Naval War College Review

Volume 52
Number 2 *Spring*

Article 6

1999

Building the Military-Industrial Relationship: The U.S. Navy and American Business, 1854-1883

Kurt Hackemer

Building the Military-Industrial Relationship
The U.S. Navy and American Business, 1854–1883

Kurt Hackemer

FOR MUCH OF THE NINETEENTH CENTURY, the United States Navy wrestled with the problem of incorporating new and essential technologies into the fleet. Rapid advances in naval science created managerial problems as the naval bureaucracy tried to figure out how to incorporate technologies like steam propulsion, iron cladding, and steel warship design without losing control over the shipbuilding process. A lack of basic facilities and technical sophistication forced the Navy to turn to private companies for much of this technology, which in turn compelled the service to alter its administrative practices in an effort to maintain control over the construction of its warships. The forced interaction and modified administrative procedures created closer ties between the Navy and private industry that ultimately produced the nascent military-industrial complex of the 1880s and 1890s.

The Navy dabbled in modernizing the fleet with steam technology during the 1830s and 1840s, but the political climate would not support much experimentation. Things began to change in the late 1840s and early 1850s. Bolstered by the emerging doctrine of Manifest Destiny, Southern hopes of a slave empire in the Caribbean and Latin America, and the spirited politics of "Young America," naval expansion became more acceptable to a broader spectrum of the country's populace. Young America in particular breathed new life into a stagnant foreign policy, with its efforts to increase America's standing in the world community. The Navy became an obvious instrument for the accomplishment

Dr. Hackemer earned a B.A. degree from the University of Chicago in 1989, an M.A. from Texas A&M University in 1991, and a Ph.D. from Texas A&M in 1994. He is an assistant professor at the University of South Dakota, where he has taught since 1996. He is currently working on a book-length manuscript based on the ideas presented in this article. For their advice and counsel at various stages of this project, the author would like to thank Professors Joseph G. Dawson III and James C. Bradford.

Naval War College Review, Spring 1999, Vol. LII, No. 2

of its goals, and for the first time in many years the growth of the fleet became politically feasible.[1]

Still, there were problems not so easily fixed by the changing winds of politics. The steam technology that powered modern war vessels was in a constant state of flux. Even the professional engineers of the Navy Department found it difficult to keep up with each new advance, and they preferred to make recommendations about equipment only after careful study and comparison. No universally acknowledged design for steam power plants yet existed; each ship's engine was a unique piece of machinery, attuned to the peculiarities of that particular vessel. A team of engineers might agree on the basic components, but each vessel had its own idiosyncrasies. Such an approach almost guaranteed mistakes and miscalculations, as was the case with well publicized failures of USS *Allegheny*, *Princeton*, and *San Jacinto*.

The Navy completed the *Allegheny* in 1847 as an experimental vessel mounting the Hunter wheel, an internal horizontal paddle wheel that proved a remarkable failure. The ship was rebuilt in 1851–52 as a conventional screw steamer and rejoined the fleet, but it never performed satisfactorily, one journal reporting it "completely disabled . . . in her first engagement with the enemy (wind and tide and fair weather)." Repairs made during active service and the alterations made in 1851–52 added over $150,000 of work to a vessel that originally cost $242,595.92.

The *Princeton* was a rebuilt version of a vessel originally designed by John Ericsson. Constructed at the Boston Navy Yard, it faced delay after delay as the engine builders and the Navy argued about the installation of the machinery. Part of the problem stemmed from the Secretary of the Navy at the time, William A. Graham, who never fully understood the implications of steam warships and exercised insufficient leadership when strong direction was sorely needed. When the ship was finally launched in November of 1852, its steam plant proved such a disappointment that the ship was taken back to port and "put in the hands of the doctors; but this time a change has been made in the practice, and there is some hope for the better, although but little can be expected where the patient has suffered so badly from malpractice." The *Princeton* retired soon after from active service and ended its career as a receiving ship.

The construction of the *San Jacinto*, launched at New York in April 1850, ruined several naval careers. The Navy's conscious effort to avoid royalty payments on existing patents saddled the vessel with flawed engines, an off-center shaft, and an obsolete propeller. The nation's engineering establishment almost universally damned the *San Jacinto*'s machinery before it ever built up a head of steam. Unfortunately, the power plant lived up to their low expectations. When Secretary of the Navy James C. Dobbin ordered new engines from a different builder and demanded guarantees for their performance, one leading technical journal observed that "in departing from the usage of the Department,

the Secretary has made a bold stand for the right," hardly a ringing endorsement of the Navy's past practices.[2]

Despite these recent failures, there was substantial political support for expansion. Secretary Dobbin made his case in December 1853 in his annual report. Although controversial in some of its aspects, Dobbin's program was presented without the vitriol usually associated with such appeals, and it proved politically acceptable to enough senators and representatives to receive the required support. Dobbin devoted much of his report to expansion of the fleet, painting a bleak portrait of the Navy's current condition and pointing out that the fleet could not hope to contend with America's European rivals. The geography of the United States only made matters worse; with two thousand miles of Atlantic and Gulf coastline and California recently added on the Pacific side, the nation was susceptible to seaborne aggression. Add to that the impressive tonnage of the vulnerable American merchant marine, and the country's shortage of adequate naval protection verged on the embarrassing. Still, Dobbin knew where to start—with the immediate construction of six steam, propeller warships. These frigates would mount fifty guns each, making them the equals of any steam warship afloat. In light of the materials on hand and those readily available from suppliers, Dobbin thought that these ships could be built and launched within twenty months of their authorization. On 6 April 1854, after a bitter but brief floor fight, Congress appropriated three million dollars for construction of the *Merrimack*, *Wabash*, *Minnesota*, *Roanoke*, *Colorado*, and *Niagara*.[3]

Despite apparent political success in the authorizing of the six steam frigates, the Navy still faced serious obstacles. A congressional mandate for "economy and efficiency" meant that the ships had to be built around previously stocked hull frames never intended for vessels of this size. Design difficulties were not the only problem; the department had to overcome its own recent history of technological failures and mismanaged contracts for steam machinery. The frigates were to be constructed in government yards, but inadequate facilities throughout the Navy meant that the power plants would have to be built by independent contractors. Secretary Dobbin would have preferred that the Navy build the engines itself, and he declared himself embarrassed "on account of the Governments [*sic*] being so entirely dependent upon private establishments" for their construction. The only naval facility capable of manufacturing marine engines—and only in limited quantities—was the Washington Navy Yard. The secretary found himself with no alternative but to turn to the network of private companies along the East Coast that traditionally supplied the Navy's machinery needs.[4]

Dobbin placed an advertisement for steam machinery in the *National Daily Intelligencer* in early July. The secretary used the opportunity to make recent changes in contract guarantees a matter of policy. Machinery contracts awarded

to private engine builders in the 1830s and 1840s had been relatively unsophisticated, and they had favored the contractor. For example, in the case of the *Missouri* and *Mississippi*, the Navy issued the contract, assigned an engineer to supervise construction, inspected the finished product, took possession, and paid the contractor in full. Possession terminated the engine builder's responsibility, much to the Navy's chagrin in some instances. In 1853, Dobbin began addressing the problem of substandard power plants by attaching a performance guarantee to a contract for a new set of engines for the *San Jacinto*. He expanded on this precedent in advertising for the new frigates' steam engines, making clear the following terms of payment:

> When one-third of the work provided for by the contract shall have been completed to the satisfaction of the Department, there shall be a payment of one-fifth of the whole amount of the contract; when two-thirds of the work shall, in like manner, be completed, there shall be a further payment of one-fifth; when the ship shall have made a trial trip, satisfactory to the Department, of not less than one week at sea, there shall be a further payment of one-fifth; and when the ship shall have been in the possession of the Department, and performed satisfactorily for six months, the remaining sum shall be paid; the repairs necessary during this period, from defective workmanship and material, being at the expense of the contractor.[5]

As if that were not enough, Dobbin required that bidders awarded contracts by the Navy post a secured bond equal in value to three-fourths of the amount of the contract. A bidder that could not meet the terms of the contract forfeited the bond.

Clearly, the Navy's relationship with private contractors was changing. As building programs went from the occasional steamship, often experimental, to entire classes, it was to change even more, most notably in that procedures became more formalized and contractors became more accountable for their craftsmanship. The uncertainty of experimentation still exerted some influence, but the sheer size of the building programs and their funding, coupled with the notable failures of the preceding decade, led to closer supervision of contracts. Of course, mistakes were still made, but by 1854 the Navy had recognized the scope of the problem and had taken realistic steps to correct it.

Subcontracting power plants to private establishments proved to be good for the Navy in both cost and efficiency. The Washington Navy Yard constructed one set of engines for the new class, for a total cost of $170,445. The remaining five plants, manufactured by private firms, cost an average of $169,647. Although all of the engines "require[d] some repairs within three years," the Secretary of the Navy noted in 1860, "the duration of the machinery built at private establishments has been the same as that built at the Washington yard."[6] These engines were far from perfect, but it seems that the mechanical problems and difficulties with contractors experienced by the Navy during the late 1840s

and early 1850s had been at least partially alleviated by the rigid controls and requirements enforced by Secretary Dobbin during the frigates' construction. The Navy thought so; the performance guarantees became standard policy for all subsequent engine and hull contracts.[7]

The outbreak of civil war in the spring of 1861 found the Union woefully short of ships of all kinds. With the Navy's limited shipbuilding capabilities quickly overwhelmed, the overtaxed bureaus turned of necessity to private industry for the construction of entire warships. The Navy quickly found itself once again confronted by a new technology clearly beyond its capabilities. Caught up in the chaos of wartime expansion but recognizing that it needed some way of monitoring private contractors, the Navy turned to the administrative mechanisms that had recently worked in peacetime.

In no case were private contractors more important than in the construction of the first ironclads. Secretary of the Navy Gideon Welles decided early on that the already overworked government yards—New York, Philadelphia, Washington, Boston, and Kittery, Maine—would not be responsible for construction of the first ironclads. On 7 August 1861 he published an advertisement soliciting "offers from parties who are able to execute work of this kind, and who are engaged in it, of which they will furnish evidence with their offer, for the construction of one or more iron-clad steam vessels of war, either of iron or of wood and iron combined, for sea or river service." Building on the Navy's prewar experience, he demanded that each offer "be accompanied by a guarantee for the proper execution of the contract, if awarded."[8] A naval board of three officers reviewed all plans submitted and recommended that three be built: the *Monitor*, a true, shallow-draft ironclad; the *New Ironsides*, an oceangoing cruiser; and the *Galena*, a hybrid gunboat traditional in appearance—and in the event a remarkable failure.[9]

The *Galena*'s contract, similar to those awarded for construction of the *Monitor* and *New Ironsides*, illustrates how the Navy applied its prewar experience with new technology. On 27 September 1861 the United States, represented by Gideon Welles, entered into a contract with Cornelius S. Bushnell & Company. The agreement contained safeguards designed to protect the government's interests. It allowed the Navy to assign to the project a superintendent, who had "the right to reject any of the materials and work which shall not be of the best quality." More importantly, the contract dictated that as the contractors submitted approved bills (in increments of at least twenty thousand dollars), the Department of the Navy would disburse three-quarters of the sums, the remaining 25 percent to be paid "after completion and delivery and satisfactory trial." Based on the Navy's experience with similar conditions during the construction of engines and hulls, the trial requirement seemed logical, and the clause was inserted as a matter of course.[10]

Design modifications and delays marred the *Galena*'s construction. The primary points of contention concerned the implementation of the new ironclad technology, as the contractor and the government's representatives debated the ship's design during the winter of 1861–1862. The deck plan was modified to accommodate revisions in the armor and ordnance required by the Navy. This was followed by changes in the steering mechanism and iron underlay, and finally by a complete redesign of the armor plating. The Navy's old nemesis, the steam power plant, also suffered from delays. Hampered by all the other changes being made to the vessel, the contractors could not get the engines installed on schedule.[11]

The deadline for launching, 27 January 1862, came and went. Tired of the delays and excuses, Commodore Joseph Smith, the bureau chief who oversaw construction of the first ironclads, finally took action. Invoking the provisions of the contract, he told the supervising naval constructor that "the Department has decided to make no further payments to the contractors until the vessel shall have been completed and accepted." Smith later partly relented in his threat to cut off payments, ordering funds released on 15 February to pay for the armor installed to date. However, the government still withheld a substantial portion of the contract price, pending successful completion and testing of the vessel.[12]

Finally, after further delays and more broken promises, Bushnell delivered the nearly finished vessel—on 15 April 1862, a critical time for the Union. Although the USS *Monitor* had turned back the CSS *Virginia* in Hampton Roads in early March, the Confederate ironclad still lurked up the James River, threatening to come down and complete the destruction of the wooden blockading squadron that was denying vital supplies to the Confederacy. No one knew if the *Monitor* could repeat its earlier feat, and all officers concerned eagerly awaited the new ironclad. With the *Galena* in its hands, the Navy rushed to finish construction, outfit the ship, and get it into combat. The work continued unabated for the next week as laborers and officers attended to the final details. On 21 April the Navy formally commissioned the *Galena*. Delivery and commissioning led to the release of more funds to the contractors, but the government still retained over fifty-six thousand dollars pending a successful trial, as called for in the contract. The following day, the *Galena* left New York for Hampton Roads.[13]

Shortly after the *Galena*'s arrival at Fortress Monroe on 24 April, and while the officers at the scene assessed the ironclad's combat readiness, Cornelius Bushnell began haggling with Commodore Smith over the final payment for the vessel. Bushnell himself journeyed to Hampton Roads on behalf of his partners, who hoped "you will get the money for the 'Galena' & *bring it back* with you." Bushnell thought he could sway the commodore on some minor issues, but his visit proved less than successful. The resolute naval officer refused to budge, and Bushnell left for New York on 2 May. Having refused to bow to

pressure from the contractor, Smith, using the precedent set in the steam frigate contracts back in 1854, suspended further payments and waited for "the report of the test of the *Galena*," after which "the Bureau will present its claim for damage in not complying with your contract" with respect to the completion date.[14]

Even as Smith considered the tests mentioned in Bushnell's contract, the gunboat steamed up the James River for its first test of another kind—combat. Confederate gunners emplaced atop Drewry's Bluff guarding the approaches to Richmond clearly got the best of the *Galena* in a prolonged engagement on 15 May, hitting the ironclad forty-three times. No area of the ship escaped the Confederates' attention. The *Galena*'s executive officer catalogued broken armor, gaping holes in the deck, broken timbers, shattered planking, damaged bulkheads, and a number of rounds still lodged in the hull. In short, the ironclad had suffered extensive damage.[15]

Despite the urgent need for major repairs, the *Galena* remained on station. The Navy made what on-site repairs it could, but the vessel was never again the same. It spent the summer of 1862 supporting General George McClellan's laborious movement up the Peninsula, providing fire support, covering troop movements, and harassing the enemy whenever possible. Although battered, its psychological impact as an ironclad made it worth more than any other ship in the James River Flotilla. Blinded by the almost mystical term "ironclad," the Confederates could not accurately assess its capabilities, which justified the reluctance to send the vessel to a navy yard for proper repairs.[16]

Its military and psychological impact aside, the *Galena* was an item purchased by the Navy from Bushnell & Company, and the status of the final payment on the ironclad's contract remained in doubt during the early summer months of 1862. Less than one week after the *Galena*'s return from Drewry's Bluff, Smith sent a note to the ship's captain asking him to arrange for a series of trials "for twelve consecutive hours in smooth water" to determine whether or not the terms of the contract had been met. The distance involved implied an ocean test, for which the *Galena* was clearly not suited at the time. Smith did not know the extent of the damage at the time of his request, but when he found out, he was, he assured Bushnell, "mortified." Although uncertain about what course of action to pursue in light of the ship's combat failure, he told the contractor, he was sure that the government would find "it necessary to withhold all further payments on account of that vessel."[17]

Unfortunately, Smith found himself in a race with time. Because of the damage inflicted at Drewry's Bluff, the Navy could be tripped up by its own contract conditions. The agreement with Bushnell & Company stipulated that the government had ninety days from the time of delivery to conduct a series of sea trials for the ship and power plant. Smith was confident that a report "will no doubt be received, and acted upon before the ninety days provided for the trial

of the vessel expires"; when it was, he would follow through on the terms of the contract—and deny funds to Bushnell, for having delayed construction and delivery. Still, he wrote Rear Admiral Louis Goldsborough, commander of the North Atlantic Blockading Squadron, and asked him to push along the trials. Recognizing the extent of the damage inflicted on the *Galena* at Drewry's Bluff, Smith gave up the idea of an ocean test, asking instead that the ironclad make a day's run down the James River.[18]

For a variety of reasons, Smith's request could not be accommodated. The deadline passed, and the Navy, ironically, fell victim to the terms of the contract, terms that had seemed to work so well during the peacetime construction of the steam frigates. Reluctantly, Smith informed Bushnell that "the time having expired within which tests of her performance should have been made, the Secretary of the Navy will not, under all the circumstances, enforce a claim for damage for non-compliance of contract in regard to time of completion." Smith was forced to relinquish the money that had been held back pending successful completion of trials, and he authorized the payment of thirty thousand dollars to the contractor in late July. On 6 August 1862, Cornelius S. Bushnell & Company received the final installment of $26,134.74. Clearly, the contract guarantees that were supposed to help manage the introduction of ironclad technology into the fleet had failed.[19]

The prewar administrative mechanism had given the Navy an effective measure of control over the building of frigate engines by private contractors because engines were what it had been designed for. Although a major component whose complexity exceeded that of the hull itself, the power plant was only one part among many. Other components under the direct control of the various bureaus, such as the hull, stores, and rigging, were addressed by different mechanisms, usually through the bureau chains of command. In peacetime the Navy also had time on its side; despite occasional political pressure, the Secretary of the Navy could always stall for a few weeks with no adverse effects.

The war had changed everything. In applying to the construction of entire ships—let alone to state-of-the-art ironclads—an administrative device that had been designed, however successfully, for a particular component system, the Navy lost the kind of day-to-day control it had enjoyed in its own shipyards, pegging its hopes instead on a comprehensive examination of the finished product. The government assigned on-site inspectors to these projects, but they had limited power over the contractors. The sheer magnitude and speed of construction overwhelmed the administrative mechanism. The pressures of war destroyed any remaining flexibility, because the Navy no longer had the luxury of extra time. The need to bring ironclad warships into combat was very real; excessive delays might prove disastrous. As a result, the prewar contract mechanism hurt the Navy as much as it helped. However, valuable lessons had been

learned, especially the need for greater oversight and more stringent contract requirements when working with private contractors.

Even as the Navy experimented with the ironclad contracts, it introduced in the fall of 1861 standard, preprinted contract forms for both steam machinery and hulls that reflected its antebellum experience. These forms were regularly modified over the course of the war, but their basic requirements stayed the same. Like the antebellum agreements, they called for a superintending engineer "who shall have the power to inspect [the machinery] at all times, and to peremptorily reject in any stage of its progress any materials, or articles, or any piece or part, which he may consider defective." Similarly, they released the United States from any financial obligations incurred for the use of patented mechanisms; prohibited members of Congress, naval officers, or government employees from profiting by the contract; and allowed the United States to seize the machinery or hull if the contractor could not deliver it as promised.[20]

Several refinements reflected antebellum experience. As before, the forms set up a payment schedule that allowed the government to withhold a portion of the contract price pending a successful sea trial. However, echoing the *Galena* contract, they called for a percentage of the final price to be withheld rather than a specific dollar amount. This gave the Navy more flexibility, allowing the government to make design changes and price adjustments without sacrificing control over a given project. The amount of time a contractor had to build and deliver the machinery would be determined on a case basis, but the contracts left blanks for specific delivery dates, to be filled in when a contract was signed.[21]

Reflecting the Navy's experience with the *Galena*, contracts printed in 1862 established strict procedures for the trial and acceptance of the contracted items. A power-plant contract offers a typical example of the tougher standards. First, after delivery the plant would undergo "one hundred and forty-four consecutive hours under steam of the maximum pressure that the boilers can be made to furnish." Second, for the three months following this marathon trial, "there shall be no deterioration or depreciation of the materials of which any of the machinery and its appurtenances are composed beyond that of ordinary friction." In addition, "there shall be no fracture of any of the parts from imperfection in design of detail, or from faulty workmanship." Finally, the machinery had to maintain at least a minimum condenser vacuum throughout the trial—a difficulty common in early steam propulsion plants. Of course, the Navy took on obligations during the trial period: it had thirty days from the time of delivery to prepare the vessel for sea and get the 144-hour trial under way; any additional time wasted would be deducted from the three-month follow-up, after which time the contractor would receive the withheld funds.[22]

The new contract forms represented more than just wishful thinking by the Navy Department; they were broadly applied to all kinds of naval construction throughout the war. For example, historian and naval engineer Frank M.

Bennett lists seventy-six ships contracted for by the Navy in 1862; the power plants for at least thirty-eight of them were built under the new terms. The Navy used similar contracts for entire classes of warships, including the nine *Canonicus*-class monitors ordered in September 1862 as well as steam-powered wooden gunboats that soon seemed to be everywhere.

The relationship between government and private industry was slowly changing. Contracts devised in the 1840s and early 1850s had been for individual ships or power plants and had met the limited needs of a particular situation. Things changed slightly in the mid-1850s, when a contract might be duplicated to cover all of the ships or machinery for a particular class, as in the case of the *Merrimack*-class frigates or the *Hartford*-class sloops. The complexity and uncertainty of the first wartime ironclads caused a regression to individual contracts. However, by the end of 1861 the Navy had found itself almost overwhelmed by the sheer number of vessels required for the successful prosecution of the war. Drawing upon its experience, the Navy settled on a series of conditions and obligations that could be applied in a variety of situations. Still, throughout this contractual evolution one theme remained constant: the Navy intended to retain as much control as possible over the shipbuilding process.[23]

The increasing number of contracts, with firms located all along the eastern seaboard, led to the creation of an office in New York City to oversee ship machinery contracts with private companies. Although the "monitor bureau" was nominally headed by Rear Admiral Francis H. Gregory, Chief Engineer Alban C. Stimers actually ran it. The oversight measures carried out by Stimers's office forged solid and long-lasting relationships with the most prominent shipbuilding firms in the country. These relationships were built around rules and regulations that applied equally to all contractors. Maintaining close correspondence with each contractor, the Navy also began to deal with contractors as a group, "to establish rules . . . explaining the course to be pursued in all cases." For example, a circular letter drafted by Stimers's office in August 1863 explaining the procedure for modifying ironclad contracts went out to twelve companies; another, sent in October 1863, was addressed to twenty-five firms.[24]

As the war went on the Navy dramatically expanded the number of companies with which it did business, because, as the *Army and Navy Journal* reported as late as September 1864, "the greatest difficulty in preparing the numerous vessels built within the last three years has been the want of the requisite number of machinists and machine shops." Government shipyards built seventy-one of the 192 hulls contracted for during the war, but fifty-six private firms constructed the other 121. The Navy's manufacturing shortcomings were more apparent when it came to advanced technology. Of the 199 steam power plants ordered over the course of the war, its yards built only six; sixty-four different companies with the necessary facilities and technological expertise produced the rest. As it had before, the Navy relied on contract conditions and

performance guarantees that traced their origins back to the *Merrimack*-class engine contracts, refined by the lessons that had been learned early in the war. While not flawless, the general contract formula worked well, and the government found itself amply supplied with vessels for the war effort.[25]

Wartime expansion, however, placed increased burdens on the entire naval administration. Recognizing the extent of the problem, Secretary of the Navy Welles reorganized the bureau system in 1862, increasing the number of branches from five to eight. Welles distributed the duties of the old Bureau of Construction, Equipment, and Repair among three new offices: the Bureaus of Equipment and Recruiting, Construction and Repair, and Steam Engineering. This reorganization facilitated control over the shipbuilding process; an increased definition of responsibilities meant that each bureau could more closely scrutinize the contractors working under its auspices. As a final touch, in the last year of the war Welles asked for and received approval from Congress to establish a judge advocate for the Navy. This officer's duties included investigating fraud and waste in naval contracts, to reinforce the authority of the revised bureau system.[26]

Over the course of the war, the Navy and its private contractors confronted problems similar to those faced during the construction of the *Galena*. Modifications after the signing of the contract and delays beyond the control of the builders, coupled with the Navy's strict adherence to its new payment guidelines, created confusion over whether the government owed contractors money and if so, how much and when. After bitter wrangling, similar to that between Cornelius Bushnell and Commodore Joseph Smith over the *Galena*, the issue was finally settled. A postwar investigation by the Senate Committee on Naval Affairs recommended that several firms be at least partially compensated for lost revenue and inflationary costs "caused by the delay and action of the Government," drawing the wartime era to a close.[27]

Despite difficulties over final payments, the limited number of Navy contracts after the war followed the wartime guidelines with only minor modifications, even using similar standardized forms. Nonetheless, some of the alterations were significant. The 1871 contract with John Roach for the engines of the USS *Tennessee* serves as a typical example and reflects the evolution of contract guidelines from the Civil War through the 1870s.

Originally built during the Civil War as the *Madawaska*, the *Tennessee* became a source of postwar controversy, earning a reputation as a financial sinkhole. After laying up the ship in 1867, the Navy spent more than half a million dollars for repairs and modifications between 1869 and 1871. The vessel then embarked on a three-month cruise, returning for additional repairs that took another three years to complete. John Roach, a private contractor in New York City, was awarded the contract for general repairs and a new set of propulsion machinery. In return, he would receive not only monetary compensation but

the *Tennessee*'s old engines, to sell for scrap. (This arrangement provoked a congressional investigation, because the Navy already had a duplicate plant at the Washington Navy Yard built for a sister ship, and the *Tennessee*'s original engines had never been condemned by a board of survey.)[28]

The *Tennessee*'s machinery contract duplicated much of the preprinted wartime instruments, often incorporating entire paragraphs from them. However, as it had with prior contracts, the Navy Department made both major and minor changes that reflected new experience with the private sector. Although the circumstances surrounding the *Tennessee* contract created controversy, the contract itself represented a positive step in the evolving relationship between the government and private industry. Both parties incurred new obligations while benefiting from new safeguards.

Like the earlier contracts, the 1871 agreement with Roach required that the finished power plant conform to an attached list of specifications and include all necessary tools and spare parts. If, however, the Navy inadvertently left anything off the list, a new clause mandated that "the same shall be furnished by the said parties of the first part [the contractor] to the satisfaction of the said parties of the second part [the government] without extra compensation therefor." This clause would simplify negotiations during the construction process, making it clear that the government expected a fully functional and maintainable power plant. As it had with all its contracts during the previous two decades, the Navy demanded that "all the materials, workmanship, detail and finish shall be of the first class," and it reserved the right to appoint a superintendent to oversee construction at the contractor's premises. Like his predecessors, the superintendent had the authority to "inspect . . . and to peremptorily reject, in any stage of its progress, any materials or articles, or any piece or part which he may consider defective, either in quality of material or of workmanship, or in propriety of detail."[29]

The new contract also contained familiar clauses designed to protect the Navy from unscrupulous contractors and political influence. The contractor was required to furnish drawings "of every piece or part used in the construction," detailed enough to allow "the same again to be constructed." He also had to provide assurances that the United States would not be held liable for any patent fees—an important lesson from the past. Finally, reflecting legislation that had been in effect since 1808, the contractor agreed that "no member of Congress, officer of the Navy, or any person holding any office or appointment under the Navy Department, shall be admitted to any share or part of this contract or agreement, or to any benefit to arise therefrom." Nor could a partial interest in the contract be transferred to an outside party after the signing. Failure to comply with either of the last two clauses would result in a null and void contract.[30]

As the case of the *Galena* so vividly demonstrated, one of the main points of contention during the Civil War had been how much time a contractor had to deliver a finished product. The preprinted wartime contracts tried to spell out the requirements in some detail, but, as noted, the Navy still found itself arguing with contractors well after the end of the war. Accordingly, the Navy now made small but important changes to the *Tennessee* contract.

Under the earlier agreements, contractors had been given a set period of time, usually two or three months, to install all the necessary machinery, bunkers, spare parts, and miscellaneous equipment and have a ship "ready for continuous sea service . . . unless prevented by the act of the Government." This arrangement had worked well when no substantial changes were made to the design of either the ship or its propulsion. However, the constantly evolving technology that characterized the Civil War period made major design changes a fact of life. During the war the government expected its contractors to make any modifications to the hull necessary to accommodate changes in the power plant. This expectation led to serious delays and prompted the government to invoke penalty clauses with increasing regularity.

Perhaps because after the war it had ultimately repaid many of the assessed penalties, the Navy inserted a new clause in the *Tennessee* contract acknowledging that "all changes in strengthening [the] hull for the more efficient erection of the engines, boilers, and their dependencies in this ship, or any modification rendered necessary in or about the hull for the more satisfactory fulfillment of this contract is [*sic*] to be made by the [Navy]." This modification protected both the government and private contractors by clearly defining each party's responsibilities. It also made it easier to assess blame, and therefore possible financial penalties, when construction lagged or contracted materials did not perform as expected. At the same time, the contractor would not be punished for delays caused by changes imposed by the government.[31]

The *Tennessee* contract contained familiar procedures for the trial and acceptance of new machinery. Again building on its wartime experience, the Navy had transferred those procedures to the new contract almost verbatim, but with one important change. Wartime engine contracts had given the private builders a great deal of latitude; although ultimately responsible for the performance of the power plants they built, they were allowed to "arrange and proportion the details of the said machinery in such manner as they shall deem best calculated to secure the most successful operation." This clause disappeared from the *Tennessee* contract; John Roach now had "rigorously [to adhere] to . . . the general drawings furnished." The new requirement restricted the contractor's freedom of action and increased the Navy's control over the project. In part, this reflected a measure of technological maturity. In the preceding decades, building steam engines had been a true craft, with several approaches possible. Each engine had its own idiosyncrasies and special requirements, which justified giving

contractors a fairly free hand. By the early 1870s, power-plant construction had become more of a science, especially with the move toward compound engines. As a result, the Navy had clearer expectations, which made it easier to dictate terms and specifications to its contractors.[32]

The most significant difference, however, between the wartime contracts and the *Tennessee* contract was the government's method of paying for work completed. Under an 1862 agreement, for example, the builders received six equal payments over the course of the contract, with 20 percent of each payment withheld pending a successful trial of the completed vessel and machinery. Even though this was a vast improvement over initial wartime payment schemes, it still proved less than satisfactory, because it required contractors to have significant capital reserves to fund their work while awaiting payments from the government, both during and after construction. The *Tennessee* contract took these difficulties into account, stipulating fifteen equal payments instead of six, and calling for a reservation of 16.66 percent instead of twenty. At the same time, it doubled the number of days the Navy had to prepare a vessel for its trials, from thirty to sixty. This provision, which may not have been expedient in time of war, guaranteed that the Navy would not be rushed as it prepared to evaluate a contractor's work.[33]

Despite allegations of impropriety that surrounded John Roach and the *Tennessee*'s new engines, the 1871 contract itself represented the culmination of two decades of hard-earned experience. The Navy now had a basic document that, with modest but telling modifications, had stood the test of time and whose framework would appear in future contracts. More importantly, the Navy had developed a working relationship with a number of private companies that had become accustomed to handling government contracts for both hulls and engines. This network would be drawn upon extensively in the next decade, when the Navy eventually embarked on an ambitious rebuilding program.

With the end of the Civil War and the disappearance of abundant funding, the Navy went from feast to famine. Americans lost interest in the fleet, asking only that it serve in its traditional roles of coastal defense and commerce protection. Because both missions could be served with stockpiled ironclads or traditional cruisers, the Navy exhibited little zeal for technological innovation. The United States quickly fell from being one of the world's preeminent naval powers to a minor player, on a par with the larger South American republics and smaller European nations. Although the Navy more than adequately performed its designated missions, it suffered a series of embarrassments during the 1870s and early 1880s. For example, the service's feeble reaction to the *Virginius* affair and its inability to protect American interests during the War of the Pacific showed how far the fleet had deteriorated since the glory days of the Civil War.

European observers no longer took the American fleet seriously, to the point of excluding it from published surveys of the world's navies.[34]

In this atmosphere of retrenchment and technological malaise came the first conceptual efforts to provide the United States Navy with warships reflecting recent advances in naval engineering. The papers discussed in the early meetings of the Naval Institute (founded in 1873) were, on the whole, examinations of the prospects and implications of technological advances in warships. The House Naval Affairs Committee, especially members Benjamin W. Harris of Massachusetts and W. C. Whitthorne of Tennessee, made repeated proposals in the late 1870s for a complete reevaluation of naval policy. Reacting to the Navy's penchant for using funds earmarked for repairs to, instead, rebuild completely obsolescent warships, the committee wanted a systematic examination of shipbuilding policy; however, its proposals repeatedly foundered in the Senate. Not until the James A. Garfield administration were any serious material steps taken toward rebuilding the Navy.

Not long after assuming his post in early 1881, Secretary of the Navy William H. Hunt appointed a board of fifteen naval officers to study the overall problem and make a recommendation. The board was chaired by Admiral John Rodgers, former captain of the ill-fated *Galena* and now in the twilight of a long and illustrious career. The Rodgers board (properly the First Advisory Board) spent the summer considering the future of the fleet. Reporting back to the secretary that fall, Rodgers and the panel recommended that the Navy immediately build sixty-eight ships, for a total cost of almost thirty million dollars. While desirable from a naval perspective, this request proved too much for the political tenor of the time, despite the approbation of Chester Arthur, who became president when Garfield was assassinated in July 1881. After much negotiating and wrangling, in August 1882 Congress authorized two steel ships but appropriated no funds for their construction. Although this congressional response seemed disappointing, it was the catalyst for the creation of the Second Advisory Board in the fall of 1882 by a new Secretary of the Navy, William Chandler; this board was chaired by Rear Admiral Robert Shufeldt. Taking a more realistic approach to the problem than its predecessor had, the Shufeldt board recommended only four steel ships. After some minor modifications to the proposal, Congress agreed and on 3 March 1883 appropriated $1.3 million for the construction of three steel cruisers and a dispatch boat—the so-called (after the initials of their names) ABCD ships.[35]

These ships, although not quite as advanced as their European counterparts, provided the foundation of the new steel navy that would enter service in the coming decades. As such, their authorization and construction have been correctly described as a significant turning point in the history of the United States Navy. The years that followed, the remainder of the 1880s and the 1890s,

during which problems of steel-production capacity and capability were worked out and the relationship between the Navy and the steel industry solidified, have been characterized as the formative period of the modern military-industrial complex. To a large extent, they were. However, failure to consider the service's relationship with private industry in the years just before ignores the true origins of the phenomenon.

One of the First Advisory Board's recommendations that found its way into the March 1883 bill required that the vessels be built of *domestic* steel. Once again the Navy confronted a technological challenge beyond its abilities. The government did not possess the necessary industrial capability, and there was some question about even the private sector's ability to provide the right kind of steel. Nonetheless, in some ways the Navy was on familiar ground: in reality, the problem was not how to build steel warships but how to introduce another new technology into the fleet. This was the kind of problem the Navy had tackled successfully in the 1850s with steam engines and in the 1860s with ironclad warships. Only the type of technology had changed. Although properly concerned about the mechanics of steel warship construction, the Navy knew where to start and how to go about the contract process. By late June the Navy Department could prepare a "list of firms to which blank proposals for construction of a steam cruiser of about 4500 tons displacement have been sent." Proposals had gone to Ward, Stanton & Company in Newburgh, New York; John Roach, who now owned the Morgan Iron Works in New York City; the Quintard Iron Works in New York City; the Pusey and Jones Company of Wilmington, Delaware; the Penn Works in Philadelphia; the William Cramp & Sons Ship and Engine Building Company in Philadelphia; Harrison Loring in Boston; the Harlan and Hollingsworth Company in Wilmington; the Union Iron Works in San Francisco; the Atlantic Works of East Boston; C. H. Delamater & Company of New York City; and H. A. Ramsay & Company of Baltimore.

The Navy Department chose most of these firms for the simple reason that it already knew something about them. Nine of the twelve companies had built either hulls or power plants for the fleet during the Civil War and were therefore familiar with contract procedures and the kind of supervision the Navy demanded on its projects. A tenth company had built a set of engines for the service in 1858. Still, the prospect of building steel warships intimidated several of these firms; some dropped out of contention almost immediately, to be replaced by other companies responding to the government's public call for bids. Ultimately, only eight companies submitted bids. Even so, six of them had prior contract experience with the Navy. When the bids were opened, John Roach's Morgan Iron Works had submitted the lowest price for each of the four ships; Roach was duly awarded all four contracts.[36]

John Roach and the Morgan Iron Works brought a wealth of experience to these first contracts for steel warships. Although construction of the USS

Atlanta, *Boston*, *Chicago*, and *Dolphin* was to be rife with controversy, with the three cruisers eventually completed in the Navy's own yards, the firm was an excellent choice for making the transition to steel technology. Roach himself, at the Etna Iron Works during the Civil War, had been the primary contractor for the machinery of the *Peoria*, *Dunderberg*, *Neshaminy*, *Java*, *Ontario*, and *Keosauqua* and a subcontractor for the machinery of the *Galatea*, *Glaucus*, *Neptune*, *Nereus*, *Pequot*, and *Somerset*. After the war, he built the power plants for not only the *Tennessee* but also *Ranger*, as well as the hull and machinery of the rebuilt *Alert*, *Huron*, *Miantonomoh*, and *Puritan*. In addition, the Morgan Iron Works itself had constructed the machinery of the antebellum *Seminole* and the wartime *Chippewa*, *Katahdin*, *Kineo*, *Mahaska*, *Tioga*, *Wachusett*, *Ascutney*, *Chenango*, *Onondaga*, *Ammonoosuc*, and *Idaho*.[37]

The Navy's past association with John Roach and with the Morgan Iron Works was significant for two reasons. First, both the contractor and his company were on the cutting edge of naval technology in the United States and had been so for years. Second, and more importantly, both the contractor and his company had established relationships with the Navy and were used to the constraints and conditions of its contract procedures. All of the ships listed above had been built under standard contract guidelines during the 1850s, 1860s, and 1870s. When it came time to draft the contracts for the *Atlanta*, *Boston*, *Chicago*, and *Dolphin*, the Navy could rely on procedures dating back two decades and more. The technology for the ABCD ships was different, but Roach had some idea what he was getting into.

The contracts for all four ships showed their antecedents, sharing many common characteristics with earlier agreements. Like their predecessors, the ABCD contracts demanded that the steel warships "conform in all respects to and with the plans and specifications hereto annexed" by the government. The craftsmanship was to "be first-class and of the very best quality, and shall, from the beginning to the end of the work, be subject to the inspection of the Naval Advisory Board." Engine repairs required within four months of delivery would be made at the contractor's expense, and any patent fees incurred during the course of construction were his responsibility. The contractor also had a defined period of time to build each ship, during which he would be paid in installments. When delivered, each vessel would undergo a trial trip; successful completion of sea trials would lead to payment of a portion of the contract price held in reserve during construction. Roach would receive the final reserved amount after the vessel was completely fitted out for sea. Neither part of the reserve could be withheld for delays beyond the contractor's control.

As had been the case throughout the 1860s and 1870s, the ABCD contracts contained refinements based on past experience and present necessity. Before letting the contracts the Navy had conducted an inquiry into the kind of steel that would best suit its purposes, and it incorporated its findings into the

agreement with Roach. In an effort to exert control over the vendor's implementation of the new technology, the contract clearly stated that "the steel to be used in the construction of the hull and boilers . . . shall conform to the 'tests of steel for cruisers' prescribed by the Naval Advisory Board." For the same reason, plans for any changes made to the vessel had to be drawn up by the contractor and "submitted to the Naval Advisory Board for approval before the material is ordered or the work commenced." These requirements limited Roach's freedom of action and ensured that the Navy knew at all times what it was buying.[38]

The service also took the opportunity to expand the clauses preserving the government's interests. For example, during the course of construction Roach was required to carry updated insurance "in the amount sufficient to cover all advance payments made under this contract, the loss, if any, to be stated in the policies as payable to the United States." Similarly, Roach built the propulsion plants under strict weight guidelines. He was given a target tonnage for the engines of each ship; if he exceeded that weight by 5 percent, he would pay a predetermined penalty. He would also pay a penalty "per ton for each ton of excess weight."[39]

Finally, the Navy inserted a protective clause that gave it enormous power over the entire shipbuilding process. This clause stipulated that "in case of the failure or omission of the contractors, at any stage of the work prior to final completion, from any cause other than the order of the Secretary of the Navy, to go forward with the work and make satisfactory progress toward its completion within the prescribed time, it shall be optional with the said Secretary to declare this contract forfeited." The contractor was then legally responsible for all payments made to date, with the completed work as collateral. The vendor could collect payment for as "much of the work as shall have been, at the time such forfeiture is declared, satisfactorily performed." Having paid this sum to the contractor, the Navy could—if it chose—finish the vessel itself. Even then, the government would not take on too great a burden; the contractor was obligated to "surrender . . . all materials on hand, together with the use of the yard or 'plant,' and all machinery, tools, and appliances appertaining thereto and therefore used or necessarily to be used in and about the completion of the work."

This is exactly what happened with the *Atlanta*, *Boston*, and *Chicago*. Unfortunately for Roach, partisanship entered the contract process in a new and disturbing way in 1885. Because of the large dollar amounts associated with ship and engine contracts, the Navy had been very careful over the years to avoid any appearance of impropriety. Major congressional investigations in 1859 and 1872 had pointed out some irregularities but generally cleared the Navy of any wrongdoing. However, the incoming Cleveland government, the first elected Democratic administration of the postwar era, raised politically charged

questions about the contract and made it difficult for Roach to receive payment for work completed.

William C. Whitney, the new Secretary of the Navy, was determined to root out what he saw as years of Republican corruption and influence in the larger operations of his department. Roach, because his *Tennessee* contract had been a prominent part of the 1872 investigation, became a convenient target of Whitney's ire. The Secretary refused to accept the *Dolphin* pending a full review of the agreement, which prevented the contractor from receiving his final installment—money Roach needed to move forward on the *Atlanta*, *Boston*, and *Chicago* if he was to meet their contract deadlines. Roach's fate was placed in the hands of a board composed of two naval officers and a civilian engineer handpicked by Whitney. All were loyal Democrats with connections to the secretary. While waiting for the board's preordained result, Roach depleted his capital reserves, entered receivership, and forfeited the contracts for the three cruisers. The Navy finished them, in Roach's shipyard. In the end, partisan politics had interfered with the contract process, driving John Roach out of the shipbuilding business. Contractors who signed deals with the government in the wake of the Roach fiasco approached those contracts with some trepidation, demanding (and receiving) safeguards against such capricious action, but they continued working with the Navy.[40]

The introduction of steel warships into the fleet signaled the beginning of the United States Navy's slow return to respectability, and for this reason many historians use the ABCD ships as a clean break with the past, a repudiation of the postwar "doldrums." Certainly the building of these ships represented a significant turning point in the Navy's history, but both their contracts and contractors were firmly grounded in the past. These aspects can be best viewed as culminations of an evolutionary process that traces its roots back to the reaction against faulty steam power plants in the 1850s.[41]

The special relationship that developed more than one hundred years ago between the government and the nation's large steel companies did not suddenly materialize out of thin air. Later, in determining how it would interact with Gilded Age industrial giants and private shipbuilders, the Navy would draw upon its past, its earlier experiences with private contractors. That past showed clear evolutionary development, from the steam engines of the 1850s through the ironclads of the 1860s to the revised engine and hull contracts of the 1870s. Over time, the Navy developed relationships with a select group of contractors who conducted a sizeable portion of their business with the government and became dependent, in part, on continuing those relationships. The officers, politicians, and contractors responsible for forging the affiliations of the 1880s were products of their past and had evolved with the Navy's procedures. When it came time to build the New Steel Navy, that earlier era exerted a powerful

influence, for it was then that the antecedents of the military-industrial complex had taken shape.

Notes

1. David M. Potter, *The Impending Crisis, 1848–1861* (New York: Harper and Row, 1976), pp. 90–120, 199–224; C. Stanley Urban, "The Ideology of Southern Imperialism: New Orleans and the Caribbean, 1845–1860," *Louisiana Historical Quarterly*, January 1956, pp. 53–4; Robert E. May, *The Southern Dream of a Caribbean Empire, 1854-1861* (Baton Rouge: Louisiana State Univ. Press, 1973), pp. 10–6; and Merle E. Curti, "Young America," *American Historical Review*, October 1926, pp. 34–5. Young America was a youthful faction of the Democratic Party. It embraced the expansionist ideas of Manifest Destiny and assnmed that all things American were clearly superior to the well-worn and often despotic ideas of Europe.

2. Frank M. Bennett, *The Steam Navy of the United States: A History of the Growth of the Steam Vessel of War in the U.S. Navy, and of the Naval Engineer Corps* (Pittsburgh: Warren, 1896; reprint ed., Westport, Conn.: Greenwood Press, 1972), pp. 54–5, 74, 110–22; U.S. Congress, House, *Annual Report of the Secretary of the Navy, 1851*, House Ex. Doc. 2, 32d Cong., 1st sess., 1851, pp. 76–149; "United States Steamers," *Journal of the Franklin Institute*, March 1854, pp. 186–7; Max R. Williams, "Secretary William A. Graham, Naval Administrator, 1850–1852," *North Carolina Historical Review*, Winter 1971, pp. 62–4; *Dictionary of American Biography*, 20 vols. (New York: Charles Scribner's Sons, 1928–36), vol. 2, p. 402; U.S. Congress, House, "Report of a Board of Engineers as to the Causes of Failure of Certain Steamers of the United States Navy," House Misc. Doc. 2, 33d Cong., 1st sess., 1853, pp. 1–8. For the power and influence of the Naval Affairs Committee on policy, see Robert Greenhalgh Albion, "The Naval Affairs Committees, 1816–1947," U.S. Naval Institute *Proceedings*, November 1952, p. 1229. In 1860, the Navy officially recognized that patented improvements in machinery more than made up for the extra cost with increased efficiency. See U.S. Congress, Senate, *Annual Report of the Secretary of the Navy, 1860*, Senate Ex. Doc. 1, 36th Cong., 2d sess., 1860, pp. 9–10.

3. U.S. Congress, Senate, *Annual Report of the Secretary of the Navy, 1853*, Senate Ex. Doc. 1, 33d Cong., 1st sess., 1853, pp. 307–11; Harold Hance Sprout and Margaret Sprout, *The Rise of American Naval Power 1776–1918* (Princeton, N.J.: Princeton Univ. Press, 1939), pp. 141–3; and *Congressional Globe*, vol. 28, pt. 1, pp. 455, 465–6, and vol. 28, pt. 2, pp. 847, 856.

4. Dobbin to John Lenthall, 10 June 1854, Naval Records Collection of the Office of Naval Records and Library, entry 13, Letters to Bureaus of the Navy Department, September 1842–Novemher 1886, record group [hereafter RG] 45, M480, National Archives, Washington, D.C.; and Secretary of the Navy James C. Dobbin to S. P. Houston, Chairman of the Committee of Ways and Means, 18 December 1854, Naval Records Collection of the Office of Naval Records and Library, entry 32, Letters from Bureaus of the Navy Department, September 1842–December 1885, RG 45, M518, National Archives, Washington, D.C. For an estimate of the cost of completing the necessary facilities at the various navy yards, see Joseph Smith, Chief of the Bureau of Yards and Docks, to Dobbin, 24 November 1854, ibid. For a more comprehensive analysis see also U.S. Congress, House, "Estimates, Additional, from Bureau of Yards and Docks," House Misc. Doc. 19, 33d Cong., 2nd sess., 1855.

5. "Steam Machinery for United States Steam Frigates," *National Daily Intelligencer*, 8 July 1854, p. 4.

6. U.S. Congress, Senate, "Report of the Secretary of the Navy, upon Various Subjects Pertaining to the Naval Establishment," Senate Ex. Doc. 4, 36th Cong., 2d sess., 1861.

7. For example, see the September 1857 hull contract for the sloop *Brooklyn* and the 19 April 1858 machinery contract for the sloop *Lancaster* in the Naval Records Collection of the Office of Naval Records and Library, entry 143, Contracts for Transportation of Mail and for Manufacture of Parts of Ships ("Contracts, Transportation of Mail"), April 1847–October 1860, RG 45, National Archives, Washington, D.C.

8. "Copy of Advertisement Calling for Plans and Specifications. Iron-Clad Steam Vessels," in U.S. Secretary of the Navy, *Report of the Secretary of the Navy in Relation to Armored Vessels* (Washington, D.C.: U.S. Govt. Print. Off., 1864), p. 2.

9. "Report on Iron Clad Vessels," in U.S. Congress, Senate, *Annual Report of the Secretary of the Navy, 1861*, Senate Doc. 1, 37th Cong., 2d sess., 1861, pp. 152–4.

10. Contracts and Bonds 1861, Records of the Bureau of Yards and Docks, RG 71, entry 42, National Archives, Washington, D.C., pp. 249–51.

11. The details of the *Galena*'s construction can be found in the correspondence between Commodore Joseph Smith and Bushnell & Co. in Subject File, U.S. Navy 1775–1910, AD—Design and General Characteristics 1860–1910, Ironclads, Correspondence relative to, between Commodore Joseph Smith and

various Designers and Builders, 1861 to 1863, RG 45, box 51, National Archives, Washington, D.C. [hereafter Correspondence Relative to Ironclads].

12. Smith to Samuel H. Pook, 12 February 1862, and Smith to Pook, 15 February 1862, ibid.; and Contract Ledger for Ironclads 1861–1862, Records of the Bureau of Yards and Docks, RG 71, entry 48, National Archives, Washington, D.C., p. 317.

13. Smith to Cornelius Scranton Bushnell, April 16, 1862, Correspondence Relative to Ironclads; Contract Ledger for Ironclads 1861–1862, p. 317.

14. John A. Griswold to Bushnell, 24 April 1862, Cornelius Scranton Bushnell Papers, New York Historical Society, New York, N.Y. [emphasis in original]; Bushnell to Griswold, 21 April 1862; Bushnell to Griswold, 28 April 1862; Bushnell to Griswold, 1 May 1862, John A. Griswold Papers, box 3, folder 56, New York State Library, Manuscripts and Special Collections, Albany, N.Y.; Smith to Bushnell, 17 May 1862, Correspondence Relative to Ironclads.

15. Report of Lieutenant Newman, U.S. Navy, executive officer of USS *Galena*, 16 May 1862, Additional Report of Lieutenant Newman, U.S. Navy, executive officer of USS *Galena*, 16 May 1862, and Additional Report of Lieutenant Newman, U.S. Navy, executive officer of USS *Galena*, 18 May 1862, U.S. Navy Department, *Official Records of the Union and Confederate Navies in the War of the Rebellion* (Washington, D.C.: U.S. Govt. Print. Off., 1894–1922), series I, vol. 7, pp. 359–62.

16. For a more detailed argument on this point, see Kurt Hackemer, "The Other Union Ironclad: The USS *Galena* and the Critical Summer of 1862," *Civil War History*, September 1994, pp. 243–6.

17. Smith to Captain John Rodgers, 21 May 1862, and Smith to Bushnell, 22 May 1862, Correspondence Relative to Ironclads.

18. Contracts and Bonds 1861, p. 249; Smith to Bushnell, 2 June 1862; and Smith to Rear Admiral Louis M. Goldsborough, 6 June 1862, Correspondence Relative to Ironclads.

19. Smith to Bushnell, 1 August 1862, Correspondence Relative to Ironclads; Waldo Abbott (Bushnell's private secretary) to Griswold, 6 August 1862, Griswold Papers, box 3, folder 56; Contract Ledger for Ironclads 1861–1862, p. 317.

20. Blank contracts found in Naval Records Collection of the Office of Naval Records and Library, entry 155, Contracts for Manufacture of Machinery for Vessels, August–December 1862, RG 45, National Archives, Washington, D.C.; Records of the Bureau of Ships, entry 235, Contracts for Construction of Naval Vessels, 1861–1864, RG 19, National Archives, Washington, D.C., and entry 39, Contracts and Specifications for a Screw Gunboat, 1861; Records of U.S. General Accounting Office, Records of the Accounting Officers of the Department of the Treasury, entry 232, Navy Contracts, May 1795–October 1893, RG 217, National Archives, Washington, D.C.

21. The Navy was determined to monitor carefully all contract changes and resulting price adjustments. For example, see the circular letters sent by the General Inspector for Ironclads, Alban C. Stimers, to all contractors building ironclad steamers on 31 August 1863 and 15 October 1863, in Records of the Bureau of Ships, Records of the Office of General Superintendence of Ironclads, entry 1254, Circular Letters Sent to Contractors, June 1863–July 1864, March–June 1865, RG 19, National Archives, Washington, D.C.

22. Blank contract, RG 45, entry 155.

23. For a list of ships contracted for, see Bennett, App. B. The thirty-eight contracts are found in RG 45, entry 155. The actual number of contracts may be higher, but these are the only ones extant. Harlan and Hollingsworth & Company, engaged in building the *Canonicus*-class monitor *Saugus*, referred to "the printed contracts" in a letter to Gideon Welles. See Harlan and Hollingsworth & Company to Gideon Welles, 10 March 1863, Records of the Bureau of Ships, entry 70, Letters and Telegrams Received from Contractors, January 1864–December 1868, RG 19, National Archives, Washington, D. C. The *Canonicus* contracts are located in RG 19, entry 235.

24. For the "monitor bureau," see Charles Oscar Paullin, *Paullin's History of Naval Administration 1775–1911* (Annapolis, Md.: Naval Institute Press, 1968), p. 265, and Edward W. Sloan, *Benjamin Franklin Isherwood, Naval Engineer: The Years as Engineer in Chief, 1861–1869* (Annapolis, Md.: Naval Institute Press, 1965), pp. 66–7. The circular letters are found in RG 19, entry 1254.

25. "Various Naval Matters," *Army and Navy Journal*, September 1864, p. 77. These numbers are extracted from Bennett, App. B.

26. Paullin, pp. 259–63.

27. For the postwar compensation issue, see Gideon Welles, *Diary*, ed. Howard K. Beale, assisted by Alan W. Brownsword (New York: Norton, 1960), vol. 2, pp. 201, 207; U.S. Congress, Senate, "Petitions of Woodruff and Beach, and Others, William H. Webb, Paul S. Forbes, and James R. Eads, for Additional Compensation for Construction of Naval Vessels and Machinery," Senate Rpt. 130, 38th Cong., 2d sess., 1865; U.S. Congress, Senate, "Record of a Board of Navy Officers Appointed to Inquire into and Determine How Much the Vessels-of-War and Steam Machinery Contracted for by the Department in the Years 1862 and 1863 Cost the Contractors over and above the Contract Price and Allowance for Extra Work," Senate Ex.

Doc. 18, 39th Cong., 1st sess., 1866; and U.S. Congress, House, "Investigation of the Navy Department," House Rpt. 80, 42d Cong., 2d sess., 1872, pp. 19–20.

28. Bennett, pp. 544–5. For a more detailed explanation of the *Tennessee* controversy, see Leonard A. Swann, Jr., *John Roach, Maritime Entrepreneur: The Years as Naval Contractor, 1862–1886* (Annapolis, Md.: Naval Institute Press, 1965), pp. 125–38. See also Donald Canney, *The Old Steam Navy*, vol. 1, *Frigates, Sloops, and Gunboats, 1815–1885* (Annapolis, Md.: Naval Institute Press, 1990), 133–44.

29. U.S. Congress, House, "Charges against the Navy Department," House Misc. Doc. 201, 42d Cong., 2d sess., 1872, p. 104.

30. Ibid., pp. 104–5, 108.

31. Ibid., p. 105.

32. Blank contract, RG 45, entry 155; Canney, pp. 149–53; Peter M. Rippon, *The Evolution of Engineering in the Royal Navy*, vol. 1, *1827–1939* (Tunbridge Wells, Kent: Spellmount, 1988), pp. 58–9. For a contemporary example of the move toward standardized engine designs, see Charles Cramp's description of his visit to British shipyards in 1871 in Augustus C. Buell, *Memoirs of Charles H. Cramp* (Philadelphia: J. B. Lippincott, 1906), pp. 111–7. Of course, not all contemporaries were so enamored of compound engines. See "The Compound Engine in War Ships," *Army and Navy Journal*, 25 July 1874, pp. 791–2. Even as late as the summer of 1877 a spirited discussion raged through the pages of the *Army and Navy Journal* over the merits and flaws of these engines.

33. For examples of the kinds of payment problems faced by contractors during the war, see U.S. Congress, House, "Relief of Certain Naval Contractors," House Rpt. 269, 43d Cong., 1st sess., 1874.

34. James L. Abrahamson, *America Arms for a New Century: The Making of a Great Military Power* (New York: Free Press, 1981), pp. 9–15; and Stephen Howarth, *To Shining Sea: A History of the United States Navy, 1775–1991* (New York: Random House, 1991), pp. 215–23. For an example of how severely the Navy's budget was slashed following the war, see U.S. Congress, House, "Letter from the Secretary of the Navy Transmitting Revised Estimates of Appropriations for that Department for the Ensuing Fiscal Year," House Ex. Doc. 111, 40th Cong., 2d sess., 1868. The *Virginius* was an old Civil War blockade runner caught by the Spanish running guns to Cuban insurgents in 1873. The execution of forty-nine crewmen by the Spanish led to a brief war scare and the mobilization of the American fleet at Key West, Florida. The assembled fleet tried to carry out maneuvers, and its inability to do so quickly demonstrated the Navy's decrepit condition. The War of the Pacific started in 1879, when Chile attacked Peru and Bolivia and quickly took the upper hand. The United States tried to bring an early end to the war, in part because of American financial interests in Peru. However, the American Pacific Squadron, containing only a few obsolete wooden vessels, was not taken seriously by the Chileans, who owned two new, state-of-the-art, British-built armored warships. Chile rather pointedly suggested that the United States mind its own business. The United States, unable to match Chilean naval power, backed down.

35. For an example of contemporary reaction to the *Virginius* affair and the call for rebuilding the Navy, see "Work for the Navy," *Army and Navy Journal*, 22 November 1873, p. 232; for historians' assessments, consult Paullin, pp. 387–93; Benjamin Franklin Cooling, *Gray Steel and Blue Water Navy: The Formative Years of America's Military-Industrial Complex, 1881–1917* (Hamden, Conn.: Archon Books, 1979), pp. 27–8; and Robert Erwin Johnson, *Rear Admiral John Rodgers, 1812–1882* (Annapolis, Md.: Naval Institute Press, 1967), pp. 366–76, and "John Rodgers: The Quintessential Nineteenth Century Naval Officer," in *Captains of the Old Steam Navy: Makers of the American Naval Tradition, 1840–1880*, ed. James C. Bradford (Annapolis, Md.: Naval Institute Press, 1986), pp. 269–70. For the majority report of the First Advisory Board, see U.S. Congress, House, "Construction of Vessels of War for the Navy," House Rpt. 653, 47th Cong., 1st sess., 1881. For the minority report, see U.S. Congress, House, "Condition of the Navy," House Exec. Doc. 30, 47th Cong., 1st sess., 1881. For the report of the Second Advisory Board, see U.S. Congress, Senate, "Report of the Naval Advisory Board," Senate Ex. Doc. 74, 47th Cong., 2d sess., 1883.

36. Naval Records Collection of the Office of Naval Records and Library, entry 200, Correspondence Concerning Construction of New Vessels ("Memoranda Concerning Construction of New Vessels"), April 1882–January 1888, RG 45, National Archives, Washington, D.C.; and Cooling, pp. 37–9. The number of firms with prior naval contract experience is based on information extracted from Bennett, App. B. Of the twelve companies listed, prior contract experience could not be verified for Ward, Stanton & Company and H. A. Ramsay & Company. Of the eight companies who bid on the ABCD contracts, prior contract experience could not be verified for Theodore Allen and Anthony Blaisdell of St. Louis or for H. A. Ramsay & Company.

37. Bennett, *Steam Navy of the United States*, App. B; and Swann, pp. 19–21.

38. U.S. Congress, Senate, "Letter From the Secretary of the Navy, Transmitting, in Response to Senate Resolution of March 5, 1886, Information Relative to the Chicago, Boston, Atlanta, and Dolphin," Senate Ex. Doc. 153, 49th Cong., 1st sess., 1886, pp. 21–22. This document contains the text of all four contracts.

39. Ibid., p. 22.

40. Ibid., p. 23; Swann, *John Roach*, pp. 209–34; Cooling, *Gray Steel and Blue Water Navy*, pp. 71–84.

41. Howarth, pp. 231–2; Dudley Knox, *A History of the United States Navy* (New York: Putnam, 1936), pp. 319–21; Sprout and Sprout, pp. 183–6; Edward L. Beach, *The United States Navy: 200 Years* (New York: Henry Holt, 1986), pp. 320–2; Kenneth J. Hagan, *This People's Navy: The Making of American Sea Power* (New York: Free Press, 1991), pp. 185–7; and E. B. Potter, *Sea Power: A Naval History*, 2d ed. (Annapolis, Md.: Naval Institute Press, 1981), pp. 159–60. Although his essay focuses more on strategy than technology, an exception to this view is Lance Buhl, who sees the ABCD ships as the natural result of the Navy's historical commerce-protection role and therefore not a break with the past. See "Maintaining 'An American Navy,' 1865–1889," in *In Peace and War: Interpretations of American Naval History, 1775-1984*, ed. Kenneth Hagan (Westport, Conn.: Greenwood, 1984), pp. 145–73.

Ψ