CONFEDERATE NAVAL ORDNANCE

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Joseph A. Gutierrez, Jr., CONFEDERATE NAVAL ORDNANCE, 1861-1865. (Under the direction of Dr. William N. Still) Department of History, East Carolina University, May, 1977.

This study examines the development of Confederate naval ordnance during the Civil War. The ordnance developed by the Confederate Bureau of Ordnance and Hydrography was extremely important not only to Confederate naval vessels but also to the defense of the Confederacy's rivers and harbors.

This study is arranged topically and deals in turn with the major problems faced by the bureau: the development of manufacturing facilities, the lack of an easily accessible supply of raw materials, the lack of an effective transportation network, the lack of skilled labor, and the bureau's attempt to develop an improved rifled cannon.

The Confederate Bureau of Ordnance and Hydrography, although it faced great obstacles, was able to develop the manufacturing facilities necessary to provide the Confederate States Navy with the implements of war. At the outbreak of the war the only establishment capable of turning out heavy ordnance was Tredegar Iron Works. In 1863 an ordnance station was opened in Selma which turned out twenty pieces of ordnance a day. In addition to this, ordnance installations were established in Richmond, Charlotte, Atlanta, Columbus, and Columbia. These installations had the potential to produce all of the materials of war needed by the Confederate navy.

The construction of the physical facilities was only one of the problems faced by the Confederate Bureau of Ordnance and Hydrography. The plants constructed needed raw materials in order to produce their finished products. The inability of the South to protect its borders

and its known supplies of raw materials needed for the production of ordnance and ordnance stores was one of the most serious problems the bureau faced. The problem was compounded further by an inadequate transportation network, and as a result even when raw materials were available the Confederate officials were unable to move them to the manufacturing centers.

Another major problem faced by the bureau was the lack of skilled labor. At the outbreak of the war the South probably had an adequate number of skilled labors to operate the various industrial establishments. However, many of these men were swept into the army, and as the war progressed the need for manpower became so great that the Confederate Bureau of Ordnance and Hydrography was unable to find and keep the number of skilled laborers needed to work the factories at full production. This and the problem of raw materials and transportation were the only major problems faced by the bureau that it was unable to solve.

The greatest success of the bureau was the development of the Brooke gun. This gun developed by John M. Brooke was very similar to the Parrot gun. While the Parrot gun only had one band shrunk over the breech, the Brooke gun had two or even three. The Brooke gun was the result of a process of evolution. Brooke studied the ordnance work of both European and American experts and his weapon was the culmination of his research. The Brooke gun was without a doubt the most powerful rifled gun of the Civil War and the failure of the United States Navy to use this weapon after the war was the result of a stated preference for smoothbores on the part of several high ranking naval officers. It is possible that if research with the Brooke gun had been continued after

the war that the evolution of modern ordnance might have occurred in the United States rather than Europe.

CHAPTER I

ORGANIZATION AND OFFICIALS OF THE CONFEDERATE BUREAU OF ORDNANCE AND HYDROGRAPHY

In February of 1861, delegates from the seceding states met in Montgomery, Alabama, and on March 11, 1861 the "Constitution for the Provisional Government of the Confederate States of America" was adopted.[1] This constitution and the later permanent one provided for the establishment of a navy and directed that the president be Commander-in-Chief of the army and the navy.[2] The first statute passed by the Confederate Congress continued in force all the laws of the United States that were not inconsistent with the Constitution of the Confederate States until they were repealed or altered by Congress. In this manner the Confederate States were able to form a new nation without major interruption of the everyday affairs of the majority of the people.

Three days after the inauguration of Jefferson Davis as president, the Confederate Congress passed "the act to establish the Navy Department" which provided for a Secretary of the Navy, who would under the president's direction guide the navy.[3] On March 16, 1861 a subsequent act was passed that provided for the basic organization of the navy.

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[1] Thomas J. Scharf, History of the Confederate States Navy from its Organization to the Surrender of its Last Vessel (New York, 1887), 27, hereinafter cited as Scharf, History of the Confederate Navy.

[2] Scharf, History of the Confederate Navy, 27.

[3] Tom H. Wells, The Confederate Navy: A Study in Organization (University, Alabama, 1971), 3, hereinafter cited as Wells, The Confederate Navy.

The offices created were each charged with specific functions and were modeled after the United States Navy's organization. The first office created was given responsibility over ordnance and hydrography, the second was given responsibility over preparation and issuance of orders and details, the third had charge of all medical responsibilities, and the fourth was responsible for obtaining provisions, clothing, and coal.[4] A Marine Corps was also established within the Navy Department by this act.

The law of March 16 authorized President Davis to appoint the personnel needed to establish the Confederate States Navy. Davis appointed men to fill positions from captain to seaman, the only restriction being that Congress had stated the total number of men appointed was not to exceed three thousand.[5] The act also gave Davis the power to appoint men to positions within the Marine Corps.[6] Thus the Confederate States Navy was born and it became heir both to the customs and traditions of the United States Navy. In fact one Confederate officer would later write that the only way he could tell the difference was by the color of the uniform.[7]

The organization of the Confederate navy differed in two significant ways from that of the United States. The "old navy" had managed personnel matters at the Secretary level and it was necessary for all officers

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[4]Wells, The Confederate Navy, 3.

[5]Scharf, History of the Confederate Navy, 29.

[6]Scharf, History of the Confederate Navy, 29.

[7]J. W. Carlin (ed.), A Naval Encyclopedia: A Dictionary of Nautical

even junior officers, to apply directly to the Secretary for duty.[8] In the Confederate navy, the inclusion of the Office of Orders and Details relieved the Secretary of this burden, even though the orders were issued in his name.[9] The Confederates, while improving on the "old navy" in personnel management, failed to provide for effective administration of shore establishments and for the construction, repair, and maintenance of ships and their machinery.[10] In 1863, there was a limited reorganization that established the posts of Chief Constructor and Engineer-in-Chief which helped to alleviate this problem.[11]

Stephen R. Mallory was appointed Secretary of the Navy on March 21, 1861. Mallory was the most logical choice for the job. As a Senator from Florida, one of the first states to secede, he had been a member of the Naval Affairs Committee for ten years. Mallory had been involved with many of the progressive changes that were taking place in the United States Navy in the last decade prior to the Civil War.[12] He had supported the completion of the Stevens Battery and had also been a supporter of the new regulations that retired personnel from active duty

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Words and Phrases, Biographical Notices and Records of Naval Officers (Philadelphia, 1881), 36, hereinafter cited as Carlin, Naval Encyclopedia.

[8]Wells, The Confederate Navy, 4.

[9]Wells, The Confederate Navy, 4.

[10]Wells, The Confederate Navy, 4.

[11]Wells, The Confederate Navy, 4.

[12]Wells, The Confederate Navy, 4.

when they became unfit for sea duty.[13]

Mallory's background in the world of politics helped prepare him for his role in the Confederate navy. Originally born in Trinidad in 1813 his family had come to the United States when he was about a year old. In 1820 the family settled in Key West Florida. Florida was to be Mallory's home from this date forward, and though he only received four years of formal education, he was to rise to the top in the state's political world.[14]

At the age of nineteen Mallory became Inspector of Customs at Key West and was subsequently appointed Collector of Customs there. During this period Mallory studied law under William Marvin, judge of the United States District Court at Key West. After being admitted to the bar, Mallory established a large and lucrative law practice.

In 1851 he was elected by the Florida State Legislature to represent Florida in the United States Senate. At the end of his first term, he was re-elected and he continued to represent Florida until he resigned his seat in 1861. After his resignation Mallory became known as a moderate and this was the reason that many of the firebrands opposed his appointment as Secretary of the Navy.[15]

Mallory has generally been praised for his administration of the Confederate navy. In the eyes of many historians, Mallory was able to

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[13]Wells, The Confederate Navy, 4.

[14]Scharf, History of the Confederate Navy, 30.

[15]Wells, The Confederate Navy, 6.

do an excellent job under severe handicaps.[16] As he began his administration, Mallory was faced with a myriad of problems. Jefferson Davis had little interest in the navy after Mallory was appointed and was known to have spoken about the navy in negative terms.[17] The public, Congress, and the President's cabinet all considered the army to be the key to the Confederate war effort. The navy department was forced to struggle against these forces to receive its share of money, manufacturing facilities, and essential materials. Mallory also ran into opposition from some of the state governors such as Zebulon Vance of North Carolina, and Joseph E. Brown of Georgia, over such issues as transportation, conscription, raw materials, and facilities.[18]

After Mallory was appointed Secretary of the Navy, he had less than two months to organize his department before war broke out. After Fort Sumter, Mallory's problems became progressively more complicated. At the outset, Mallory was a Secretary of the Navy without a navy. The United States had a total of forty-two ships in commission and only one of these was captured by the South.[19]

Many of the naval officers who came South were forced to serve in the Confederate army as there was simply more manpower available than the Confederate navy could make use of at the outset. A number of them were

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[16]Joseph T. Durkin, Stephen R. Mallory: Confederate Navy Chief (Chapel Hill, 1954), 3.

[17]William N. Still, Jr., Confederate Shipbuilding (Athens, 1969), 6, hereinafter cited as Still, Confederate Shipbuilding.

[18]Still, Confederate Shipbuilding, 6.

[19]Still, Confederate Shipbuilding, 5.

assigned duties as artillery and ordnance officers in the Confederate army.[20] In this way the experience of the naval officers was utilized even though it was not in the branch of service for which they were trained. Out of the 671 officers in the United States Navy who had some southern affinities, 321 of these resigned and went South.[21] Among the prominent United States officers to "go South" were Franklin Buchanan, French Forrest, Josiah Tattnall, Matthew Fontaine Maury, Catesby ap R. Jones, Robert D. Minor, George Minor, Duncan M. Ingraham, William H. Parker, Raphael Semmes, Hunter Davidson, and John M. Brooke.[22] However, while a large group of commissioned officers came South, only a handful of non-commissioned officers offered their services to the Confederacy.[23]

The South had few common seamen and many of those it did have did not wish to fight or serve in the Confederate navy. As the war progressed the rewards of blockade running caused more and more of these seamen to resist service in the Confederate navy. Thus while the Confederate navy was able to start with a nucleus of officers, there were not enough non-commissioned officers and common seamen. Mallory's navy also faced an enemy which had forty-two vessels in commission and

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[20]George M. Brooke, "John Mercer Brooke" (unpublished doctoral dissertation, University of North Carolina, Chapel Hill; 2 vols., 1955), II, 750, hereinafter cited as Brooke, "John M. Brooke."

[21]Brooke, "John M. Brooke," II, 751.

[22]Brooke, "John M. Brooke," II, 751.

[23]Brooke, "John M. Brooke," II, 752.

a total strength of 7,000 men supplemented by the world's second largest merchant marine.[24]

Mallory's first task as Secretary was to organize his department.[25] He placed Commander Samuel Barron in charge of the Bureau of Orders and Details, Duncan Ingraham to head the Bureau of Ordnance and Hydrography, John DeBree in charge of the Office of Provisions and Clothing, W. A. W. Spotswood as Surgeon in charge of the Office of Medicine and Surgery, Colonel Lloyd J. Beall as Marine Commandant, and sent Commander James Bulloch to Europe as naval agent.[26]

The bureaus were really small departments in themselves and were administered somewhat as individual agencies by their respective chiefs. However, Mallory was able to exercise much more control over the navy than the numerous secretaries of war did over the army.[27] As a result, he was able to develop policy and strategy and to coordinate the activities of his subordinates along his policy guidelines. Unlike many Confederate leaders who expected a short war or foreign intervention, Mallory developed both long and short range programs.[28] His policies were, in the words of John M. Brooke " . . . farsighted and liberal minded . . . " and

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[24]Brooke, "John M. Brooke," II, 752.

[25]Brooke, "John M. Brooke," II, 752.

[26]Wells, The Confederate Navy, 13, 46, 118, 122.

[27]Allan Nevins, War for the Union (New York, 4 vols., 1959-1971), I, 23, hereinafter cited as Nevins, War for the Union.

[28]Frank Vandiver, Rebel Brass: The Confederate Command System (Baton Rouge, 1956), 66, hereinafter cited as Vandiver, Rebel Brass.

this along with his quick perception of the demands of modern naval warfare, allowed him to become one of the most successful Confederate administrators.[29]

Mallory was able to put together an impressive array of individuals to assist him. In fact his bureau chiefs deserve much of the credit for the success of the Confederate navy. Perhaps the most successful of the bureaus was the Bureau of Ordnance and Hydrography. This bureau was in charge of the designing, testing, development, distribution, and maintenance of guns, ammunition, ordnance stores, tools, pyrotechnics, and navigational instruments.[30] The bureau also had the responsibility for the preparation and distribution of charts, the collection and dissemination of other hydrographic information, the maintenance of navigational aids, and the formal education and training of midshipmen.[31]

The hydrography responsibilities of the Bureau of Ordnance and Hydrography were secondary to the bureau's ordnance responsibilities. In 1862 the bureau had two officers with the rank of master employed in the office dealing with hydrography. By 1864 another officer with the same rank was added. Confederate maritime policy was defensive in nature and aids to navigation were considered to be more help to an invading enemy than to Confederate ships. As a result, lighthouses were darkened, buoys removed from their positions, and lightships were con-

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[29]James P. Baxter, III, The Introduction of the Ironclad Warship (Cambridge, 1933), 228; Brooke, "John M. Brooke," II, 768.

[30]Wells, The Confederate Navy, 46.

[31]Wells, The Confederate Navy, 46.

verted to other uses.[32]

Perhaps the only really effective step taken by the Bureau dealing with hydrography was when Lieutenant John Wilkinson was ordered to Wilmington, North Carolina. Wilkinson was ordered to establish a system of lights, buoys, and other navigational aids up and down the Carolina coast to the entrance of Wilmington. Wilkinson was to also collect information on water depths in the various channels at different times and to distribute this information to both incoming and outgoing ships. Wilkinson's organization appears to have performed very well in collecting and distributing hydrographic information until he was transferred.[33] At this time the organization broke down because of the inexperience of his assistants.

While the Bureau of Ordnance and Hydrography's office dealing with hydrography contributed little to the Confederate war effort and was rather ineffective, the Bureau's office dealing with ordnance was probably the most successful of all the Confederate navy's various branches. The office dealing with ordnance kept records of guns' performances, maintained control of ordnance equipment in inventory, set production goals for the various naval ordnance installations, made contracts for both foreign and domestic production, gave technical advice on the operation and maintenance of its equipment, and worked with the army on ordnance matters.[34] The chain of command called for the various com-

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[32]Wells, The Confederate Navy, 62.

[33]Wells, The Confederate Navy, 66.

[34]Wells, The Confederate Navy, 49.

manders of naval ordnance installations to report to the chief of the bureau and the chief in turn reported to the Secretary of the Navy. The structure also called for draftsmen, clerks, and ordnance inspectors. Though there were quality controls at each installation, the Inspector of Ordnance was entitled to inspect ordnance material from any installation.

The Bureau of Ordnance and Hydrography, like the rest of the Confederate navy, adopted the structure and methods of the United States Navy. The organization of the bureau, the operating methods, and the official manual of the United States Bureau of Ordnance and Hydrography were carried over intact. The ordnance officers of the Confederate States Navy were not a special corps and when not attached to ordnance duty, they were available for other duties. In fact, personnel was one of the early strengths of the Confederate Bureau of Ordnance and Hydrography. Catesby ap R. Jones, one of the United States Naval officers to "go South," was probably the most experienced ordnance officer in the United States Navy next to John Dahlgren. The three chiefs of the bureau during the war were all men of distinction. Duncan M. Ingraham, George Minor, and John M. Brooke all contributed to the ability of the Confederate Bureau of Ordnance and Hydrography to develop, manufacture, and distribute the most powerful rifled guns of the Civil War. Ingraham, Minor, and Brooke all were men with diverse backgrounds in the navy whose backgrounds helped them to discharge their duties as chief of the Bureau of Ordnance and Hydrography.

Duncan M. Ingraham's naval career began as a nine year old midship-

man.[35] During the War of 1812 Ingraham served on the Congress and then the Madison. In 1825 he became a lieutenant and by 1838 he had been promoted to commander.

Ingraham's fame rested on the Koszta affair. Martin Koszta was a Hungarian revolutionary who after the failure of the revolution of 1848 had moved to the United States and announced his intention of becoming an American citizen. He was seized by the Austrians while on a private business trip to Turkey. On June 23, 1853 the sloop-of-war St. Louis under Ingraham's command entered the harbor of Smyrna where Koszta was being held prisoner on an Austrian vessel.[36] Upon advice from the American Charge d'affairs at Constantinople that Koszta was entitled to American protection, Ingraham demanded that Koszta be released.[37] Ingraham informed the Austrians that unless Koszta was released the St. Louis would be forced to use force to secure his safety. At the last minute, after the St. Louis's guns had been loaded and she was in position to attack, a compromise was reached and Koszta was turned over to the French Consul pending a diplomatic settlement. The end result was the Koszta was released and overnight Ingraham became a hero. He received many awards upon his return home and Congress even awarded him

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[35] Allan Johnson and Dumas Malone (eds.), Dictionary of American Biography (New York, 22 vols., 1928), II, 69-70, hereinafter cited as Johnson and Malone, Dictionary of American Biography.

[36] Timothy Barret, "A Salvo-less Naval Victory," United States Naval Institute Proceeding, LXXVII (March, 1951), 744.

[37] The National Cyclopedia of American Biography (New York, 56 vols., 1932), XXII, 29-30.

a gold medal.

In March of 1856 Ingraham was appointed chief of the Bureau of Ordnance and Hydrography. The reason for his appointment is somewhat unclear but his fame as a result of the Koszta affair probably influenced the decision to some degree. In August of 1860 Ingraham returned to the Mediterranean as commander of the Richmond. In January of 1861 Ingraham resigned from the United States Navy and on March 26, 1861 he entered the Confederate States Navy.

On June 10, 1861 he was appointed chief of the Bureau of Ordnance and Hydrography even though he was openly critical of Mallory.[38] The reasons for his appointment are clear. Ingraham was one of the most well known United States Navy officers to offer his services to the Confederacy and he had previously served in the same position in the United States Navy.

Ingraham surrounded himself with capable assistants and succeeded in establishing an efficient organization. Ingraham, however, unlike George Minor and John Brooke who would head the bureau after him, did not emphasize expansion. The reason for this could have been the fact that during his short tenure as head of the bureau the supply of officers was greater than the number the Confederate navy could use effectively.[39] In November 1861 Ingraham was transferred to Charleston, South

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[38]Wells, The Confederate Navy, 47.

[39]William N. Still, Jr., "The Construction and Fitting Out of Ironclad Vessels" (unpublished doctoral dissertation, University of Alabama, University; 1964), 70, hereinafter cited as Still, "Ironclads."

Carolina, where he was given command of the naval forces on the coast of South Carolina. At Charleston he supervised the construction of the vessels Palmetto State and Chicora. After completion of these ships, Ingraham attempted to raise the blockade and claimed he had succeeded in doing so for a short period of time. In 1863 Ingraham relinquished command of the squadron but retained his shore position.

Upon his transfer to South Carolina, Ingraham was replaced by George Minor. Minor had almost as long a service record as Ingraham. He had entered the United States Navy in 1826 and had acquired considerable experience with ordnance during his tenure.[40] He deserved the credit for organizing the Confederate Bureau of Ordnance and Hydrography and creating the various naval ordnance establishments throughout the Confederacy. Minor appears to have been a quiet and unassuming man. He had been one of the "elderly" lieutenants in the old navy. His tenure as head of the Bureau of Ordnance and Hydrography has been somewhat overlooked by historians. This is probably because of the fame of his successor, John M. Brooke.

When Minor assumed control of the bureau in December of 1861, he found Ingraham had done little in the way of establishing ordnance facilities in the Confederacy.[41] Minor immediately began to move in this direction. Mallory and Minor both were worried about the dependence of the Confederate navy on one firm, the Tredegar Iron works in Richmond, Virginia, for the production of ordnance and projectiles.

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[40] Brooke, "John M. Brooke," II, 873.

[41] Wells, The Confederate Navy, 46.

As a result the bureau adopted a program of expansion. Construction was started on a naval powder works at Petersburg, Virginia, and contracts were let with a number of private firms for shot, shell, and ordnance.[42] Minor also directed that agents be sent throughout the Confederacy to contract for iron, coal, and other raw materials. In October of 1861, contracts were signed with Tredegar Iron Works and one month later $10,000 was advanced to Clark and Company of New Orleans.[43] Also in the fall of 1861, the Richmond ordnance facility was set up under the direction of Lieutenant Robert D. Minor, the younger brother of George Minor.[44] Minor later succeeded in establishing ordnance works at Charlotte, North Carolina, Atlanta, Georgia, and Selma, Alabama.[45] The Selma facility was to be the Confederate States Navy's most important supplier of ordnance other than Tredegar.

The most outstanding personality to head the Bureau of Ordnance and Hydrography during the Civil War was John M. Brooke. Brooke took over the bureau on March 31, 1863.[46] When Brooke assumed command, he found the basic structure of the bureau to be sound. Minor had done his work well and it was fortunate for Brooke that he had since Brooke now had administrative duties to contend with in addition to his scientific and technological studies. Because of Brooke's profound influence upon

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[42] Still, "Ironclads," 73.

[43] Still, "Ironclads," 73.

[44] Still, "Ironclads," 73.

[45] Brooke, "John M. Brooke," II, 874.

[46] Brooke, "John M. Brooke," II, 873.

the Bureau of Ordnance and Hydrography it will be necessary to delve into his background somewhat deeper.

John Mercer Brooke was born at Tampa, Florida, on December 18, 1826.[47] Brooke's father, George Brooke, was a brevet major-general in the United States Army and had participated with distinction at the battle of Lundy's Lane and in the operations at Fort Erie during the War of 1812. Brooke decided on a naval career very early and at the age of fourteen entered the navy.[48] After serving four years under Commander David Farragut, he entered the naval academy at Annapolis and was graduated in 1847.

In 1851 Brooke was selected as a member of a hydrographic coastal survey party. After duty with this team, he was attached to the Washington Naval Observatory. While working at the observatory he invented a deep-sea sounding apparatus by which for the first time specimens were brought up from the ocean floor.[49] For this achievement, Brooke was awarded the Gold Medal of Science by the Academy of Berlin in 1860.[50]

After this invention Brooke was considered a rising star in the "old navy," and in 1854 he was appointed a member of the North Pacific and Bering Straits Surveying and Exploration Expedition. This expedition, which was at first commanded by Commodore Cadwalder Ringgold and later

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[47] Brooke, "John M. Brooke," I, 13.

[48] Johnson and Malone, Dictionary of American Biography, II, 69-70.

[49] Brooke, "John M. Brooke," I, 290.

[50] Johnson and Malone, Dictionary of American Biography, II, 69-70.

by Commodore John Rogers, was assigned the task of determining astronomically the geographical position of primary points and of measuring with the chronometer differences of longitude. During this expedition Brooke and a company of ten men were put ashore in Glassenappe Harbor in the Straits of Seniavine for two months. During this period, they lived near a village of several hundred natives and managed to maintain cordial relations despite rather extreme differences in culture. After this expedition, Brooke returned to Washington to prepare maps and records of the expedition for publication.

On September 15, 1855, Brooke was appointed to the rank of lieutenant and assigned the duty of surveying a route to China.[51] Brooke left for the Orient in the schooner Fenimore Cooper and made deep sea soundings and surveys of a number of islands in the Pacific along with much of the coast of Japan. As a result of a severe storm, Brooke's ship was wrecked and he was forced to wait at Yokohama until the Powhatan arrived in February of 1860. During this period, he was able to establish cordial relations with many Japanese officials and Brooke became an unofficial advisor to them in many different areas. As a result of his relationship with the Japanese, Brooke did not join his crew when they left on the Powhatan for America but instead, at Japanese request, took passage on the Japanese corvette Candimarroo. When Brooke left Japan he was presented with several gifts on behalf of the emperor which included a sword, five pieces of damask, and a lacquered box.[52]

Brooke, "John M. Brooke," II, 517.

Brooke, "John M. Brooke," II, 699.

Upon arriving home, he found that several southern states had seceded from the Union. Brooke resigned from the United States Navy on April 20, 1861 and immediately joined the Virginia State Navy and later the Confederate States Navy.[53] Brooke and Secretary of the Navy Mallory met for the first time in Richmond during the changing of capitals by the Confederate government. Mallory was impressed with the young naval officer and on June 10, 1861 requested that Brooke, ". . . aid the department in designing an ironclad vessel . . . ."[54] The novel feature of Brooke's plan was the extension of the bow and stern beyond the shield under water. Later when a controversy arose over who had really designed the Virginia, Brooke requested and received from the Confederate government a patent.[55] His patent was based on the fact that the Virginia's bow and stern extended beyond the shield.

However, Brooke is best known for his work with ordnance. There is no evidence to indicate that Brooke had specialized in ordnance while an officer in the United States Navy. Nevertheless Brooke would design various rifled cannon that would bear his name. The Brooke gun will be dealt with at length in a later chapter. While Brooke's work on the Virginia and the Brooke gun have received wide publicity, he also performed several little known tasks for the Confederate navy. Brooke, to his chagrin, was appointed to a board of officers who were to design the uniform of the Confederate navy. Brooke designed the button which

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[53]Brooke, "John M. Brooke," II, 743.

[54]Brooke, "John M. Brooke," II, 765.

[55]Brooke, "John M. Brooke," II, 777.

depicted a ship at full sail seen from the bow surrounded by stars in an arch over the sea.[56]

On March 31, 1863 Brooke succeeded Commander George Minor as chief of the Bureau of Ordnance and Hydrography. This was the culmination of Brooke's career as a naval officer. There does not appear to have been any friction between Brooke and Minor. In August of 1862 Minor referred to Brooke as ". . . this meritorious officer who has rendered valuable service to the department in perfecting improvements in rifled cannon and projectiles."[57] Brooke served as chief of the bureau until the end of the Civil War. After the war, Joseph R. Anderson, the "Ironmaker to the Confederacy" wrote that Brooke was as able an administrator as he had ever known.[58] The end of the war found Brooke very bitter, but he decided to swallow his pride and apply for a pardon. This he did on June 3, 1865 but one year later still had not received it. Brooke must have wondered if David Dixon Porter's words to the Prussian Minister to the United States had caught up with him. Porter had told the minister that Brooke ". . . had done the North more harm than any other man in the South."[59] Finally in August of 1866 Brooke received his pardon. From 1866 to 1867 Brooke was in business with Catesby ap R. Jones and Robert D. Minor, but when offered a teaching position at Virginia Military Institute, he accepted it. Brooke taught

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[56]Brooke, "John M. Brooke," II, 791.

[57]Brooke, "John M. Brooke," II, 873.

[58]Brooke, "John M. Brooke," II, 901.

[59]Cited in Brooke, "John M. Brooke," II, 904.

at the military school until his retirement in 1898 as professor emeritus.[60] John Brooke died on December 14, 1906.

Mallory, Ingraham, Minor, and Brooke all helped to make the Bureau of Ordnance and Hydrography an efficient and effective organization. The result of their combined leadership was that the bureau was able to overcome many of the obstacles it faced in the development, production, and distribution of ordnance and munitions. Minor and Brooke would both be forced to deal with the problems of raw materials and labor which would threaten to destroy the progress that had been made. However, the first challenge faced by the bureau was to establish and supply strategically located foundries and plants capable of producing enough weapons, shells, and powder to supply the Confederate Navy. The success of this venture would determine the effectiveness of the Bureau during the coming years.

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[60] Brooke, "John M. Brooke," II, 906.

CHAPTER II

CONFEDERATE NAVAL ORDNANCE MANUFACTURING FACILITIES, 1861 - 1865

While many historians have emphasized the South's lack of manufacturing facilities, few have recognized the fact that the Confederate navy was able to develop a successful program of industrial expansion. The South faced overwhelming problems in the development of industrial facilities in 1861, but the Confederate Bureau of Ordnance and Hydrography under the capable leadership of Ingraham, Minor, and Brooke was able to develop the facilities needed to supply the munitions of war. When war broke out, the Tredegar Iron Works of Richmond, Virginia, was the only company within the Confederacy that could supply heavy ordnance. By 1865, however, ordnance was being produced not only by Tredegar but also by several other establishments, both governmental and private. The program was so successful that by 1864, John M. Brooke could state that these facilities were able to supply ". . . all the heavy ordnance required to arm the ironclads and other vessels completed and building; and to furnish guns for the defense of our ports . . . ."[1]

The Confederate navy obtained its ordnance from three sources: capture, through the blockade, and by manufacture. In the beginning the former proved to be the major source. The evacuation of Norfolk by the Federal forces on April 20, 1861 gave the South approximately a thousand

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[1]John M. Brooke to Stephen Mallory, April 30, 1864, Official Records of the Union and Confederate Navies in the War of Rebellion (Washington, 31 vols., 1894-1927), Ser. II, III, 642, hereinafter cited as Official Records (Navy).

pieces of heavy ordnance with bores ranging from 6.4-inches to eleven-inches.[2] Of this number three hundred were Dahlgrens of the latest type.[3] After this, ordnance was occasionally salvaged from wrecked or captured enemy vessels. A number of guns were brought in through the blockade, the most famous of these being the Blakeleys which saw action at Charleston and Vicksburg.[4] The most important centers for the production of Confederate naval ordnance were the Tredegar Iron Works at Richmond, the Selma Foundry, and the Naval Ordnance Works in Richmond, Charlotte, and Atlanta.[5]

Although the industries of the South were limited in extent and many were primitive in technique, the seceding states were not, contrary to popular belief, entirely destitute of the materials, machinery, and skill necessary to provide the means of warfare.[6] As the antebellum period had drawn to a close, a significant movement had begun in the South to encourage industrialization. This pro-manufacturing movement began not as Henry W. Grady claimed with the postwar "New South," but rather in the ante-bellum period.[7] This can be seen in part by the fact that between the years 1837 and 1860 more than twelve commercial conven-

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[2] Brooke, "John Mercer Brooke," II, 751-752.

[3] Brooke, "John M. Brooke," II, 751-752.

[4] Brooke, "John M. Brooke," II, 876.

[5] Brooke, "John M. Brooke," II, 876.

[6] Victor Clark, The History of Manufacturing in the United States (New York, 3 vols., 1929), II, 41.

[7] Clement Eaton, A History of the Old South (New York, 1949), 423.

tions were held in the South.[8] This is not to say, however, that the South was a large manufacturing center, for such was not the case. In 1860 the North had in round numbers approximately 110,000 manufacturing establishments with 1,300,100 industrial workers while the South contained approximately 18,000 establishments with a total employment of 110,000 industrial workers.[9]

As Secretary of Navy, Mallory recognized the problems he faced. Mallory realized that the South could not hope to match the Union ship for ship, but instead desired that the South manufacture several very powerful ships. On February 27, 1862 he stated, "The United States has a constructed navy, we have a navy to construct . . . and we should, in (its) construction, compensate by the offensive and defensive power for the inequality of numbers."[10] Though Mallory realized the South could not hope to compete with the North in numbers, he did not realize all of the problems attendant with the construction of a navy. Mallory had little in the way of industry to back his desires as there was only one foundry in the entire South that had ever manufactured cannon, Tredegar Iron Works in Richmond. The Confederacy contained only two powder mills in 1860, one operating in South Carolina and the other in Tennessee.[11]

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[8] E. Q. Hawk, Economic History of the South (Englewood Cliffs, New Jersey, 1934), 313.

[9] Nevins, War for the Union, I, 425.

[10] Report of Secretary of Navy Stephen Mallory, February 27, 1862, Official Records (Navy), Ser. II, II, 74.

[11] Arthur P. VanGelder and Hugo Schlatter, History of the Explosives Industry in America (New York, 1927), 107, hereinafter cited as VanGelder and Schlatter, Explosives Industry; Joseph G. Kennedy, The Eighth Census of the United States, 1860, Manufacturers of the United

The mill in South Carolina employed three men and the value of its output for that year was valued at $3,800, while the Tennessee mill employed ten men and the value of its output for 1860 was $25,000.[12] As far as gun carriages and ammunition go, these had not been manufactured in the South for more than fifty years.[13] As a result, the Confederacy was ill-prepared to produce the necessities for the outfitting of warships.

When Mallory began to construct his navy, he announced that ". . . the only two rolling mills now in operation in the Confederate States, the Tredegar Iron Works and the Atlanta Works, are engaged in rolling plates for plating vessels of war."[14] Undoubtedly, Tredegar was the father of all the naval ordnance manufacturing centers established in the South. Joseph R. Anderson, who owned Tredegar, and his associates were called on to provide some form of castings, rolling mill products, boiler plate and patterns, iron or spikes for almost every navy shop which the Navy Department organized from Richmond to Selma.[15] During the war Tredegar would expand to include rolling mills, saw mills, machine

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in 1860 (Washington, 1864), 177, hereinafter cited as Kennedy, The Eighth Census of the United States.

[12]Kennedy, The Eighth Census of the United States, 177.

[13]Jennings C. Wise, The Long Arm of Lee (Lynchburg, Virginia, 2 vols., 1916), I, 41.

[14]Report of Secretary of Navy Stephen Mallory, February 27, 1862, Official Records (Navy), Ser. II, II, 74.

[15]Kathleen Bruce, Virginia Iron Manufacture in the Slave Era (New York, 1931), 349, hereinafter cited as Bruce, Virginia Iron Manufacture.

shops, forges, coal mines, and even a blockade-runner. These works produced 1,099 cannon for the Confederacy while at the same time managing to make machinery, iron plate, and other implements of war.[16] Anderson, a West Point graduate, was not a novice at producing ordnance. He had first started in 1842 producing chain, shot, shell, and cannon for the United States.[17] Between 1842 and 1860, Tredegar had cast and delivered to the United States 881 pieces of ordnance of excellent quality.[18]

Although Tredegar offered the South excellent facilities for ordnance production, from the beginning the Confederacy's demands exceeded the company's ability to produce. The need to expand caused Anderson to rent the Bellona foundry thirteen miles up the James River from Richmond. Anderson, however, soon abandoned this scheme for an expansion of his own works.[19] A foundry next to Tredegar was leased and the facilities at Tredegar itself were expanded by the Construction of new boring and finishing lathes, rifling equipment, and machinery for fabricating wrought iron cannon carriages. Tredegar was kept extremely busy by the orders coming in, and by early May, 1861 request for four hundred columbiads alone had been accepted.[20] Orders continued to pour in during the summer and by August, 1861 additional applications for

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[16] Thomas Cooper DeLeon, Four Years in the Confederacy (Mobile, 1890), 117; Charles Dew, Ironmaker to the Confederacy: Joseph R. Anderson and the Tredegar Iron Works (New Haven, 1966), 290, hereinafter cited as Dew, Ironmaker to the Confederacy.

[17] Dew, Ironmaker to the Confederacy, 7-8.

[18] Still, Confederate Shipbuilding, 25.

[19] Dew, Ironmaker to the Confederacy, 108.

[20] Dew, Ironmaker to the Confederacy, 112.

ninety-two more pieces of artillery were placed, and in December the Navy ordered fifty nine-inch Dahlgren shells and fifty more thirty-two pound cannon.[21]

Tredegar also received in 1861 its first orders for the famous Brooke guns. The first Brooke guns cast by Tredegar were 6.4-inch and seven-inch rifles. The 6.4-inch was a standard thirty-two pound naval cannon rifled and banded; the seven-inch Brooke gun was of a nine-inch pattern bored only to seven-inches.[22] While Tredegar was the industrial backbone of the Bureau of Ordnance and Hydrography, Tredegar's inability to cast by the Rodman hollow core process prohibited the construction of large caliber naval guns.[23] Tredegar using the solid cast method could produce guns up to ten-inches in caliber. Anderson had rejected the Rodman method in early 1859, and though he later realized his mistake, it was not until October, 1864 that his workmen had completed preparation for the casting of a twelve-inch gun around a hollow core.[24] By December, 1863 Anderson had cast an eleven-inch Brooke gun for harbor defense of Charleston, but it took until July, 1864 before this weapon and a companion piece were ready.[25] Though Anderson tried to rectify the problem, the machinery needed to finish large twelve-inch guns was

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[21] Dew, Ironmaker to the Confederacy, 112.

[22] Dew, Ironmaker to the Confederacy, 119.

[23] Dew, Ironmaker to the Confederacy, 226.

[24] Dew, Ironmaker to the Confederacy, 276; see Chapter V, 91 for explanation of the Rodman method.

[25] Dew, Ironmaker to the Confederacy, 276.

not completed until the end of the war.[26] Anderson's early dislike of the Rodman method resulted in Tredegar's inability to produce ordnance above eleven-inches. Thus the Confederacy was denied the opportunity to defend itself with large bore artillery.

Tredegar had production problems throughout the war. In May, 1863 a major fire destroyed the blacksmith shops, machine shops, pattern shops, boring mill and moulding shops.[27] The extensive damage prevented the gun mills from boring or rifling any cannon until November of the same year. However, within two weeks of the blaze, Tredegar was again casting cannon which were then carried over to the naval works in Richmond to be finished. Between 1863 and 1865 Tredegar delivered over 150 siege and seacoast guns to the Confederacy, most of which went to river and harbor defense at Wilmington, Charleston, Mobile, Savannah, and Richmond.

Tredegar was not the only producer of ordnance in Richmond during the Civil War. Machinery evacuated from Norfolk before its fall was brought to the capital where an ordnance store and laboratory were set up. These works under the command of Lieutenant Robert D. Minor were located in the lower part of Richmond. They were primarily devoted to the construction of gun carriages, trains, and equipments. Later in the war Brooke reported to Mallory that ". . . with the exception of heavy forgings and cannon, foundry articles of every description pertaining

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[26]Josiah Gorgas, "Notes on the Ordnance Department of the Confederate Government," Southern Historical Society Papers, XIX (January, 1891), 23.

[27]Brooke, "John M. Brooke," II, 897; Bruce, Virginia Iron Manufacture, 396-397.

to the armament and wants of war are made here."[28] Though this facility did not perform heavy casting, cannon were bored in Richmond and ordnance equipment was produced in large enough volume for Mallory to inform President Davis that, "Its capacity is sufficient for all naval wants in the waters of Virginia and to meet a large demand from the army . . . ."[29] Mallory went on to explain to Davis that the plant's capacity was not being utilized since there were not enough skilled laborers to operate the machinery.[30] The Richmond plant at its peak employed 136 men and was an important source of war materials for the Confederate naval forces in Virginia.

At the outbreak of the war the major naval establishments were located in the large ports of the Confederacy. Though the efforts were to prove futile, the Bureau of Ordnance and Hydrography tried to develop and sustain manufacturing centers for war materials in these areas. George Minor, older brother of Robert Minor and the second chief of the Bureau of Ordnance and Hydrography, stated in a report to Mallory that

> . . . in consequence of the great and pressing demands for ordnance and ordnance stores for the defense of . . . it was found impossible with the means at the disposal of the Department in Richmond and Norfolk . . . to comply promptly with the requisitions made upon this bureau . . . and more

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[28]John M. Brooke to Stephen Mallory, January 4, 1865, Letters Sent, Office of Ordnance and Hydrography, War Department Collection of Confederate Records, War Records Branch, Record Group 109, National Archives, Washington, D. C., hereinafter cited as R. G. 109, NA.

[29]Stephen Mallory to Jefferson Davis, June 5, 1865, Jefferson Davis Papers, Manuscript Department, Duke University Library, Durham, hereinafter cited as Davis Papers.

[30]Mallory to Davis, June 5, 1865, Davis Papers.

> particularly for ordnance . . . required for the naval defenses of the Mississippi. It therefore became necessary to establish a laboratory in New Orleans for the preparation of fuzes (sic), primers, . . . and to authorize the casting of heavy cannon, the construction of gun carriages . . . .[31]

Mallory's first public statement calling for the production of naval ordnance in New Orleans was released on April 26, 1861.[32] In this statement Mallory spelled out the basic goal of establishing facilities for the production of ordnance at different points in the Confederacy. Mallory mentioned particularly the importance of the government "fostering" private manufacturing firms attempting to produce naval ordnance. This appealed to many southern administrators who realized that the lack of industrial resources was a major obstacle to overcome. To Mallory and others, contracting put the major share of responsibility on the producing companies. The companies would be responsible for dealing with the problems of labor, machinery, raw materials, and transportation.[33] To aid the businesses with which the government had contracted, the Confederate Congress allowed the government to lend one-half of the expenses in setting up new facilities, and to ensure large supplies of coal and iron, the Confederate Congress also authorized the government to advance payment for one-third of the contemplated output.[34] However, to hold prices in line the government limited profits to seventy-five percent of

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[31]George Minor to Mallory, December 12, 1862, Official Records (Navy), Ser. II, II, 797.

[32]Report of Secretary of Navy Stephen Mallory, April 26, 1861, Official Records (Navy), Ser. II, II, 53.

[33]Vandiver, Rebel Brass, 65.

[34]Vandiver, Rebel Brass, 65.

the cost, a figure that was later reduced.[35] The government was able to enforce these regulations by refusing to detail laborers and transportations facilities to those who would not conform.[36]

In New Orleans there were numerous foundries which entered into government work. Lieutenant Beverly C. Kennon was ordered in August, 1861 to organize an ordnance store in New Orleans.[37] Kennon made several contracts with different companies to produce ordnance. For example, he contracted with the company of Bennett and Surges to cast fifty eight-inch guns.[38] Kennon also contracted for shells, solid shot, and munitions of all types. Bennett and Surges, Lurger, Leeds, Patterson Iron Works, and the Armstrong Foundry were all firms in New Orleans that became involved in the production of naval ordnance.[39] Kennon was an extremely energetic officer who within one month had contracted for nearly a million dollars' worth of ordnance. As a result of this overspending by Kennon, most of the contracts were cancelled by Mallory and he was replaced.

Even before the contracts were cancelled, ordnance production in the Crescent City had encountered problems. Kennon had tested thirteen guns manufactured there, six made by Leeds and Company, one eight-inch made by Surges and Bennett and six made by Bujac and Bennett, and of these, he had to reject all six made by Bujac and Bennett as defec-

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[35] Vandiver, Rebel Brass, 65.

[36] David Donald (ed.), Why the North Won the Civil War (Baton Rouge, 1960), 13, hereinafter cited as Donald, Why the North Won.

[37] Donald, Why the North Won, 13.

[38] Still, Confederate Shipbuilding, 43.

tive.[40] Kennon stated:

> The six made by Bujac and Bennett I had to condemn because they would not pass inspection, the interior being filled with cavities, when a single one will condemn any gun . . . there was no telling when they might burst.[41]

Most of the guns cast at New Orleans appear to have been of doubtful quality. In regards to this, General David Twiggs commented in 1861 that ". . . the guns made here are not as good as those made in Richmond . . . the rifled cannon prepared here were a failure . . . the range is less than the smoothbore."[42] It is interesting to note, however, that the Phoenix Iron Works at Gretna, Louisiana, opposite New Orleans, cast the first piece of ordnance for the Confederate Navy.[43]

After the removal of Kennon, Lieutenant John Eggleston was appointed ordnance officer for the New Orleans naval station. Eggleston was understandable more conservative than Kennon. He did, however, establish a laboratory to manufacture primers and other ordnance parts.[44] Because of the Union movement against the city in the spring of 1862 this material along with the stores gathered by Kennon were shipped to Lieutenant David

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[40]Court of Inquiry, April 25, 1863, Official Records (Army), Ser. I, VI, 599.

[41]Court of Inquiry, April 25, 1863, Official Records (Army), Ser. I, VI, 599.

[42]Court of Inquiry, April 25, 1863, Official Records (Army), Ser. I, VI, 598.

[43]Nelson Tifts to Stephen Mallory, October 14, 1861, Official Records (Navy), Ser. II, II, 577.

[44]Frank Moore (ed.), Rebellion Records, A Diary of American Events (New York, 12 vols., 1864-1868), IV, 57.

McCorkle at Atlanta.[45]

This movement of ordnance facilities to the interior represented a change in Mallory's overall strategy. Previously he had tried to establish production centers throughout the South where shipbuilding and subsidiary facilities were located.[46] However, as a result of the fall of New Orleans and Norfolk, the decision was made to locate ordnance and shipbuilding facilities in the interior. These stations were more secure from enemy attack, but their location made distribution and supply difficult, even though most were well served by railroads. The supply and distribution problems were in large part caused by the fact that the railroads were crowded with troops and governmental supplies for the army.[47]

The naval ordnance works at Charlotte, North Carolina, was a direct result of Mallory's anticipation of the loss of Norfolk. On March 26, 1862 Mallory sent a confidential dispatch to Captain Sidney Smith Lee (brother of Robert E. Lee) who was in command of the Norfolk Navy Yard, instructing him to begin dismantling and readying for transportation all tools and machinery not being used.[48] The official reason given was that the department needed the additional equipment to establish another workshop. Several train loads were sent off while other machinery was taken

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[45] Still, Confederate Shipbuilding, 43.

[46] Still, Confederate Shipbuilding, 43.

[47] William N. Still, Jr., Iron Afloat (Nashville, 1971), 89-90.

[48] Report of the Chief of the Bureau of Ordnance and Hydrography, August 15, 1862, Official Records (Navy), Ser. II, II, 250-251; James D. Bulloch, The Secret Service of the Confederate States in

by ship to Richmond. Captains William H. Murdaugh and William Parker had earlier been sent by Mallory to select a site for the valuable equipment, and their choice was Charlotte. The Confederate Government then purchased the Mecklenburg Iron Works from Captain John Wilkes and much of the machinery removed from Norfolk was installed at once.[49] The works soon contained various shops such as a gun carriage shop, a large forge shop, along with several coke ovens, a foundry, and the largest steam hammer in the Confederacy.[50] In 1863 this naval establishment was expanded; the improvements included better facilities for the construction of marine engines, expansion of the physical plants, new machinery, and a new cupola furnace.[51] The Charlotte works manufactured gun carriages, sights, projectiles, shafts for ironclads, propellers, and other materials of war.[52] It was the only establishment in the Confederacy where wrought iron bolts could be forged. Thomas Dwyer, an employee of the Charlotte works, invented a machine for making a perfect sphere.[53] His invention was easily adapted to the production of cannon balls and

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Europe (London, 2 vols., 1883), 209-210, hereinafter cited as Bulloch, Secret Service of the Confederate States in Europe.

[49]Official Records (Navy), Ser. I, VII, 751-752.

[50]John W. H. Porter, A Record of Events in Norfolk County, Virginia from April 19, 1861 to May 10, 1862 with a History of the Soldiers and Sailors of Norfolk County, Norfolk City and Portsmouth Who Served in the Confederate States Army or Navy (Portsmouth, Virginia, 1892), 31.

[51]Ralph W. Donnelly, "The Charlotte, North Carolina, Navy Yard, C. S. N.," Clyde C. Walton, (ed.), Civil War History, V (March 1959), 74, hereinafter cited as Donnelly, "Charlotte Navy Yard."

[52]Donnelly, "Charlotte Navy Yard," 76.

[53]Wells, Confederate Navy, 55.

helped to make the works more efficient. Later this invention was used at various U. S. Navy Yards in the production of shot and shells.[54] In 1865 Mallory wrote President Davis:

> This establishment manufactures shells, wrought iron, and cannon shot. Worked to full capacity it could supply the Navy and shore batteries in the charge of the Navy. The heaviest forgings in the Confederacy are done here and much machinery manufactured. It is now worked at half capacity for the want of mechanics.[55]

The Charlotte works did not engage in the casting of guns, but did manage to produce a number of torpedoes for the Confederate navy during the war.[56] The last function of the naval works at Charlotte was a dramatic one. In the last days of the Confederacy, men from this work provided an escort for the Confederate Treasury's specie once it was decided to move it west to prevent its capture.[57] This and the burning of the Confederate Navy Department's records at Charlotte were the last services rendered by the establishment in the war.[58]

Since Charlotte and Richmond did not cast guns and New Orleans had been taken over by the Union, Tredegar was in reality the only producer of large guns in the Confederacy.[59] In February, 1862 a contract was signed between Colin J. McRae and representatives of the War and Navy

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[54]Donnelly, "Charlotte Navy Yard," 77.

[55]Violet G. Alexander, "The Confederate States Navy Yard at Charlotte, North Carolina, 1862-1865," Charlotte News, June 5, 1910.

[56]Mallory to Davis, January 5, 1865, Davis Papers.

[57]Brooke to Mallory, June 4, 1865, Letterbook of Office of Ordnance and Hydrography, R. G. 45, NA.

[58]Donnelly, "Charlotte Navy Yard," 79.

[59]Donnelly, "Charlotte Navy Yard," 79.

Departments. McRae agreed to build a foundry near Selma, Alabama that would help relieve the pressure on Tredegar by producing ". . . guns, boiler plate, and the plates now so much in need for covering ships."[60] The Confederate government became interested in this operation at an early date. By March 22, 1863 the army and navy had agreed to purchase the property jointly.[61] McRae had recently been appointed to go on an important financial mission to Europe, and he insisted before he left that he be relieved of his works and contracts "without pecuniary loss to himself."[62] As a result the Confederate government took over the works on February 20, 1863 with Lieutenant Colonel George Rains as commanding officer.[63]

The purchase of the Selma Works was a joint army-navy operation. Josiah Gorgas, Chief of Ordnance for the Confederate army, was concerned about the amount of money being spent at Selma even before it officially passed into government hands.[64] Rains, whom Gorgas deeply respected, had reported a year before against locating a large ordnance establishment at Selma. Gorgas' own attitude as to the selection of Selma as an ordnance center is one of the most confusing elements in his

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[60]Wells, Confederate Navy, 53.

[61]Minor to Colin McRae, March 25, 1862, Colin J. McRae Letterbook in Colon J. McRae Papers, Alabama Department of Archives and History, Montgomery, Alabama, p. 62, hereinafter cited as McRae Papers.

[62]Gorgas to McRae, March 22, 1862, McRae Papers.

[63]Frank E. Vandiver, Ploughshares into Swords (Austin, 1947), 169, hereinafter cited as Vandiver, Ploughshares.

[64]Official Records (Navy), Ser. I, XVIV, 841.

whole program concerning the location of ordnance facilities.[65] He evidently changed his mind and desired that Selma become a major ordnance center.[66] A large group of his officers, however, were against him on this matter.[67] Rains led the opposition, believing the physical disposition of the Selma Gun Foundry to be inappropriate for an army installation. He further stated that:

> The works are entirely too far to the Southwest for any supplies in general for three fourths of all casting would be required east of the Main Georgia line of communication and this is some 300 miles off connected by a river and two separate grades of roads at West Point (Georgia), requiring reshipment . . . should the Army retain it, farewell to all ideas of a National Foundry (I would not apply that name to these works) for its costs has been too great to put it aside, and like the old man of Sinbad's it will continue to cling tenaciously around the neck of the Ordnance Department notwithstanding all its unavailing struggles.[68]

Rains further wrote that he regretted ". . . that the Army assisted in the purchase of the Foundry Works at this place . . ." and stated that ". . . he would like to see the Navy in full possession."[69] Gorgas, influenced undoubtedly by Rains' views, agreed to turn the works over to the navy and on June 1, 1863 the navy took full possession of the works. At this time the foundry was situated about one-half mile below the army arsenal and consisted of offices, a gun foundry, a machine shop, a pattern shop, a moulding shop, a rolling mill, melting furnaces, three

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[65] Vandiver, Ploughshares, 170.

[66] Vandiver, Ploughshares, 171.

[67] Vandiver, Ploughshares, 170.

[68] Vandiver, Ploughshares, 170.

[69] Cited in Vandiver, Ploughshares, 170.

cupolas, puddling furnaces, and a blacksmith shop.[70] Rains had predicted that it would take at least "several weeks" to cast the first gun and he felt that this was a very optimistic prediction.[71] In November, 1863 Lieutenant Catesby Jones, who had taken command of the works from the army, was still trying to get the first gun cast for combat purposes.[72] Jones was one of the South's outstanding ordnance experts. He had spent three years helping Dahlgren conduct the experiments that led to the development of the Dahlgren gun and as a result of this experience and his own research Jones was familiar with ordnance production.[73] Jones had helped Brooke conduct the first tests on the Brooke gun and as a result was well acquainted with the weapon. He also had experience with the Brooke gun in combat as executive and ordnance officer of the Virginia.[74]

One of the secrets of Selma's success was that Jones was able to secure the services of George Peacock, the most expert foundryman in the South. Peacock had come to America in 1848 from England and was considered something of a scientist and metallurgist. In 1861 he was employed at a foundry at Natchez and after the fall of Corinth, he moved

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[70]Cited in Vandiver, Ploughshares, 170.

[71]Ethel Armes, The Story of Coal and Iron in Alabama (Birmingham, 1910), 140-141, hereinafter cited as Armes, Coal and Iron in Alabama.

[72]Vandiver, Ploughshares, 170.

[73]W. S. Marby, Brief Sketch of the Career of Captain Catesby an R. Jones (Selma, 1912), 7, hereinafter cited as Marby, The Career of Catesby Jones.

[74]Marby, The Career of Catesby Jones, 6.

to Shelby County, Alabama, and was employed there. After a special act of the Confederate Congress created the office of "Superintendent of the Naval Foundry" with a salary twice that of Jones, he consented to move to Selma.[75]

Jones and Peacock, however, were unable to get the first gun cast for combat purposes until January, 1864. This was several months longer than Rains' optimistic prediction. Though the machinery at Selma was English and of the newest and most complete pattern it took Jones and Peacock seven months to cast their first combat piece.[76] However, once Selma went into production guns were turned out fairly regularly. From January, 1864 to April 2, 1865 when it was captured by Union forces, Selma produced over 190 guns.[77]

Selma experienced problems with labor, transportation, raw materials, and army interference. Yet in 1864 and 1865, under the leadership of Jones, it produced Brocke guns at the rate of twenty a day.[78] When problems developed at other establishments with shell production, Brooke felt he could turn to his capable subordinate. In 1864 Brooke wrote Jones the following letter:

> The failure of our attempts to make rifle shells at Charlotte, together with the interruptions at Atlanta, the scarcity of iron in Virginia, and the inability of manufacturers in South Carolina to furnish projectiles,

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[75] Bell Wiley, Southern Negroes, 1861-1865 (New Haven, 1938), 113.

[76] Armes, Coal and Iron in Alabama, 142-144.

[77] Jones to Brooke, March 8, 1865, Jones Letterbook, R. G. 45, NA.

[78] Edward F. Winslow to Major Eugene B. Beaumont, April 9, 1865, Official Records (Army), Ser. I, I, 484.

> has reduced the sources of naval supplies so that it will be necessary to call upon the works under your command for projectiles, particularly shells, for stations on the Atlantic coast.[79]

Selma and Tredegar, as the major suppliers of cannon for the Confederate Bureau of Ordnance and Hydrography, were extremely important to the war effort. In 1863 Brooke was worried about the capacity of the Confederacy to produce enough heavy ordnance. The opening of Selma and the expansion of Tredegar combined to increase the ability of the South to produce heavy ordnance, and as a result, Brooke wrote to Mallory that ". . . the wants of the service could be fully supplied."[80]

When the Union troops overran Selma, they found five large buildings housing all the equipment necessary to manufacture on a large scale large naval and siege guns.[81] The capture of Selma and the fall of Richmond on the same day effectively destroyed the capacity of the Bureau of Ordnance and Hydrography to produce cannon and the other implements of war.

Another ordnance facility was developed by the Bureau of Ordnance and Hydrography at Columbus, Georgia. In the years before the Civil War, Columbus had become one of the largest manufacturing towns south of Richmond. In 1862, the Bureau of Ordnance and Hydrography sent an officer to investigate Columbus directing him to proceed ". . . to Columbus, Ga. to make inquiries concerning the resources of that city . . . for the

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[79] A. B. Fairfax to Julius Fairfax, March 29, 1862, P and I File, R. G. 45, NA.

[80] Diffie W. Standard, Columbus, Georgia, in the Confederacy (New York, 1954), 42, hereinafter cited as Standard, Columbus.

[81] Standard, Columbus, 43.

location of government works."[82] The basis for the interest in Columbus was the Columbus Iron Works which had been casting light bronze pieces for the Army Bureau of Ordnance.[83] In June of 1862 this facility was leased to the Confederate Government, and it undertook three major tasks, that of casting cannon, assembling steamship boilers and machinery, and that of constructing gunboats.[84] In 1862 the company had in operation ". . . twelve or fifteen large and small lathes and customary machinery; also a large foundry capable of melting twenty tons of pig iron at a heat."[85] Chief Engineer James H. Warner was appointed to command the works. When they were leased to the Confederate Government, according to the local newspapers, he immediately set out ". . . to expand the facilities in the shops for the casting of brass, bronze, and wrought iron cannon."[86] The same article suggests some of the problems Confederate naval ordnance establishments faced:

> The only apparent solution to the problem of securing brass and bronze was the collection of plantation and church bells and household articles made of these items.[87]

The Columbus naval works employed 138 men and in the main was noted for the construction of boilers and other marine machinery. On November

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[82] T. Conn Bryan, Confederate Georgia (Athens, 1953), 102.

[83] Inquirer (Columbus, Georgia), March 23, 1862.

[84] Sun (Columbus, Georgia), June 5, 1862.

[85] Standard, Columbus, 43; Official Records (Navy), Ser. II, II, 750-753.

[86] Edward F. Winslow to Major Eugene B. Beaumont, April 18, 1865, Official Records (Army), Ser. I, I, 486.

[87] Mallory to Davis, Jan. 5, 1865, Davis Papers.

1, 1864 John Porter, Chief Constructor for the Confederate navy, reported that six of the ten ships under construction were being built at Columbus.[88] When the Union forces captured the works, Edward F. Winslow sent the following description of the facilities he destroyed to Major Eugene B. Beaumont:

> Naval armory: one small rolling mill in operation, 1 engine, 40 horsepower, 1 blast engine, 8 horsepower, 2 sets of rollers, and 3 furnaces capable of making 4,000 pounds of iron per day. One new rolling mill nearly completed - one 50 horsepower engine intended to roll railroad and boiler plate iron; 3 large furnaces; 1 blast engine, one 10 horsepower steam hammer. One machine shop, one blacksmith shop, containing 10 forges. Several offices and drawing rooms . . . One pattern shop, with 3 wood turning lathes and 1 wood planer. Foundry, boiler shop, cooper shop, and their content.[89]

The Columbus works along with Selma, Richmond, Atlanta, and Tredegar demonstrate that though the South did lag far behind the North in manufacturing, the Confederacy was able to develop rather quickly manufacturing centers to provide itself with the instruments of war.

Other centers of naval ordnance production were developed at Atlanta, Georgia, Bellona, Virginia, and at Shreveport, Louisiana. The Atlanta establishment was a phoenix rising out of the capture of New Orleans. Mallory in a report to President Davis explained that the Atlanta works obtained its machinery from New Orleans before its fall. With the invasion of Georgia by Sherman and the threat to Atlanta, the works were removed to Augusta.[90] Upon the approach of Union forces they

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[88] Mallory to Davis, January 5, 1865, Davis Papers.

[89] Mallory to Davis, January 5, 1865, Davis Papers.

[90] Mallory to Davis, January 5, 1865, Davis Papers.

were again moved, this time to Fayetteville, North Carolina.[91] Mallory described the plant as one with ". . . a capacity to employ 100 mechanics in the production of all ordnance equipment and projectiles."[92] The works under the command of Lieutenant David McCorkle had a harried existence, since not only did the Yankee troops in the area cause problems, but so did Governor Joseph E. Brown and Secretary of War James Seddon. Both Seddon and Brown contributed to McCorkle's problems which reflected in a reduction in production of gun carriages and other equipment.[93] Atlanta was operating by the summer of 1862, and in the eyes of the Bureau of Ordnance and Hydrography, was expected to play a major role in the production of ordnance. In 1863 a circular from the Bureau directed that ". . . Richmond will supply Richmond and Wilmington, Charlotte will supply Charlotte, Savannah, Charleston, and Atlanta will supply Mobile and the Gulf Stations."[94] Thus Richmond, Charlotte, and Atlanta, at this point, were considered as the major producers of ordnance by the Bureau.

Atlanta was also the home of several private industries which produced equipment for the Bureau of Ordnance and Hydrography. Gullath and Company and Solomon and Company both received large payments from

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[91]For hints of McCorkle's exasperation, see Official Records (Army), Ser. IV, III, 522; Official Records (Navy), Ser. I, XXI, 870.

[92]Cited in Still, Confederate Shipbuilding, 43.

[93]Invoice of Confederate Bureau of Ordnance and Hydrography, August 14, 1864, Gullath and Company, Solomon and Company, Ordnance and Ammunition File, R. G. 45, NA.

[94]Invoice of Confederate Bureau of Ordnance and Hydrography, August 10, 1863, A. T. Taylor and Company, Ordnance and Ammunition File, R. G. 45, NA.

the Bureau of Ordnance and Hydrography in 1863 and 1864.[95] McCorkle also authorized payment to A. T. Taylor and Company of Atlanta during 1863 and 1864.[96] These companies all produced shells, solid shot, and Gullath and Company also did some casting for the Bureau.[97]

Numerous private companies throughout the Confederacy manufactured shop and shell for the Bureau during the war. In Lynchburg, Virginia, F. D. Deane, Jr. and Son manufactured mainly shells for the Bureau.[98] In Savannah, V. Hawkins and Company produced shells and other naval ordnance. In 1862 Lieutenant Alexander M. DeBree, the Assistant Inspector of Ordnance, wrote George Minor the following report:

> The office procured ordnance, iron products, and other metals through contracts with Tredegar Iron Works in Richmond, the Etowah Ironworks in Cass County, Georgia, the Shelby Iron Works in Shelby County, Alabama, F. D. Deane, Jr. and Son in Lynchburg and the Bellona Foundry in Chesterfield County . . . it obtained heavy guns, projectiles, and boiler plate.[99]

The Confederate Bureau of Ordnance and Hydrography also was interested in the production of powder. Powder was in short supply at the outbreak of the war and this shortage lasted until after the capture of

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[95]Invoice of Confederate Bureau of Ordnance and Hydrography, June 13, 1864, Gullath and Company, Solomon and Company, A. T. Taylor and Company, Ordnance and Ammunition File, R. G. 45, NA.

[96]Invoice of Confederate Bureau of Ordnance and Hydrography, March 21, 1863, F. D. Deane, Jr. and Son, Ordnance and Ammunition File, R. G. 45, NA.

[97]Lieutenant Alexander M. DeBree, Assistant Inspector of Ordnance to Commander George Minor, November 24, 1862, Ordnance and Ammunition File, R. G. 45, NA.

[98]Invoice of Confederate Bureau of Ordnance and Hydrography, March 25, 1863, F.D. Deane, Jr. and Son, Ordnance and Ammunition File, R. G. 45, NA.

[99]Kennedy, The Eighth Census of the United States, 177.

states, one in South Carolina and one in Tennessee.[100] These were rather small plants and the value of their output was listed as only 3,800 and 25,000 dollars respectively. As with ordnance, the capture of Norfolk turned into a bonanza for the Bureau of Ordnance and Hydrography since 60,000 pounds of badly needed powder were captured.[101] Early in the war the Bureau set up a powder factory at Petersburg to help relieve this problem. This mill was later moved to Charlotte and then to Columbia. By 1865, under the supervision of P. Baudery Guresche, it manufactured approximately 20,000 pounds of fine high grade powder a month for the Confederate navy.[102]

The invasion of the lower South by the North in 1864 and 1865 forced the Bureau of Ordnance and Hydrography to destroy or move many of the facilities it had struggled to build to prevent them from being destroyed. In early June, 1864 the Atlanta works were moved to Augusta. When Augusta was threatened, the works were moved to Fayetteville, North Carolina, where Mallory hoped to continue production. However, in February, 1865 they were destroyed by General Sherman's army.

As part of the overall Union movement, General James H. Wilson led raids through Alabama and Georgia intent on destroying Confederate establishments in these states. One after another the ordnance centers fell. At Selma, Jones did not have time to remove his machinery before the works were captured. At Columbus, two weeks later, efforts at relocation were

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[100]Kennedy, The Eighth Census of the United States, 177.

[101]Jefferson Davis, The Rise and Fall of the Confederate Government (New York, 2 vols., 1881), I, 472.

[102]VanGelder and Schlatter, Explosives Industry, 115.

destroyed.

It is obvious from the surviving records that the Confederate navy was able to establish a successful program of ordnance production. Decentralization after the fall of New Orleans and Norfolk caused delays in supply and transportation; yet on the whole these problems were overcome. Selma, Tredegar, Richmond, Atlanta, Charlotte, and Columbus supplied the navy with ordnance and equipment of a generally high quality. The outfitting of centers of production with the necessary machinery was so successful that Brooke was able to report that ". . . the wants of the service can be fully supplied provided the requisite number of mechanics can be procured."[103] Brooke by this time no longer retained any doubt of the Bureau's success in developing the necessary facilities for the production of ordnance. In 1861 only one establishment in the South had had any experience in the production of ordnance; yet by 1865 an area that had been traditionally considered almost totally agrarian had developed the facilities necessary to supply a navy engaged in a life and death struggle. In the final analysis the success of the program to develop the facilities to manufacture ordnance for the Confederate navy cannot be doubted. The failure of ordnance production in the end was the result of the inability of the Confederacy to protect their establishments.

The inability of the Confederacy to resist the invasion of its territory resulted not only in the eventual destruction of its manufacturing facilities, but also limited the Confederacy's ability to

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[103]Brooke to Mallory, April 30, 1864, Official Records (Navy), Ser. II, II, 641.

supply their manufacturing facilities with raw materials. The lack of an efficient transportation system only compounded this problem. This, of course, greatly influenced the ability of the Bureau of Ordnance and Hydrography's establishments to produce ordnance and ordnance stores. The South's most serious industrial weaknesses were the lack of raw materials and an adequate transportation system. The Confederate Bureau of Ordnance and Hydrography's success would depend on their ability to deal with these problems.

CHAPTER III

RAW MATERIALS AND TRANSPORTATION: THEIR EFFECT ON THE MANUFACTURE OF CONFEDERATE NAVAL ORDNANCE

The South in 1861 had done little to exploit the raw materials that lay within her boundaries. While many scholars have emphasized the Confederacy's industrial weakness, it was not the lack of manufacturing facilities that proved to be the South's fatal weakness, but instead it was the inability of the South to provide her industries with the essential raw materials. The raw material base of the South was insufficient to support the industrial superstructure and this greatly contributed to the collapse of the Confederacy.[1] Foundries which had grown dramatically during the 1850's were starved for iron, copper, lead, and other items during the Civil War. The inadequate transportation system and the failure of the government to control the railroads effectively until late in the war prevented Confederate industries from drawing on distant sources of supply.[2]

Iron and iron products were produced by establishments in almost every southern state. The operations, however, were usually on a small scale except in the vicinity of Richmond, Virginia, where the industry had gained a firm hold. The census of 1860 reveals that in that year there were thirty-nine furnaces in the South, each state having at least one, and that the total production from these furnaces was 26,262 tons

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[1] Dew, Ironmaker to the Confederacy, 290.

[2] Dew, Ironmaker to the Confederacy, 178.

of pig iron a year.[3] Tennessee was the largest producer with seventeen furnaces, Virginia was next with sixteen furnaces, Alabama had four furnaces, Georgia had two, while the rest of the states that made up the Confederacy had six.[4] Unfortunately for the Confederacy the important iron producing sections of the South, Kentucky, Tennessee, and western Virginia, all fell into Union hands early in the war. As a result of this, the Confederacy was forced to depend increasingly on the ore from the lower South.

Tredegar Iron Works, the largest industrial complex within the Confederacy, would soon realize that dependence upon the lower South for pig iron was impossible. During a frantic search for pig iron in the summer of 1861, the company purchased substantial lots of pig iron from foundries in northern Georgia, Tennessee, and New Orleans.[5] In each case the shipment by rail took an increasingly long time to arrive in Richmond where the company was located. The New Orleans pig iron was shipped in mid-September of 1861 and did not begin to arrive in Richmond until November 4 and the last lot did not reach the capitol until January 20, 1862.[6] Five hundred tons from Tennessee also suffered a similar fate. The railroad lost over one hundred and twenty tons in transit and the final load did not reach Richmond until April 24, 1862.[7] The Georgia

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[3]Kennedy, The Eighth Census of the United States, 177; Joseph H. Woodward, Alabama Blast Furnaces (Woodward, Alabama, 1940), 46.

[4]Nevins, War for the Union, I, 89.

[5]Dew, Ironmaker to the Confederacy, 103.

[6]Dew, Ironmaker to the Confederacy, 103.

[7]Dew, Ironmaker to the Confederacy, 103.

pig iron was equally slow in arriving. As a result of this experience, Anderson, the owner of Tredegar, decided to utilize the Virginia iron producers as much as possible. He believed that if Tredegar was going to be forced to rely on distant sources that the cost factor would be extremely high and the supply would be erratic at best. For these reasons, Anderson contracted almost exclusively with Virginia blast furnaces. Pig iron had risen from a prewar price of twenty-eight to thirty-four dollars a ton, depending on the grade, to forty to forty-five dollars a ton and this helped to stimulate a revival of the Virginia industry.[8] Anderson committed his company to a large number of contracts with Virginia iron producers which were very favorable for the producers.[9]

On October 15, 1861, Anderson met with Mallory to discuss the problems he had had in ensuring a steady flow of iron to Tredegar. Anderson disclosed to Mallory in meetings over the next few days that he was reluctant to guarantee high prices for iron producers without a specific contract from the government ". . . equal to these purchases at a corresponding rate."[10] The end result was a contract which set the government's annual purchases at two million dollars.[11]

While Anderson was making contracts with various Virginia producers, the Bureau of Ordnance and Hydrography was negotiating contracts with iron producers throughout the Confederacy. Between April, 1861 and June,

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[8]Dew, Ironmaker to the Confederacy, 103.

[9]Dew, Ironmaker to the Confederacy, 103.

[10]Dew, Ironmaker to the Confederacy, 103.

[11]Dew, Ironmaker to the Confederacy, 105.

1863, the Bureau was responsible for obtaining the iron needed by the navy.[12] Within the first few months of the war, the Bureau had contracted for 21,700 tons of iron and by August, 1862 it had added another 107,500 tons to the total. The navy also had an option on 37,500 tons for which the Ordnance Bureau of the Army had written agreements.[13] The contractors had agreed to deliver the iron annually in various stages (pig, bloom, and plate) and in definite amounts.[14] There are no available records to indicate how much of this iron was ever delivered. However, the amount appears to have been quite small.

By April, 1862 the supply of iron was extremely limited. Tredegar, which had attempted to obtain its own iron, was forced to seek an agreement with the War and Navy Departments to supplement its reserves. While Tredegar was to continue to assume primary responsibility for its supply of iron, in the agreement the Confederate government promised to allocate to Tredegar enough iron to enable the company to meet its military production quotas.[15] However, the government simply did not have the necessary iron to allocate to Tredegar. The Confederate authorities could only provide a few hundred tons while in reality Tredegar needed several thousand tons. Throughout the entire war, Tredegar's production was curbed by the lack of available raw materials and for the duration of the war Tredegar never received enough metal to operate at more than one-

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[12] Still, "Ironclads," 99.

[13] Still, "Ironclads," 99.

[14] Official Records (Navy), Ser. II, II, 73-74.

[15] Joseph R. Anderson and Company, April 29, 1862, Confederate Citizen File, R. G. 109, NA.

third capacity.[16]

By 1862 both Secretary of War Judah Benjamin and Secretary of Navy Stephen Mallory had begun to realize the immense proportions of the iron problem. Benjamin warned Davis on March 12, 1862 that ". . . the supply of iron will soon be far short of our wants for both cannon and the construction of gunboats."[17] Benjamin recommended that Congress pass legislation to induce slave owners to shift their slaves from invasion threatened areas to iron-producing regions where the labor could be used to help produce iron.[18] Mallory's report contained much broader recommendations that Benjamin's:

> . . . materials of construction, the artisans, the workshops, the instructed officers, and the seamen, all essential to the creation of a naval establishment demand time and the fostering hand of the government . . . to develop and bring to useful operation.[19]

At first no action was taken on either Mallory's or Benjamin's recommendations. However, nine days after Benjamin's report, Mallory notified President Davis that Tredegar was unable to meet its production quotas and deliver cannon, munitions, or armor plate because of pig iron shortages.[20] He also wrote Albert G. Brown, Chairman of the Senate Naval

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[16]Dew, Ironmaker to the Confederacy, 262.

[17]Secretary of War Judah Benjamin to Jefferson Davis, March 12, 1862, Official Records (Navy), Ser. IV, I, 987-988.

[18]Benjamin to Davis, March 12, 1862, Official Records (Navy), Ser. IV, I, 987-988.

[19]Secretary of Navy Mallory to Davis, February 27, 1862, Official Records (Navy), Ser. II, II, 151.

[20]Still, Confederate Shipbuilding, 53-54.

Affairs Committee, to urge the adoption of a policy of advance payments to individuals and firms for the purpose of stimulating coal and iron production.[21] One week after Brown received Mallory's request Congress passed a bill authorizing the government to lend up to fifty percent of the capital needed to erect or expand ". . . all establishments or mines for the production of coal and for the production and manufacture of iron."[22]

In August Mallory again addressed himself to the problem of iron production stating:

> The want of iron is severely felt through the Confederacy, and the means of increasing its production demand, in my judgement, the prompt consideration of Congress. The government has outstanding contracts amounting to millions of dollars, but the iron is not forthcoming to meet the increasing public wants. Scrap iron of classes is being industriously collected by agents of the Government and we are now rolling rail and iron into plates for the covering of ships while the condition of the roads admonish us that they will soon require extensive supplies . . . .[23]

The Confederacy had first attempted to manufacture the iron it needed domestically, but by mid 1862, it was obvious that this supply would not meet the demand. Three other methods were used by the navy and the Bureau of Ordnance and Hydrography to obtain the needed iron: importation, collection of scrap, and the confiscation of railroad iron. Railroad T-rails were in great demand because of the ease by which they

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[21]Mallory to Albert G. Brown, April 11, 1862, Official Records (Navy), Ser. II, II, 183; Mallory to Davis, September 24, 1862, Official Records (Navy), Ser. II, II, 274.

[22]Cited in Dew, Ironmaker to the Confederacy, 149.

[23]Report of the Secretary of Navy, August 16, 1862, Official Records (Navy), Ser. II, II, 246.

could be rolled into armor plates. At first the Bureau concentrated on acquiring unlaid rails and rails from lines that were not in use. In June of 1862, 1000 tons were confiscated from the Atlantic and Gulf Company in Georgia, and following this, 3,000 tons were requisitioned from a small line in South Carolina.[24] This supply of iron from unused lines was soon exhausted and the government began impressing iron from railroads owned by northerners and from lines with little strategic value. In Georgia the Brunswick and Albany lost sixty miles of rails; in South Carolina the Northeastern "contributed" iron to the navy, as did the Portsmouth and Weldon and the Norfolk and Petersburg in Virginia.[25]

By autumn of 1862 the Confederacy was swamped with impressment agents of a dozen different departments, offices, and commands, each laying claim to available stocks of railroad iron. It soon became obvious to all concerned that there was an imperative need to reduce the competition among the various governmental agencies. However, it was not until January, 1863 that anything was done. The government was finally persuaded to act when Tredegar was forced to close down because of a shortage of iron.[26] On January 22, 1863 a directive of the Adjutant and Inspector General's office created a commission ". . . to examine and advise on what railroads in the Confederate states the iron on their tracks can best be dispensed with."[27] This order stated that

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[24]Still, "Ironclads," 101.

[25]Still, "Ironclads," 102.

[26]Dew, Ironmaker to the Confederacy, 175.

[27]John Withers, Assistant Adjutant General, Special Order Number 36, January 22, 1863, Official Records (Navy), Ser. IV, II, 393.

the use of the impressed rails was specifically limited to the construction of public vessels, the building of railroad connections desired by the Congress as necessary to military operations, and the repair of other roads considered essential.[28] The impressment of rails from important roads was forbidden, and if new iron was taken from any source, it was to be exchanged if possible for used rails suitable for rerolling. The commission was composed of three men, including Major I. M. St. John who, the year before had suggested the impressment of railroad iron. The commission survived until the end of the war, although it did have some problems as a result of personnel fluctuations. The railroad iron problems were never effectively solved and competition continued between the railroads and the navy throughout the war.[29] In fact by 1864 the picture had become so bleak that the Engineer Bureau recommended the diversion of all naval iron to railroad use.[30]

On April 11, 1862, the Confederate Congress passed an act entitled "An Act for the Organization of a Corps of Officers for the Working of Nitre Caves."[31] This act created a sub-bureau of the army's Ordnance Bureau designated the Bureau of Nitre and Mining, originally organized for the purpose of obtaining saltpeter for making gunpowder.[32] How-

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[28]John Withers, Assistant Adjutant General, Special Order Number 36, January 22, 1863, Official Records (Navy), Ser. IV, II, 393.

[29]Robert C. Black, The Railroads of the Confederacy (Chapel Hill, 1952), 200, hereinafter cited as Black, Confederate Railroads.

[30]Black, Confederate Railroads, 230.

[31]Journal of the Congress of the Confederate States of America, 1861-1865 (Washington, 7 vols., 1904), IV, 151-152.

[32]General Order Number 65, June 16, 1862, Adjutant and Inspector

ever, the increasing importance of mining resulted in the bureau becoming an independent body in April, 1863 and by June of the same year all ". . . mining activities including the manufacture of iron" were delegated to the Bureau of Nitre and Mining.[33] The bureau was headed by Major William R. Hunt and all firms holding contracts from the government for the production of iron and coal in addition to all such establishments operated by the Confederate government fell under his jurisdiction.[34]

The Bureau of Nitre and Mining supplied the Bureau of Ordnance and Hydrography with sufficient amounts of nitre ". . . for naval purpose."[35] This nitre was shipped to the navy's powder mill in Columbia, South Carolina. Brooke had earlier suggested that the Bureau of Ordnance and Hydrography obtain saltpeter by extracting it from the dirt floors of tobacco barns in North Carolina and Virginia.[36] However, even with ingenious methods of production the importation of nitre exceeded domestic production until the end of 1862. Even after this date, importation provided one of the major sources of nitre for the Confederacy. From November 1, 1863 to December 8, 1864, over 1,932,000 pounds of salt-

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General's Office, Official Records (Army), Ser. IV, V, 594-595.

[33]General Order Number 85, June 16, 1863, Official Records (Army), Ser. IV, V, 2.

[34]General Order Number 85, June 16, 1863, Official Records (Army), Ser., IV, V, 2.

[35]John M. Brooke to Mallory, January 4, 1864, Letters Sent, Office of Ordnance and Hydrography, R. G. 109, NA.

[36]Brooke to George Minor, Nd., Ordnance and Ammunitions File, Naval Records Collection of the Office of Naval Records Library, Record Group 45, National Archives, Washington, D. C., hereinafter cited as R. G. 45, NA.

peter were brought in through Wilmington and Charleston.[37]

The Bureau of Ordnance and Hydrography was not completely dependent on the Bureau of Nitre and Mining for copper, iron, and other minerals even though Brooke reported to Mallory in 1864:

> . . . for supplies of pig iron and nitre the Navy is dependent upon the Nitre and Mining Bureau, but in consequence of the frequent interruption of furnace operations by the enemy, want of subsistence, for the hands and difficult means of transportation, particularly in Virginia, it has not been in the power of the Bureau to supply the iron required, and at this time it will be extremely difficult that demands for projectiles for immediate service can be met.[38]

The lack of iron forced a closing of not only Tredegar but also of other naval ordnance works. In June, 1863 the Navy Department had taken over the operation of a foundry at Selma, Alabama, giving the Confederate navy what it hoped would be a second major producer of ordnance.[39] Under the capable leadership of Catesby Jones, the Selma facility would become a major producer of naval ordnance, particularly of Brooke guns.[40]

The Selma facility faced the same problems as Tredegar in regard to production of ordnance: labor, inflation, and raw materials. During 1864 the lack of iron became particularly acute at Selma. On March 20,

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[37]William Diamond, "Imports of the Confederate Government," Journal of Southern History, VI, 481, hereinafter cited as Diamond, "Imports of the Confederate Government."

[38]Brooke to Mallory, Memorandum, 1864, Letters Sent, Office of Ordnance and Hydrography, R. G. 109, NA.

[39]Still, Confederate Shipbuilding, 42.

[40]Brooke to Catesby ap R. Jones, September 6, 1864, Area File, Letterbook of the Office of Ordnance and Hydrography, R. G. 45, NA.

1864, Jones received a letter in which, a fellow naval officer, Charles C. Simms, expressed his sympathy for Jones' predicament namely, how to cast cannon when out of iron.[41] On March 21 Jones complained to Major William R. Hunt of the Nitre and Mining Bureau:

> I am constantly receiving urgent demands for guns from all quarters. A telegram from Admiral Buchanan says "Can you send General Maury two 7 inch guns. They are very important here." Our capacity to furnish guns is of course much circumscribed by the limited supply of iron, none having been received this month . . .[42]

Jones' reply to another request for guns from Admiral Franklin Buchanan is very revealing. In his reply Jones states:

> I don't know when we will have another VII ready as we gone (sic) more than six weeks without casting a gun. We have just commenced to cast again but the iron differs from any that we have had before. We therefore cannot tell how it will turn out and even if it proves well it will be six weeks before it can be finished.[43]

On the same day he wrote Buchanan, Jones wrote a friend and complained about not only the quantity but also the quality of the iron he was receiving. The Nitre and Mining Bureau ". . . are commencing to supply us with iron again in limited quantities . . .," he wrote, but the iron was so poor Jones concluded ". . . I don't know what kind of guns I am making."[44] A letter from Jones to his uncle written in May,

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[41] Charles C. Simms to Jones, March 20, 1864, Official Records (Navy), Ser. I, XXI, 886.

[42] Jones to Major William R. Hunt, March 21, 1864, Official Records (Navy), Ser. I, XXI, 882.

[43] Jones to Franklin Buchanan, April 12, 1864, Jones Letterbook, R. G. 45. NA.

[44] Jones to Cuylor, April 15, 1864, Letterbook of the Office of Ordnance and Hydrography, R. G. 45, NA.

1864 shows that the Selma foundry was out of iron again and that Jones had begun to feel extremely frustrated about the situation.[45] By September Jones was thoroughly exasperated, and in a report to Brooke he allowed his feelings to show:

> We have no iron for guns and have but three cast this month. A large portion of the iron furnished during the last month as gun metal was a very inferior quality and entirely unsuited for guns . . . We shall use up all the iron . . . .[46]

The shortage of iron and the poor quality of available supply severely curtailed the production of ordnance at Selma. In fact, Jones was forced to cease production for two months due to the lack of iron.[47] Some of the guns that were cast immediately after this period were so liable to cavities that Jones refused to ship them unless ordered to.[48]

Although there were more than twenty-eight furnaces built in the Confederacy's two biggest iron producing states between 1862 and 1865, (thirteen in Alabama and fifteen in Virginia), these new furnaces were unable to relieve the demand for iron ore.[49] Most of these furnaces were

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[45] Jones to Brigadier General Richard Page, May 11, 1864, Official Records (Navy), Ser. I, XXI, 898-899.

[46] Jones to Brooke, Letterbook of Office of Ordnance and Hydrography, R. G. 45, NA.

[47] Jones to Dabney Maury, October 28, 1864, Jones Letterbook, R. G. 45, NA.

[48] Jones to Buchanan, April 12, 1864, Official Records (Navy), Ser. I, XXI, 892. However, it should be noted that an experienced iron man was sent to inspect the quality of Selma's ordnance and he concluded that Selma's guns were as uniform as Tredegar's not ". . . withstanding the different qualities of iron." Jones to T. A. Jackson, April 15, 1864, Jones Letterbook, R. G. 45, NA.

[49] Still, "Ironclads, " 111.

built with funds advanced by the government and they were required to furnish a percentage of their output to the government. These new furnaces did not result in an increase in production for two reasons. The first was the failure of the Confederacy's railroads to provide adequate communications with the lower South. The overburdened and underequipped railways could not maintain a constant flow of supplies to Virginia from the lower South. Production of pig iron in Alabama was four times Virginia's output yet because of transportation problems, Tredegar did not use a single ton of Alabama iron during the war.[50]

The second factor was the gradual occupation of the Confederacy by Union forces. By October, 1864 ten furnaces in Virginia, all but three in Tennessee, all in Georgia, and all but four in Alabama had been burned out or lost to Federal troops.[51] These losses offset the construction of new furnaces and the total amount of iron produced did not rise substantially. In November, 1864 Congress directed that a committee be set up to examine the iron situation.[52] However, there was little the committee could do because of the lack of time.

Another serious problem for the Bureau of Ordnance and Hydrography was the South's lack of lead, copper, tin, zinc, and other materials that were essential to the war effort. Of these only copper was available within the Confederacy. The others had to be brought in through the

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[50]Dew, Ironmaker to the Confederacy, 176.

[51]Issac St. John to James A. Seddon, October 1, 1864, Official Records (Army), Ser. 10, III, 695.

[52]Still, Confederate Shipbuilding, 58.

blockade.[53] The Confederate government recognized this early in the war and made every effort to increase its supply from foreign sources. Between 1863 and 1865 the Bureau of Nitre and Mining had imported over 31,208.7 pounds of copper, almost four percent of the total Confederate supply during this period.[54]

Tennessee was the Confederacy's major producer of copper during the war. Although some Tennessee mines were overrun by Union forces in 1862, it was not until the destruction of the Ducktown mines in 1864 that the Confederacy became completely dependent on importation. The Ducktown mines had been the source for over ninety percent of the Confederacy's copper supply until their destruction.[55] After the loss of the Ducktown mines, Brooke immediately placed orders with Bulloch in England for copper in addition to orders for lead, zinc, block tin, and cast steel.[56] Throughout the war, there was usually enough copper, zinc, and lead for ordnance production.[57] In January, 1865 Brooke reported to Mallory on the supply of certain metals:

> for cast steel, copper, tin, and zinc we are dependent on foreign countries . . . Fortunately we have received

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[53]Still, Confederate Shipbuilding, 58.

[54]Diamond, "Imports of the Confederate Government," 483.

[55]Frank Vandiver, Blockade Running Through Bermuda, 1861-1865 (Austin, 1947), 86.

[56]Brooke, "John M. Brooke," II, 891-892.

[57]Still, "Ironclads," 101; see Jones to Brooke, March 12, 1864, Office of Ordnance and Hydrography Letterbook for one occasion projectile manufacturing ceased for want of copper, R. G. 45, NA.; also Jones to Maury, August 8, 1865, Jones Letterbook, R. G. 45, NA.

> from abroad, chiefly through Wilmington . . . a supply sufficient for several months.[58]

The Confederacy except for the trans-Mississippi west had a large number of coal mines in 1860. Virginia had twenty-two mines, Tennessee had six, Alabama had four, Georgia had three and Arkansas had at least one mine.[59] At the outbreak of the war, there was a large supply of coal awaiting shipment at New Orleans which was confiscated by the Confederate government.[60] Some of this coal was shipped to Savannah and Mobile for naval purposes while the rest was used in New Orleans.[61] The responsibility for obtaining coal for the navy shifted frequently during the war. At first the Office of Provisions and Clothing had this responsibility and contracted with Robert Jemison, Jr., of Tuscaloosa, Alabama and James Browne of Charleston, South Carolina for 25,000 tons of coal.[62] However, these efforts were completely unsuccessful. In September of 1862, the Office of Orders and Details took over responsibility for providing coal for the navy. Commander John K. Mitchell was appointed superintendent of "coal contracts."[63] While Mitchell was

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[58]Brooke to Mallory, January 4, 1865, Letters Sent, Office of Ordnance and Hydrography, R. G. 109, NA.

[59]Kennedy, The Eighth Census of the United States, 426.

[60]Howard Eavenson, The First Century and a Quarter of American Coal Industry (Pittsburgh, 1942), 299, hereinafter cited as Eavenson, Coal Industry.

[61]Eavenson, Coal Industry, 299.

[62]Still, "Ironclads," 112.

[63]Still, Confederate Shipbuilding, 57.

attempting to find coal for the navy, individual stations and facility commanders also attempted to obtain coal for their commands. Finally in June, 1863 the Bureau of Nitre and Mining took over responsibility for supplying the navy. After this all coal for navy use was supposed to be obtained through this bureau. However, central control was loose and the Bureau of Ordnance and Hydrography continued to contract for coal and ship it to its various ordnance facilities.[64] In 1864 while the Bureau of Nitre and Mining was supposed to be providing all of the navy's coal, Catesby Jones was ordered by the Secretary of the Navy to". . . take charge of the coal contracts of the department . . . ."[65] Jones, however, was unable to accomplish much because of the poor transportation system.

Though a number of coal mines were lost to the Confederacy early in the war, new ones more than offset this loss. Mallory appointed a commission of naval officers to examine the coal deposits in several Virginia counties ". . . with a view to the fabrication of heavy ordnance."[66] Coal was supplied to the naval facilities on a geographic basis. The Richmond and Charlotte works received their coal from fields around Richmond.[67] Charleston and Savannah received their supply from the Deep and Davis River basins which produced large amounts of coal

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[64]Still, "Ironclads," 113.

[65]Jones to James H. Warner, October 15, 1864, Subject File, R. G. 45, NA.

[66]Mallory to G. W. Randolph, October 25, 1862, Official Records (Army), Ser. IV, VI, 143.

[67]Report of Office of Order and Details, October 31, 1864, Official Records (Navy), Ser. II, IV, 753-754.

during the Civil War.[68] Mobile, Columbus, and Augusta were supplied by coal mines in central Alabama.[69]

As with iron, the problem of coal production could have been overcome, but the Confederacy found no solution to the lack of an efficient transportation system which would have made Alabama coal and iron available in Richmond. Concerning the transportation problem Catesby Jones wrote:

> The appointment of Mr. Gonzalez to have exclusive charge of the supply of coal for the Navy will alleviate many of the disadvantages that hitherto have arisen from having a number of agents acting independent of each other . . . This change will not, however, have all the beneficial results expected if Mr. Gonzalez will not have control of the steamboats and barges built for the transportation of coal . . . The principal difficulty in securing coal now arises, not from its scarity, for there is an abundance of it at the mines but from the limited means of transportation.[70]

The inadequate transportation system compounded the South's severe shortage of raw materials. Large areas of the Confederacy such as much of the interior of Alabama and Mississippi were entirely without rail service. There were only 9,000 miles of railroad track operational in 1860 in the Confederacy compared to 21,000 miles of operational track in the North.[71] Only a few southern manufacturers produced railroad rails

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[68] The Building of the Nation (Richmond, 12 vols., 1909), V, 292.

[69] Report of Office of Order and Details, October 31, 1864, Official Records (Navy), Ser. II, II, 753-754.

[70] Jones to Captain Sidney Smith Lee, Chief of Bureau of Orders and Details, September 17, 1864, Jones Letterbook, R. G. 45, NA.

[71] George E. Turner, Victory Rode the Rails: The Strategic Place of Railroads in the Civil War (Toronto, 1953), 29.

and these establishments, Tredegar, Nashville Manufacturing Company, the Atlanta Rolling Mill and the Etowah Iron Works, were all put to producing ordnance soon after the war began.

The Confederate railroads were weak in three major ways. First of all, there were simply not enough railroads in the South in terms of miles and many of those that did exist were not in the right places. There were too many gaps in what should have been continuous lines, and the South's ability to manufacture railroad equipment was too limited.[72] Because the few manufacturing facilities in the South were monopolized for the production of iron plate and ordnance by the Army and Navy Departments, there were no new rails produced in the Confederacy.[73] As a result of inadequate transportation, the amount of raw materials available to industry decreased as the coal and iron producing areas of the lower South had no method of transporting the needed raw materials to the manufacturing areas. This, coupled with Union occupation, resulted in a situation which the Confederate government was unable to deal with effectively. When the Bureau of Ordnance and Hydrography began its decentralization of manufacturing facilities, the problem was compounded even more. Between March, 1861 and January, 1865 the price of coal rose from $25 a ton to $1,300 partly as a result of the Confederacy's inability to move it from the mines to the manufacturers.[74]

In the final analysis one must conclude that the Confederacy's lack

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[72] Black, Confederate Railroads, 124-244.

[73] Black, Confederate Railroads, 124-128.

[74] Black, Confederate Railroads, 124-128; Bullock, Secret Service of Confederate States in Europe, I, 20-21.

of an effective transportation system along with the scarcity of raw materials undermined the progress that was made in the development of manufacturing facilities. With the Union invasion of the South, the Confederacy's ability to produce ordnance was severely hampered. The production of ordnance at Selma was curtailed for months while at the Atlanta works production completely stopped. Tredegar was able to operate only at one-third of its capacity and these facilities were really the heart of the Confederate Bureau of Ordnance and Hydrography's industrial program. It is clear that the Bureau of Ordnance and Hydrography was unable to deal effectively with these problems. The other major problem for which the bureau was unable to find a solution was that of labor. The combination of the lack of raw materials and skilled labor was to have a great effect on the production of ordnance.

CHAPTER IV

LABOR PROBLEMS IN THE BUREAU OF ORDNANCE AND HYDROGRAPHY

If the Confederacy had been fortunate enough to have had an adequate industrial base, the necessary raw materials, and an efficient transportation system, the production of ordnance would still have been hampered by what would become by 1864 a severe labor shortage. In 1860 according to the United States census, there were approximately 4,570 men employed in machinery works within the South.[1] Throughout 1861 the Bureau of Ordnance and Hydrography was not pressed for manpower as most of its facilities were still in the initial stages of construction.[2] However, even at this time, there was a growing concern over the supply of skilled labor. The root of the labor problem can be traced to overmobilization by the Confederate army in the early stages of the war and the Confederacy's later inability to solve the complex labor problems presented by a "total war." Compounding this problem was the fact that a large number of northern and foreign laborers left the South with the outbreak of the war.[3] The general nature of the war made it clear that the army was to be the most important cog in the Confederate military machine. That the navy ran a poor second was reflected by Congressional appropriations, popular thinking, and cabinet meetings.[4] This attitude,

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[1]Kennedy, The Eighth Census of the United States, 77.

[2]Still, Confederate Shipbuilding, 61.

[3]Mary E. Massey, Erastz in the Confederacy (Columbia, 1952), 27; Gerald M. Capers, The Biography of a River Town (Chapel Hill, 1952), 143.

[4]Vandiver, Rebel Brass, 72.

coupled with the above problems, ultimately served to make the labor problem insurmountable.

In 1861 Secretary of the Navy Stephen Mallory began what was to be a long and frustrating correspondence with the War Department regarding labor. Mallory wrote requesting that designated ship carpenters and skilled mechanics "as may be willing to receive discharge . . ." be released to work for the navy.[5] The Secretary of War approved this request and ordered the men to be released.[6] However, opposition soon developed from officers such as General George Pickett who suggested that all future requests be denied and that all men detailed already be returned to their units.[7] The increasing opposition from the officers of the Confederate army forced the Secretary of War to modify his decision. In December, 1861 the Secretary of War notified Mallory that all requests for mechanics would be refused unless "the parties interested will furnish substitutes."[8] Thus if the Bureau of Ordnance and Hydrography wanted mechanics it would have to provide replacements for every one detailed.

This continuing conflict between the army and navy led Mallory to seek help from President Davis. However, Davis, an old army officer, had no real use for the navy and he refused to intervene.[9] His own

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[5]Cited in Still, Confederate Shipbuilding, 62.

[6]Still, Confederate Shipbuilding, 62.

[7]_____ to Silas Cooper, October 21, 1863, Official Records (Army), Ser. I, XXIX, 789.

[8]A. T. Bledsoe to Mallory, December 19,28, 1861, Office of Ordnance and Hydrography Letterbook, R. G. 45, NA.

[9]Still, "Ironclads," 120.

personal disappointment with the navy combined with the army's need for men in the field resulted in Davis's writing to the Secretary of War that ". . . as far as practical it will be proper to aid in the work but it must be considered that no effort is to be spared to find mechanics outside of the army."[10]

The refusal of Davis to provide an effective solution to the problem led Mallory to try congressional legislation. In the meantime, Colin J. McRae in Selma and others were bombarding the Bureau of Ordnance and Hydrography with letters complaining that they could not secure an adequate number of mechanics to complete the work they had contracted to do.[11] However, this matter became intertwined with conscription legislation in Congress. On March 20, 1862, a bill entitled "An Act to Provide for Ascertaining and Detailing Artisans and Mechanics from the Confederate Army" was passed by the Senate.[12] This bill was delayed in the House and died there when Davis, on March 29, asked for the conscription of men between the ages of eighteen and thirty-five. A few months later a second conscription act extended the age limit upward to forty-five. This program of selective service contained several classes of exemptions and protected laborers employed in manufacturing.[13] Though these bills protected labor already employed in manufacturing, they did not solve the major problem of how to obtain skilled workers from the army. Neither act

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[10]Davis to Mallory, January 15, 1862, Letterbook of the Office of Ordnance and Hydrography, R. G. 45, NA.

[11]Colin J. McRae to George Minor, September 8, 1862, McRae Papers.

[12]Still, Confederate Shipbuilding, 62.

[13]Still, "Ironclads," 121.

mentioned the transferring of workers from the army to the navy and as a result the shortage of skilled laborers began to mount.

As demands for skilled labor increased, the War Department instituted a policy of detailing men to naval ordnance works.[14] Davis personally liked this arrangement much better as it allowed the War Department to keep direct control of the men. This system was applied not only to governmental works, but later was expanded to include all facets of southern manufacturing.[15] In this system the weakness was that the detailing of men was left to the discretion of the commanding officer, from commanding generals to company commanders.[16] While correspondence indicates that some army officers cooperated, asking only that the men obtained be "from any part of the army not facing the enemy," the majority of requests were refused.[17] Commander Catesby Jones, who commanded the ordnance works at Selma, Alabama, wrote Brooke complaining that none of his applications were ever granted. Most army officers agreed with the view expressed by General Robert E. Lee in a letter to the Secretary of War in which he stated, "I think that the facility of obtaining labor in the army sometimes impairs the efforts of officers superintending Government works to procure it elsewhere . . . ."[18] The army was suffering at

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[14]Still, Confederate Shipbuilding, 63.

[15]Dew, Ironmaker to the Confederacy, 228.

[16]Still, Confederate Shipbuilding, 63.

[17]Memorandum, n.d., Shelby Ironworks Collection, University of Alabama Library Collection, University, Alabama.

[18]Robert E. Lee to Secretary of War James Seddon, April 19, 1864, Official Records (Army), Ser. I, XXXIII, 1294.

this time from what Lee termed "weakened ranks" and it is little wonder that army officers looked at requests for men with suspicion.

Naval officers were not the only ones encountering serious opposition to their requests for labor. Private contractors such as Colin J. McRae, who was under contract to establish an ordnance work at Selma, Alabama, wrote the Bureau of Ordnance and Hydrography the following letter:

> When I made the contract with the Secretaries of War and Navy it was understood between you, Colonel Gorgas, and myself that the Departments were to give me all the aid they could in procuring both materials and mechanics. Though I have applied for the detail of a good many mechanics from the army I have never succeeded in getting but one and now a cancellation of his detachment by the army has deprived me of his services.[19]

As time passed, the situation worsened at all of the naval ordnance facilities. In the spring of 1864 Brooke, the head of the Office of Ordnance and Hydrography since 1863, asked his subordinates commanding ordnance works to submit a detailed report of their labor needs to him. Catesby Jones reported that he could produce one gun a week, "whereas with the proper number of mechanics, . . . I could manufacture, with carriages and equipment complete, three in a week, and in a few months one everyday."[20] Jones also stated that Selma had sufficient tools and powder to furnish all the shot and shell for the navy.[21] The Charlotte establishment reported that ". . . a number of our more important tools

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[19]McRae to Minor, September 8, 1862, McRae Papers.

[20]Jones to Brooke, May 14, 1864, Official Records (Navy), Ser. IV, III, 523.

[21]Mallory to Davis, July 1, 1864, Official Records (Navy), Ser. IV, III, 570-571.

are idle a large portion of the time for the want of mechanics to work them . . . and many of the large forgings required for the building and arming of war vessels can only be made with the assistance of these tools."[22] The report of the Atlanta works, under Lieutenant David McCorkle, was even gloomier:

> At one time last year I had no lumber for shell boxes and the commander of the camp of instruction in this district refused to detail a sawyer who owned a mill on the ground the man wished to get out of the army by obtaining a contract . . . . I have been four months unable to have forged the wrought iron bolts for the Brooke gun for a want of blacksmiths. Major General Maury detailed a second rate blacksmith to me, but revoked the order two weeks ago . . . . I have asked for details until I am tired, and even those conscripts who are unwillingly detailed to the works are accompanied by so many orders and so many papers that a clerk is constantly employed to try and keep their papers correct.[23]

The ordnance work at Richmond reported that the plant's capacity was sufficient "to meet all naval wants in the waters of Virginia and . . . a large demand from the army"; however, the plant was operating at only half capacity because of the lack of mechanics.[24] The Confederacy only had one naval ordnance facility operating at full capacity. Located at Columbia, South Carolina, it produced approximately 20,000 pounds of high grade powder a month.[25]

The Confederate Bureau of Ordnance and Hydrography's establishments

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[22]H. A. Ramsay to Brooke, May 5, 1864, Official Records (Navy), Ser. IV, III, 521-522.

[23]David McCorkle to Brooke, May 7, 1864, Official Records (Navy), Ser. IV, III, 522.

[24]Mallory to Davis, January 5, 1865, Davis Papers.

[25]Mallory to Davis, January 5, 1865, Davis Papers.

suffered from a lack of labor of all descriptions. Though the greatest need appeared to be mechanics, Jones, as well as others, wrote often complaining of the void in all classes of skilled labor. In 1863 Jones wrote Brooke that "we are in want of machinists, moulders, pattern makers, and blacksmiths."[26] A lack of skilled blacksmiths prevented Jones, Minor, and McCorkle from banding guns that had already been produced. This lack of skilled labor coupled with the army's refusal to provide adequate details led many of the naval ordnance officers to ignore red tape and orders to return detailed men. Jones, writing to Brooke on June 25, 1863, noted that:

> When these works were transferred from the army, there were a number of mechanics employed who belonged to the army. On inquiry I find that some have been regularly detailed, others do not appear to have been detailed at all . . . . The foundry would be crippled by the loss of them and . . . I shall not give them up.[27]

McCorkle also tried to evade orders requiring him to return details, but a threat from Secretary of War Seddon to withdraw all details from the Atlanta works brought him in line. This type of evasion became an art among not only the ordnance works commanders but also among shipbuilders both private and governmental, contractors, and manufacturers. In many cases a worker would be "hired" while home on leave and his "employer" would be responsible for protecting him from the provost marshall.[28]

The conscription law of February, 1864 made the retention of details even more difficult. Enrolling officers had the authority to grant

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[26]Jones to Brooke, June 25, 1863, Jones Letterbook, R. G. 45, NA.

[27]Jones to Brooke, June 25, 1863, Jones Letterbook, R. G. 45, NA.

[28]Still, Confederate Shipbuilding, 66.

details for only sixty days at a time. After this the unit requesting the detail had to reapply. Brooke noted that fewer than "one out of ten" of those requested were detailed.[29] The situation became unbearable, and in April, 1864 Mallory addressed the following letter to Davis:

> A perpetual struggle exists between the military officers whose commands these mechanics are detailed from and the naval officers under whom they are employed for their possession. The navy department received almost daily notices of the revocation of details of its workmen, or of calls for their return to their command, while the mechanic himself uncertain as to what moment he may be returned to a marching regiment is discontented and neglects means and opportunities for improving his condition . . . .[30]

Mallory again suggested that mechanics be transferred to the navy rather then be detailed. He felt if the men were required to enlist in the navy that it ". . . would lead to the improvement of the condition of the individual artisan" and at the same time by placing a body of men permanently under the district organization and discipline of the navy" . . . render them more efficient."[31]

On April 30, 1864 Brooke reported to Mallory that "the addition of new tools and machinery" had increased capacity "so that the wants of the service could fully be supplied provided the requisite number of mechanics for whose detail application has been made can be procured."[32]

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[29] Brooke, "John M. Brooke," II, 889.

[30] Mallory to Davis, April 20, 1864, Official Records (Navy), Ser. II, II, 637.

[31] Mallory to Davis, April 20, 1864, Official Records (Navy), Ser. II, II, 637.

[32] Brooke to Mallory, April 20, 1864, Official Records (Navy), Ser. II, II, 639.

In 1863 Brooke had warned that there had been a serious deficiency in guns, but the opening of Selma, and the expansion of Tredegar and Richmond, had amended this situation. He then stated that the most serious problem the bureau faced was the shortage of skilled labor. In 1864 Brooke wrote Mallory a detailed examination of the labor problem:

> There are in the Southern states more than a sufficient number of mechanics to work the establishments to full capacity and to supply all the heavy ordnance required to arm ironclads and other vessels completed, and to furnish guns for the defense of our ports against which the enemy ironclads cannot stand.[33]

Brooke correctly concluded that the problem resulted from the fact the men had been swept en masse into the army. He stated that the Bureau of Ordnance and Hydrography needed only two hundred additional mechanics to work the establishments and that, although he had the names and addresses of over a hundred mechanics serving in the field, the army refused despite his "most strenuous exertions" to grant the necessary details.[34]

As a result of Brooke's and Mallory's reports, a plan that would have possibly alleviated the labor problem was drawn up. In December, 1864 a bill incorporating their ideas was introduced in the House of Representatives, but the war was over before it was passed into law.[35]

Though he never provided an effective solution to the problem, Jefferson Davis had long recognized the fact that the South needed more

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[33]Brooke to Mallory, April 30, 1864, Official Records (Navy), Ser. II, II, 641.

[34]Brooke, "John M. Brooke," II, 889.

[35]Still, Confederate Shipbuilding, 67.

skilled laborers. Even before the Confederate States Navy was organized, Davis had ordered Raphael Semmes north to hire mechanics. Semmes was able to persuade only a few to come South and most of these left at the outset of hostilities.[36]

As difficulties mounted in obtaining skilled labor inside the Confederacy, Mallory also looked outside the Confederacy. Mallory hoped to make up for the labor deficiencies through the importation of skilled personnel from Europe, particularly England.[37] Early in the war Confederate agents in Europe were ordered to try to hire workers for the Confederacy. As early as 1862 Mallory wrote to Commander James Bulloch requesting that he induce ". . . any number of foundry men, workers in iron, machinists, boiler makers, brass founders, and blacksmiths combined up to five hundred" to come and work in the Confederacy.[38] In return for their services, Mallory promised "the most liberal compensation."[39] Bulloch was later requested to send out mechanics, and if possible a man capable of superintending the manufacture of Bessemer steel. Bulloch found that "owing to the high rate of pay" that skilled laborers received in Europe, he met with "unexpected difficulties" and "found it wholly impossible" to obtain an individual skilled in the manufacturing of Bessemer

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[36] Raphael Semmes, Memoirs of Service Afloat during the War Between the States (New York, 1869), 83.

[37] Mallory to James Bulloch, October 8, 1862, Official Records (Navy), Ser. II, II, 286.

[38] Mallory to Bulloch, October 8, 1862, Official Records (Navy), Ser. II, II, 286.

[39] Bulloch, Secret Service of Confederate States in Europe, II, 231-232.

steel willing to travel to the Confederacy.[40]

Davis was evidently more optimistic about the feasibility of obtaining foreign labor. In 1864 he wrote Governor Joseph E. Brown of Georgia that ". . . skilled workmen, experts in various mechanical pursuits, indispensable in foundries, laboratories, arsenals, machine shops, and factories have been engaged in Europe . . . and many immigrants are now on the way to the Confederacy."[41]

To bring in foreign labor the Confederacy offered such inducements as high wages, exemption from military service, and in some cases payment in gold.[42] However, despite these promises, few Europeans were persuaded to run the blockade, and those that did stayed, as a rule, only a short time. The wartime conditions in the South, the hostilities of the southerners because of the special privileges granted to Europeans, the constant threat of invasion, and the inability of the government to meet their contracts (particularly those specifying payment in gold) usually resulted in departure within a few months.[43]

Private companies also sought to obtain skilled European labor. Tredegar Iron Works, frustrated by the War Department's refusal to grant its details, sent agents to Europe to hire almost every description of a rolling mill and foundry labor. However, these agents, like govern-

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[40]Bulloch, Secret Service of Confederate States in Europe, II, 231-232.

[41]Davis to Governor Joseph E. Brown, September 19, 1864, Confederate Records of the State of Georgia (Atlanta, 6 vols., 1909-1911), III, 111.

[42]Ella Lonn, Foreigners in the Confederate Army and Navy (Chapel Hill, 1940), 339-340.

[43]Bulloch, Secret Service of Confederate States in Europe, II, 231-232; Still, Confederate Shipbuilding, 68.

mental agents, were on the whole unsuccessful.[44]

The Confederacy was able to relieve some of the pressure by the use of prisoners-of-war.[45] Union prisoners who took an oath of allegiance to the Confederate government were paroled and allowed to seek employment.[46] To insure their compliance and their loyalty, the Confederate government dispatched their names to Federal authorities as deserters.[47] In 1863 Tredegar was employing seventy former prisoners-of-war at the Glenwood furnaces, while those with iron working skills were retained at Richmond.[48] These workers were paid at the same rate as southern workmen and constituted a valuable source of labor.[49]

The ordnance facilities in the South also made extensive use of Black labor. As early as 1862 Colin McRae, who was in charge of setting up the foundry at Selma, contracted for the use of 130 slaves, agreeing to pay their owners $125 per year and to furnish clothes, food, and medical supplies.[50] At first slave labor was used to cut timber, work mines, and perform other unskilled tasks. This use was continued throughout the war and its importance can be seen by the fact that the Chief of the Niter and Mining Bureau reported in September, 1864 that the "govern-

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[44] Dew, Ironmaker to the Confederacy, 234.

[45] Clark, History of Manufacturing, II, 51.

[46] Dew, Ironmaker to the Confederacy, 234.

[47] Dew, Ironmaker to the Confederacy, 234.

[48] Dew, Ironmaker to the Confederacy, 235.

[49] Dew, Ironmaker to the Confederacy, 235.

[50] Charles Davis, Colin J. McRae: Confederate Financial Agent (Tuscaloosa, 1961), 29.

ment controlled blast furnace and mining operations employed 4,301 Negroes and 2,518 whites."[51]

As the labor shortage began to strangle many establishments, Blacks were used more and more to perform skilled jobs. Tredegar Iron Works in Richmond saw Black labor as the solution to the labor problem and at the peak of its productivity employed approximately 1,200 Blacks, both free and slave, and 1,200 Whites.[52] Many Black's had become skilled mechanics in antebellum days and now Tredegar, Richmond, and other ordnance establishments took advantage of their skills.[53] In 1862 Tredegar began using skilled Black technicians when Anderson hired twelve slaves of which at least two operated punch machines.[54] Later, Negroes worked in foundries, rolling mills, the spike factory, machine shops, forges, gun mills, coal mines, and blast furnaces belonging to Tredegar. By 1864 Black labor had replaced White labor at a large number of jobs; for example in the gun shop fifty-two of the ninety-one workers were Black, and of these, approximately twenty-five percent were free.[55] It is interesting to note that the Blacks were paid substantially the same wages as Whites and on one occasion Anderson informed an individual attempting to secure a raise for his slave that the rate paid for his

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[51]Brooke to Mallory, February 1, 1865, Letters Sent, Office of Ordnance and Hydrography, R. G. 109, NA.

[52]James Brewer, The Confederate Negro: Virginia's Craftsmen and Military Laborers, 1861-1865 (Durham, 1969), 51, hereinafter cited as Brewer, Confederate Negro.

[53]Brewer, Confederate Negro, 51.

[54]Brewer, Confederate Negro. 59.

[55]Brewer, Confederate Negro. 60.

slave plus the food and clothing he received made "his pay excel that of any white man in the shop."[56]

The Richmond facility made extensive use of Black labor as did all of the naval ordnance establishments. Richmond, Tredegar, and Selma along with other naval ordnance facilities advertised for the hire of slaves. By 1862 the Richmond works had thirty-six Blacks employed in the shop, and in 1865 this number had increased to forty-two, with many of them being skilled technicians.[57] Catesby Jones, writing to Brooke from Selma complained that the work there was being hampered for the want of slaves.[58] Selma was later to advertise for one hundred slaves while Tredegar increased its advertised quota to a thousand.[59] While the total number of Blacks used in the naval works is impossible to compute, in February of 1865 Brooke reported to Mallory that the establishments under his control employed a total of 541 Blacks and 532 Whites.[60]

One of the most detrimental aspects of the labor problem was the fierce rivalries that developed over the skilled workmen. This competition involved private industry, the army, and the navy. In September, 1862 McRae wrote the Navy Department accusing Commander Ebenezer Farrand, who was superintending the building of two ironclads at Selma, of luring

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[56] Dew, Ironmaker to the Confederacy, 263.

[57] Brewer, Confederate Negro, 32.

[58] Brooke to Mallory, February 1, 1865, Letters Sent, Office of Ordnance and Hydrography, R. G. 109, NA.

[59] Dew, Ironmaker to the Confederacy, 234.

[60] Brooke to Mallory, February 1, 1865, Letters Sent, Office of Ordnance and Hydrography, R. G. 109, NA.

foundry mechanics away by offering higher wages. The next month McRae complained that Farrand had not only lured a "good many mechanics from me" but now "has caused the balance of my men to demand higher wages."[61] As a result of this, McRae found himself having to let go seven of his eighteen moulders, and he bitterly complained to Mallory that far from providing assistance the Navy Department was hindering him. McRae was not the only officer to have problems with Farrand; later Catesby Jones found that a number of his mechanics demanded to be paid wages equivalent to those Farrand was paying.[62] To complete the circle Tredegar lodged complaints with Mallory stating:

> Our operations for your department are now being interfered with to such an extent by the efforts of establishments elsewhere, especially Selma, to draw off our hands that we beg to invoke your prompt and serious attention to the subject.[63]

The struggle between various naval works was intense, but it was overshadowed by the army-navy rivalry. At Selma this struggle resulted in Colonel J. L. White, commander of the arsenal, sending the provost marshall to the naval foundry to arrest a navy employee.[64] Jones, in a message to White after the incident, stated that "this establishment is under the exclusive control of the Navy and no other authority will be

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[61] McRae to Jossiah Gorgas, October 24, 1862, McRae Papers.

[62] Jones to Captain Ebenezer Farrand, June 10, 1863, Letterbook of the Office of Ordnance and Hydrography, R. G. 45, NA.

[63] Anderson and Company to Mallory, December 11, 1862, Tredegar Letterbook, cited in Dew, Ironmaker to the Confederacy, 239.

[64] Jones to J. L. White, July 16, 1862, Selma Foundry Letterbook, R. G. 45, NA.

recognized by me."[65] These complaints eventually resulted in Secretary of War Seddon suggesting to Mallory that "consultations between the officers of the respective Departments commanding establishments at the same post" would provide a solution.[66] Although a sensible suggestion, it is doubtful that this would have solved the problem and, at any event, it was never tried.

The struggle revolved around the wage scale, which was aggravated by rampant inflation in the Confederacy. With this rapid inflation in the South, workmen's wages, particularly skilled workers wages, were constantly on the increase. The Confederate government attempted to control prices by regulating the price the government could be charged for certain goods. Though no real attempt was made to regulate the open market, the Conscription Act of 1862 set seventy-five percent of the cost of production as the legal limit on profits.[67] The Bureau of Ordnance and Hydrography, however, considered this profit margin excessive and limited manufacturers to a profit level of twenty-five to thirty-three and one third percent.[68] Wage scales differed from one area to another. After losing a large number of workmen to various army and naval establishments, Tredegar sought to arrange an agreement with the government on wages, claiming that only a general agreement on wages and a mutual pledge

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[65] Jones to White, July 16, 1862, Selma Foundry Letterbook, R. G. 45, NA.

[66] Secretary of War James Seddon to Mallory, October 21, 1863, Letterbook of the Office of Ordnance and Hydrography, R. G. 45, NA.

[67] Dew, Ironmaker to the Confederacy, 223.

[68] Dew, Ironmaker to the Confederacy, 223.

not to make unilateral advances could "prevent demoralization in our establishment."[69]

To make matters worse the policy of detailing men to industries (private and governmental) created dissension since detailed soldiers were limited to regular military pay plus rations or, in lieu of that, $3.00 per day.[70] The Secretary of War pointed out in April, 1864 that this was an entirely inadequate wage considering the areas where manufacturing facilities were located. He went on to note that the higher pay for civilian workers caused dissension and low morale among the military personnel that were detailed to factories. At Seddon's recommendation Congress in June of 1864 passed a law dealing with the problem.[71] The bill, modeled on the Secretary's suggestions, called for regular military pay, rations, and wages of $2.00 a day plus extra compensation for "extraordinary skill and superior workmanship."[72] The general orders putting this law into effect were issued in August and set the standard of extra pay allowed a mechanic at $6.00 a day, and stated that wages paid details by private companies ". . . shall conform as nearly as possible to the wages received by similar classes in the employ of the government."[73]

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[69]Dew, Ironmaker to the Confederacy, 240.

[70]Dew, Ironmaker to the Confederacy, 241.

[71]Dew, Ironmaker to the Confederacy, 241.

[72]"An Act to provide for the Compensation of Non-Commissioned Officers, Soldiers, Sailors, and Marines on detailed service," Official Records (Army), Ser. IV, III, 493, 591-592.

[73]General Order Number 66, Official Records (Army), Ser. IV, III, 591-592.

In many shops this represented a wage increase of 100 per cent.[74] This meant that a first class mechanic earned $16.00 per day, a yearly income of $6,000, while a member of Congress received $5,550 a year. Even at this rate, by 1865 Confederate mechanics were slipping behind in their fight with inflation. Mallory stated in February, 1865 "one year ago we paid mechanics an average of seven dollars a day, and we are now paying, in money and allowances, fourteen. In the private establishments of the country, private mechanics were receiving twenty-thirty dollars a day," and this forced government establishments to increase their compensation.[75]

Mallory illustrated the problem of inflation by pointing out that in Richmond the price of beef in 1865 was $7.00 per pound compared to a prewar price of twelve and one-half cents, and a barrel of flour was now $700.00 compared to a prewar price of only $6.00.[76] Overall this was an increase of eighty-six percent in the cost of these two basic necessities.

The result of the inflation, the disparity in wages, and the overall economic situation was strikes, slowdowns, and walkouts. McCorkle, in charge of the ordnance works at Atlanta, wrote Catesby Jones in 1864 complaining that his men had struck ". . . because Governor Brown . . . has given that price to the men in state and road shops . . . ."[77] Jones

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[74]Dew, Ironmaker to the Confederacy, 241.

[75]Mallory to Albert G. Brown, February 18, 1865, Letterbook of Office of Ordnance and Hydrography, R. G. 45, NA.

[76]Mallory to Brown, February 18, 1865, Letterbook of Office of Ordnance and Hydrography, R. G. 45, NA.

[77]McCorkle to Catesby Jones, n.d., Official Records (Navy), Ser. I, XXI, 870.

himself complained that many of his men had left and that some were now working for the enemy. The work stoppage, dissension, and desertion caused by the economic situation cannot be underestimated. Production at Atlanta, Selma, and other facilities was severely hampered by this problem.

Work was also delayed by the fact that the laborers were organized into military units. Lieutenant Robert Minor, in charge of the naval station at Richmond, wrote in July, 1864 that "... . wrought or cast iron bolts for the seven inch gun can not be supplied by the naval ordnance workshops as the employees . . . are now in the field."[78] At the end of the summer Minor was to complain that the military situation required his workers to spend "the greater part of the summer in the field."[79] Frequent interruptions at Richmond caused by the necessity of workers manning the city defenses, "seriously retarded, and in some instances entirely suspended, the progress of important work," Mallory reported to Davis.[80] The production of ordnance at Atlanta was threatened by enemy forces in June, 1864. Consequently, McCorkle moved most of the machinery and stores to Augusta. Work here was delayed by the chaotic situation arising out of the defeat of Hood by Sherman. Later McCorkle would remove the machinery and equipment to Fayetteville, North Carolina, to avoid enemy forces. The invasion of the South interrupted the production of ordnance, because laborers had to fight the Federal

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[78] Still, Confederate Shipbuilding, 73.

[79] Still, Confederate Shipbuilding, 73.

[80] Still, Confederate Shipbuilding, 74.

forces or had to move equipment to safer areas to continue production.

There can be no question that the lack of skilled labor was one of the most serious problems that the Bureau of Ordnance and Hydrography faced during the war. Though hampered by a lack of manufacturing facilities, raw materials, and transportation the naval ordnance establishments were nonetheless able to maintain some production as long as they were able to obtain skilled labor. In the final analysis, Confederate authorities were never able to solve the complex labor problems with which they were faced. By trying to fill her constantly depleting armies, the South had to draw from its economic front a higher percentage of manpower than the North. Though sporadic attempts were made to solve the problem, it was never successfully resolved. By the end of the war, the complaints were not primarily concerned with the lack of machinery but the lack of labor.

Yet even though the Confederate Bureau of Ordnance and Hydrography failed in its attempt to secure enough skilled laborers to work its industrial facilities at full capacity, the bureau did succeed in developing the necessary manufacturing establishments. The development of these manufacturing facilities was a notable success in itself and this, along with the development of an improved rifled cannon, were the major accomplishments of the Confederate Bureau of Ordnance and Hydrography.

CHAPTER V

THE DEVELOPMENT OF THE BROOKE GUN

In the beginning of the nineteenth century, ordnance was still basically the same as that produced three hundred years earlier. Regardless of their size guns up to this time were generally smooth-bores and were made from a single homogenous casting.[1] The only improvements had been in the casting, the powder used in the charges, and in the ability to cut the bores more precisely for better fitting projectiles.[2] The nineteenth century, however, was to see a revolution in ordnance. During this century there would be four major improvements in ordnance: the adoption of rifling, the change to breech-loading, the development of recoil mechanisms, and the improvements in interior ballistics.[3] The Brooke gun was to incorporate some of these improvements and it was in many ways a culmination of the ordnance experiments of the early part of the nineteenth century.

Some of the early work with rifled cannon in this century was done by Major Cavelli of Italy and Baron Wahrendoff of Germany.[4] These men laid the ground work for the experiments that would eventually lead to the Brooke gun. In 1846 they developed simultaneously and independently

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[1] Bernard Brodie, Sea Power in the Machine Age (Princeton, 1941), 182, hereinafter cited as B. Brodie, Sea Power.

[2] B. Brodie, Sea Power, 182.

[3] Bernard and Fawn Brodie, From Crossbow to H-Bomb (Bloomington, 1937), 139-140, hereinafter cited as B. and F. Brodie, Crossbow to H-Bomb.

[4] B. and F. Brodie, Crossbow to H-Bomb, 139.

a rifled breech-loading cannon.[5] This was a major step toward the development of modern ordnance. The rifle differed from the smooth-bore in that the rifled gun imparted a gyroscopic action to the shot.[6]

In the past gunnery regulations had always provided for a certain amount of windage which served to assure easier and quicker loading. Windage, the space between the cannon ball and the barrel of the cannon, caused an excessive loss of power due to the escape of the gases which some experts have estimated to have been as much as one quarter of the power of the total explosion.[7] Excessive windage also resulted in the eccentric flight of the ball down the barrel of the gun, which in turn caused a loss of accuracy as well as exaggerated wear on the barrel.[8] However, many artillerists of the period considered windage necessary to prevent unusual strain on the weapon, and some shells, such as the Paxihans, made use of the windage for the ignition of the fuse.[9]

With the development of the rifled gun, there was not as great a problem with windage. This was a result of the fact that in a rifled gun jamming was very unlikely and a reduction of the powder charge compensated for the lack of an escape route for the gases.[10] The rifled ordnance also offered other advantages such as a great increase in the

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[5]Albert Manucy, Artillery Through the Ages (Washington, 1949), 14, hereinafter cited as Manucy, Artillery.

[6]Manucy, Artillery, 14.

[7]B. Brodie, Sea Power, 187.

[8]B. Brodie, Sea Power, 187.

[9]B. Brodie, Sea Power, 187.

[10]B. Brodie, Sea Power, 189.

accuracy of the gun. The passage of the projectiles down the bore in a line parallel to the axis of the bore resulted in an accuracy of fire that was previously unknown. The rifled weapon also made use of elongated projectiles which helped to increase range. The elongated projectile always presented the same axis to the wind and could be designed with lines more suited to the penetration of air. The mass of the elongated shot was greater in proportion to the resistance met than was the mass of the spherical shot.[11] Since air resistance increases with the velocity of the projectile at a very steep curve according to geometric progression, a spherical shot fired at a certain muzzle velocity would be impeded in the first portion of its flight by a resistance many times greater than that met by an elongated projectile which was fired at a lower muzzle velocity. The lower rate of retardation enabled the rifled projectile to retain a greater residual velocity than a spherical shot. The major problem with rifled guns, which Brooke would have to solve if his gun was to be successful, was directly related to the rifled gun's advantages. The rifling of guns and the use of elongated projectiles caused a diminution of power in the weapons. An elongated projectile, if solid, had a mass greater than a spherical shot of the same caliber. The added inertia of this mass caused greater pressure in the chamber when the gun was discharged and often resulted in the bursting of the gun. This it was necessary to reduce the propelling charge when firing elongated

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[11]Report on Heavy Rifled Guns Development, January 8, 1863, Big Gun File, Naval Records Collection of the Office of Naval Records Library, Record Group 45, National Archives, Washington, D. C., hereinafter cited as Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

projectiles. The amount of powder used had to be not only less in proportion to the weight of the shot, but it was also smaller in absolute quantity than the amount for spherical shot. As a result of this reduction in the charge, both the velocity of the projectile as it left the muzzle and the impact with which it struck the target were greatly reduced. It appeared in the 1850's that rifled weapons were not the answer to the problem of penetrating iron plating since penetration required both high velocity and high energy impact.

During this period the United States was a leader in ordnance experimentation. One of the most important aspects of the Brooke gun was adopted from Professor Daniel Treadwell's research. Treadwell, of Harvard University, was involved in producing a limited number of guns for the United States government during the 1840's. Treadwell's guns were the first made in the country to be "built up" or "hooped." Brooke was very familiar with Treadwell's work entitled, "On the Practicability of Constructing Cannon of Great Calibre Capable of Enduring Long Continued Use Under Full Charges," and in his report to Secretary Mallory, Brooke quoted extensively from it.[12] Treadwell first cast weapons for the United States government in 1843, but the principles he developed were not adopted until the introduction of ironclads.[13]

Treadwell proposed to:

> . . . form a body for the gun containing the calibre and breech . . . but with walls of only about ½ the thickness of the diameter of the bore. Upon this body I will place

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[12] B. Brodie, Sea Power, 184-185.

[13] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

> rings or hoops of wrought iron in one, two or three or more layers.[14]

The purpose of Treadwell's experiments was to overcome the problem of the lack of power of the rifled gun caused by the necessity of reducing the charge in the chamber. Treadwell felt that with several layers of "rings" ". . . that the body of the gun and the several layers will be distended to the facturing point at the same time and thus all take a portion of the strain."[15] The Armstrong gun, developed by William Armstrong also utilized the built up principle with tubes constructed by coiling wrought iron bars. The fibers of the material were thus arranged in the direction of the tangential strain, which made the gun the strongest in the direction that the most strength was required.[16] However, even the forty and seventy pound rifled Armstrong guns were less effective against armor than were the old sixty-eight pounder smooth-bores.[17]

Experiments with the hooped or built up gun had begun as early as 1829. At this time, A. Thiery, Chief of Squadron in the French army, had conducted experiments in which the basic principles of hooped construction were clearly stated.[18] Brooke would later find it necessary to review Thiery's experiments when he began to develop the Brooke gun. Thiery was trying to obtain the advantages of wrought iron construction

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[14] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[15] B. Brodie, Sea Power, 195.

[16] B. Brodie, Sea Power, 195.

[17] B. and F. Brodie, Crossbow to H-Bomb, 141-142.

[18] B. Brodie, Sea Power, 194.

and at the same time avoid its defects in costliness and lack of durability. He succeeded by shrinking a wrought iron "envelope" over a cast iron barrel.

The principle of "hooped" construction was to be the key to the development of the Brooke gun. The compression of rings or hoops around the bore submitted the inner coil to considerable compressive pressure. The effect was to help prevent the ignition of the powder from causing the inner barrel to expand beyond its elasticity, since before this could happen, compression had to be overcome.[19] The external cylinder fortified the resistance of the barrel from the very instant of the explosion.

In 1856 the United States Navy adopted the Dahlgren gun which was designed by Commander John A. Dahlgren.[20] At the time of its adoption the Dahlgren was one of the most powerful weapons in the world. Dahlgren, in designing the weapon, had made use of recent advances in interior ballistics. The Dahlgren was so constructed that the thickness of metal along the bore increased corresponding to the change in internal pressures.[21] This was the smooth-bore which the United States Navy would rely on primarily throughout the Civil War. The Dahlgren was produced in three calibers: the nine-inch, the ten-inch, and the eleven-inch. A few fifteen-inch Dahlgrens were made but manufacture was discontinued. The eleven-inch Dahlgren with a thirty-pound charge was clearly superior

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[19] B. Brodie, Sea Power, 182.

[20] Carlin, Naval Encyclopedia, 621.

[21] B. Brodie, Sea Power, 182.

in armor smashing ability to British ordnance of the same period.[22] The Dahlgren was the first improved ordnance to be adopted by the naval service during this period.

Another major step forward was taken when Major Thomas J. Rodman of the United States Army developed an improved method of casting. Rodman cast a smooth-bore gun with a hollow bore but chilled the interior first so that the exterior shrank upon a hardened interior.[23] Thus when the weapon was fired, the interior received support from the instant of explosion rather than after the expansion of the gases. The Rodman method was used to cast the Dahlgren gun during the Civil War and this produced one of the most powerful smooth-bores of the war.

Robert Parrot was another whose experiments in ordnance helped to give Brooke the idea of using bands to strengthen the gun.[24] In the latter part of the 1850's Parrot developed a muzzle loading rifled gun that was made of cast iron. The most distinctive part of Parrot's weapon was a wrought iron band placed around the breech.[25] This gave the weapon added strength so that larger charges of powder could be used. Brooke would later carry this idea to the logical extreme and add extra bands which would give the Brooke gun even more strength. The Parrot gun was to be the standard rifled piece of the United States Navy during the Civil

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[22]Carlin, Naval Encyclopedia, 621.

[23]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[24]Eugene B. Canfield, Notes on Naval Ordnance of the American Civil War 1861-1865 (Washington, 1960), 7, hereinafter cited as Canfield, Naval Ordnance.

[25]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

War. Nevertheless, the Dahlgren smooth-bore would remain as the navy's principal weapon until the 1880's. The Parrot gun was used to supplement the broadside guns which were generally Dahlgrens.

John Brooke was thoroughly familiar with the experiments of Dahlgren, Parrot, and Rodman as well as the experiments that were taking place in France and England. His knowledge on this subject is truly impressive and he quotes from American, French, and English journals in his report to Mallory on the Brooke gun.[26]

When Brooke first resigned from the United States Navy, he was appointed to the staff of General Robert E. Lee as a naval aide.[27] Brooke and Lee developed a relationship of mutual trust and respect and Brooke was sorry to leave the general's staff.[28] With the formation of the Confederate States Navy, however, Brooke felt that he could serve the Confederacy better in the navy. On May 6, 1861 Brooke began his first contact with Stephen Mallory.[29] In a letter to Mallory, Brooke suggested that the purchase of an ironclad in France would greatly help offset the preponderance of Union ships.[30] This was the beginning of the relationship between Brooke and Mallory that would give Brooke the support and authority he would need to develop the Brooke gun. Mallory evidently agreed with Brooke because a few days later he asked Congress to appropriate the necessary funds for just such an enterprise. Mallory was

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[26]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[27]Brooke, "John M. Brooke," II, 754.

[28]Brooke, "John M. Brooke," II, 760.

[29]Brooke, "John M. Brooke," II, 760-761.

[30]Brooke, "John M. Brooke," II, 760-761.

obviously impressed with Brooke and he was one of the first individuals Mallory conferred with when he arrived in Richmond.[31] Even before Brooke had officially transferred from Lee's staff, Mallory was making use of his talents.[32]

On September 27, 1861 Brooke wrote his wife that the designs of cannon that he had been working on were being requested ". . . with all possible dispatch."[33] A few days later on November 2, 1861 Brooke recorded in his diary that by ". . . order of the Secretary of Navy I have designed two rifled cannon of 7 inch calibre for the Virginia."[34] Brooke envisioned a battery of both smooth-bore and rifled guns for the Virginia. The smooth-bores were to be nine-inch Dahlgrens which could fire shells and heated shot, the most effective projectiles for use against a wooden ship.[35] The rifled guns would possess both a greater range and accuracy than the smooth-bores and would be able to fire shells, solid shot, or wrought-iron "bolts."[36] These rifled guns designed for the Virginia were the first Brooke guns.

The Brooke guns produced during the war were of several calibers: the 6.4-inch rifled, the seven-inch rifled, the eight-inch rifled, and

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[31] Brooke, "John M. Brooke," II, 763.

[32] Brooke, "John M. Brooke," II, 764-765.

[33] Brooke, "John M. Brooke," II, 798.

[34] Brooke, "John M. Brooke," II, 798.

[35] Dew, Ironmaker to the Confederacy, 171.

[36] Dew, Ironmaker to the Confederacy, 171.

the ten and eleven-inch smooth-bores.[37] In January of 1863, Brooke wrote for Mallory a detailed report of the guns he had designed. In this report, Brooke traced the developments in ordnance over the recent decades and indicated that the ideas involved in the design of his guns were not new.[38] Included in his study were the reports of various ordnance experts who had attempted to develop a rifled gun that would withstand heavy powder charges. Brooke also described the various experiments that were performed with the Brooke gun. When testing was done by someone other than himself, Brooke includes extracts of the individual's report.

In the first part of his report Brooke stated:

> The sustained efforts made during the past few years to improve the ordnance of England, France and the United States has placed at our disposal results of numerous escperiments (sic) demonstrating the appliability of certain principles of construction by which sufficient strength may be obtained to permit the employment in rifles of heavy elongated, solid-shot; with the high charges required to give them velocities nearly equal to those hitherto obtained with smooth-bores.[39]

In making this statement Brooke was claiming to understand how to eliminate the basic problem with rifled cannon. It must be remembered that the elongated shot has a heavier mass than the spherical projectile and as a result requires a greater charge to overcome the initial resistance. The increase of the mass resulted in added inertia which

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[37] Carlin, Naval Encyclopedia, 621; Brooke, "John M. Brooke," II, 850-851.

[38] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[39] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

caused greater pressure in the chamber and often resulted in the bursting of the gun. The Parrot gun was not trusted by many naval officers because of its tendency to burst.[40] The key to a successful rifled gun was to strengthen it in order to increase the initial velocity. This could be done by increasing the charge of powder to bring it nearly equal with that of the smooth-bore. Then since the elongated projectile met with less resistance than the spherical shot, the actual penetrating power of the rifled gun could be increased so as to be much greater than that of the smooth-bore. However, many ordnance experts such as Dahlgren doubted that this could be done. Dahlgren went so far as to state ". . . naval smooth-bore ordnance will not be surpassed by rifles."[41]

In his report to Mallory, Brooke outlined the various experiments that had preceded his and allowed him to draw the conclusion he did. Brooke stated that:

> In constructing a gun to throw heavy elongated projectiles we have to provide for an increased charge and the additional strain due to the suppression of windage by the close fitting rifled projectile or its sabot and the resistance it encounters from the inclination of the groove from which it derives its rotation . . . .[42]

He felt that the ". . . simplest and most direct method of proceeding was to determine what form of projectile of sufficient size was best adapted to the penetration of armor."[43] Thus the development

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[40] Carlin, Naval Encyclopedia, 621; B. Brodie, Sea Power, 189.

[41] Cited in Brooke, "John M. Brooke," II, 830-831.

[42] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[43] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

of the Brooke's gun was tied directly to the development of his wrought-iron "bolt." Brooke realized from the results of experiments abroad that cast iron was unsuitable for this type of projectile and steel was unavailable, so he turned to wrought iron, the only other material which he had in sufficient quantities.[44] In Brooke's design the head of the "bolt" was slightly tapered. The result of this tapering was to compress the iron in upon the axis of the "bolt" thus condensing the head.[45] It was necessary for the "bolt" to be designed in this manner because of the machinery available with which to construct the bolts. To obtain rotation, which was essential to the accuracy of the projectile, the ". . . metal was turned out of the base leaving a thin lipped cup similar to that of the Minie ball, and to ensure expansion a groove was turned around the bolt."[46] These Brooke "bolts" were first tested on March 11, 1862 when they were fired from a three-inch Parrot gun with a charge of one and one-half pounds at a target of oak nine inches thick faced with iron plates.[47] The plates were six inches wide by two inches thick and were firmly bolted to the target.[48] With only a one and one-half pound charge being used, the target was placed fifty feet from the muzzle of the gun. The first "bolt" fired weighing eight and one-half pounds ". . . perforated the plate and splintered the

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[44] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[45] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[46] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[47] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[48] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

timber backing."[49] After other tests it was concluded that the "bolt" had armor penetrating ability.[50]

Brooke reported to Mallory that in view of past experiments:

> we are justified in assuming that a vast iron cylinder; terminated by a hemisphere, and bored out to the calibre required, with walls of sufficient thickness to give such proportion between the areas of longitudinal and traverse sections as will tend to equalize the strength of the gun to resist longitudinal and cross fracture will bear the charges of one-sixth the weight of a well proportioned projectile which with the expanding sabot is sufficient to give the required velocity.[51]

Brooke analyzed Treadwell's mistakes and noted that the Harvard professor did not ". . . consider in connection with the area cross-section the compressibility of the metal forming the bottom of the bore, by which the power of resistance to cross fracture is materially diminished."[52] Thus Brooke felt that he could give the weapon a greater thickness of cast iron than would have generally been required and thus, ". . . control the weight of the gun with reference to recoil . . ." and ". . . modify the shock of the explosion which may be supposed to act more or less injuriously upon the band."[53] While Treadwell had advocated the necessity of bands with screw threads which ". . . fit a corresponding screw or thread upon the body of the gun . . .," Brooke felt that these could be dispensed with ". . . as the fibers of wrought-

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[49] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[50] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[51] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[52] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[53] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

iron hoops shrunk upon the gun, and lying transversely serve the purpose of a screw thread."[54] Treadwell had also recommended welding the trunnions to the bands shrunk upon the cast iron.[55] Brooke rejected this idea and stated that it would be preferable to weld the trunnions to a band ". . . thicker than the others, bored to fit smoothly, without shrinking, and to transfer the shock of the recoil from the body of the gun to a strap closely fitting around the breech and attached to the trunnions."[56]

By doing this, Brooke was able to avoid disturbing the bands and to eliminate the strain of recoil which often caused cross fractures.[57] Thus Brooke was able to cause the breech to derive support during recoil from the straps.[58]

Brooke also recognized that in the past many artillerists had placed their hoops or bands only at the breech of the weapon. Dahlgren and others had proven that the strain on the gun diminished rapidly as the projectile traveled down the barrel. Brooke recognized that this was the great advantage of the Dahlgren gun, ". . . the ability to adjust the preponderance of the weapon without weakening the gun."[59] Brooke disagreed with Parrot's positioning of the bands and stated, ". . . it

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[54]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[55]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[56]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[57]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[58]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[59]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

must be remembered that the charges of rifles occupy a greater length of the bore in proportion to the calibre than those of smooth-bores."[60] Thus the maximum point of strain would be more advanced in a rifle than a smooth-bore, and as a result Brooke determined to place his bands further up the bore. This was, in Brooke's view, the Parrot gun's weakness since it was banded only at the breech while most of the strain on the weapon occurred just in advance of this.[61] It is extremely interesting to note that there is not a single known case of a Brooke gun bursting except as a result of faulty workmanship, raw materials, or the mishandling of the weapon by the gun crew. On the other hand a large number of Parrot guns were known to have burst.[62]

Brooke believed that his gun combined the advantages of several types and considered it superior to most guns in production:

> In considering the method of construction applied to the English gun, which fails to give increase strength to resist crossfracture it will appear that the heavy cast iron tube of the Confederate process contains certain advantages: the Bronze ratchet sabot enables us to obtain the requisite rotation of the projectiles without weakening the gun by the introduction of a polygonal base.[63]

The first gun Brooke designed was a 6.4-inch rifled cannon to weigh

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[60]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[61]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[62]Brooke to Jones, September 18, 1864, Brooke to Jones, December 19, 1863, William Brooke to William Garret, February, 1864, Charles W. Stewart, Superintendent of Library and Naval War Records, to _____, 1909, Big Gun File, R. G. 45, NA, Brooke to Jones, June 14, 1864, Brooke to Jones, March 21, 1864, Brooke to Jones, March 22, 1864, Brooke to Jones, February 12, 1864, Ordnance and Ammunition File, R. G. 45, NA; Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[63]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

9,000 pounds.[64] This gun was designed primarily as a broadside weapon. Brooke intended this type gun to fire shells of 110 pounds and "bolts" of 120 pounds. Two of the 6.4-inch guns were placed on the Virginia. Both this gun and the seven-inch rifle Brooke gun were designed in October, 1861 and both were first used on the Virginia. The seven-inch gun weighed 15,000 pounds.[65]

On October 22, 1862 the 6.4-inch Brooke gun was tested against a target composed of three layers of eight by two inch iron bolted on an oak backing seventeen inches thick.[66] The plates were arranged so that the outer ones were vertical and the inner plates laid horizontally to the target at a distance of one hundred yards from the gun.[67] The first "bolt" fired at the target weighed seventy pounds and was fired with an eight pound charge.[68] The result was that the "bolt" made such an impression in the plates, that "the second plate was broken into three pieces and the middle piece was forced against the wood bending the two of them suddenly."[69] However, using an eight pound charge it was not until the third shot that all the plates were broken and the oak backing splintered.[70] On the next day the same test was repeated using

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[64]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[65]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[66]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[67]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[68]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[69]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[70]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

a twelve pound charge. The results were very impressive as ". . . it (the shot) passed through the three layers of iron and the oak backing glancing up through the heavy earth backing in the rear of the target."[71]

Even though this weapon was clearly more powerful than the 6.4-inch Parrot gun, Brooke was still not satisfied. A second series of bands was added to his 6.4-inch gun to give it even more power.[72] Since this resulted in a weapon that was too heavy to handle easily, Brooke redesigned the gun so that the weight increase would be only 2,000 pounds and the new strength of the weapon would be a maximum of 65,693 pounds per square inch.[73]

The seven-inch gun was also redesigned and the thickness of the cast iron reduced and a second series of bands was added so that the strength of the weapon was increased to 61,642 pounds per square inch.[74]

Brooke was pleased with the results of tests with the seven-inch double banded gun. During one of the tests an armored target was set up composed of four layers of two inch iron plate and twenty-two inches of timber backing. With the seven-inch Brooke ". . . broke three layers of plates so that the pieces came out, and broke the remaining plate and

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[71]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA. It is interesting to note that the Monitor only had five inches of iron plate. See Douglass C. Browne, The Floating Bulwark, (New York, 1963), 147. The standard charge for a 6.4 inch Parrot gun firing a 150 pound shell was ten pounds. See Canfield, Naval Ordnance, 8.

[72]Canfield, Naval Ordnance, 8.

[73]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[74]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

pushed it firmly into the wood."[75] This test was conducted at a range of two hundred yards with a charge of twenty-five pounds of powder propelling a one hundred and forty pound Brooke "bolt."[76] Experiments such as these showed that Brooke was entirely correct when he stated that ". . . with high charges wrought iron bolts may be driven through the thickest armor yet applied."[77]

The Virginia was armed with bolt 6.4-inch and seven-inch Brooke guns during her engagement with the Monitor. Though the Monitor had only five inches of armor these plates were not penetrated during the battle because of the Virginia's lack of proper ammunition. It had taken almost the total resources of the Confederate Bureau of Ordnance and Hydrography just to supply shells and rifled guns for the ship and as a result the Virginia was not supplied with Brooke "bolts."[78] The decision to supply the Virginia with shells instead of "bolts" was really a wise one because shells were the most effective projectiles against wooden vessels, and until March 9 the Monitor was merely a reported threat. There was, however, no doubt in Brooke's mind had the Monitor accepted Flag Officer Joseph Tattnall's offer of battle on April 11 that ". . . her turret would have been destroyed."[79] The Virginia had been armed with five Brooke "bolts" by this time and Brooke felt sure that

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[75]Alexander M. DeBree to George Minor, November 24, 1862, B. G. File, R. G. 45, NA.

[76]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[77]Brooke, "John M. Brooke," II, 827.

[78]Brooke, "John M. Brooke," II, 827.

[79]Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

these "bolts" would have penetrated the Monitor's armor. But as it was, only shells were fired from the Virginia and these were not designed to be used against an ironclad.[80] Brooke, however, felt that Dahlgren should have realized that the Monitor was vulnerable to the Brooke guns because when the Monitor was inspected by an ordnance team they should have noted the importance of the fact that the vessel was struck only by "soft" shells.[81]

In an attempt to develop an even more powerful gun Brooke treble banded his seven-inch gun. This was an exceptionally long gun; the distance from the cascable to the muzzle was thirteen feet and three inches.[82] Brooke proposed to fire "bolts" from this weapon weighing over 3,000 pounds.[83] To test this weapon a target composed of pine boards was set up six hundred and seventy-five yards away from the gun. A twenty-five pound charge of powder was used to fire a one hundred and sixteen pound "bolt" at the target.[84] This first shot passed over the target and ". . . penetrated 16 feet into solid earth."[85] The test continued and the second shot,

> was made with 20 pounds of powder and a cast bolt of the same description as the first . . . this shot also passed over a few feet above the target and penetrated a solid rock four feet and then through

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[80] Brooke, "John M. Brooke," II, 828.

[81] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[82] Brooke, "John M. Brooke," II, 828.

[83] Brooke, "John M. Brooke," II, 828.

[84] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

[85] Alexander M. DeBree to George Minor, November 24, 1862, B. G. File, R. G. 45, NA.

> twelve feet of earth. The third shot was made with 17 pounds of powder . . . and penetrated the target a little to the right and below center and also about twelve feet of earth.[86]

Assistant Inspector of Ordnance Alexander M. DeBree who conducted the test reported that the gun was highly successful.[87] He wrote that, ". . . the gun will stand a 25 pound charge with perfect safety and a higher charge if necessary."[88] Brooke was able to succeed in his attempt to increase the ability of the rifle to stand high charges of powder. The eight-inch or one hundred and fifty pound Parrot gun could only use sixteen pounds of powder per charge while the fifteen-inch Dahlgren smooth-bore used twenty-five pounds per charge.[89] The treble banded Brooke gun as clearly indicated by this data was able to stand a much greater strain and therefore was a more powerful weapon than the eight-inch Parrot gun. These experiments proved that Brooke was entirely correct in his belief that, ". . . with high charges wrought iron bolts may be driven through the thickest armor yet applied . . . .[90]

Thus Brooke by the judicious use of strategically placed bands was able to open a new era in the development of ordnance. Prior to the Brooke gun, rifled ordnance had been considered unacceptable as the standard weapon of any navy. This was because, even though they had been proven to have greater range and accuracy, rifles were unable to with-

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[86] DeBree to Minor, November 24, 1862, B. G. File, R. G. 45, NA.

[87] DeBree to Minor, November 24, 1862, B. G. File, R. G. 45, NA.

[88] DeBree to Minor, November 24, 1862, B. G. File, R. G. 45, NA.

[89] Canfield, Naval Ordnance, 8.

[90] Brooke Report on Heavy Rifled Guns, B. G. File, R. G. 45, NA.

stand the heavy powder charges necessary to achieve the same effect as smooth-bores. The Brooke gun proved that rifled cannon could be produced that would withstand the strain of heavy powder charges and this helped pave the way for the development of modern ordnance.

The Brooke gun was to prove its worth time after time. In an action at Drewry's Bluff during May of 1862 the Brooke gun was most effective. Drewry's Bluff was a fortified position overlooking the James River. The bluff was located seven miles below Richmond and the James River at this point was less than a mile wide. The Confederate strategy for the defense of the James River called for token resistance at Wharf's Landing and Hardin's Line Bluff and then a concentrated defense at Drewry's Bluff.[91] Rear Admiral Louis M. Goldsborough, commander of the North Atlantic Blockading Squadron, complained that officers he had sent up the James had failed to follow his orders and destroy all enemy works.[92] While Goldsborough was upbraiding his officers for their failure to carry out his orders, General Robert E. Lee reported:

> In addition to the three guns originally at Drewry's Bluff several navy guns have been mounted, and every exertion is being made to render the obstructions effective and the battery commanding them as formidable as possible.[93]

The weapons added by Commander John R. Tucker of the Confederate States Navy brought the total number of guns in the battery to ten: nine rifled

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[91] Scharf, History of the Confederate Navy, 710.

[92] Scharf, History of the Confederate Navy, 710.

[93] Scharf, History of the Confederate Navy, 710.

Brooke guns and one ten-inch Columbiad.[94]

On May 15, 1862, a Union flotilla consisting of the ironclads Monitor, Galena, and Naugatuck along with the wooden gunboats Aroostock and Port Royal attacked the Confederate position at Drewry's Bluff.[95] The Galena and the other Union vessels pulled within six hundred yards of the Confederate battery.[96] Commander John R. Tucker had ordered the Confederate gunners to concentrate their fire on the Galena.[97] The Galena quickly proved that she was not shot proof as fire from the Brooke guns penetrated her iron skin and its wood backing.[98] The ability of the Brooke rifles to penetrate the Galena over eighteen times conclusively proved Brooke's thesis that banded guns would allow a sufficient charge to impart to the projectiles the needed power for penetration through iron plating. The Monitor was only struck three times during the four hour engagement.[99] In his report to Admiral Goldsborough, Commander John Rodgers stated:

> We demonstrated that she (the Galena) is not shot proof; balls came through and many men were killed with fragments of her own iron. One penetrated just above the water line

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[94]Cited in Scharf, History of the Confederate Navy, 710.

[95]Report of Captain John Rodgers to Rear Admiral Louis M. Goldsborough, May 18, 1862, Letters Received by the Secretary of the Navy from Commanding Officers of Squadrons, Naval Records Collection of the Office of Naval Records, Record Group 45, National Archives, Washington, D. C., Microfilm Publication M89, Roll 159, hereinafter cited as LR from Squadron Commanders, R. G. 45, NA, M89.

[96]Scharf, History of the Confederate Navy, 711.

[97]Scharf, History of the Confederate Navy, 714.

[98]Scharf, History of the Confederate Navy, 714.

[99]Scharf, History of the Confederate Navy, 714.

> and exploded in the steerage. The greater part of the balls after breaking the iron stuck in the wood. No shot penetrated the spar deck but in three places there are large holes one of them a yard long and about eight inches wide . . . .[100]

Commander Rodgers also indicated in his report that the cannon the Confederates had mounted on the bluff were rifled.[101] This was not the first indication of powerful Confederate weapons that the Union had received. Commander William Armstrong, commanding the State of Georgia, off Wilmington, North Carolina, reported to Goldsborough that ". . . the Rebels are very active in strengthening their fortifications, and have . . . Rifle guns of great range."[102] A report to Goldsborough after a brief expedition up the York River yielded this information: ". . . concerning batteries placed on the York River . . . their cannon are managed and serviced with surprising accuracy exceeding anything we have heretofore known . . . ."[103]

However, probably the clearest indication of the power of the Brooke gun came with the Federal attack on Charleston. On April 7, 1863 a Union fleet of nine armored vessels, seven of which were monitors, attacked Charleston, South Carolina. The attack was repulsed by the Con-

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[100] Report of Captain John Rodgers to Rear Admiral Louis M. Goldsborough, May 18, 1862, LR from Squadron Commanders, R. G. 45, NA, M89.

[101] Report of Captain John Rodgers to Rear Admiral Louis M. Goldsborough, May 18, 1862, LR from Squadron Commanders, R. G. 45, NA, M89.

[102] Commander William Armstrong to Rear Admiral Louis M. Goldsborough, August 24, 1862, LR from Squadron Commanders, R. G. 45, NA, M89.

[103] _____ to Rear Admiral Louis M. Goldsborough, April 27, 1862, LR from Squadron Commanders, R. G. 45, NA, M89.

federates and according to Rear Admiral Sammuel F. DuPont, commander of the attacking fleet, if the Union forces had continued to press their attack ". . . it would have converted a failure into a disaster."[104] During a period of two hours, the Confederates fired an estimated 2,200 rounds at the Union fleet at ranges varying between five hundred and fifty and six hundred yards. DuPont reported to Secretary of the Navy Gideon Welles that while he had hoped that the ironclads could withstand the fire, he found ". . . so large a portion of them were wholly or one-half disabled by less than an hours engagement . . ." that a persistance in the attack ". . . would have only resulted in the loss of the greater portion of the ironclad fleet.[105]

Captain Percival Drayton, on the ironclad Passic, realized the power of the rifled Brooke gun when a shot from one at 1400 yards:

> struck the upper part of the turret, broke all eleven of its plates, and then glancing upward, struck the pilot house with such force as to make an indentation of 2½ inches extending nearly the whole length of the shot. The blow was so severe as to considerably mash in the pilot house, bend it over, open the plates, and squeeze out the top, so that on one side it was lifted up three inches above the top on which it rested, exposing the insides of the pilot house and rendering it likely the next shot would take off the top itself.[106]

Donald Fairfax, who commanded another Union ironclad during the attack, stated in his report to DuPont that:

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[104] Sammuel F. DuPont to Gideon Welles, April 8, 1863, Official Records (Navy), Ser. I, XIV, 3.

[105] DuPont to Welles, April 15, 1865, Official Records (Navy), Ser. I, XIV, 10.

[106] William Brooke to Willi Garret, February 1864, B. G. File, R. G. 45, NA; Captain Percival Drayton to Sammuel F. DuPont, April 8, 1863, Official Records (Navy), Ser. I, XIV, 16.

> the effect of their fire upon the Keokuk together with that of their heavy rifle shot upon the monitor, is sufficient proof that no one vessel could have long stood the concentrated fire of the enemy's batteries.[107]

John Downes, commander of the ironclad Nahant, in his report to DuPont stated that:

> the effect of the blows from the heavy shot . . . one of these breaking off a piece of iron weighing 78 pounds . . . throwing it with such violence to the other side of the house, striking, bending, and disarranging steering gear . . . in the smokestack armor there are three shot marks one that pierced the armor, making a hole 15 inches long and 9 inches broad . . . one shot struck the upper part of the turret, breaking through every plate, parting some of them in two, three, and four pieces . . . .[108]

The Union forces also suffered the complete loss of one vessel, the Keokuk. This vessel took position about five hundred yards off Fort Sumter and maintained it for about thirty minutes.[109] During this time the Keokuk was struck ninety times and ". . . nineteen shots pierced her at and just below the water line."[110] Commander Alexander C. Rhind, who commanded the Keokuk during the attack, stated that ". . . her turrets were pierced in many places, one of the forward port shutters shot away, in short the vessel was completely riddled . . . finding it impossible to keep her afloat many minutes more, during which rifle pro-

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[107]Commander Donald M. Fairfax to DuPont, April 18, 1863, Official Records (Navy), Ser. I, VIX, 17.

[108]Report of Commander John Downes, April 13, 1863, Official Records (Navy), Ser. I, XIV, 21-22.

[109]Alexander C. Rhind to DuPont, April 8, 1863, Official Records (Navy), Ser. I, XIV, 23.

[110]Rhind to DuPont, April 8, 1863, April 8, 1863, Official Records (Navy), Ser. I, XIV, 23.

jectiles of every species and the largest calibre were poured into us . . . ."[111]

After the attack on Charleston, Brooke requested information on the performance of his guns. Major Louis K. Huger, an artillery officer stationed at Fort Sumter, wrote that two seven-inch Brooke guns on the eastern face of the fort were ". . . alone available."[112] Forty-two and forty-five shots were fired respectively from the guns and the ". . . effect of these was decidely greater than any other we had."[113] While heavy Confederate smooth-bores helped to contribute to the victory, the Brooke rifle was the only gun to penetrate through the iron plating of the Union vessels.[114] In fact the power of the Brooke gun was so great that many Northerners refused to believe that they were cast iron. The Philadelphia American Gazette on April 18, 1863 stated:

> It has been demonstrated beyond dispute that we want for more effective naval ordnance, guns that will at least be equal to those furnished by the Rebels . . . The eleven and fifteen inch cast iron guns cannot compete with the rifled wrought iron cannon as the conflict at Charleston so conclusively proves. How shall we meet what is now known to be the great perfection obtained in guns in the Rebel service . . . .[115]

The Gazette went on to suggest that the United States import as many

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[111]Rhind to DuPont, April 18, 1863, Official Records (Navy), Ser. I, XIV, 23.

[112]Louis K. Huger to John Brooke, August 16, 1863, B. G. File, R. G. 45, NA.

[113]Huger to Brooke, August 18, 1863, B. G. File, R. G. 45, NA.

[114]William Brooke to William Garret, February 1864, B. G. File, R. G. 45, NA.

[115]Philadelphia American Gazette, April 18, 1863.

". . . Whitworths as the enemy."[116] The article noted that the powerful Confederate guns had in about three-quarters of an hour so seriously damaged five out of the nine ironclads that they were unable to fight.[117]

The Brooke gun became known not only for its power but also for its endurance. A correspondent for the London Times noted that the great success in the area of ordnance ". . . in this war is the Brooke rifle . . .," and that the ". . . results obtained with this gun would astonish Europe."[118] A smooth-bore of unusual endurance would stand 3,000 to 4,000 firings. A rifle was not expected to last that long as the pressure on the bore was four or five times as great.[119] However, several Brooke guns were reported to have fired more than 2,000 rounds without significant deterioration.[120]

It is interesting to compare the reactions of Confederate officers using the Brooke gun to the reactions of Union officers using the Parrot gun. Early in the war many Union commanders desired to have rifled ordnance placed at their disposal. Admiral Louis Goldsborough in a report to Secretary of the Navy Welles written in 1861 stated:

> I must say that from all the observations I can make a rifled Gun of 8, 9, or 10 inch caliber would be more effective and much more easily handled

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116 Philadelphia American Gazette, April 18, 1863.

117 Philadelphia American Gazette, April 18, 1863.

118 William Garret, February 1864, B. G. File, R. G. 45, NA.

119 William Garret, February 1864, B. G. File, R. G. 45, NA.

120 Charles Stewart, Superintendent of Library and Naval War Records, to _____, 1909, B. G. File, 45, NA.

I repeat I would prefer a Rifled Gun.[121]

Many Union commanders such as C. J. Gleson felt that rebel blockade runners escaped due to the lack of rifled ordnance aboard Union ships.[122] However, by January 24, 1865 David Dixon Porter and many other Union naval officers had rejected the Parrot gun. Porter stated that:

> I have repudiated the Parrot gun altogether, but have written the Bureau of Ordnance requesting that two 20 pounder brass Dahlgren rifles be sent to you . . . .[123]

The Bureau of Ordnance and Hydrography was also concerned about the reliability of the Parrot gun and to help reduce the strain on the gun the charge was reduced from sixteen to ten pounds in 1862.[124] However, as a result on continuing complaints from officers the charge was reduced even more. On January 14, 1865 the charge was reduced from ten to eight pounds.[125]

Reports from Confederate officers on the Brooke gun were complimentary throughout the war. Lieutenant Catesby Jones on April 4, 1862 sent the Confederate Bureau of Ordnance and Hydrography its first report

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[121]Louis M. Goldsborough to Gideon Welles, July 2, 1861, LR, From Squadron Commanders, R. G. 45, NA, M89.

[122]O. J. Gleson to Louis M. Goldsborough, February 14, 1862, LR, From Squadron Commanders, R. G. 45, NA. M89.

[123]David Dixon Porter to William H. Harcourt, January 24, 1865, Letters Received from Naval Officers, Records of the Bureau of Ordnance, Record Group 74, National Archives, Washington, D. C. hereinafter cited as R. G. 74, NA.

[124]Circular of the Bureau of Ordnance and Hydrography, December 29, 1862, Records of the Board on Rifled Guns, R. G. 74, NA.

[125]Circular of the Bureau of Ordnance and Hydrography, January 14, 1865, B. G. File, R. G. 45, NA.

on the Brooke gun's success in battle. Jones stated that he had used only twelve pounds of powder in the seven-inch gun and only seven pounds in the 6.4-inch guns.[126] Even with these small charges Jones stated that ". . . the gun was one of great accuracy and power."[127] This opinion was seconded by Lieutenant Charles Simms who had charge of one of the Virginia's guns. Later Brooke tested double and triple banded guns which could use greater charges. In February of 1863, Brooke guns designed for the C.S.S. Richmond were fired at a target composed of four layers of two-inch iron plate and twenty-two inches of timber. The seven-inch Brooke gun (treble banded) was fired at this target at a range of 200 yards with a twenty-five pound charge and ". . . broke through three layers of plates so that the pieces came out and broke the remaining plate and pushed it firmly into the wood."[128] Assistant Inspector of Ordnance Alexander M. DeBree who conducted the test considered it "highly successful" and stated that the treble banded Brooke gun could use a charge of twenty-five pounds with perfect safety.[129] It should be remembered that the charge for the eight-inch Parrot was reduced from sixteen to eight pounds while the charge for the Brooke gun was increased. After the Charleston engagement Brooke was complimented

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[126]Lieutenant Catesby Jones, Executive and Ordnance Officer of C.S.S. Virginia, to George Minor, April 4, Ordnance and Ammunition File, R. G. 45, NA.

[127]Jones to Minor, April 4, 1862, Ordnance and Ammunition File, R. G. 45, NA.

[128]Alexander M. DeBree to George Minor, November 24, 1862, B. G. File, R. G. 45, NA.

[129]DeBree to Minor, November 24, 1862, B. G. File, R. G. 45, NA.

on the successful performance of his gun by various army officers including General Pierre G. T. Beauregard.[130]

Although Union forces captured a large number of Brooke rifles during the war apparently no serious testing of these was done. The captured Brooke guns were stored at the Philadelphia Navy Yard, Pensacola Navy Yard, New Orleans, and at the Washington Navy Yard.[131] Lieutenant William Mitchell in requesting instructions as to the disposal of the armament of the Confederate ironclad Tennessee wrote, "the Guns of the Tennessee are of the "Brooke" pattern, banded and rifled and I suppose will never be fired again . . . ."[132]

The failure of the United States Navy to test the rifled Brooke guns was a result of a definite preference for smooth-bores on the part of many high ranking naval officers. Louis M. Forbes, a naval ordnance inspector, reflected this bias when he inspected a Blakely rifle and stated

> I have made a personal examination of the Blakely rifle gun . . . . In my opinion the Blakely rifles from their exterior form and defects exhibited in their construction are unsuitable for naval purposes.[133]

John Dahlgren as Chief of the Bureau of Ordnance and Hydrography

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[130]Lieutenant Nicholas H. Van Zandt to John M. Brooke, May 1, 1863, B. G. File, R. G. 45, NA.

[131]Commander William H. Macourt to Lt. Commander William Adams, September 11, 1865, William Mitchell to Henry Wise, September 11, 1865, William Mitchell to Henry Wise, September 25, 1865, Letters Received from Naval Officers, R. G. 74, NA, 71.

[132]Mitchell to Wise, September 25, 1865, Letters Received from Naval Officers, R. G. 74, NA, 71.

[133]Louis M. Forbes to Henry Wise, October 5, 1865, Letters Received from Naval Officers, R. G. 74, NA, 68.

had clearly preferred smooth-bores and even after the war he refused to believe that rifled ordnance could ever replace the smooth-bore. In answer to a request passed on from the Secretary of Navy for a trial for the Armstrong gun, Commander Henry Wise, Dahlgren's successor, stated that he would convene a board if Secretary Welles so ordered but that it would be a waste of time and money since the result ". . . which is already known, is a continued preference for our own manufacture."[134] In other letters to the naval secretary Wise indicated his own mistrust of rifled guns and suggested that the United States rely on smooth-bores until new rifled guns were developed.[135] As a result of this feeling on the part of many high ranking Union officers no official tests were conducted. However, it is clear that John Brooke and the Confederate Bureau of Ordnance and Hydrography developed a high velocity, rifled naval gun superior to the U. S. Naval ordnance until the 1880's.

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[134]Wise to Welles, February 15, 1865, Letters Sent to the Secretary of the Navy and the Chiefs of Naval Bureaus, R. G. 74, NA.

[135]Wise to Welles, October 20, 1865, Letters Sent to the Secretary of Navy and the Chiefs of Naval Bureaus, R. G. 74, NA.

CHAPTER VI

CONCLUSIONS

This study has attempted to describe the efforts of the Confederate Bureau of Ordnance and Hydrography to develop and produce weapons for the Confederate States Navy. Secretary of the Navy Mallory and his subordinates faced many problems, not only industrial but also psychological. The Confederate navy was considered by most Southerners to be relatively unimportant, and Mallory had to fight extremely hard for an appropriate share of the military budget. The press, Confederate Officials, army officers, and many of the Southern people derided the Confederate navy during the Civil War.

The Confederate navy made important contributions to the war effort. The Bureau of Ordnance and Hydrography was the most successful of the navy's departments. The bureau was able, in the short time available, to develop the physical facilities that enabled it to become a major producer of guns, powder, gun carriages, shot, and shell. A number of historians have blamed the South's lack of industry for her inability to carry on a successful war effort. It is true that the industrial base of the South was weak at the beginning of the war. However, as has been shown in this study, the Confederate Bureau of Ordnance and Hydrography was able to develop the necessary facilities for the production of essential war materials. The major weaknesses of the South, however, lay in her transportation system and her lack of skilled labor. The labor problem was compounded by the failure of the Confederacy to develop any comprehensive labor plan until late in the war. In 1861 the South probably had enough skilled artisans to provide an adequate labor base.

Many of these artisans were aliens and with the outbreak of the war, they fled. Most of the remainder were swept into the army without regard to the fact that they were needed in the factories throughout the South. This resulted in a severe labor shortage that became more acute because of the bitter struggle for skilled workmen among the various branches of the Confederate government and industries.

The only other major problem the Confederate Bureau of Ordnance and Hydrography faced that it was unable to solve was that of raw materials. While the South had large deposits of most of the natural resources needed to manufacture the munitions of war, the Confederacy was denied access to many of these by the Union armies, and furthermore was often unable to move available resources to their manufacturing centers. The Bureau of Ordnance and Hydrography developed plants at Richmond, Charlotte, Atlanta, Selma, and in cooperation with Tredegar, these manufacturing centers could supply all of the needs of the Confederate States Navy. However, these establishments were not able to operate at full capacity at any time during the war, even when there was an adequate supply of labor, as a result of the lack of raw materials. Tredegar never operated at more than one-third capacity and never received a single ton of Alabama coal during the war. The Confederacy's raw materials were spread out, with coal and iron located in large deposits in the lower South. The transportation system, primarily railroads, was inadequate and failed to provide an effective link between the different sections of the country. The result was that the raw materials did not reach the manufacturing centers in adequate amounts. Decreased production of weapons and materials of war, and an increase in the

number of defective weapons were the results.

Despite the problems of transportation and raw materials, and labor, the bureau continued to produce ordnance and ordnance stores. The Brooke gun was the greatest accomplishment of the Bureau of Ordnance and Hydrography. The first Brooke guns were not as powerful as the later ones would be since Brooke continued to improve them throughout the war. This weapon gave the Confederacy a standard piece which it could use to defend its harbors and arm its vessels. The extensive damage done to the Union ironclads at Charleston serves to give proof of the power of the Confederate navy's standard weapon.

The successes of the Bureau of Ordnance and Hydrography are impressive. The fact that the bureau could develop the physical facilities needed and continue to operate them, though not at full capacity, throughout the war stands out as one of the Confederacy's major triumphs.

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