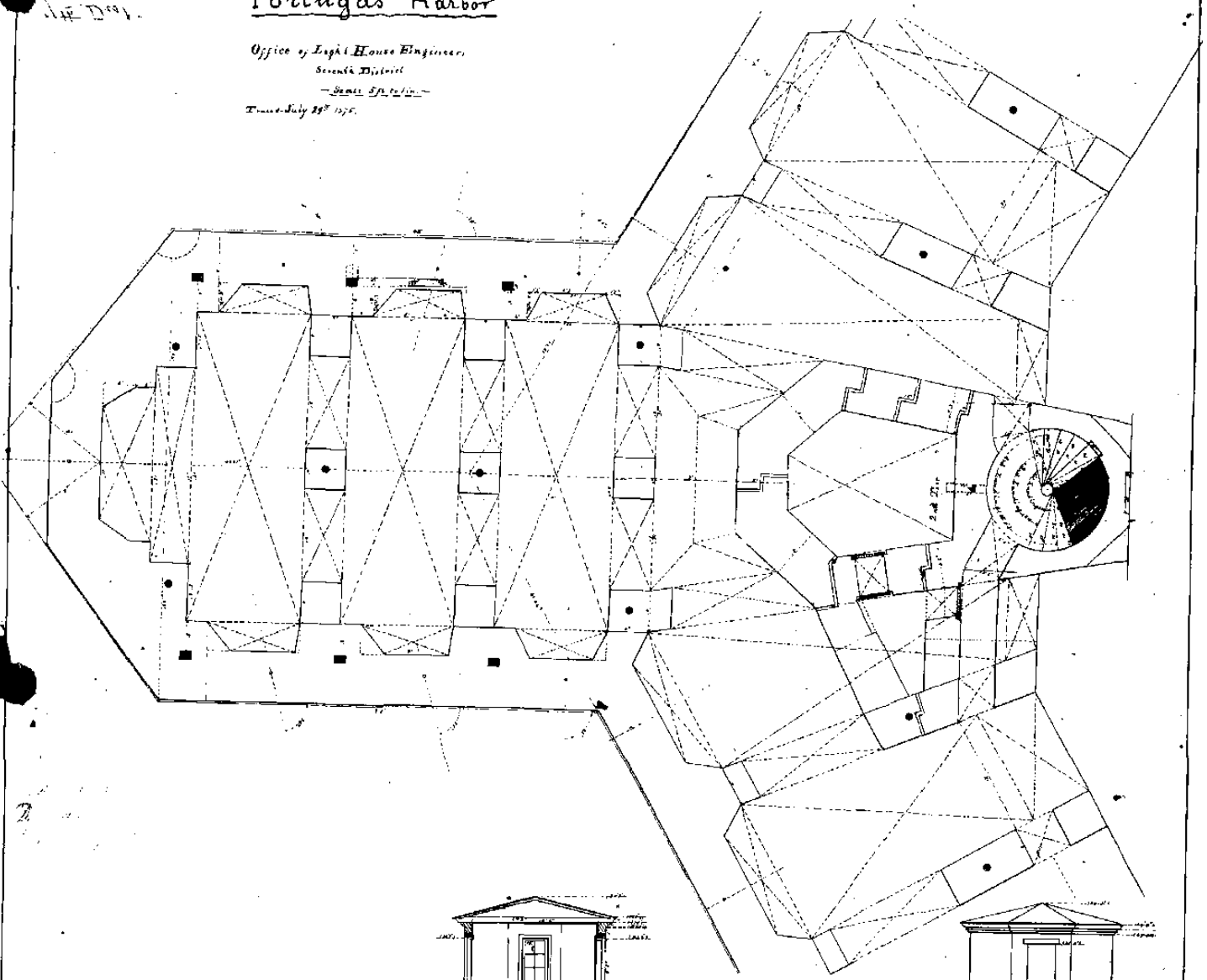
74-98

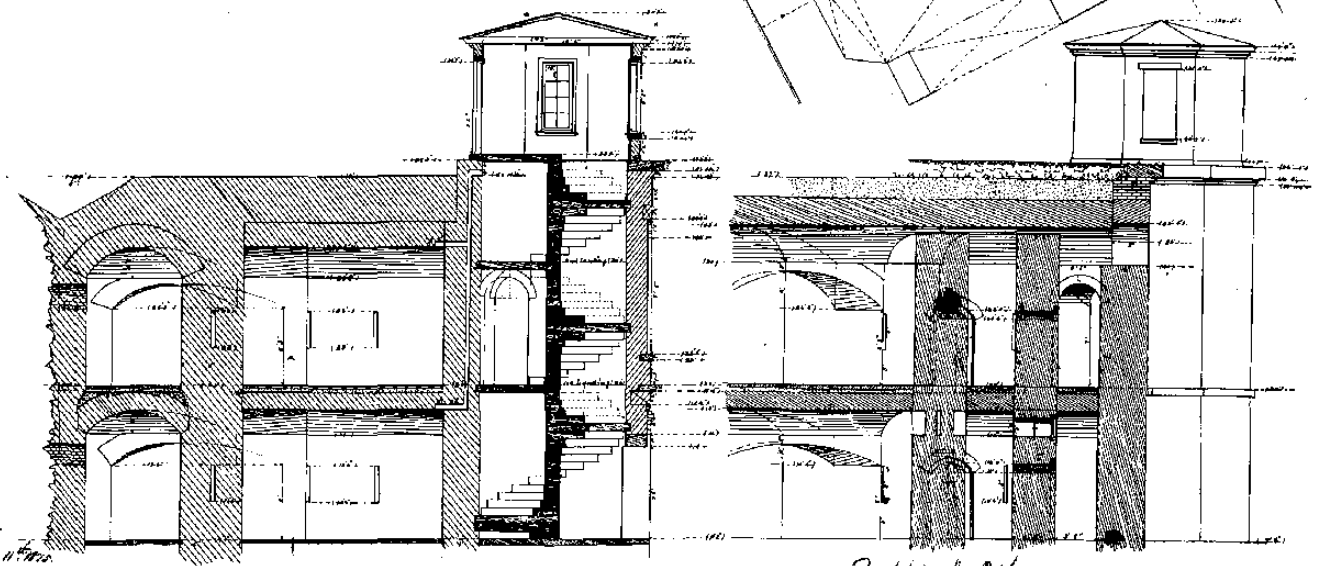


INTERIOR ELEVATION 5, 6

Tortugas Harbor

Office of Light House Engineer,
Seventh District
Scale 1/8 to the foot.
Tampa July 29th 1875.





7th Dist.
Cad. 11 Tortugas.

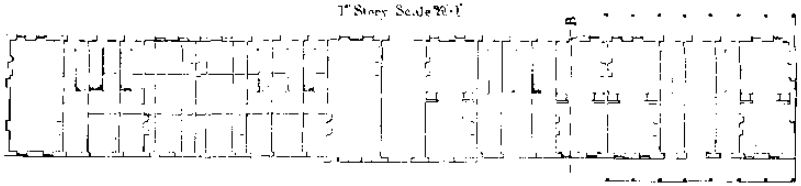
7 ID A 24

FORTIFICATIONS

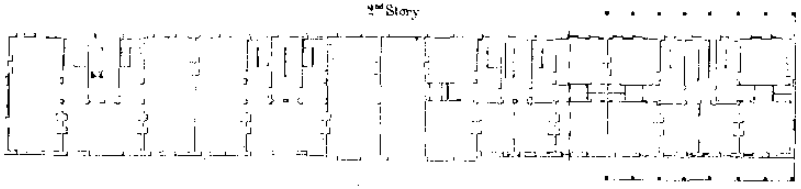
FORT JEFFERSON
DRY TORTUGAS FLA.

OFFICERS' QUARTERS

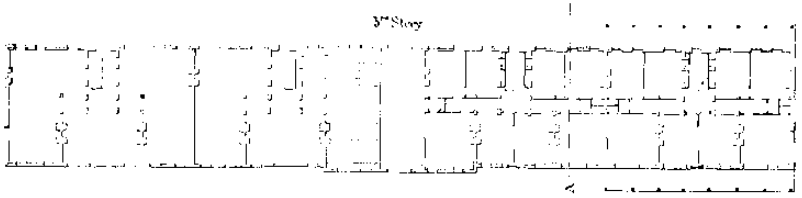
1st Story Scale 20-1'



2nd Story

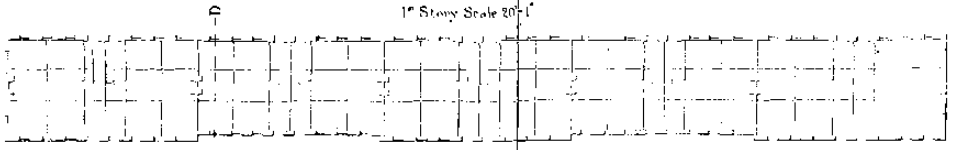


3rd Story



SOLDIERS BARRACKS

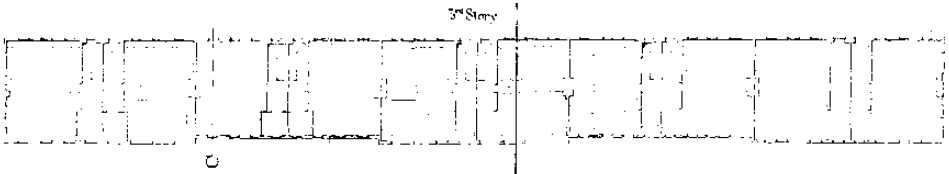
1st Story Scale 20-1'



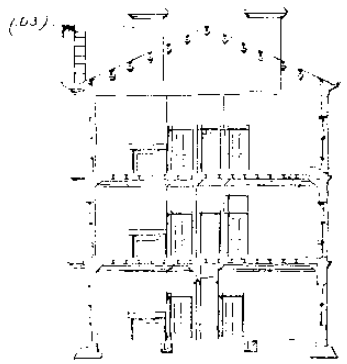
2nd Story



3rd Story



Section on AB
Scale 10-1'

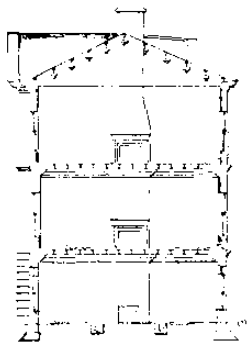


Legend
Brick ⌴ Concrete ⌴ Iron ⌴ Sand ⌴ Wood ⌴

Sketch showing condition of works June 30th 1861
To accompany annual report

Transmitted to the Chief of Engineers at Washington with letter of this date, Sept 19th 1867
Walter McFarland
Major of Engineers

Section on CD
Scale 10-1'



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.

Publication services were provided by the graphics staff of the Denver Service Center. NPS 2080