

ROSIE THE RIVETER NATIONAL HISTORICAL PARK, KAISER SHIPYARDS
Rosie the Riveter WW II Home Front National Historical Park
San Francisco Bay
Richmond
Contra Costa County
California

HAER No. CA-326-L

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C St. NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD
ROSIE THE RIVETER NATIONAL HISTORICAL PARK,
KAISER SHIPYARDS

HAER No. CA-326-L

Location: eastern shore of San Francisco Bay, Richmond, Contra Costa County, CA

Date of Construction: 1940-1943

Designer/Engineer/Fabricator: various units of the Kaiser organization, including the Permanente Metals Corporation

Present Owner: National Park Service, private entities

Present Use: none (idle)

Significance: The four Kaiser shipyards at Richmond ranked as the most technologically and organizationally innovative and productive shipbuilding facilities in the United States during World War II. Managers and workers at Richmond pioneered rapid “prefabricated” shipbuilding techniques that greatly increased the speed of merchant-ship production in the U.S. These processes were exemplified by such physical aspects of the shipyards as the giant “Prefab” plant and by the overall layout of the yards.

Historian: Christopher James Tassava, 2004

Project Information: In 2001, the Historic American Engineering Record (HAER) began assisting Rosie the Riveter World War II Homefront National Historical Park, a newly established National Park unit, by documenting associated significant structures within its immediate area. The project is a cooperative endeavor among: the California Coastal Conservancy, Mary Smalls, Project Manager; the Richmond Redevelopment Agency, Gary Hembree, Project Manager; Rosie the Riveter World War II Homefront National Historical Park, Judy Hart, Superintendent; and the Historic American Engineering Record, Richard O’Connor, Project Leader.

Christopher Tassava wrote the historical report, which was prepared for transmittal by HAER Historian Justine Christianson.

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HISTORICAL OVERVIEW

Operations at the Richmond Shipyards, 1940-1946

In 1940, Henry Kaiser, the California construction entrepreneur, opened the first of four shipyards in the sleepy railroad town of Richmond, California, on the eastern shore of San Francisco Bay. Henry Kaiser's sprawling heavy-industrial engineering and construction firms had never before built ships of any sort. Yet within a few months of groundbreaking for the first shipyard, and even as the construction crews built three yards, Kaiser's workers had begun building the cargo vessels sorely needed by Great Britain and the United States in the war against the Axis. By V-J Day, the Kaiser shipyards at Richmond had produced more merchant ships in the famous and stalwart Liberty and Victory classes than any other shipyard in the country, as well as scores more ships of other types: giant troopships, tiny corvettes, amphibious-landing ships.

In adapting the organization to shipbuilding, Kaiser, his talented cadre of managers and engineers, and thousands of workers did little less than revolutionize shipbuilding. Ship production at Kaiser-Richmond discarded almost every aspect of prewar shipbuilding practice, the roots of which ran all the way back to the golden age of wooden shipbuilding in the eighteenth century. Beginning instead with materials-transfer methods borrowed from heavy construction, Kaiser's men, guided by federal officials in the U.S. Maritime Commission (USMC), intensified the use of two relatively new techniques: electric-arc welding and prefabrication or section-building.

The former, an industrial technique that had only begun to be used in shipbuilding just before the war, offered the means to more quickly and efficiently join metal than riveting, the traditional shipyard skill. The latter entailed two distinct kinds of operations. First, in giant shops far from the waterfront, workers fabricated the various components or "subassemblies" of a completed ship, such as prows, deckhouses, and side shells. These units were then transported to shoreline construction berths called "shipways" where crews combined them into complete vessels that were then launched and outfitted for use in the Allied merchant marine.

Despite labor and raw material shortages, changing demands by the Maritime Commission and other federal institutions (including the navy) for ships, and especially a constant flow of innovations devised by workers, engineers, and managers, the ship construction

methods based on prefabrication and welding can be described and explained as a coherent labor process and as the most important element of the entire shipbuilding enterprise at Kaiser-Richmond. Similarly, these labor practices illustrate that the Kaiser shipyards in the East Bay ranked as some of the most significant and representative industrial sites on the American World War II home front.

The Significance of Shipbuilding at Richmond

The Kaiser shipyards at Richmond were historically significant for three main reasons. First, the four shipyards at Richmond ranked as the most productive shipbuilding complex in the United States (and the world) during the largest shipbuilding boom in American and world history, World War II. The four Kaiser yards at Richmond launched 745 ships, 13 percent of the 5,777 ships built by Maritime Commission-sponsored shipyards and three-quarters of the 1,015 ships produced in the Bay Area. San Francisco Bay was the most productive shipbuilding zone on the West Coast, which was in turn the most productive shipbuilding region in the country; the eleven yards on the San Francisco Bay exceeded by almost a hundred ships the production of the nineteen USMC yards on the Gulf of Mexico.

The proportions of Kaiser-Richmond's achievement emerge even more clearly when considering the yards' production of the two key merchant vessels, the Liberty ship and the Victory ship. Considered as a single unit, Richmond Yards 1 and 2 produced 661 Liberty and Victory ships, more than any other yard in the country. The 519 Liberty ships produced by Yards 1 and 2 were almost a fifth of the entire nation's output, and 135 more than the next-most productive shipyard, Bethlehem Steel's facility at Fairfield, Maryland. Richmond Yards 1 and 2 also ranked first in the production of Victory ships by turning out 142 such vessels, more than a quarter of the 531 Victories built by 1945 and eleven more than Calship at Los Angeles, the next most productive Victory shipyard.¹

Second, the Richmond shipyards were an integral and leading part of the war economy. Production at Kaiser-Richmond Yards 1 and 2 was running smoothly well before Pearl Harbor,

¹ The Kaiser-managed shipyards at Richmond, California; near Portland, Oregon; and in Rhode Island produced a total of 1,480 ships, or a quarter of the 5,777 vessels launched by American merchant shipyards during the war. Those same yards produced 862 Liberties, almost a third of the 2,708 built in American yards between 1941 and 1944, and 306 Victories, or almost three-fifths of the 531 built in American yards in 1944 and 1945.

the event that galvanized the rest of the war effort into action. Compared to aircraft manufacturing, the industry often considered the emblematic war industry, shipbuilding at Kaiser-Richmond achieved more at an earlier point in the war (or rather, in the war emergency, since production began well before the United States formally entered the war). For instance, the prefabrication and welding methods that enabled Kaiser-Richmond to out-produce every other shipyard complex in the country were substantially in place by the end of 1941. In November 1942, Kaiser-Richmond Yard 2 set a permanent record for shipbuilding speed by building a complete Liberty ship in just under seven days—a fraction of the 240 days taken in 1941 by Bethlehem Steel’s Fairfield yard (just outside Baltimore) in building the PATRICK HENRY, the first Liberty ship.

While production scale and speed of production offer two measures of Kaiser-Richmond’s importance to the war effort, the massive scope of the shipyards offers another perspective. At the peak of ship production in July 1943, Kaiser-Richmond employed almost 100,000 workers, nearly 15 percent of the nation’s entire 650,900-strong merchant shipyard workforce.² Even more than in other regions and in other shipyards on the Pacific Coast, the Kaiser-Richmond shipyards notably employed a more diverse workforce and put those workers in more valuable and challenging roles than other war industries, where black men and women, for instance, typically worked as laborers or janitors.

Third, Kaiser-Richmond was significant as a major influence on the development of the new shipbuilding methods that characterized the industry around the world after World War II. Japan offers the best case in point. Prefabrication and welding techniques were transferred to Japan immediately after the war by an American shipbuilder who leased a Japanese shipyard and staffed it with American engineers who had honed their skills in wartime yards.³ Combined with numerous indigenous techniques and altered to fit the Japanese context, prefabrication and welding formed the core of the Japanese method of “block construction,” an efficient and inexpensive means of producing the merchant ships that by 1956 had become Japan’s largest

² Frederic C. Lane with Blanche D. Coll, Gerald J. Fischer, and David B. Tyler, *Ships for Victory: A History of Shipbuilding Under the U.S. Maritime Commission in World War II* (Baltimore: The Johns Hopkins University Press, 1951), 250.

³ At least one had worked in an important role at Kaiser-Richmond.

dollar-earning export and thus a key means to fund the country's rapid reindustrialization.⁴ Block construction techniques also allowed Japanese shipyards to supplant British yards as the world's most productive—an emblem and harbinger of the country's economic ascendancy. The shipbuilding techniques developed at Kaiser-Richmond thus became central to the postwar shipbuilding industry around the world.

PREWAR SHIPBUILDING

Traditional Shipbuilding Processes

Merchant shipbuilding techniques in 1940 resembled their 1900 ancestors more than they resembled their 1943 descendants. On the cusp of World War II, ships were still built using techniques that had been initially developed to build some of the first ships with iron hulls and steam engines. A shipyard at the turn of the nineteenth century was a compact, dense facility. After a shipowner and the shipbuilder contracted for the construction of a particular vessel, naval architects and marine engineers designed the vessel or adapted the owner's plans for production.⁵ The yard itself comprised numerous small shops in which a cadre of skilled craftsmen custom-made steel plates and shapes, engines, and other specialized items destined for use in the custom-designed ship. Shipfitters and riveters erected the vessel in a waterfront assembly berth, applying their intrinsic skill to the task of assembling the ship, plate-by-plate and rivet-by-rivet.⁶ In fact, riveting offers valuable proof of the continuity in shipbuilding practice. First used around the Civil War, riveting was used more broadly after the invention of the pneumatic rivet gun around the turn of the century, an innovation that turned the craft from an essentially manual skill into a partly mechanical one.⁷ Whether accomplished by hand with a punch and hammer or with a pneumatic gun, riveting entailed a complicated process of preparing the metal plate;

⁴ "Japanese Shipbuilding Industry," *Far Eastern Economic Review* 18, no. 24 (June 16, 1955): 760.

⁵ On this point, see Thomas Heinrich, *Ships for the Seven Seas: Philadelphia Shipbuilding in the Age of Industrial Capitalism* (Baltimore: Johns Hopkins University Press, 1997), 59-60, 130-140, 170-177, 206-217; David McGee, "From Craftsmanship to Draftsmanship: Naval Architecture and the Three Traditions of Early Modern Design," *Technology and Culture* 40, no. 2 (April 1999): 209-236; John K. Brown, "Design Plans, Working Drawings, National Styles: Engineering Practice in Great Britain and the United States, 1775-1945," *Technology and Culture* 41, no. 2 (April 2000): 195-196, 236-237. For an interesting look at wooden shipbuilding, see Peter Linebaugh, *The London Hanged: Crime and Civil Society in the Eighteenth Century* (New York: Cambridge University Press, 1992), 394-401.

⁶ Heinrich, 84-92.

⁷ Heinrich, 45-46, 88-92, 140-142.

punching and reaming the rivet holes; heating, driving, and finishing the rivets; and then caulking the overlapped joint against leaks. As late as 1943, riveting was still the technique of choice for most advanced warships like the aircraft carrier U.S.S. HORNET.

The U.S. Maritime Commission

Against this backdrop of longstanding, stable shipbuilding practices, the rapid and thorough shift to welding and prefabrication stands as an even more important and surprising accomplishment. While this accomplishment was concretely realized in shipyards like Kaiser-Richmond, the shift away from traditional shipbuilding practices had its genesis in the U.S. Maritime Commission, an obscure but powerful federal agency born in June 1936 with the passage of the Merchant Marine Act of 1936 and charged to “further the development and maintenance of an adequate and well-balanced American merchant marine, to promote the commerce of the United States, [and] to aid in the national defense.”⁸

Though part and parcel of the New Deal, the Maritime Commission faced the legacy of problems created during and since World War I. American shipbuilding during the Great War was almost a complete fiasco. The federal U.S. Shipping Board and its subsidiary, the Emergency Fleet Corporation, had barely begun building new ships when the war ended. The wartime program’s showpiece shipyard, the Hog Island facility near Philadelphia, did not actually produce a single ship that saw service before the Armistice. Worse, this quintessential wartime shipyard operated until the 1920s, turning out all the ships on its federal contract.⁹ When the war boom belatedly ended around 1922, American shipbuilding essentially collapsed. The federal government’s only major attempt to keep the industry afloat in the interwar period was a program designed to subsidize shippers whose new vessels would carry U.S. mail. Always fraught with problems, the subsidy program heard its death knell in 1932 when Democratic Sen. Hugo Black reported the results of a three-year investigation into the program. The Black Committee found incorrigible mismanagement and corruption at almost every level, but in keeping with its New Deal context, the committee recommended not that the federal government

⁸ U.S. Congress, *Merchant Marine Act of 1936*, 74th Cong., 2nd sess., 1936, chapter 858, 1985.

⁹ Andrew Gibson and Arthur Donovan, *The Abandoned Ocean: A History of United States Maritime Policy* (Columbia, SC: The University of South Carolina Press, 2000), 105-109. A brief and accessible account of these events appears in Deborah Hirshfield, “From Hog Islanders to Liberty Ships: The American Government and Merchant Ship Construction in Two World Wars,” *American Neptune* 54, no. 2 (Spring 1994).

stop all subsidy to American shipbuilders, but that the government devise a more rational process of equalizing the high cost of building ships in American shipyards with the much lower costs of doing so abroad.¹⁰

After several years of intermittent debate over that purpose, the Senate Commerce Committee finally offered a bill, the Merchant Marine Act of 1936, which the rest of Congress passed on June 29, 1936, under heavy pressure from President Roosevelt.¹¹ The new act described the nature and purpose of the U.S. maritime industries, most notably by charging a new federal agency, the USMC, with responsibility for “the creation of an adequate and well-balanced merchant fleet...readily and quickly convertible into transport and supply vessels in a time of national emergency...[and] the ownership and the operation of such a merchant fleet by citizens of the United States insofar as may be practicable.”¹²

President Roosevelt immediately named five men to the new Maritime Commission. As chairman, he recommended Joseph P. Kennedy, the patriarch of a rising Massachusetts family, a Democratic Party stalwart, and an experienced administrator who had run one of Bethlehem Steel’s shipyards during World War I and the Securities and Exchange Commission in 1934-1935, among other enterprises.¹³ To aid Kennedy in the effort to reform the corrupt mail-subsidy program, Roosevelt nominated Thomas Woodward, an attorney who had served in the Emergency Fleet Corporation and Shipping Board Bureau.¹⁴ Then, as counterweights to these two New Dealers, Roosevelt nominated three conservatives: Edward Moran, a Republican who had served as a U.S. representative from Maine and thus served as the emissary from the shipbuilding industry, and two retired admirals, Henry Wiley and Emory S. “Jerry” Land.¹⁵ After some turnover, Moran and Wiley left and two new commissioners joined: John Carmody, a longtime New Dealer, and Adm. Howard Vickery, a colleague of Land’s.¹⁶

¹⁰ Benjamin Larabee, William M. Fowler, Jr., Edward W. Sloan, John B. Hattendorf, Jeffrey J. Safford, and Andrew W. German, *America and the Sea: A Maritime History* (Mystic, CT: Mystic Seaport, 1998), 536; Gibson and Donovan, 116-129.

¹¹ Gibson and Donovan, 134-136; “HR 8555,” *Fortune*, September 1937, 78, 188.

¹² Quoted in Gibson and Donovan, 137.

¹³ “Mr. Kennedy, the Chairman,” *Fortune*, September 1937, 57-58.

¹⁴ “How Many Ships How Soon?,” *Fortune*, July 1941, 100; “HR 8555,” 77.

¹⁵ Emory S. Land, 28 October 1940, “The Shipping Industry,” lecture to Army Industrial College Special Course, August-December 1940, p. 1, in Emory S. Land papers, carton 10, unlabeled binder, located in Manuscript Division, Library of Congress (hereafter cited as “ESL papers”).

¹⁶ Lane, 15, 16, 20.

Of the five men nominated in 1936, however, Roosevelt put only Land up for a six-year term, a sign of their long relationship. Land had worked with Roosevelt in the Navy Department during World War I and then had served as the chief constructor of the U.S. Navy during the early New Deal, in which capacity he helped accelerate American warship building.¹⁷ Liberal Democrats in the Senate nearly blocked Land's nomination on the grounds that he had evinced anti-labor sentiment over the course of his career, but after considerable debate, all five nominees were confirmed and the Maritime Commission officially began operations.¹⁸

The commissioners and their growing staff quickly determined that the key weakness of the American shipbuilding industry was a lack of actual construction capacity: too few yards, too few shipbuilding berths (or shipways), and too few workers. In 1937, American commercial shipbuilders operated only ten shipyards with a total of forty-six shipways—just over half of Hog Island's total capacity.¹⁹ To spur growth of new shipyards and to provide a mechanism for funding new ships, the commission implemented a "construction differential subsidy" (CDS) program, under which the commission essentially became a shipbuilding broker. First, the commission reviewed the design and operating plan for a ship that each private operator wanted to build. After modifying the plan as the U.S. Navy saw fit for possible wartime service, the commission took bids from shipyards to actually construct the vehicle and awarded the contract to the low bidder. When the vessel was completed—often, several years later—the commission sold the ship to the operator for what the ship would have cost in a foreign yard, usually about half its actual cost.²⁰ The CDS program seemed to benefit everyone: shippers renewed and expanded their fleets with inexpensive new vessels, shipbuilders received a stream of lucrative orders, and the Maritime Commission fulfilled its Congressional mandate. While wartime operations inevitably drifted away from the CDS model, it nonetheless set the Maritime Commission at the head of the merchant shipbuilding industry—the position it would occupy during the entire war.

¹⁷ To demonstrate his longstanding ties to the Roosevelt clan, Land like to recall that when he fell too ill to walk in the graduation ceremony at Annapolis, the commencement speaker, Theodore Roosevelt, visited him in his sickbed afterwards. Baltimore *Evening Sun*, 23 February 1942, p. 4, c. 1. In ESL papers, carton 5, "Clippings 1942," folder.

¹⁸ ESL papers, carton 31, n.d., "The Franklin Delano Roosevelt Memorial Foundation," p. 4.

¹⁹ "The Yard 1 Bottleneck Now is Lack of Ships," *Fortune*, May 1942, 69.

²⁰ Gibson and Donovan, 153.

Unwilling to let private needs drive the entire merchant shipbuilding industry, the Maritime Commission launched a “long-range program” to parallel and reinforce the CDS scheme, a plan to build up to 500 merchant ships by 1948. The initial round of bids was a fiasco: no operating shipyards offered a price anywhere near the figure the Maritime Commission considered appropriate, so the commission awarded its first contract to a shipbuilding concern in Tampa, Florida, whose yard had actually burned down some years before. Revitalized by the contract, the shipyard completed its ships and went on to build ships for the commission during the war. More importantly, this episode demonstrated to all American shipbuilders and other interested observers that the commission would go to almost any length to obtain low-cost ships and to enlarge the shipbuilding industry.²¹

The “Six Companies” construction consortium was one especially intrigued bystander. Founded in 1931 to bid on the Hoover Dam project, the group actually comprised eight Western construction companies, including firms run by Henry Kaiser and his close allies, the Bechtel family, as well as well-known enterprises such as Utah Construction, Morrison-Knudsen (M-K), MacDonald & Kahn, and others. All of the companies had collaborated to some extent before Hoover Dam, but that massive project required the formation of a consortium that was both broad and deep. Successfully completing Hoover impelled the Six Companies to formalize their relationship and to seek additional projects in the West. In various combinations, the companies were primarily or partly responsible for building Bonneville and Grand Coulee dams and the Golden Gate and San Francisco Bay-Oakland Bay bridges. As federal investment turned in the late 1930s from heavy infrastructure to national defense, the Six Companies came to view shipbuilding as a logical sector into which to diversify: not only did the industry now have ready access to federal subsidies, but also it was likely that the government would be buying ships for a long time. Moreover, the organizational and technical problems inherent to shipbuilding were similar to those encountered on big construction jobs like the Hoover Dam. In late 1938, Henry Kaiser, Steven Bechtel, and John A. McCone decided to seek shipbuilding work for the Maritime Commission.

²¹ “Shipbuilding Costs in the U.S.,” February 6, 1938, in ESL papers, carton 7, “Shipbuilding Data 1938-1942 Costs etc.” folder; “Shipbuilding Costs in the U.S.,” Memo for Mr. Kennedy, February 6, 1938, in ESL papers, carton 9, “Shipbuilding Data 1938-1942 Costs etc.” folder.

Recognizing the unlikelihood of obtaining contracts without any shipbuilding experience, the partners sought out and found a firm that wanted to expand its role in the maritime industries, the Todd Shipyards Corporation. Based in New York, Todd had built ships during World War I, but then turned to ship repair as a strategy to survive the interwar depression. Todd viewed the Maritime Commission in much the same light as the Six Companies did: an agency that would revitalize the shipbuilding industry by channeling federal funds to private firms. Todd and the Six Companies then formed a new company, the Seattle-Tacoma Shipbuilding Corporation (“Sea-Tac”), which took on a \$9 million contract to build five small freighters.²² In successfully fulfilling that contract, the partners divided their labor carefully: Todd managers learned new construction techniques by studying how Six Companies engineers and construction crews built the firm’s new shipyard near Tacoma; Six Companies personnel observed how Todd’s shipbuilders actually built the five vessels.²³

With the work at Sea-Tac well under way, Todd and the Six Companies began seeking additional work from the Maritime Commission. In October 1940, a British mission traveled to the United States in an effort to contract with an American shipyard to build up to eighty large, standardized freighters.²⁴ After considering other alternatives, the Maritime Commission decided to place the British ship order in two new shipyards, one on each ocean coast in an effort to revitalize two different and distant shipbuilding districts and to prevent competition for labor and materials like steel and the ships’ coal-fired steam engines.²⁵ Chairman Land argued that the new yards should feature a simple layout (including between eight and fourteen construction berths), operate in ways “similar to the Hog Island production plan of the last War,” and turn out all its ships between November 1941 and November 1942.²⁶

After winning formal approval from the war-mobilization authorities, the Maritime Commission divided the British order for sixty 10,000-deadweight ton freighters between two shipyards run by Todd concerns: the Bath Iron Works, a destroyer-building yard at Portland,

²² For details on the Six Companies-Todd partnership and the 1939 increase in the long-range program, see three articles in *Fortune*: “The No. 1 Bottleneck Now is Lack of Ships,” May 1942, 69; “Biggest Splash,” July 1941, 122; and “The Earth Movers II,” September 1943, 222 (hereafter cited as “EM II”).

²³ “EM II,” 222; Bechtel, *Building a Century, 1898-1998* (Kansas City, MO: Andrews McMeel, 1998), 40.

²⁴ Lane, 39.

²⁵ Lane, 42.

²⁶ Emory Land to William Knudsen, November 8, 1940, in ESL papers, carton 29, “E.S. Land Special Correspondence Operational Memoranda and Notes March 1909-Jan. 1941.”

Maine, and Todd-California or “Todd-Cal,” a new seven-shipway yard at Richmond, California. Todd-Cal, which was later renamed and commonly called “Yard 1,” was the first of the four Kaiser shipyards at Richmond, and the first of the Kaiser’s eight merchant shipyards around the country. Executives from Todd, Bath and the Six Companies signed a \$120 million “vessels contract” on December 20, 1940, which fixed the per-ship price at \$160,000.²⁷ Todd and the Six Companies also signed a \$7.1 million “facilities contract” to furnish capital (but little or no profit) for erecting the Todd-Cal yard.²⁸

On January 14, 1941, construction crews working under Clay Bedford, the new general manager at Todd-Cal and a longtime lieutenant of Henry Kaiser, began building the yard, which was initially little more than a few acres of mud just south of Cutting Boulevard in Richmond. Eighty-eight straight days of rain hampered the construction project, but on April 14, 1941, personnel from Todd laid the yard’s first keel for the vessel that was eventually named the OCEAN VANGUARD. Todd-Cal had begun building ships.²⁹ The shipyard was located at the cramped north end of Richmond Inner Channel, a narrow ship channel extending north from San Francisco Bay. Yard 1’s seven shipbuilding berths were shoehorned into a south-facing stretch of shoreline at the end of the channel; the rest of the yard’s fabrication facilities were packed into a trapezoid of 127 acres between the shipways and Cutting Boulevard to the north.

By that time, the Maritime Commission’s merchant shipbuilding program had already grown to unprecedented dimensions. On January 3, 1941, President Roosevelt had called for 200 more cargo ships to be operated directly by the United States.³⁰ Central to this massive increase in the commission’s workload was a vessel no one on the commission liked: the Liberty ship.³¹ In a crash program, the Maritime Commission and a private naval architecture firm redesigned the ships Britain had ordered for American needs. The Liberty could not sail rapidly—at 10,00 deadweight tons and about 440’ long, she could only make about 11 knots—

²⁷ “EM II,” 222.

²⁸ *Fore ‘n’ Aft* 14, no. 15 (April 14, 1944): 6.

²⁹ For accounts of the construction process, see *A Booklet of Illustrated Facts*, 18, in Henry J. Kaiser papers (hereafter cited as HJK papers), carton 157, folder 12, The Bancroft Library of the University of California, Berkeley; *Fore ‘n’ Aft* 4, no. 15 (April 14, 1944), 7; and “The Permanente Metals Corporation Richmond Shipyard Yard 1, Schedule of Shipyard Facilities as of July 1, 1944,” 1 in National Archives and Records Administration, Record Group 178 (hereafter cited as NARA RG 178), entry 100, box 26, “United States Maritime Commission, West Coast Yards.

³⁰ Lane, 40-43.

³¹ Lane, 43-45. A brief account of the Liberty’s debut appears in “Ships for *This War*,” *Fortune*, July 1941, 42.

but she could, more importantly, be *built* rapidly. To that end, the Maritime Commission distributed the initial complement of 200 Liberty ships over a number of new shipyards, including three run by the Six Companies and Todd. In April 1941, as the war turned against Britain and France, the president requested 306 more cargo vessels, including 112 more Liberties, and the Maritime Commission authorized even more new shipyards, including a second facility at Richmond, which Kaiser prosaically named Yard 2. (Though the original Richmond yard would be known as Todd-Cal for a few more months, it was always considered “Yard 1” and, in mid-1942, was formally renamed as such.)

Kaiser’s construction crews simply moved slightly southeast from Todd-Cal to the site of Yard 2, which soon grew from nine to twelve shipways (the largest of the three Kaiser yards at Richmond). Occupying 365 dry-land acres (and just over a 100 acres of water for launches and ship outfitting), Yard 2 was the largest of the four facilities that eventually filled the Richmond shoreline.³² The shipbuilding berths faced south over a vast square basin that opened into San Francisco Bay; the rest of the shipyard extended north from the ways toward the city of Richmond. Several fabrication ships were operational in early June, and workers laid out the first three Liberty ship keels in September.³³ By placing Yard 2 within Permanente Metals Corporation, a new holding company that omitted Todd, Henry Kaiser was able to use the new yard to begin cutting ties with Todd, a decision made partly for personal reasons (Kaiser and Todd’s presidents disliked one another), partly because Kaiser felt the need to be independent of East Coast businesses like Todd, and partly because Kaiser—and other Six Companies partners—wanted as much of the Maritime Commission’s work as he could get.³⁴

Just after Pearl Harbor, Kaiser seized the opportunity to garner this additional work. With the United States now plunged into the war, President Roosevelt called for far more merchant ships than the Maritime Commission ever anticipated building, at production rates that far exceeded the commission’s plans.³⁵ The commission had intended to get two hulls from each berth in its emergency shipyard (those which would primarily build Liberty ships, like Todd-Cal

³² “The Permanente Metals Corporation Richmond Shipyard No. 2, Schedule of Shipyard Facilities as of July 1, 1944,” 2, in NARA RG 178, entry 100, box 26, “United States Maritime Commission, West Coast Yards Shipyard Facilities Index, July 1, 1944.”

³³ *Fore ‘n’ Aft* 4, no. 15 (April 14, 1944): 7-8.

³⁴ Lane, 59.

³⁵ Lane, 142-143.

and Yard 2) during 1942 and four ships per way in 1943. To meet the president's post-Pearl Harbor demands, the commission altered those forecasts to expect four Liberty ships per berth in 1942 and five or six hulls in 1943, effectively doubling the pace of production for 1942 and increasing it by half again as much for 1943.³⁶ The construction rate per ship, as specified in all new contracts, dropped to just 105 days—less than a third of the time it took to build the first Liberty ship.

Faster, more intense production rates compelled Richmond managers to dramatically enhance their two Liberty shipyards by constructing a giant prefabrication plant. Located on a tract of land abutting Todd-Cal on the northwest and Yard 2 on the southeast (and just north of the Ford Motor Company plant that had been operating before the war and that built jeeps during the war), Prefab was designed to make Liberty ship subassemblies for the two yards. Though wartime shipyards all over the country had prefabrication plants, Richmond "Prefab" rationalized shipbuilding to an extraordinary degree by focusing its labor force on the manufacture of extraordinarily large and complex subassemblies like deckhouses, hull sections, and prows and sterns. Prefab turned out its first deckhouse in July 1942, seven months after groundbreaking but coincident with the delivery of the last British freighter and the construction of the first Liberty ships at Todd-Cal.³⁷ Prefab dramatically and immediately affected Liberty ship output, but it also pushed the Maritime Commission and its contractors to work more closely with the American military. Henry Kaiser, for instance, accepted a contract to build giant C4 troop transports for the U.S. Army. Since the C4s were large for the existing berths at Richmond and too complex to fit into the tight schedules that governed Liberty ship production, and since Kaiser was now supremely sure of his organization's ability to build almost any kind of ship, Kaiser erected another yard at Richmond, predictably named Yard 3. Begun in January 1942 at the tip of Potrero Point, south of Yard 1 and across the Richmond Inner Channel from Yard 2, the 156-acre shipyard had one key difference from its sister yards: five expensive and elaborate graving docks, measuring 590' long and 100' wide. These basins allowed shipbuilders to erect

³⁶ Lane, 138-140.

³⁷ *Fore 'n' Aft* 4, no. 15 (14 April 1944): 9.

the giant C4s in a dry, sunken chamber that could be flooded by opening giant cofferdams, thus launching the ships.³⁸ The first C4 was laid down in an incomplete basin in mid-May 1942.³⁹

Yard 3 and its unusual graving docks gave Henry Kaiser the chance to finally break with Todd, whose leaders correctly viewed the docks as Kaiser's promise to enter Todd's traditional ship repair and refitting businesses in a market—San Francisco Bay—which the older firm had ignored.⁴⁰ Rather than precipitating an ugly corporate war, Todd and the Kaiser/Six Companies executed a neat and complete exchange of interests, effective with the delivery of the last British ship from Todd-Cal in July 1942. Todd-Cal was officially renamed Richmond Yard 1 and, along with Yard 2, was placed under Kaiser's exclusive control through his Permanente Metals Corporation. Several other West Coast yards went to other Six Companies concerns, while Todd took control of shipyards in Seattle, Houston, and Portland, Maine.⁴¹ Almost simultaneously, Kaiser bought out several of his Six Companies partners, some of whom were worried that he had diversified too far and too fast. Bechtel and Kaiser, however, remained intertwined at least through late 1943, sharing ownership of Permanente Metals and the sister companies operating Oregon Ship and Calship.⁴²

Amidst these changes, Kaiser added one more facility to the complex at Richmond, a small and specialized yard initially called Yard 3A to denote its geographical proximity and organization dependence on the still-new Yard 3, but later renamed Yard 4 as its operations became more independent. This new facility was tucked into the only remaining undeveloped land near the other yards: a rectangular zone of 68 acres across the ship channel from Yard 1 and well north of its parent, Yard 3.⁴³ Like that yard, Yard 4 grew out of the increasingly close ties between the military and the Maritime Commission and its contractors. The army and navy had already determined that the Allies' grand strategy would require a substantial fleet of "LST" or

³⁸ "Kaiser Company, Inc. Richmond Shipyard No. 3, Schedule of Shipyard Facilities as of July 1, 1944," 2, NARA RG 178, entry 100, box 26, "United States Maritime Commission, West Coast Yards Shipyard Facilities Index, July 1, 1944."

³⁹ "Kaiser Company, Inc. Richmond Shipyard No. 3, Schedule of Shipyard Facilities as of July 1, 1944," 8-9.

⁴⁰ "EM II," 225; Stephen B. Foster, *Henry J. Kaiser: Builder in the Modern American West* (Austin: University of Texas Press, 1989), 83.

⁴¹ "EM II," 222, 225; "Biggest Splash," 225.

⁴² "EM II," 225; "Earth Movers III," *Fortune*, October 1943, 140-141 (hereafter cited as "EM III").

⁴³ "Kaiser Cargo, Inc. Richmond Shipyard No. 4, Schedule of Shipyard Facilities as of July 1, 1944," 2, NARA RG 178, entry 100, box 26, "United States Maritime Commission, West Coast Yards Shipyard Facilities Index, July 1," 1944.

“landing ship-tank” craft, amphibious-assault vessels that could plow up onto a beachhead to disgorge tanks, trucks, jeeps, and other heavy equipment. The navy and Maritime Commission had already determined that a nationwide network of subcontracted metalworking firms would manufacture sections of the LST vessels and then ship them to the new LST “shipyards” to be combined into complete ships. Kaiser volunteered to build in new yards in Washington and at Richmond.⁴⁴ Accordingly, the almost skeletal workforce at Yard 4 merely assembled ship components fabricated by subcontractors throughout northern California.⁴⁵ Yard 4 launched its first LST in summer 1943, but could publicize little of its work, for the assault ships were then a military secret.⁴⁶ A contemporary Richmond employee manual said only that the yard “has been built, is doing its full share in the American war effort.”⁴⁷

Shipbuilding and Organized Labor

As the four shipyards at Richmond went up and construction of the first hulls commenced, Henry Kaiser and his executive staff faced myriad problems, from obtaining enough steel to actually build the vessels to training their already-giant workforces for the new kind of shipbuilding. Owing to considerable efforts on the part of the federal government, private contractors and organized labor, however, Kaiser managers did not encounter any severe labor relations problems any time between 1940 and 1945.

⁴⁴ Lane, 610: “EM III,” 140-141. The LST enterprise had one of the most convoluted structures of any Maritime Commission-affiliated program. A joint British-American naval planning group had begun devising rough plans for a big landing ship in 1941, but passed those plans to the Maritime Commission after Pearl Harbor abruptly created other priorities. The USMC handed the LST back on discovering that the navy controlled the supply of the diesel engines each LST needed. The navy first spread LST contracts to its own shipyards, including inland oddities like the “prairie shipyard” at Seneca, Illinois, southwest of Chicago, or “Evanship” in Evansville, Indiana, which had substantial funding from Bechtel, Kaiser and other Six Companies concerns. Two Bechtel companies, Bechtel Corp and Bechtel-McCone-Parson Corp., each held 10 percent shares in the Indiana shipyard, while a Kaiser concern had a 20 percent stake, second only to the 24 percent share of Missouri Valley Bridge & Iron, the operating partner. (Several other construction firms had investments ranging from 15 percent to 5 percent.) Seneca and Evansville sent their LSTs to the Mississippi River and the Gulf of Mexico via the Illinois and the Ohio rivers, respectively. When the navy requested the right to place LST with Maritime Commission contractors, Land and Vickery acquiesced out of fear that the navy would permanently co-opt the companies.

⁴⁵ Lane, 610-611.

⁴⁶ On construction, see: “Kaiser Cargo, Inc. Richmond Shipyard No. 4, Schedule of Shipyard Facilities as of July 1, 1944,” 1, NARA RG 178, entry 100, carton 26, “United States Maritime Commission, West Coast Yards Shipyard Facilities Index,” July 1, 1944. Another source of construction dates is *A Booklet of Illustrated Facts*, which puts the date at June 2 (page 19). On the first launch: *Fore ‘n’ Aft* 4, no. 15 (14 April 1944): 9.

⁴⁷ “Yard 3 Employee Handbook” (1943), 13, in HJK papers, carton 288, folder 26, “Yard 3.”

By the advent of World War II, shipbuilding had been subject to decades of attempts by organized labor to organize shipyard workers, efforts that had found uneven success. During the half-century between the Civil War and World War I, the Delaware River shipyards, which ranked as the country's most important, had effectively resisted incursions by organized labor, in keeping with the "open shop" atmosphere that predominated around Philadelphia.⁴⁸ Other East Coast shipyards were equally obdurate. The warship building yards run by Bethlehem Steel and other old-line shipbuilders up and down the Atlantic Coast were especially tough for organized labor to crack. When the New Deal seemed to promise an official federal imprimatur of labor organizing, the Congress of Industrial Organizations seized the opportunity to mount another push. The Industrial Union of Marine and Shipbuilding Workers of America (IUMSWA), for instance, struggled from 1933 to organize a number of shipyards on the Atlantic Coast.⁴⁹ The culmination of IUMSWA's efforts came in August 1941, when the union struck Federal Shipbuilding at Kearny, New Jersey (a subsidiary of U.S. Steel) to halt warship production and compel the government to seize the yard. After the navy took over the yard, the union agreed to end the strike, having established itself as the representative of Federal's workers.⁵⁰ This dramatic gamble had far-reaching effects: in October, IUMSWA won the union election at Bethlehem Steel's new Fairfield facility near Baltimore—the largest and most productive shipyard on the East Coast—though, it took until September 18, 1942, to finally sign a contract there.⁵¹

By contrast, the organization of the old and new shipyards on San Francisco Bay came relatively quickly and easily. Three interrelated factors account for this difference. First the San Francisco Bay yards—even older yards that had been built in the nineteenth century, but especially the new shipyards built for World War II production—had not experienced the vituperative labor-relations history of the East Coast shipyards. Second, shipbuilding's boom-and-bust cycles had afflicted the Pacific yards even more than their Atlantic counterparts, encouraging West Coast managers and entrepreneurs like Kaiser to take whatever steps seemed

⁴⁸ See Heinrich.

⁴⁹ See David Palmer, *Organizing the Shipyards: Union Strategy in Three Northeast Parts, 1933-1945* (Ithaca: Cornell University Press, 1998).

⁵⁰ Lane, 291-292. Nelson Lichtenstein, *Labor's War at Home: The CIO in World War II* (New York: Cambridge University Press, 1982), 68.

⁵¹ Lane, 293.

necessary to win contracts for their companies, such as accommodating themselves to organized labor or acquiescing to other federal mandates. Third, Western shipbuilding contractors like Kaiser had a short but intense history as participants in New Deal projects, which made them even more likely to see organized labor as a fact of operational life rather than a burden to be shaken off.

As Kaiser readied his organization for its shipbuilding activities, he encountered the two heavy-industrial unions that predominated in the Bay Area before World War II: the Boilermakers and the International Association of Machinists (IAM). Affiliated respectively with the American Federation of Labor and the CIO, both unions ultimately and enormously benefited from the most important labor-relations innovation in the wartime shipyards: shipbuilding stabilization agreements between the commission and other federal agencies, shipbuilding contractors, and organized labor.

In slightly modified form, all the stabilization agreements were intended—and served—to ensure labor peace. Sidney Hillman, an organized-labor official who helped administer both the Office of Production Management and the National Defense Advisory Commission, announced the formation of a nationwide shipbuilding stabilization committee on November 27, 1940.⁵² Composed of representatives of the Maritime Commission, the navy, various unions like the Boilermakers and IAM, and many shipbuilders, the committee aimed to write “stabilization agreements” to govern activities in the four main shipbuilding regions: the Atlantic, Pacific, Gulf Coasts, and the Great Lakes (including, eventually, inland yards).

On December 5, 1940, just a few days after its formation, the committee offered a “no strike” pledge on behalf of its constituents, well ahead of actually acquiring the power to keep such a promise.⁵³ Given the rapid growth of shipbuilding on the Pacific Coast, the stabilization committee chose to focus on achieving the first labor-stabilization agreement there. The West Coast Shipbuilding Stabilization Zone Conference convened on February 3, 1941, with representatives of the Maritime Commission, the U.S. Navy, various labor unions, several other federal agencies, and a number of West Coast shipyards in attendance. Just over a week later, the conference announced that it would not consider matters relating to work rules or other

⁵² Lane, 273.

⁵³ Lane, 274.

typical shop floor concerns, but would instead concentrate on establishing a common wage scale for the entire West Coast industry.⁵⁴ Deliberations continued throughout February and March, a period in which Congress put the Lend-Lease program into law and thereby guaranteed high, long-term demand for ships. Finally, on April 1, the conference announced that it had set the wage for a “first class machinist” at \$1.12 per hour, establishing not only a maximum wage for the West Coast shipyards, but also, since labor costs were deemed highest in that region, setting a *de facto* maximum wage for the entire American shipbuilding industry, east and west, merchant and naval, public and private.⁵⁵ In June 1941, wage-stabilization agreements were reached for shipyards on the East Coast and Gulf Coast and for the Great Lakes yards in July. The Gulf yards had the lowest wage rate at a nickel below the \$1.12 per hour for the East Coast, West Coast and Great Lakes. The stabilization agreements reached in 1941 were maintained throughout the war, with just one minor modification: a nationwide 8 cents per hour raise effective July 19, 1942.⁵⁶

Though intended to forestall labor strife, the agreements instead precipitated a brief burst of it. On May 10, the International Association of Machinists (IAM, an American Federation of Labor union) and the Steel Workers Organizing Committee (affiliated with the Congress of Industrial Organizations) struck several Bay Area shipyards. Part of a strike wave that also famously afflicted the North American Aviation factories in southern California, the strike lasted six weeks, until IAM recognized that the stabilization agreement and especially the wage scale were effectively set in stone. Union leaders called off the strike on June 26.⁵⁷

Several events encouraged union leadership to reach this conclusion. First, on May 27, 1941, President Roosevelt had officially declared a state of national emergency, permitting the government to take drastic steps to ensure smooth mobilization, including the use of force.⁵⁸ Second, and equally important, IAM risked being shut out of the burgeoning West Coast shipyards and losing new members and dues that would accrue to the unions in each yard. On

⁵⁴ Lane, 278.

⁵⁵ Lane, 280.

⁵⁶ Lane, 309.

⁵⁷ Lane, 287-290. IAM continued to cause trouble for federal labor officials throughout the war. See Richard P. Boyden, “The San Francisco Machinists and the National War Labor Board,” in *American Labor in the Era of World War II* ed. Sally M. Miller and Daniel A. Cornford (Westport, CT: Greenwood Press, 1995), 105-119.

⁵⁸ The U.S. Army had been deployed to crush the communist-led strike at North America after just five days. Lane, 290; Lichtenstein, 64.

May 12, Henry Kaiser's new Oregon Shipbuilding Company at Portland, Oregon, had become the first West Coast shipyard to sign on to the stabilization agreement. The company then selected the AFL Boilermakers as the representative of its workers—even though there were only sixty-six workers in the shipyard and about 200 at a sister yard.⁵⁹

Kaiser's yards 1 and 2 signed on to the shipbuilding stabilization agreement soon after Oregon; the two later yards 3 and 3A/4 were also incorporated into the agreement when they began production. The stabilization agreements thus converted all four Richmond shipyards—with a peak employment of nearly 90,000 workers—into closed shops where only union-affiliated workers could hold line jobs.⁶⁰ Thanks to the agreements, shipbuilding unions were guaranteed to accrue millions of dollars in dues from thousands of new members, male and female, black and white, old shipbuilding craftsmen and neophyte industrial laborers.

The big Boilermakers union predominated in all of the Richmond shipyards. Besides the Boilermakers, numerous other unions, large and small, counted shipyard workers on their rolls, including the machinists, shipfitters, shipwrights, and riggers. The Boilermakers and the smaller unions never served as the main point of identification for workers, as unions did in settings such as the East Coast shipyards. Instead, workers at Richmond identified with the shipyards, and to a large extent with Henry Kaiser himself, rather than the unions into which they were dropped. The unions were thus critical to shipyard operations in a passive way, as federally mandated associations that collected and categorized all shipyard workers. The Richmond unions neither represented the organizational outcome of years of labor-management struggle, like IUMSWA in the East Coast shipyards, nor functioned as activists for workers' interests, like the United Mine Workers did for coal miners. With the contracting firms and the unions thus in agreement that the unions would serve as the channels through which all new workers entered the shipyards, the conditions for labor peace were in place.

Away from the West Coast shipyards, though, Maritime Commission Chairman Land did his best to continue to stir up discord, while also seeming to denounce it. A lifelong opponent of organized labor, Land made a series of provocative statements throughout 1942. In February and March, Land repeatedly claimed that strikes had cost the country up to a dozen ships in 1941,

⁵⁹ The CIO later sued to overturn this seemingly premature agreement, but the suit failed and the National War Labor Board affirmed the AFL's official status. Lane, 296-297.

⁶⁰ For labor-force figures, see *A Booklet of Illustrated Facts*, 28.

and then in April he announced that there was “too damn much loafing” in the merchant shipyards.⁶¹ After partially endorsing these claims, President Roosevelt later privately chastised Land for his shrill rhetoric.⁶² Land dutifully held his tongue for several months, but then went too far in October, delivering a speech in which he called for the execution of “organizers” whose efforts, he claimed, retarded war production.⁶³ Vociferous protests immediately erupted, not least from organized labor, whose leaders called for Land to resign. While the former admiral did not resign (and in fact served up until 1946), he did soften his rhetoric (and take succor from a few private statements of agreement). In any case, Land’s statements about laggard unions and sluggish workers had no basis in the reality of Bay Area shipbuilding, for remarkable conditions of labor peace predominated there throughout the war, especially in the giant Kaiser yards at Richmond.

The Workforce and Social Services at Richmond

After the 1941 IAM strike, which only slightly affected Richmond, there were no major strikes in the four shipyards. Unlike numerous other war-production facilities, such as a shipyard in Mobile, Alabama, and aircraft plants in Southern California and Pennsylvania, Kaiser-Richmond benefited from continuous labor peace and the high production that followed. In fact, the Richmond yards were so well known for workmanlike peace and quiet that workers from other shipyards strove to join the Richmond workforce. Though Californians always outnumbered others, significant fractions of the Richmond workforce came from elsewhere: 10 percent from Oklahoma; 7 percent from Arkansas; 6 percent from Texas; 3 percent from both Minnesota and Missouri.⁶⁴ Whether native Californians or migrants from the Dust Bowl, few of these workers had any experience in shipbuilding—but then, neither did many of their bosses. Some Richmond workers came directly to the shipyards from rural settings such as small towns or farms. Many of the men had held urban industrial jobs before the war, though many had worked in offices or domestically. In sum, workers who came to Richmond brought little

⁶¹ Lane, 166, 298-299.

⁶² Lane, 166.

⁶³ See Lane 303-304. For the text of the speech, see ESL, carton 21.

⁶⁴ *A Booklet of Illustrated Facts*, 31.

beyond an attraction to the working environment of the yards (especially to the relatively high wages), a willingness to learn new skills, and a desire to contribute to the war effort.

Migrants from the South were especially likely to be black. After a violent race riot at a shipyard in Mobile, Alabama, for example, some African-Americans fled to the safer and calmer environment in Richmond.⁶⁵ Closer to home, Selena Foster applied at the private Moore shipyard in Oakland after her husband forbade her from taking a welding job at Richmond, though she had already heard that the Kaiser yards were the best places to work. A Moore instructor, whom she remembered as “very biased and prejudiced,” kept her and other blacks out of the welding-instruction classes by giving all the available training equipment to white trainees.⁶⁶ Foster ultimately chose to work at a restaurant near the Richmond yards rather than subject herself to the conditions at Moore.

Though strikes were unknown at Richmond, there was some racial conflict, which arose not from the management or operations of the yards but from the conservative Boilermakers union. In participating in the common wartime exchange of craft prerogatives for new workers’ initiation fees and dues, the Bay Area Boilermakers restricted blacks to powerless auxiliaries and stripped women of voting and other rights. A few small actions against this discrimination, including a brief strike at another Bay Area yard and an ultimately successful lawsuit by a black welder—supported by the NAACP and argued by a young Thurgood Marshall before Earl Warren in the California Supreme Court—hardly dented the Boilermakers’ power.⁶⁷ That these conditions did not create wider protest indicates just how marginal the unions were to most workers’ interests: they simply did not shape workers’ lives to any great extent, either positively or negatively.

This was perhaps even truer for women, whose interest in union activity was the inverse of their importance to the overall workforce. At the peak of production in June 1944, 24,500 women worked in the Richmond shipyards, making up just over a quarter of the entire

⁶⁵ Lane, 981.

⁶⁶ Selena Foster, “A Longtime Richmond Resident from Cherokee County, Texas,” 81-82, oral history conducted in 1986 by Judith K. Dunning, Regional Oral History Office, available at The Bancroft Library of the University of California, Berkeley, 1992.

⁶⁷ Marilyn Johnson, *The Second Gold Rush: Oakland and the East Bay in World War II* (Berkeley: University of California Press, 1993), 68-75; Deborah Ann Hirshfield, “Rosie Also Welded: Women and Technology in Shipbuilding During World War II” (Ph.D. diss., University of California-Irvine, 1987), 96-107; Charles Wollenberg, *Marinship at War: Shipbuilding and Social Change in Wartime Sausalito* (Berkeley, CA: Western Heritage Press, 1990).

workforce. Women occupied 70 percent of all the position as laborers, the unskilled workers who literally did the heavy lifting around the yards. More importantly, however, women made up 40 percent of all welders, 33 percent of all burners (who cut metal into shapes), and about a quarter of all craft workers (such as the carpenters who did interior work on mostly-completed ships) and warehouse workers. Women even made up big fractions of the two most highly-skilled trades, occupying 19 percent of the shipfitters (who performed the actual assembly of ships) and 17 percent of all machinists.⁶⁸

As these figures show, systematic gender discrimination did not significantly hamper the open and relatively egalitarian use of workers.⁶⁹ In utilizing workers, no matter their gender, race, ethnicity or age, Kaiser adopted the best wartime expectations of socio-economic equality—to use every available worker in the interest of meeting heavy demand for ships.

Formal arrangements, like the wage-freeze agreements, along with broader policies enacted by the War Production Board, War Manpower Commission, and other federal agencies to prevent gender discrimination, had a great deal to do with the prevention of strikes, lockouts, and other kinds of unrest. Kaiser also took unparalleled efforts to establish social services for its workers and unions, thereby going beyond simple wages to maintain good labor relations with its workers. Kaiser's social services focused on three key matters: housing, transportation, and health care. In August 1941, Henry Kaiser asked the Maritime Commission for assistance in building worker housing near the shipyards, where he could reasonably ensure that workers lived decently and guarantee a ready supply of workers for the round-the-clock production at the yards. Initially uninterested in serving as a housing contractor or landlord, the USMC directed Kaiser to the federal housing authority.⁷⁰ After Pearl Harbor, however, the USMC joined other federal agencies like the Federal Public Housing Administration (FPHA) to build and manage public housing in Richmond and other shipbuilding districts.⁷¹ Contrary to federal policy, which strictly separated funds intended for public housing from funds intended for other kinds of war-effort and infrastructure, the Maritime Commission built worker housing at Richmond with

⁶⁸ *A Booklet of Illustrated Facts*, 30.

⁶⁹ Vera Jones Bailey, "Migration of a Working Family: From the San Joaquin Valley to the Richmond Shipyards, 1942," 44; Margaret Louise Cathey, "A Wartime Journey: From Ottumwa, Iowa to the Richmond of Shipyards, 1942," 25-26; oral histories conducted in 1985 (Cathey) and 1986 (Bailey) by Judith K. Dunning, Regional Oral History Office, The Bancroft Library of the University of California, Berkeley, 1990.

⁷⁰ Lane, 428.

⁷¹ Lane, 428-430.

resources intended for shipbuilding facilities. However, to maintain its focus on ship production, the USMC turned most completed housing over to other federal agencies to be managed.⁷² Thus, the commission spearheaded the construction of much worker housing throughout the country. By April 1944, the National Housing Administration ran 67,000 units while the USMC controlled only 9,000. (FHPA operated thousands more.) Alone among wartime shipbuilders, Kaiser became a landlord, operating dormitories at Richmond. Still, the hundreds of small single-family houses and dorms near the Richmond shipyards could only house a fraction of the giant shipyard workforce. Most workers found accommodations wherever they could and then figured out some way to commute to the yards.

This, in turn, created another debacle: getting those workers to the yards. After initially attempting to simply improve the roads near the shipyards, Richmond managers determined that mass transit offered a better solution to the transportation problem. The Maritime Commission accordingly authorized and funded an extensive network of ferries, busses, and light rail, in the form of recycled New York city railcars at a cost of \$7 million. By January 1944, however, less than 20 percent of Richmond workers used those mass-transit alternatives; two-thirds drove or rode in private cars. The rest walked to the yards.⁷³

Beyond public housing and mass transit, Kaiser found other ways to ameliorate the rigors of war work. An orientation manual for Richmond workers addressed the housing scene (and even offered information about rental rates), while also highlighting regional amenities like the picturesque bay, the University of California at Berkeley, and local libraries, schools, and churches.⁷⁴ An article in *Fore 'n' Aft* traced a fictional worker's path through the Richmond yard's numerous social services: an office that loaned money to newly-arrived employees, a board to sign up for carpools, a store to buy safety equipment, registration for the shipyards' sports leagues. All existed "for the purpose of producing more ships—of helping to win the war as quickly as possible."⁷⁵ Rare among war plants, the Richmond yards also featured a daycare

⁷² Lane, 431-433.

⁷³ Lane, 434, 443.

⁷⁴ Dormitory rooms rented for \$3.50 per week, furnished apartments for \$32 to \$37 per month, and houses for \$33 to \$40 per month. "Serve Your Country and Yourself: Help Build War-Winning Ships at Richmond, California" (Richmond, CA: Richmond Shipyards Central Employment Office, n.d. [1943?]), 12-15, in HJK papers, carton 288, folder 3, "Shipbuilding—Richmond—Recruiting Pamphlets."

⁷⁵ *Fore 'n' Aft* 4, no. 9 (3 March 1944): 8-9, quote on p. 9.

facility, which was a key means of appealing to female workers—if also one inadequate to handle the thousands of working women and their children.⁷⁶ More importantly, and almost uniquely, Kaiser offered prepaid medical care to his workers through the Kaiser Permanente health plan, which originated on Kaiser’s prewar construction projects, grew to serve hundreds of thousands of war workers and their families, and survived the war to become America’s first large health-maintenance organization.⁷⁷ According to shipyard press, the staff of the well-equipped hospital at Richmond understood “that they are pioneers in a form of medicine that will prove of tremendous value to working people” who suffered some 7.1 million injuries and deaths between Pearl Harbor and October 1943 as versus 48,330 American military casualties.⁷⁸ In combination, the medical plan and other social services, shipyard housing, and mass transit augmented the prevailing shipyard wage structure and offered another way to guarantee peace and high production in the shipyards.

One more factor played a large part in maintaining stable conditions in the Richmond shipyards: the wide use of bipartite labor-management committees to handle worker grievances. Before World War II, some labor leaders had called for such committees to run the entire mobilized economy, but President Roosevelt had stymied such dreams (and the converse dreams of some zealous managers to directly administer the war economy) by choosing to maintain firm federal control over war production.⁷⁹ In common with their ilk at other industrial facilities, the committees in the Bay Area shipyards formed after Donald Nelson, the chairman of the War Production Board, proposed the establishment of joint labor-management bodies to serve as instruments for maintaining good industrial relations. Nelson offered this idea in March 1942, at the nadir of the antagonistic relationship between Admiral Land and the shipyard unions.⁸⁰ Two of the other commissioners, including one with longstanding interest in organized labor, formally endorsed Nelson’s idea, and by the end of the year, all but three Maritime Commission yards had such committees, making shipbuilding “second only to the ordnance industry in the relative

⁷⁶ *A Booklet of Illustrated Facts*, 34.

⁷⁷ The best account of the Kaiser-Permanente health plan appears in Foster, 211-233.

⁷⁸ *Fore 'n' Aft* 4, no. 15 (14 April 1944): 20-21, quote on p. 20.

⁷⁹ David Brody, “The New Deal and World War II,” in *The New Deal*, vol. 1, “The National Level,” ed. John Braeman, Robert Bremmer, and David Brody (Columbus, OH: Ohio State University Press, 1975), 287.

⁸⁰ Lane, 451.

number of workers covered by labor-management committees.”⁸¹ At Richmond, the committees offered forums where workers could expect a fair hearing of problems such as inter-craft jurisdictional disputes, which otherwise might have developed into formal union grievances or harsh managerial fiats. Empowered to both consider and resolve such difficult situations, the committees also performed other activities. The committees could sometimes choose sponsors for launched ships, thereby bestowing a bit of fame on deserving workers. More frequently, the committees could weigh innumerable suggestions submitted by workers for concrete ways to improve work routines. Part of a nationwide program to use workers’ ingenuity to cheapen, speed and otherwise enhance their quotidian labor, the suggestion campaign devolved onto the labor-management committees, which considered each submission and awarded war-bond prizes to the best.

SHIPBUILDING AT KAISER-RICHMOND

Workforce Composition

The key sociological characteristic of the Richmond shipyard workforces was the diversity of gender, race and skill. While Todd-Cal initially operated with the customary complement of white, male workers, many of whom had already worked for Henry Kaiser on his prewar heavy-construction projects, that group was soon joined, at Yard 1 and the other Richmond yards, by a broader array of men and women, including significant groups of white women and of black men and women.

This alteration to the longstanding composition of the shipyard workforce was driven, as in other American war industries, by the sudden development of a full-employment economy that was also stressed by the military’s steady consumption of able-bodied young men. Since there were, for instance, simply too few welders to satisfy American merchant shipyards’ voracious demand, managers at Richmond determined quite early in the war to launch a major training program that would convert men (and beginning in large 1942, women) who had never before welded into skilled tradesmen, and women capable of performing something like the full array of welding tasks in the shipyards.

⁸¹ Lane, 451-453 (quote on 453).

As California emerged as a center of war industry and the Bay Area as the fulcrum of shipbuilding on the Pacific Coast, the shipyards quickly ran out of native workers. Luckily, the combination of federal employment programs and labor-market forces combined to continuously replenish the Bay Area shipyards' supply of prospective workers. High wages attracted many, from Midwesterners to Southerners. Ira Dale Mays, a white emigrant from Iowa, took night classes after a day shift as a crane repairman to learn to weld.⁸² Lucille Preston, a black emigrant from Mississippi, worked her way from a job as a welder's helper at Richmond Yard 2 to become a fully-fledged welder and, in fact, was one of the relatively few who earned certification from the American Bureau of Shipping. As Preston put it, "if you passed the test, then you would get the rating and the wages that the people who had been there a long time get... So I went to take the test, and I passed it."⁸³

In microcosmic or anecdotal fashion, Mays and Preston demonstrated the extent and success of the changes to the shipyard workforce, which between 1942 and 1944 steadily grew to include ever more women, African-Americans, and newly minted industrial workers. These changes in the composition of the workforce were all the more striking because they did not hamper the development or elaboration of a far-reaching set of technical innovations, not the least of which were prefabricated construction and electric arc welding. Thanks at least in part to the open-mindedness exhibited by Kaiser managers, from Henry down to superintendents who had cut their teeth on Kaiser's prewar heavy-construction projects, women and men who did not perform much highly skilled or highly paid industrial work before the war were given the opportunity to successfully pursue that work in the shipyards.

Steel Processing

Prefabrication provided a conceptual and practical base for shipbuilding at Richmond, because it helped managers and engineers organize the entire production process around the goal of achieving "a straight flow of steel" from the sidings where railcars delivered raw steel all the

⁸² Ira Dale Mays, "Stories of a Second-Generation Ironworker from Iowa," 42-43, 53, oral history conducted in 1985 by Judith K. Dunning, Regional Oral History Office, The Bancroft Library of the University of California, Berkeley, 1992.

⁸³ Lucille Preston, "A World War II Journey: From Clarksdale, Mississippi to Richmond, California, 1942," 21-27, oral history conducted in 1985 by Judith K. Dunning, Regional Oral History Office, The Bancroft Library of the University of California, Berkeley, 1992.

way to the outfitting docks where complete ships were equipped for their maiden voyages. As such, Richmond Yards 1, 2, and 3 shared with their peers around the country a distinctive arrangement of buildings, zones of open but useful space, shipways (or graving docks), and outfitting berths.⁸⁴ (Yard 4, on the other hand, did not, since it served as an assembly point for materials fabricated elsewhere.)

Henry Kaiser and his key lieutenants, like Richmond general manager Clay Bedford, viewed shipbuilding as a giant materials-handling enterprise that culminated in a product notable only in that it would it sail away, not sit in place like a dam or bridge.⁸⁵ In testimony before the Truman Committee, the Congressional investigative body chaired by the senator from Missouri, the Maritime Commission's second-in-command, Howard Vickery, described his West Coast contractors as eager to treat shipbuilding just like any other "production construction job where they can move a lot of mass material and move it quickly."⁸⁶

As Hoover Dam—the Six Companies' great prewar construction project—had required a constant supply of concrete, the building ships at Richmond required a reliable supply of steel. Using cranes and other heavy equipment, riggers transferred steel from railroad freight cars into giant storage yards, as much as 3 million square feet at Richmond Yard 2.⁸⁷ The biggest steel plates were stacked flat, but many smaller plates were placed on end in special racks. Stockyard work was often dangerous: collapsing plate racks could crush feet and legs and kill the unwary and unlucky. Keeping track of all the steel required ceaseless mental and physical labor: at Richmond Yard 2, more than a hundred receiving agents raced each day to process thousands of tons of steel in scores of different plates and shapes. By January 1942, the Maritime Commission and Kaiser had agreed to reduce one group of forty-two different plates to ten standard sizes.

⁸⁴ Lane, 214 (and see 202-230, especially the figure on 221, for a good overview of wartime shipbuilding practices).

⁸⁵ "EM II," 226.

⁸⁶ Testimony by Admiral Vickery, Truman Committee, *Hearings*, pt. 12, pp. 5183-5185, as quoted in Lane, 513. Admiral Vickery made these comments while describing the failure of a shipyard in Portland to make the transition from building destroyers to Liberty ships.

⁸⁷ *Fore 'n' Aft* 5, no. 17 (27 April 1945): 6. The usual distinction between plates and shapes is quite simple: plates are flat, rectangular sheets of steel in a wide variety of dimensions; shapes are elements formed at the mill (or elsewhere) into particular structural members, such as the familiar I-beam girder.

Simplification aside, the yards could not reduce their voracious demand for steel: 3,150 tons of steel went into one Liberty ship; 8,000 tons into a C4 troopship.⁸⁸ Neither could the yards easily overcome the problems created by other claimants for steel, such as the navy. The scarcity of steel actually limited shipyard production during the period of peak demand for merchant shipping from mid-1942 to early 1944, when American steel mills began to meet merchant shipyards' needs. Steel shortages caused constant delays in the West Coast yards. In 1942, Henry Kaiser claimed "our West Coast shipyards can produce 30% more [ships] without expenditure of additional funds for facilities, if basic steel is made available."⁸⁹ In October 1942, steel scarcity forced Clay Bedford, the Richmond general manager, to half-jokingly report to the Maritime Commission that "we have for rent one very fine shipbuilding way with southern exposure and lots of services available for immediate occupancy...Big opportunity—don't wait—act now!"⁹⁰ Material shortfalls plagued the Richmond yards throughout the war. As late as 1944, Bedford pointed to "a gross inequity in the delivery of critically needed materials" and to the dire situation at Yard 3, where shortages had sharpened to the point that "we have arrived at the point of wasting manpower" for lack of steel to work.⁹¹

Under normal circumstances, the Richmond shipyards had enough steel to operate, and the quotidian problem was simply to get it in the right place for fabrication and assembly. Cranes and "Hyster" carry-alls carried steel away from the storage yards and into the fabricating plants. The use of Hysters—odd vehicles that resembled farm tractors on stilts but that could carry a loaded plate rack anywhere in the yard—permitted managers to dedicate their cranes to more important work, such as the biggest plates or, even better, to entire fabrications. The Hysters could be quite dangerous: 20' up in the air drivers could not easily see pedestrians, who often underestimated the vehicles' speed and were run over. At Richmond, workers ingeniously solved this problem by equipping the Hysters with warning bells and by mounting the driver's seat further forward on the chassis.

⁸⁸ *Fore 'n' Aft* 4, no. 18 (5 May 1944): 7.

⁸⁹ Henry J. Kaiser to H[oward] Vickery, Marvin McIntyre, and Leon Henderson, 24 September 1942, in HJK papers, carton 15, folder 36. Not only did Kaiser, a consummate Beltway operator, send this letter to the shipbuilding czar, one of the president's trusted advisors, and one of the staunchest New Dealers in the mobilizations bureaucracy, but the letter was actually a quote of a telegram from Kaiser to Donald Nelson, the head of the War Production Board.

⁹⁰ Clay Bedford to H[oward] L. Vickery, 16 October 1943, in HJK papers, carton 25, folder 26.

⁹¹ C.P. Bedford to Carl W. Flesher, 27 November 1944, in HJK papers, carton 25, folder 25.

No rigid or even regular schedule governed the travels of the Hysters and cranes. Instead, the yard's production control departments, from which daily operations were controlled, routed the vehicles as needed to ensure that each point of production in the yards obtained the steel or subassembly it needed. Engineering and electrical staffs tracked daily production by tallying the weight of all the steel fabricated in each shop on a particular shift and comparing those figures to daily production orders and overall goals, such as ship-delivery deadlines.⁹² Noting delays and advances, production controllers then formulated and issued work orders for the next shift.⁹³

Steel Fabrication

Work orders traveled down from superintendents to foremen to leadermen to the rank and file as the Hysters ferried steel from the storage yards to the first real point of production, the plate shops where workers began to fashion raw plates and shapes into usable pieces of ships. Plate shops were ubiquitous in wartime shipyards: Richmond Yards 1, 2, and 3 each had one plate shop, and the high-production Yards 1 and 2 shared a fifth co-located with the Prefab plant. Bare and cavernous, the plate shops varied in size, but none were much more than tall, open-ended boxes whose interiors were arranged into long aisles or "bays," each of which shared with its adjoining neighbors a bank of machinery between them. Two adjacent bays in the plate shop at one shipyard produced the curved plates for Liberty ship shells (outer hulls) and keels, and thus shared a common set of steel cutting and bending machines.⁹⁴ Plate shop machinery did not operate at the tolerance of aircraft or automobile manufacturing, for such precision would actually have hampered workers' abilities to rapidly fill divergent orders. In fact, most plate-shop workers were machine operators who, though not expert machinists, did exercise

⁹² On Clay Bedford, the general manager of the Richmond shipyards, see Foster, *Henry J. Kaiser*, 57, 62-63.

⁹³ "Yard 3 Employee Handbook" (1943), p. 44, in HJK papers, carton 288, folder 26.

⁹⁴ "Construction Procedures for U.S.M.C. Type EC-2 Cargo Vessel at California Shipbuilding Corporation," 17. Basic information about the Bay Area yards' plate shops is scattered across many sources. See, for instance, "Yard 3 Employee Handbook," p. 49, in HJK papers, carton 288, folder 26.

This discussion relies heavily on a document, "Construction Procedures for U.S.M.C. Type EC-2 Cargo Vessel at California Shipbuilding Corporation" (on file at the Hagley Museum and Library, Wilmington, Delaware). This document thoroughly describes construction processes at Calship, a Los Angeles shipyard operated by Bechtel-McCone-Parsons Corporation. Though this document does not deal directly with either the Richmond yards, it is useful, not least because Calship and Richmond Yards 1 and 2 were designed and built simultaneously.

considerable skill in setting up and operating the machinery to turn out the products described in specific work orders on generic job cards.

The machine operators themselves did not control the inherent flexibility of their machines. Rather, directing the ceaseless shifts between products was the charge of shipfitters, the key workers on the plate shops as well as the fabrication shops, shipways, and outfitting docks. As the name of the craft indicates, shipfitters' work focused on assembling large parts (subassemblies, entire ships) out of smaller pieces (individual steel plates, prefabricated units) that had been manufactured quickly, but not precisely, in the plate shops. Analogizing war work and peacetime crafts, the Richmond yard magazine described shipfitters as "tailors of steel" whose ability "to locate all the ship's parts in exactly the right places," required "see[ing] the ship as a whole."⁹⁵

Many fitters worked in the shops where steel plates were cut and assembled into ever-larger sections, but their tasks always centered on ensuring that a particular item would fulfill its eventual purposes. Almost every product turned out by the plate shops at Richmond had a particular, quite narrow destination: the pace and scope of production, not to mention the chronic scarcity of steel, permitted workers and managers to make goods for stock. The Richmond shipyard magazine profiled shipfitters Bill Chinn and Bill Chan (whose ethnicity was so obvious as to merit no overt comment), whose efforts to fabricate deck girders for a specific ship illustrate this aspect of production. Working at a table in a plate shop, Chinn and Chan clamped a wooden template—crafted from a blueprint that had been probably drawn up months before the yard's naval architects—to a raw plate, then snapped a chalk line to indicate a particularly important cut. One marked this line with a hammer and punch so that the flame-cutter could find the line even as the flame obliterated the chalk; the other painted on the plate their names and a set of encoded fabrication instructions copied from the template. The instructions "conveyed all information needed to identify a piece, its location, its processing," in short, its unique fate. In this instance, "D-DKL-GIRD WEB PLT FRS 12-17 HULL 2268 STAR," classed the piece of steel as the D (fourth) deck girder running between the twelfth and seventeenth web plate frames

⁹⁵ *Fore 'n' Aft* 4, no. 5 (4 February 1944): 4-5.

on the starboard side of hull 2268 (a Liberty ship that became the HENRY ADAMS at its launch on March 10, 1944).⁹⁶

When Chinn and Chan finished, a crane carried the marked-up plate over to the plate shop to be processed. By making each plate into its own template and instruction manual, shipfitters eliminated the need for plate-shop machine operators to know more than the few common codes that would enable them to bevel a plate for welding or cut a plate to size.⁹⁷ To further minimize the chance of incorrect fabrication or routing, shipfitters in Richmond Yard 3 marked plates in four rotating colors, so that hull no. 1's white paint was not used again until hull no. 5.⁹⁸ The classic piece of plate-shop machinery was the flame cutter, a fiery device that could cut steel better than mechanical tools like shears and also prepare plate for welding by beveling the edges. Simple and adaptable flame cutters like the "Radiagraph" (of which one big Liberty ship had thirty-three) required little more than placing a small rolling carriage on a movable track, setting the pair of torches to make a parallel cut, igniting the torches, and sending the machine in self-propelled motion down the track. At the end of the cut, the carriage stopped and the torches went out. Bigger and more intricate "Travograph" and "Oxygraph" machines demanded more skill to operate and accomplished more complex tasks, such as dividing a single plate into identical strips or making one overlapping cut through an especially thick plate.⁹⁹

From the plate shop, semi-finished steel could go back into storage to await an order to be carried onwards. More commonly, the steel went directly to the subassembly or prefabrication shops that adjoined the plate shops. The overhead cranes could place steel anywhere along a plate-shop bay and could also transfer it from the plate shop to the prefab shop. Crucial to and characteristic of wartime ship production, the subassembly facilities were the key worksite of the most important trade in the wartime shipyards, the welders.

⁹⁶ This translation combines the code quoted in *Fore 'n' Aft* 4, no. 15 (4 February 1944): 4; and the glossary of "the main abbreviation and symbols" appearing in the "Yard 3 Employee Handbook," 46-47, in HJK papers, carton 288, folder 26.

⁹⁷ *Fore 'n' Aft* 4, no. 18 (5 May 1944): 6-7.

⁹⁸ "Yard 3 Employee Handbook" (1943), 47, in HJK papers, carton 288, folder 26.

⁹⁹ The Oxygraph's pedigree went back to 1911, when its maker, the Davis-Bouronville Welding Co., exhibited an early model at a railroad mechanics' convention. R.D. Simonson, *The History of Welding* (Morton Grove, IL: Monticello Books, 1969), 69.

Prefabrication and Subassembly

Typically, Kaiser pushed prefabrication furthest with the giant “Prefab” plant that served Yards 1 and 2.¹⁰⁰ Strategically located between the two yards, Prefab furnished those two yards with deckhouses, fore- and afterpeaks, double bottoms, and other giant hull units. Sophisticated and ambitious enough to constitute a clear competitive advantage over other yards, Richmond Prefab elicited half-joking protest from other shipbuilders. John McCone, an erstwhile partner of Kaiser who ran the big Calship yard at Los Angeles, voiced a “loud objection” to Prefab on the grounds “that it was hard enough...to stay ahead of those yards when you have them separated.”¹⁰¹

Like other shipyard prefabrication facilities around the country, the Richmond facility was organizationally centered on the prefabrication shop itself, a tall, long, shed-like structure that housed a kind of flexibly rudimentary assembly line for certain key subassemblies. (The Richmond Prefab building stood for more than fifty years after World War II, serving a variety of industrial purposes such as automobile storage, but was finally torn down in 2003.) The Prefab building was a relatively small part of the entire complex, which, in common with other prefabrication facilities at other shipyards, also included a great deal of open, unobstructed space in which to build, manipulate, and store the subassemblies that were as large as big houses. For instance, while the Richmond Prefab facility occupied 42 acres (and thus would have dwarfed many entire prewar shipyards), the plate and prefabrication shops themselves only covered 176,000 square feet, leaving the vast majority of the facility open for outdoor fabrication.¹⁰²

This space was neither empty nor disorderly. Rather, much of it was covered by “skids” or “platens,” fabrication spaces that ranged from clear but crude areas of compacted earth to flat concrete pads, almost all of which could be used for a wide variety of prefabrication tasks. A few skids, marked by elaborate frames or jig-like structures, were dedicated to fabrication of particular ship sections. Perhaps the most common skid-built ship component was the inner bottom assembly that formed the bottom of the hull. Each unit was fabricated by arranging a

¹⁰⁰ C.W. Fleisher to H.L. Vickery, 9 May 1942, 3, in RG 178, subgroup WEREG, carton 2, “Reading File 5/42” folder, on file at the NARA facility in San Bruno, California.

¹⁰¹ G.G. Sherwood to C.P. Bedford, 3 February 1943, in HJK papers, carton 16, folder 18.

¹⁰² “The Permanente Metals Corporation Prefabrication Plant, Schedule of Shipyard Facilities as of July 1, 1944,” 1, 7, in NARA RG 178, entry 100, carton 26, “United States Maritime Commission, West Coast Yards Shipyard Facilities Index,” July 1, 1944.

score of long, edge-on steel strips onto a much larger steel panel resting on the skid itself. Each plate had been fabricated in the plate shop; welders assembled the flat panel and the strips on another skid. This formed a low honeycomb of 4' square boxes. A team of welders moved from cell to cell, joining the strips at their intersections and each strip to the floor panel. When the grid was complete, gantry cranes lifted it up and off the skid, carefully flipped it over so that the honeycomb faced down and the panel faced up, and carried the subassembly to a waiting hull where it was lowered into place and welded to the hull.

The massive forepeak section, which, when installed, became the prow of the ship, was another typical skid-built assembly, but one that had to be built on special skids covered with a combination scaffold and jig. Cranes placed steel plates against this structure, and welders and shipfitters clambered over it to fix the plates in place, gradually forming a massive V-shaped structure. A completed forepeak, measuring 40' high and 50 tons in weight, resembled a slumping pyramid as it awaited the teamed-up cranes that would rotate it 90 degrees and install it at the front of a building hull.¹⁰³

A third kind of assembly, the Liberty ship deckhouse, exemplifies a different but closely related model of prefabrication, one many observers took as evidence that shipbuilding at Richmond verged on mass production. On skids at the intake end of the Prefab building, workers turned plate steel into deck plates, individual compartments, and other discrete pieces of the large deckhouse. Overhead cranes toted these sub-assemblies into the Prefab building and laid them on massive rolling platforms where teams of shipfitters and welders began to assemble them into recognizable deckhouses—each as large as a substantial house. Beginning with the square surface of the main deck, these teams added the bulkheads of that deck's compartments, then the second deck and its compartments, and finally the third deck and its compartments. All the while, the platforms rolled slowly towards the output end of the plant, so that the series of deckhouses comprised a physical record of their own fabrication. A similar process, if not on this scale, occurred in other Liberty shipyards, where heavy cranes carried complete deckhouses to the shipways for erection on a building hull. The distance between Richmond Prefab and the shipways in Yards 1 and 2 proscribed this solution: the miles-long craneways and the numerous

¹⁰³ Postwar Japanese shipbuilders, the world leaders, barely exceeded these lifts. In 1972, Japanese shipyards commonly built subassemblies that ranged in weight from 80 to 120 tons.

additional cranes would be too expensive and too dangerous. Thus, Richmond engineers took the audacious step of having burners cut each deckhouse into four horizontal slices, which could be hauled by tractor-trailer to the shipways for reassembly on a hull.¹⁰⁴

The work at Richmond Prefab elicited constant comparisons to car making and to other mass production industries, and indeed, Prefab was organized into a kind of assembly line. Beyond this resemblance, however, the comparison falters. The Prefab “assembly line,” like similar shops elsewhere at Richmond, did not move products past stationary workers and single-purpose machine tools. Similarly, the size and complexity of subassemblies like three-story deckhouses made conveyor belts and dedicated machine tools unrealistic.

Instead of being subjected to rigorous regimentation, Prefab workers, especially welders, roamed throughout the shop, performing whatever tasks they needed to do in the place and at the time they were asked. Margaret Cathey, who earned the highest welding certification in the yards, initially spent six weeks making the short “tack” welds that held two plates together until a production welder could permanently join them. After six weeks of this work, Cathey herself became a production welder. Shortages of everything from steel to welding equipment (which welders sometimes stole from one another) and helpers prevented many welders from performing their jobs and forced Cathey’s new leaderman to track down leads and carry his female workers’ gear to their worksites. Still, Cathey claimed that Prefab workers had the prerogative of taking breaks “whenever you had to go, or whenever you wanted to go”—a liberty she does not remember “anybody abusing.”¹⁰⁵ Cathey’s leaderman had almost total discretion over his welder’s daily duties; he could assign them to a particularly easy task or withdraw them from duty with a disliked shipfitter. In short, welders like Cathey had no single, regular job to perform. Instead, she performed a wide variety of tasks, from working at a fixed jig on an outdoor skid to performing difficult, out-of-position welds in cramped deckhouse cabins. In Prefab, as elsewhere in the Richmond yards, the paramount value was on flexibility, not regularity.

Beyond the daily round of the average welder, the prefabrication shops produced too many different and various goods to stand as a site of mass production like a car plant. In fact,

¹⁰⁴ At one of Kaiser’s shipyards in Portland, Oregon, a crane had actually dropped a deckhouse during a short lift between the prefabrication plant and the shipway, wrecking the deckhouse and damaging the hull. Lane, 229.

¹⁰⁵ Cathey oral history, 9-11, 20.

the characteristic productive flexibility and product diversity of prefab plants at Richmond helped shipyard managers and Maritime Commission administrators develop a typically American way of war, one predicated less on sheer mass production than on turning out a wide array of goods and turning from one item to another on short notice. Richmond Yards 1 and 2, for instance, had the good fortune to build nothing but Liberty ships over relatively long periods: from May 1942 (after delivering the last of the thirty freighters for Great Britain) to April 1944 at Richmond Yard 1, and from September 1941 to July 1944 at Richmond Yard 2. In early 1944, the Richmond Prefab plant switched to “a half-and-half deal,” with one side of the plant devoted to Liberty deckhouses and the other to “stuff” for that vessel’s larger and faster successor, the Victory ship. Over one representative week during that shift, the plant produced deckhouses, hull inner bottoms, boilers, smokestacks, and air uptakes for both kinds of ships.¹⁰⁶ This variety clearly indicates that Richmond Prefab adhered not to a mass production model of industrial activity but instead utilized principles that characterize “flexible” or “specialty” industrial production. This instance of flexibility mirrored the broader capacity of the yards to produce different variants of the same ships. By war’s end, Richmond Yards 1 and 2 had built three different types of the basic Victory ship.¹⁰⁷

The conversion of the Liberty shipyards to Victory ship production was probably the most significant product shift in the wartime shipbuilding industry. To shift from the relatively simple Liberties to the more sophisticated Victories, a shipyard needed to rapidly and smoothly execute a massive overhaul of its management and labor organization and of its technical infrastructure, all the while continuing to produce ships. In assessing the capabilities of its nineteen Liberty ship contractors, the Maritime Commission determined that only a minority were up to the challenge posed by the Victory: just six yards—half of which were run by Kaiser—were assigned the arduous task of adapting to the new merchantman. Of the other thirteen yards, a few underperformers received no new contracts while a few overachievers had already converted to other vessels.

¹⁰⁶ *Fore 'n' Aft* 4, no. 16 (21 April 1944): 7-8, in NARA RG 178, entry 95B, carton 533, “Clapper Contest” folder.

¹⁰⁷ The VC2-S-AP2 ran on a 6,000 horsepower Westinghouse turbine engine, the VC2-S-AP3 used a 8,500 horsepower General Electric turbine, and the VC2-S-AP5 “attack transport” was built to carry thousands of fully-equipped combat troops.

At Richmond Yard 2, the switch to the bigger, heavier Victory ship required far-reaching changes. Most obviously, each shipway was rebuilt. The floor was narrowed but the rest of the structure was widened and strengthened. Behind the ways, changes ran deeper. New specifications for cargo hold floor panels forced engineers to scale back the time-saving use of automatic welding machines in favor of what the Richmond yard magazine described as “more precise” manual welding—an odd statement that implied imprecise welding had been expected or allowed on the Liberty.¹⁰⁸ That relatively discrete change faintly suggested the wide-ranging alternations necessitated by new Victory ship subassemblies that could not be fabricated inside the Prefab plant itself. Bigger and heavier double-bottom subassemblies required sturdier prefabrication skids and more labor from workers. Pipefitters performed a third more labor on each unit and mastered altogether new tasks like installing a new kind of oil line coupling.¹⁰⁹ When possible, erection crews tested new procedures at innocuous times: a crew of riggers, working with two gantry cranes, spent much of one graveyard shift lifting the first prefabricated Victory deckhouse, flipping it right side up, and placing it on a waiting hull.¹¹⁰ Though far-reaching, converting to the Victory ship never halted or even significantly slowed ship production at Richmond Yard 2, in large part because of the inherent flexibility of the Liberty ship construction process.

The classic characterization of wartime merchant shipbuilding depicts the Maritime Commission as totally oriented to the production of Liberty and Victory ships. While American shipyards did indeed produce more Liberty and Victory ships than any others, emphasizing the production of the “emergency types” obscures the less prolific but still important production of advanced merchant ships like the sophisticated C4 troopships, T2 tankers, or small warships like landing craft and convoy escorts.

Here Yard 4 offers further proof of the flexibility of shipbuilding techniques. The initial LST program at Yard 4 encountered serious problems at almost every turn. After finally overcoming initial problems in securing usable ship plans and securing Diesel powerplants, the yard won the unusual rights to manufacture whatever vendors could not supply and to use its

¹⁰⁸ *Fore 'n' Aft* 4, no. 6 (11 February 1944): 1-2.

¹⁰⁹ *Ibid.*

¹¹⁰ *Fore 'n' Aft* 4, no. 14 (7 April 1944): 1, 3.

inhouse Maritime Commission inspectors to vet the adequacy of these items.¹¹¹ Though Yard 4 did not meet its contractual deadlines for finishing the LST order, the Maritime Commission and the navy nonetheless awarded the yard a contract to build frigates, small warships needed for convoy-escort duty in the Atlantic. Smaller than the LST, each frigate proved more difficult to build because each hull contained crew quarters, specialized naval equipment, and munitions, not just open cargo holds.¹¹² Yet Yard 4, once augmented with some of the skilled welders from the other shipyards, proved well suited to the frigates, for its small building berths and undersized cranes could easily accommodate the new vessels, and its regional network of subcontractors proved capable of making frigate sections. Moreover, the Maritime Commission named Yard 4 to act as the “lead yard” for the entire frigate program. The yard was thus responsible for drawing up working plans, disseminating them to the other frigate-building shipyards, and procuring and allocating materials for the entire program. Though some yards resented Yard 4’s stature, ultimately the centralization of authority in Richmond helped the frigate program run more smoothly.

Even as they built single types of vessels, the Richmond yards had to accommodate a stream of change orders from the Maritime Commission that altered some aspect of one or many ships. Even before Kaiser officially accepted the contract to build the original thirty freighters for Great Britain, the commission informed Kaiser’s engineers of numerous changes to the vessels, from putting on one coat of paint, not two, all the way to procuring and installing a new type of engine-room boiler.¹¹³

Change orders to ships already under construction were somewhat more difficult to handle, but Richmond managers and workers were well equipped to translate Maritime Commission change orders into new work routines. Field engineers or outside experts from the Maritime Commission, the Coast Guard, or the American Bureau of Shipping (an independent ship-inspection service akin to Lloyd’s of London) passed changes on to an “engineering bulletin department” whose staff checked the germane blueprints, issued a bulletin containing “a

¹¹¹ Lane, 611. Carl Flesher to E. Musser, 8 June 1942, two letters of same date, in NARA RG 178, subgroup WEREG, series “Records of the Director, West Coast Regional Construction Division,” carton 3, “Reading File, 6-7/42” folder, “Misc.” divider, on file at the NARA facility in San Bruno, California.

¹¹² Actual measurements: overall length: 303’-11”; beam: 37’-6”; draft: 12’-8.5”; deadweight: 984 tons; displacement: 2,199 tons; powerplant: twin-screw, 5500 shp steam reciprocating engine; two 900-hp diesels; speed: 21.5 knots; crew: 128 men. All data drawn from HJK papers, volume 70.

¹¹³ George Havas to W.B. Gibbs, 29 October 1940, in HJK papers, carton 7, folder 7.

description of the change and a clarifying sketch,” reproduced the documents, and distributed them to foremen and workers who actually made the changes in the field. By October 1945, thousands of bulletins had affected every class of ship built at Richmond.¹¹⁴ In March 1944, for instance, Liberty shipbuilding crews at Richmond Yard 2 rapidly mastered the installation of a giant “gunwale bar” that reinforced the notoriously weak junction between the uppermost line of hull plates and the main deck, even though the Maritime Commission required that the bar be riveted into place. Workers quickly revived the almost-dead craft of riveting and hashed out a complex fabrication routine. After a few iterations of the process, workers had significantly sped up the process and improved the quality of the end product.¹¹⁵

Ship Erection and Launch

From the prefabrication plants, subassemblies flowed steadily towards the penultimate but quintessential site of shipyard production, the shipways. Technical reports and popular accounts of shipbuilding used the number of shipways as a crude measure of yard capacity: Richmond Yard 2 was a “twelve-way yard.” This convention allowed rough guesses about a yard’s physical size and output rate. To outside observers and to workers, the shipways were the emblematic shipyard structure. From a distance, they looked like the skeletons of tipped-over skyscrapers, albeit with ships nestled into them. Up close, the shipways became little more than highly elaborate scaffolds, nearly a 100’ tall, bracketing a seemingly flat floor that declined towards the water at a few fractions of an inch per foot.¹¹⁶ Workers on the hulls had to constantly correct for this declivity, which eventually helped the completed hull slide down into the water.

The ways, and the graving docks at Yard 3, buzzed with activity. Much of this labor, like work in the dry-land shops, entailed skilled craftspeople working in their own specialized domains. Shipfitters and welders continued to play key roles, sometimes working together and sometimes working independently: two shipfitters and a burner cooperated to make a brace for a

¹¹⁴ *Fore ‘n’ Aft* 5, no. 40 (5 October 1945): 3.

¹¹⁵ *Fore ‘n’ Aft* 4, no. 13 (31 March 1944): 2.

¹¹⁶ “Marinship Corporation, Schedule of Shipyard Facilities as of July 1, 1944,” 1, in NARA RG 178, entry 100, carton 26.

lifeboat rack; a female fitter (“motherly-looking even in a hard hat”) fixed some incorrectly-installed support brackets with the aid of several welders.¹¹⁷

The most typical kind of work at the shipways was the erection of prefabricated subassemblies, a task often requiring close collaboration between many crafts. Installing a rectangular bilge plate, which fit into the gap between the hull’s vertical side shells and the keel’s curved bottom plates, required at least seven trades: riggers and a crane operator lifted the plate onto the shipway, plate hangers placed it correctly, shipfitters adjusted the location, burners cut away excess steel and prepared the edges for welding, flangers aligned the plate and its neighbors, welders fixed the plate in place, and flangers checked and corrected the final position.¹¹⁸

Erecting a giant subassembly like a deckhouse required an even larger, if not more diverse, team of workers. The deckhouses that emerged from Richmond Prefab had been sliced into three units, which were ferried to the shipway on railcars, then lifted by gantry cranes into place on the waiting hull. There, gangs of shipfitters and welders maneuvered each unit into the proper spot and fixed it in place, first with short “tack” welds at strategic points and later with regular “production” welds along the full length of the seams. Though the work itself was easy to perform, the scale of the job required several hundred hours of welding time. Determining the progress of work on the shipways was easy, however, for the ship literally took shape before an observer’s eyes as subassemblies were joined together to form the keel, then the hull and interior compartments, and finally the deck and the deckhouses. Once the hull could float—but often before it was not yet complete—it was readied for launching.

A ship launch required delicate work by a special crew of craftsmen who moved from shipway to shipway, preparing hulls for their launches. The crew first carefully raised each hull a few inches off the shipway and built a wooden launching cradle underneath it. Just before the launching ceremony, the crew drove heavy wooden “poppets” into the space between the hull and the cradle and welded several steel “burn-off plates” into the space between the hull and the way.¹¹⁹ At the climax of the launching ceremony, taking place on top and in front of the way,

¹¹⁷ *Fore 'n' Aft* 4, no. 5 (4 February 1944): 4-5.

¹¹⁸ *Fore 'n' Aft* 4, no. 18 (5 May 1944): 6-7.

¹¹⁹ Marinship Corporation, *Marinship: The First Two Years* (privately printed, 1944), 16; *Mariner* 2, no. 20 (15 April 1944): 5.

the poppets were knocked away, shifting the hull onto the cradle, and a team of burners—listening to a called-out announcement from the ceremony emcee above—methodically cut through the burn-off plates, weakening them until the ship finally tore loose and slid backwards down the way into San Francisco Bay. Normally, heavy “dragweight” chains slowed the hull enough that the waiting tugboats could guide her to the outfitting dock.

Sometimes this choreography went wrong. On her August 31, 1941, launch at Richmond Yard 1, the British merchantman OCEAN VIGIL broke her dragweight chains and plowed into a Russian freighter. Though neither ship was seriously damaged, the incident deeply embarrassed the shipyard’s managers, for Bess Kaiser, Henry’s wife, had christened the OCEAN VIGIL.¹²⁰ The labor required to launch a ship took place under the way, out of sight of the crowds who assembled to revel in the visible accomplishment of having built a ship. These spectators could range from a few dozen workers taking time from their lunch breaks to watch an ordinary launch to thousands of workers, family members, and dignitaries gathered to see a notable ship get splashed. Launches naturally centered on the christening ceremony in which a female sponsor smashed a bottle of wine across the bow just as it began sliding backwards into the water. These sponsors were usually remarkable apart from their central role in the launching ceremony, if only by dint of being the female relation of a notable male, like Mrs. Kaiser. Occasionally, notable female workers were honored.

Outfitting and Delivery

A launched ship was not necessarily one ready for service on the high seas. While launching a ship freed a shipway for a new hull, the launch itself was less important as a production milestone than as a chance to publicize a shipyard’s efforts, since launches were widely considered to be the last stage of production. The actual final phase of production, outfitting, thus took place behind the scenes at special docks, where big, diverse workforces raced to perform the myriad chores that would prepare the ship to set sail. As the last obstacle to putting the ship into service, outfitting might have merited special attention from managers, but

¹²⁰ *San Francisco Chronicle*, 1 September 1941, 1. A year later, as Mrs. Kaiser prepared to launch another Richmond-built ship, a company photographer joked, “Please christen SS John Fitch light[ly]...no more Russian vessels available for bumpers.” Ed Hill to Mrs. Henry J. Kaiser, 28 August 1942, in HJK papers, volume 158, “Scrapbook—August 1942-September 1942.”

Richmond administrators only turned to the unique problems presented by outfitting after they had attended to the more interesting work of ship construction proper and, unfortunately, after outfitting had emerged as a serious weakness in the shipbuilding process.

This neglect can be explained partially by the fact that outfitting seemed like an extended exercise in amphibious housekeeping, which one yard considered well-suited to “the woman war worker.”¹²¹ Administrators’ ignorance of the emerging problems with outfitting can also be ascribed to the staggering, nearly unmanageable variety of tasks, “500,000 things to do in 45 days,” according to one shipyard magazine.¹²² In addition to their struggle with the countervailing sense of being lost in the inchoate sprawl of outfitting and the complacency-inducing idea that floating a hull created a ship, the converted heavy-construction bosses who dominated shipyard management at Richmond could not readily assimilate outfitting to previous experiences. Building a dam simply had no resemblance to equipping a hull with everything from winches and machine oil to bed linens and freezers.

Once Richmond managers and workers began paying due attention to the minutiae comprising outfitting and to view outfitting, too, as a problem of materials handling, they remarkably accelerated this last phase of shipbuilding—except for the obdurate problem of installing propulsion equipment. The complexity and importance of that task, especially under war conditions, made it critical that the Maritime Commission’s engine-building contractors met their production schedule and amplified the trouble caused when they did not. In the middle of 1945, with the end of the war imminent but the Maritime Commission still ravenous for Victory ships, Admiral Vickery asked Clay Bedford if “Richmond One has stopped shipbuilding as no deliveries reported this month so far.”¹²³ Bedford responded by claiming, “if turbines and gears were available now would launch... and could speed up our delivery schedule.”¹²⁴ Vickery’s report was typically brutal: “I am not interested in that kind of alibi: I am interested in your meeting your contract and production schedule.”¹²⁵

Even worse, Yard 3 proved all but unable to properly install the engines of its massive troopships. The yard needed six months to launch its first C4, the GENERAL GEORGE O.

¹²¹ *Marin-er* 2, no. 2 (24 July 1943): 2, on file at the Sausalito Historical Society, Sausalito, California.

¹²² *Marin-er* 2, no. 2 (24 July 1943): 2; *Marin-er* 2, no. 6 (18 September 1943): 4.

¹²³ Howard L. Vickery to C.P. Bedford, 20 June 1945, in HJK papers, carton 25, folder 26.

¹²⁴ C.P. Bedford to Howard L. Vickery, 21 June 1945, in HJK papers, carton 25, folder 26.

¹²⁵ Howard L. Vickery to C.P. Bedford, 21 June 1945, in HJK papers, carton 25, folder 26.

SQUIER, which then sat at its outfitting dock for nine months. A Maritime Commission official wrote to his superiors in Washington that “Richmond’s crew, which I believe to be inexperienced,” was apparently not up to the task of installing the C4’s complex and powerful turbine engine. The Maritime Commission put its own chief inspector in charge of the engine crew at Yard 3, imported the “best gear men” from the engine manufacturer, Westinghouse, and solicited advice from four other shipyards and a marine engineering firm.¹²⁶ All this manpower eventually did get the engine installed, but the yard still took another nine months to conquer the ocean-liner complexity of the ship’s interior spaces. Undoubtedly, the SQUIER represented the nadir of production at Richmond. Richmond Yard 1 and 2 delivered almost 200 Liberties during the time it took Yard 3 to finish the SQUIER.

Kaiser’s shipbuilding enterprise at Richmond ranked as one of the most productive and significant parts of the American war effort. The simple gauge of sheer output demonstrates the power of the shipbuilding methods developed at Richmond. During World War II, American merchant shipyards produced 5,775 ships. The four Kaiser yards at Richmond produced 745 vessels, more than any other linked group of yards and 12 percent of the entire nation’s merchant shipyard output. Richmond Yards 1 and 2 produced 661 Liberty and Victory ships, more than any other yard in the country. The 519 Liberty ships produced there were almost a fifth of the entire nation’s output, and 135 more than the runner-up, a Bethlehem Steel yard at Fairfield, Maryland. Yards 1 and 2 also ranked first in the production of Victory ships, turning out 142 such vessels, more than a quarter of the 531 Victories built by 1945 and eleven more than the next most productive Victory shipyard, the Calship facility operated by Bechtel on Los Angeles harbor.

Altogether, the Kaiser-managed shipyards at Richmond, California, near Portland, Oregon, and in Rhode Island produced a total of 1,480 ships, or a quarter of the 5,777 vessels launched by American merchant shipyards during the war. Those same yards produced 862 Liberties, almost a third of the 2,708 built in American yards between 1941 and 1944, and 306 Victories, or almost three-fifths of the 531 built in American yards in 1944 and 1945.

¹²⁶ C[arl] W. Flesher to H[oward] L. Vickery, 29 November 1943, in NARA RG 178, subgroup WEREG, series “Records of the Director, West Coast Regional Construction Division,” carton 3, “Reading File, November-December 1943” folder, “Vickery” divider, on file at the NARA facility in San Bruno, California.

POSTWAR SHIPPING

Closing the Richmond Shipyards

Henry Kaiser did not let his shipbuilding enterprise slide into oblivion with the end of the war. During the summer of 1946, Kaiser, in alliance with the overburdened Richmond municipal government, fought the U.S. Maritime Commission (USMC) to keep control—or even to purchase—Richmond Yard 3. The federal government had already declared the other three Richmond shipyards and the giant Prefab plant to be surplus, and thus disposable for pennies on the dollar. Facing the loss of his last and most modern shipyard, Kaiser fought a brutal bureaucratic war on the government, one the city government abetted in an effort to avoid having the city's frenetic and unmanageable wartime growth turn into a catastrophe of unemployment and social decay.¹²⁷

In a series of strident messages to the commission, Kaiser mentioned his own plans for the future, emphasizing the social benefits of industrial production and, oddly, given his near-complete dependence on federal contracts, the sanctity of free enterprise. In August, writing to his lawyer in Washington, Kaiser repeated claims he had already made to the chair of the Maritime Commission. Evicting Kaiser from the last shipyard would compel the company “to commence a layoff” and forestall plans for the “productive and beneficial use of Yard No. 3,” which included, Kaiser said, “ship repair, new ship construction, ship conversion, and ship breaking...steel fabrication, aluminum fabrication and construction of aluminum buses... We expect that by doing so we will maintain a steady and increasing payroll in this yard.”¹²⁸

By the middle of 1946, the Maritime Commission had already lost its most effective wartime leaders: Chairman Emory S. Land had retired and Howard L. Vickery, the wartime shipbuilding czar, had died of a heart attack. Attacked by budget-cutters in Congress and lacking a coherent or convincing plan for the future, especially compared to the military's clear national-security mission, the Maritime Commission had little sympathy for Kaiser, much less ability to help him. On August 24, after Henry Kaiser's son Edgar made an unexpected personal appearance at a USMC meeting in Washington, Commissioner John Carmody sent a harsh telegram to the Richmond city attorney. “Astonished” and insulted by Kaiser's schemes to use

¹²⁷ “Richmond Took a Beating,” *Fortune*, February 1945, 262.

¹²⁸ Henry J. Kaiser to Oscar Cox and Fred Drewes, 12 August 1946, 1, 2, in NARA RG 178, entry 27, carton 15, “Kaiser Richmond Yard #3,” folder.

Yard 3 for “miscellaneous manufacturing,” Carmody concluded that since the commission’s “business is appropriately restricted by law to certain definite relationships to the American merchant marine and national defense,” it could not subsidize a private entrepreneur like Kaiser.¹²⁹ The commission or other government agencies, such as the War Assets Administration and Surplus Property Administration, would dispose of the yard as they saw fit. Kaiser would have to seek his postwar fortunes elsewhere. The city of Richmond would have to find another way to survive.

The Collapse of American Shipbuilding

Even as the Maritime Commission forced Kaiser to abandon his plans, the federal government ranked as the world’s largest owner and operator of merchant ships. Yet the success of wartime shipbuilders had actually deeply damaged the industry’s long-range prospects by demonstrating both that merchant shipbuilding completely depended on federal subsidy and that the industry could rapidly increase production at any time. Rather than exploiting this for national gain—for instance, by using the American merchant marine and navy to retard the reconstruction of other countries’ merchant fleets—the U.S. government moved immediately to end its involvement with merchant ship construction and operation and to pare the American merchant marine back to the very best war-built ships.

The Ship Sales Act of 1946 achieved the goals of ending U.S.-involvement and paring back, but it hardly ensured the future vitality of American shipbuilders and shipowners.¹³⁰ In essence, the act arranged for the sale of almost all the vast war-built merchant fleet to buyers in the United States and abroad. American buyers had priority, especially with respect to the best vessels, but all purchasers enjoyed fantastically deep discounts: an initial 20 percent to undo the inflationary effect of the war on construction costs, then another 12.5 percent for tankers and 50 percent for dry-cargo vessels.¹³¹ Thus a ship that cost a million dollars to build in 1944 would cost just \$400,000 to purchase in 1946.

¹²⁹ Kaiser to Cox and Drewes, p. 1. For more on Carmody’s postwar career, in which he played a part in the reorganization of the executive branch, see Jason Scott Smith, “Public Works and the Postwar World: the Legacies of New Deal Public Works Programs, 1943-1956,” paper presented at the Policy History Conference, St. Louis, MO, 1 June 2002, 8-9.

¹³⁰ *Merchant Ship Sales Act of 1946, Statutes at Large*, 60.

¹³¹ In the act, see especially sections 3, 4, 6, and 7.

Of course, the Maritime Commission did not intend or desire to recoup the cost of building thousands of ships between 1941 and 1945, only to eliminate the surplus of war-built shipping and clear the way for the long-term improvement of the American merchant marine. By the time the great ship sale ended, Americans had purchased a thousand vessels while foreigners had purchased 1,100.¹³² The 1946 Ship Sales Act certainly realized the goal of eliminating the government's position as a shipper, but as policy it proved short sighted. Great Britain, France, Greece, Japan and other prewar maritime nations used the act to cheaply rebuild their fleets and to begin competing with the shrinking American merchant marine, whose share of world shipping plunged from 60 percent in 1945 to just 36 percent in 1948.¹³³

The effort to shrink American shipbuilding capacity had results as harmful as the ship sales program. In effect, the Maritime Commission and its allies in Congress and elsewhere remade shipbuilding in its pre-1940 image. Most of the same firms that had struggled along during the depression were given a new, but not especially favorable, lease on life in 1946. As part of a broad reorganization of the executive branch, a new Maritime Administration ("MarAd") housed within the Department of Commerce replaced the older, independent Maritime Commission in 1950.¹³⁴

Just as the Maritime Commission had attempted to resuscitate American shipbuilding by distributing contracts for standard ships to yards all over the country, so, too, did the MarAd. With the support of the Eisenhower administration, MarAd let contracts for thirty-five new MARINER vessels, part of a new standard dry-cargo class. The retired admiral who had run the navy's shipbuilding bureau during World War II before becoming the first head of the new Maritime Administration viewed the ships as valuable naval auxiliaries and as a way to maintain a nucleus of skilled shipyard labor and management.¹³⁵ In fact, the MARINER program rescued shipyards on the West Coast from five years of near idleness.¹³⁶

That the highly productive Pacific Coast shipyards had fallen into disuse indicated the deep troubles of the American shipbuilding industry. As World War II receded, shipbuilders

¹³² Donovan and Gibson, 170. For official records of the ship sale program, including a record of every purchase, see NARA RG 178, entry 6 (U.D.), box 1.

¹³³ Donovan and Gibson, 171.

¹³⁴ Donovan and Gibson, 173.

¹³⁵ Donovan and Gibson, 173-174.

¹³⁶ *Marine Engineering*, January 1954, 49-50.

identified several major impediments to greater American shipbuilding. First, labor costs in the U.S. far exceeded labor costs in other countries. Average wages in 1959 ranged from just 40 cents in Japan, already the world's largest shipbuilder, to just over twice that in Great Britain, \$1.06 in Sweden, and a whopping \$2.71 in the United States.¹³⁷ Beyond low labor costs, foreign yards could also offer far more attractive credit terms than any American shipyard. State subsidies allowed Japanese, French and German shipbuilders to require less than a third down on new ships, with the balance spread over six or even eight years at very low interest rates.¹³⁸ A third problem plaguing American shipbuilders well into the 1950s was the shortage of steel, the same problem that had troubled the wartime shipbuilders.¹³⁹

The fourth and most vigorously criticized problem facing American shipbuilders was the perceived lack of political support for their industry, the "Fourth Arm of Defense."¹⁴⁰ One after another, the presidents of the Society of Naval Architects and Marine Engineers (SNAME) delivered annual addresses castigating the government for doing too little to sustain what one called "active and virile shipbuilding and ship repair industries."¹⁴¹ In 1953, for instance, as the small Korean War boom faded, the SNAME president faintly praised the Eisenhower administration's announcements of support for merchant shipyards, but then pleaded for "a basic government policy" for determining, once and for all, the proper amount of government subsidy for each ship and for providing private firms with contracts as favorable as those routinely placed with the navy's own shipyards.¹⁴² The next year, he remarked on "the precarious condition of the shipbuilding industry" and decried the fact that the government insisted on allocating shipbuilding contracts "on a political basis rather than on a competitive basis," which, he said melodramatically, "gnawed at the very heart of our capitalist system." In the same breath, he called for federal aid to the industry, including shipyard subsidies, a reasonable long-range plan to combat the obsolescence of the war-built fleet, and training programs to increase the number of skilled workers in the yards.¹⁴³

¹³⁷ *Marine Engineering/Log Yearbook* (31 May 1960), 143; see also *SNAME Transactions* 62 (1954): 119.

¹³⁸ *Marine Engineering/Log Yearbook* (31 May 1960), 268.

¹³⁹ *SNAME Transactions* 59 (1951): 399-401; *SNAME Transactions* 60 (1952): 68; *SNAME Transactions* 64 (1956): 207-208.

¹⁴⁰ *SNAME Transactions* 64 (1956): 207-208.

¹⁴¹ *SNAME Transactions* 64 (1955): 132.

¹⁴² *SNAME Transactions* 61 (1953): 240.

¹⁴³ *SNAME Transactions* 62 (1954): 119.

In 1955, the new president also called for those same measures and added several others. In typical fashion, though, he warned that without clear and extensive federal support for shipbuilding, the American merchant marine and navy would shrink, American sea power would vanish, and America's "star will start to decline."¹⁴⁴ Though private ship operators had ordered a significant number of oil tankers and the government had placed contracts for high-speed cargo ships, neither program lasted for long nor had deep positive effects on the industry. New programs mandated by Congress in 1954 and 1955 faltered badly: though fifty-nine ships had been authorized, contracts had been awarded for only seventeen. In the twelve months ending in July 1955, world shipbuilding activity had increased by 6 percent, yet "an almost complete dearth of orders" in American shipyards pushed American merchant shipbuilding from eighth to tenth place in world output, behind titans like Britain, Germany, and Japan and rising builders like Norway and even tiny Denmark.¹⁴⁵

At the same time, shipbuilders disparaged what federal support they received. SNAME criticized the government-funded MARINER program on the grounds that the new vessels were "primarily justified from military considerations" and thus hard to operate as moneymaking freighters. Still worse, the MARINERS "very nearly constituted the total postwar dry cargo ship construction by U.S. yards" through 1953, demonstrating the lack of support.¹⁴⁶

To be sure, American shipbuilders did face difficult challenges. After World War II, shipbuilders around the world had to adapt to two changing characteristics of merchant ships: ever-narrower purposes and ever-larger dimension. Exotic and hard-to-standardize ships like fruit-juice tankers, liquid-propane carriers, and containerships challenged shipbuilders' design and fabrication skills. Increasingly large supertankers exceeded even big new shipyards' capacities.¹⁴⁷ American builders played almost no part in either trend.¹⁴⁸ Instead, they invested their energy in quixotic projects like retrofitting obsolete Liberty ships with modern powerplants, building the world's one and only nuclear-powered merchant ship, the SAVANNAH (a ship

¹⁴⁴ SNAME *Transactions* 63 (1955): 132-133.

¹⁴⁵ SNAME *Transactions* 63 (1955): 132.

¹⁴⁶ SNAME *Transactions* 61 (1953): 99, 173.

¹⁴⁷ SNAME *Transactions* 65 (1957): 152.

¹⁴⁸ Donovan and Gibson, 215-220.

most ports banned as a safety risk), or constructing a huge passenger line, the S.S. UNITED STATES, even as airliners overtook ocean liners as the best form of long-distance travel.¹⁴⁹

Even successful experiments by American shipowners quickly went overseas. In 1956, the American entrepreneur Malcolm McLean invented the first containership by converting a war-built tanker to carry semi-tractor trailers. Over the next fifteen years, several other American shippers followed suit, but almost all of the construction of new containerships, which now dominate oceangoing cargo transport, occurred in foreign shipyards.¹⁵⁰

Similarly, American shipyards played a relatively small role in developing the supertanker, the quintessential postwar ship. The Maritime Commission and American builders had long recognized the growing importance of oil tankers.¹⁵¹ Indeed, the commission considered a big tanker fleet to be an integral part of a postwar merchant marine, and contracted for 536 tankers of the T2 class, more than any other ship but the famous Liberty and a giant increase in world oil-shipping capacity.¹⁵² In fact, American oil companies often chose to order their ships abroad. In 1956, foreign yards built 130 times more oil-tanker tonnage for American companies than U.S. yards, whose output accounted for less than 1 percent of the world's tanker output but almost all of American merchant shipbuilding's output.¹⁵³

Japan's Ascent

Production techniques developed in the United States during the war laid the groundwork for the incredible postwar growth in the size of oil tankers and in the success of shipyards in other countries, especially Japan. That the Richmond yards had pioneered new shipbuilding methods was demonstrated during the war by frequent exchanges of plans, techniques, and personnel with other shipyards. Early in World War II, for instance, engineers from a Florida shipyard visited Richmond to study the country's leading Liberty ship producer. During that trip, a Kaiser production superintendent loaned jig plans to the visitors, who later asked for "any

¹⁴⁹ Constructed for \$70 million by Newport News Shipbuilding, the noted warship builder, the UNITED STATES served two masters: it could carry 2,000 passengers as a luxury liner or 14,000 soldiers as a troop transport. SNAME *Transactions* 63 (1955): 281-311; Donovan and Gibson, 224; Larabee et al, 594.

¹⁵⁰ Donovan and Gibson, 209-215.

¹⁵¹ SNAME *Transactions* 48 (1940): 270-271.

¹⁵² SNAME *Transactions* 49 (1941); Gerald J. Fischer, *A Statistical Summary of Shipbuilding Under the U.S. Maritime Commission During World War II*, Historical Reports of War Administration, United States Maritime Commission, No. 2 (Washington, D.C.: Government Printing Office, 1949), 41 (table B-3).

¹⁵³ *Marine Engineering/Log Yearbook*, 31 May 1957, 131 (table 1), 167 (table 4), 173.

suggestions...in regard to the various operations that you found it advantageous to keep a record on.”¹⁵⁴ A few days later, the Richmond engineer mentioned the interchange to Henry Kaiser as “further proof of our full cooperation with all Shipyards [sic] in the matter of exchanging technique, methods of production, and other tangibles.”¹⁵⁵

The wartime exchange of information about shipbuilding processes set a precedent for postwar dissemination of American methods, especially to Japan, which soon emerged as the world’s leading shipbuilder as the former champions faded. In 1959, the British economist J.R. Parkinson ascribed low productivity in the United Kingdom’s once-great shipyards to the fact that “much of the reputation of the industry was established by highly skilled workers operating in sparsely equipped yards.”¹⁵⁶ In Parkinson’s estimation, successful postwar shipbuilders stressed the use of sophisticated equipment like cranes, welding machinery, and modern machine tools.

In Japan, for instance, shipbuilding firms combined physical capital with a low-wage shipbuilding labor force, a highly educated engineering-management workforce, and a blend of indigenous and imported production methods.¹⁵⁷ National Bulk Carriers (NBC), an American oil-tanker builder, served as the medium of transmission. After losing its lease on a North Carolina shipyard, NBC relocated to the giant dockyards at Cure, Japan, where the company intensified its tanker-building activities. Between 1951 and 1961, NBC launched fifty-two ships at Cure, including several that set successive records as the world’s largest.

In addition to furnishing Japan with much-needed foreign direct investment, Cure offered the Japanese government a way to jump-start the country’s shipbuilding industry. Many NBC managers and employees had worked in American shipyards during World War II, including one who had played a prominent role in Kaiser’s wartime operations. The Japanese shipyard managers and engineers who visited Cure at the behest of their government thus learned American methods from the men who had developed and perfected them. Within just a few

¹⁵⁴ E.R. Dunsford to David Oppenheim, November 16, 1942, in HJK papers, carton 14, folder 30, “Shipyards.”

¹⁵⁵ D[avid] A. Oppenheim to E.M. Corrigan, November 28, 1942, in HJK papers, carton 14, folder 30, “Shipyards.”

¹⁵⁶ J.R. Parkinson, “Productivity in Shipbuilding,” *Journal of Industrial Economics* 7, no. 3 (July 1959): 192-193, 197.

¹⁵⁷ Japanese shipbuilders (and other industrialists) had long relied on importing and then adapting foreign technologies. See Katsuo Otsuka, “Choice of Technologies in the Ship-Building Industry: Modern versus Traditional,” Ryoshin Minami, Kwan S. Kim, Fumio Makino, and Joung-hae Seo, eds., *Acquiring, Adapting, and Developing Technologies: Lessons from the Japanese Experience* (New York: St. Martin’s Press, 1995), 112-137.

years, Japanese shipbuilders had developed a characteristic “block” or “module” construction method that synthesized American section-building techniques with native aircraft-manufacturing methods.¹⁵⁸ Block construction proved especially well suited to the ever-larger oil tankers that became the mainstay of world shipping after World War II.¹⁵⁹ Moreover, the success of block construction encouraged the Japanese government to invest more deeply in the country’s resurgent shipbuilding industry, which supplanted Britain as the world’s largest shipbuilder in 1956 (a title it still maintains).¹⁶⁰ The government had good reason to be so interested: within a decade of the end of the war, ships had become Japan’s largest dollar-earning export, and thus the key to rapid reindustrialization and to national prosperity.¹⁶¹

CONCLUSION

The Richmond shipyards ranked among the most significant industrial facilities of the American effort to win World War II, and stood as pillars of the merchant-shipbuilding effort overseen by the U.S. Maritime Commission. Built and operated by the entrepreneur Henry Kaiser’s huge organization, the shipyard complex grew up between 1940 and 1943 along the eastern shoreline of San Francisco Bay. The first pair of shipyards, Yards 1 and 2, were established to build Liberty ships, the mainstay of the Allies’ wartime merchant marine. Augmented by the “Prefab” plant, which used innovative assembly-line techniques to fabricate big subassemblies for those ships, Yards 1 and 2 produced more Liberty ships than any other yard in the United States.

¹⁵⁸ The synthetic character of “block construction” is demonstrated in Kazuo Wada and Takao Shiba, “The Evolution of the ‘Japanese Production System’: Indigenous Influence and American Impact,” in Jonathan Zeitlin and Gary Herrigel, eds., *Americanization and Its Limits: Reworking U.S. Technology and Management in Post-War Europe and Japan* (Oxford, UK: Oxford University Press, 2000), 317-339. For more on the method, see also Shin Goto, “Competitive Advantage in the Japanese Shipbuilding Industry: the Case of IHI,” in Takeshi Yuzawa, ed., *Japanese Business Success: The Evolution of a Strategy* (New York: Routledge, 1994), 119-133, especially 119-121; Tomohei Chida and Peter N. Davies, *The Japanese Shipping and Shipbuilding Industries: A History of their Modern Growth* (London: Athlone Press, 1990), 111-112; and “Japan’s Booming Shipbuilding Industry,” *Far Eastern Economic Review* 19, no. 19 (10 November 1955): 598. An obituary for a prominent Japanese shipbuilder offers a contrary, and incorrect, assessment of the method’s provenance by ascribing it to a single innovator: “He developed a new way to build ships by constructing compartments of the boat and assembling the pieces later. The method cut construction times sharply and improved productivity in the industry.” Ken Belson, “Hisashi Shinto, an Industrialist in Japan, Dies at 92,” *New York Times*, 29 January 2003.

¹⁵⁹ For a brief description, see Goto.

¹⁶⁰ Chida and Davies, 113.

¹⁶¹ “Japanese Shipbuilding Industry,” *Far Eastern Economic Review* 18, no. 24 (16 June 1955): 760.

Recognizing the two shipyards' prowess, midway through the war the Maritime Commission selected them to build the Liberty's successor, the faster and more modern Victory ship. This, too, the yards accomplished peerlessly, demonstrating the powerful flexibility and productivity of a shipbuilding system founded on large-scale prefabrication of ship components, extensive use of newly-trained workers like welders, and impressively peaceful labor relations. In this last area, a wide variety of localized social services, from public housing to company-provided medical care, combined with national initiatives such as federal endorsement of organized labor to provide the foundation for the fast-moving constantly-changing, and brilliantly successful shipbuilding methods of Yards 1 and 2.

The other two Richmond facilities, Yards 3 and 4, were comparatively less productive, but still important to America's wartime giant shipbuilding industry. Yard 3 was entirely dedicated to the production of giant troopships, while Yard 4 turned out a myriad of lighter craft such as landing ships and frigates. Despite these key differences from the original facilities and their overall lower output, Yards 3 and 4 also exemplified the Richmond production system.

None of the four shipyards at Richmond survived the end of World War II, although neither did many of the other pieces of the American shipbuilding industry, which collapsed as fully and permanently as any other modern American industry. The methods of prefabrication-intensive production, which had been pioneered and refined at Richmond, did survive the end of the war, and in fact became the fundamental components of Japan's massive postwar shipbuilding industry. In this way, Richmond occupies a large place not only in the industrial history of the United States, but also in the industrial history of the world.

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