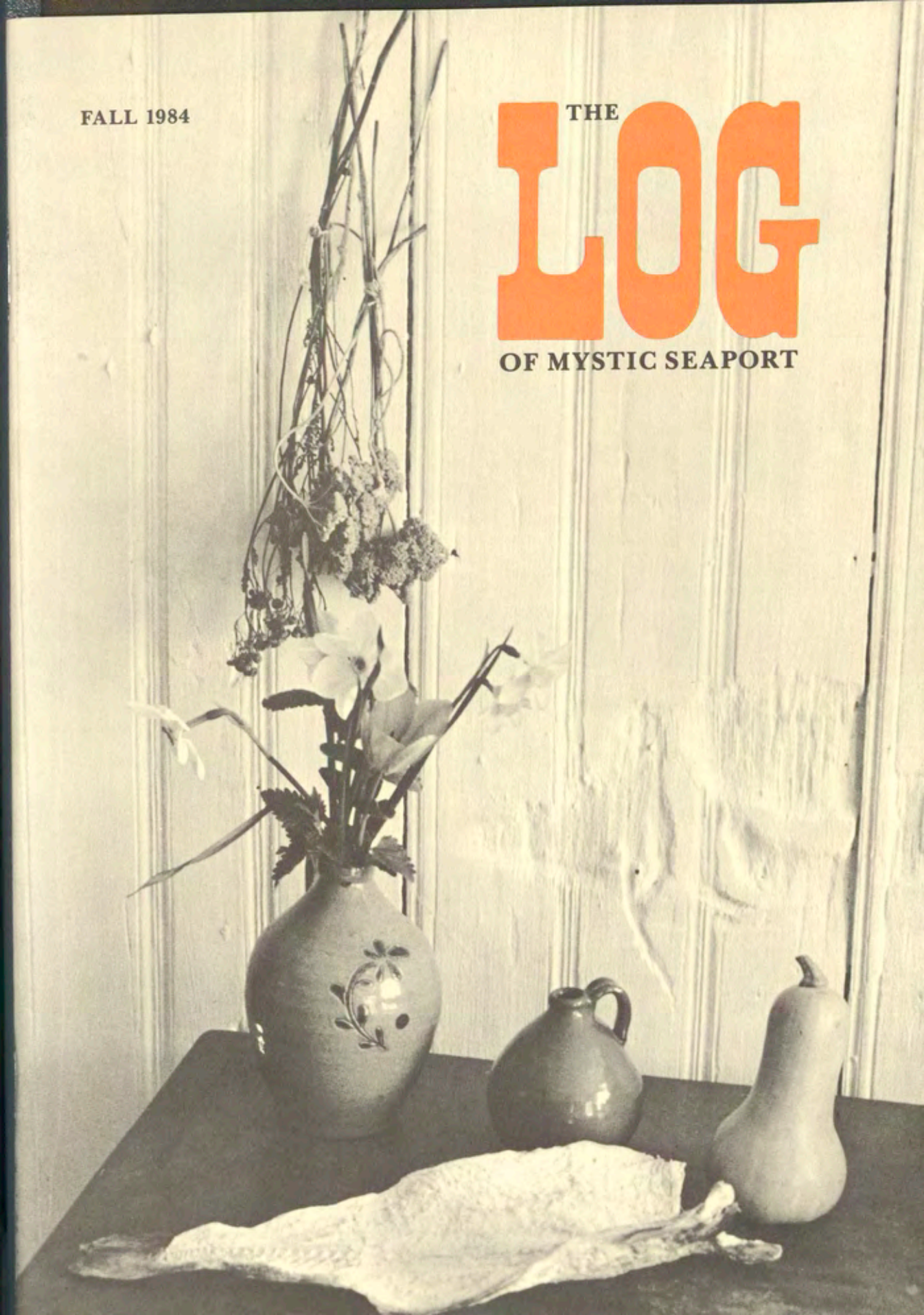
FALL 1984

THE LOG OF MYSTIC SEAPORT



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COVER: *"Cape Cod turkey"–salt cod–in the Buckingham House kitchen. (Photo by Claire White-Peterson)*

BACK COVER: *A fall morning at Mystic Seaport. (Photo by Claire White-Peterson)*

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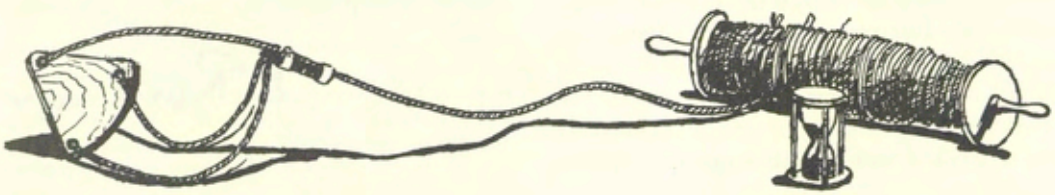
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SIGHTINGS



Beyond the obvious functions of preservation and exhibition of objects, the Museum has obligations to catalog its holdings and to disseminate information and publish research results. However, cataloging standards have changed during the Museum's fifty years of existence, and to update the records and provide convenient access is a monumental task. Research and publication projects also require extraordinary funding that cannot always be allocated. It was, therefore, of great benefit to the Seaport when the Andrew W. Mellon Foundation chose Mystic as one of the maritime museums to which it bestowed grants in 1981.

The foundation sought to encourage a broader public awareness of museum collections through research and publication. With this generous support Mystic Seaport has been able to undertake four very significant projects that will have permanent impact on the field of maritime scholarship.

The first project funded was the publication of Dorothy Brewington's major catalog of the Museum's marine paintings and drawings. This formal catalog, which includes the more than 1,000 paintings and drawings in the collection, is a very handsome reference to the Museum's holdings.

Another critically important project was the cataloging of our oral and video history tapes, and the devlopment of a system to insure that future material can be easily integrated into the collection and made readily available. Over the past thirty years Museum researchers have interviewed and recorded individuals whose maritime experiences reflected on the Museum's exhibits or programs. Sixty-one of these interviews, plus many Museum lectures and functions, and ninety-seven hours of videotape from our valuable film archives, were processed. As a result of sophisticated organizational work they have become a usable research resource.

Similar conditions existed with our historic photograph collection, which includes tens of thousands of glass-plate and soft negatives as well as positive images. Prior to the Mellon grant we had made significant progress in the care of this collection, but much of it lay unused because we had been unable to devote resources to its thorough cataloging. The Mellon funds made possible the copying and cataloging of 18,000 images. For the first time, this wealth of maritime information is now available in convenient form for researchers.

The final portion of the Mellon grant supported a series of monographs to introduce the general public to important elements of the Museum's collections. At the same time the monographs were meant to have scholarly appeal, and in bridging the gap between novice and scholar they have succeeded well. They complement the comprehensive catalogs of our paintings and watercraft collections, but in narrative rather than catalog form. *Graven by the Fishermen Themselves* (1983) uses our scrimshaw collection to describe this whaleman's art form, and *Silent Pilots* (1984) analyzes forty of our figureheads. A monograph on our historic buildings is currently in production.

The carefully considered generosity of the Andrew W. Mellon Foundation has enabled Mystic Seaport Museum to undertake and complete these very important projects and to better serve the field of maritime studies.

J. Revell Carr

Reinforced Concrete for Ships

ARTHUR H. NILSON

For engineering innovation and daring these structures must rank high on any list. Imagine, if you will, a monolithic concrete vessel having length approximately equal to the height of a thirty-five-story building, with walls thirty-six feet high and merely five inches thick, yet designed to resist all of the forces the sea can exert. The ship must, of course, be watertight, and also impervious to leakage of oil and gasoline, which would be held in integral tanks. Solid cargo versions of the vessel must transport goods safely to their destination over 3,500 miles away. The entire work, including design, construction, and commissioning must be carried out under an accelerated schedule dictated by wartime emergency, with launchings scheduled less than two years after the start of the design work.

That the project was carried out successfully is a matter of historic record. The achievement, which would be remarkable even with today's technology, is particularly noteworthy in that it took place in the period from 1918 to 1920, when reinforced concrete was in its infancy, construction standards poor, and workmanship on the job typically crude. This was only a quarter century after reinforced concrete engineering in America began in earnest.

In the opening months of U. S. participation in World War I some very gloomy estimates were made of the size of the merchant fleet needed to transport the U. S. Army to Europe and to provide adequately for its supply.[1] It was estimated that three million men would be required; some estimates ran as high as five million. It was further estimated that goods and equipment to support this force would be close to six tons per man. Consequently, the needed shipping capacity would be a minimum of eighteen million tons and possibly much higher.

Available tonnage in June of 1918 was less than three million. To provide for the replacement of ships lost to the highly effective German submarine fleet in the Atlantic, and to provide for the increase of shipping that was needed, would require no less than nine million tons of new shipping each year.

Consideration was given to the possibility of accelerating production of steel for ships. It was found that this would require an increase in the production of coal. Coal was already in short supply due to the lack of railroad cars in which to ship it. The manufacture of additional railroad cars would, in turn, require the diversion of the steel plate desperately needed for production of the ships.

Accelerated building of wooden ships was attempted but failed because of the impracticality of using unseasoned timber.

It was with this background that the Concrete Ship Section was established on 1 January 1918 as a part of the Emergency Fleet Corporation. R. J. Wig, then of the Bureau of Standards, was named Chief Engineer and Head of the Section, and S. C. Hollister, at age twenty-six, was named Chief Designing Engineer. Professor W. A. Slater of the University of Illinois was retained as consultant, and James L. Bates, the chief civilian naval architect of the Navy,

Arthur H. Nilson, an expert on reinforced and prestressed concerete structures, is Chairman of the Department of Structural Engineering at Cornell University. Formerly a practicing engineer, he joined the faulty of the School of Civil Engineering at Cornell in 1956 and earned a PhD from the University of California at Berkeley in 1967. He has been an enthusiastic yachtsman for more than forty years.

was assigned to the work, at first on a part time basis. An ambitious program of design and construction was initiated. It was planned to produce one 3,000-ton, three 3,500-ton, and thirty-eight 7,500-ton ships, some to carry dry cargo and some to transport gasoline and oil. The program was proceeding at full speed at the time of the armistice, when it was severely cut back. Still, before its termination, a total of twelve concrete ships were produced, including one 3,000-ton, three 3,500-ton, and eight 7,500-ton vessels.*

Although a project of the proposed scale was unprecedented, the notion of building small boats, barges, and ships of concrete was not new. The first concrete boat on record is the famous rowboat constructed in 1849 at Carces in France by M. Lambot.[2] It is worth noting that this construction is generally acknowledged to be the first example of reinforced concrete. The boat was patented and exhibited at the World's Fair in Paris in 1855.

Not until 1887 were any further attempts made to construct concrete boats. A small boat was then built in Holland by the Fabriek van Cement-Ijzer Werken, to be used for duck shooting. The same firm later built concrete barges up to eleven tons capacity. Following successful experience with these, larger vessels were built of fifty-five ton capacity, having a length of sixty-four feet and fourteen foot beam. The system of construction consisted of longitudinal and transverse bulkheads spaced about six feet apart, resulting in a cellular construction that made the barges virtually unsinkable.

A motor boat, built for recreational purposes by R. Last and Sons in Holland, is interesting in that it anticipated the "ferrocement" method of construction developed more fully in Italy later in the 1930s. The boat was built by covering a framework of steel ribs and longitudinal rods, to which wire mesh was attached, with a coat of mortar, making the finished shell about ½ inch thick.

In 1897 Carlos Gabellini of Rome began the construction of concrete scows, barges, rowboats, and bridge pontoons. The Gabellini method of construction differed greatly from the methods which had been used previously. Reinforcement of the keel and ribs, usually consisting of round steel rods, was first placed. This was then covered on the outside with ¼-inch wire mesh to which a 1-inch coat of mortar was applied. A somewhat thinner coat of mortar was then placed inside. Forms for the ribs and keel were then put in place and these units cast. Ribs ran both longitudinally and transversely, a checkerboard pattern resulting, the pockets being 10 inches deep. A ⅛-inch wire mesh was then placed over these ribs and a thin mortar covering plastered on. Finally a third and coarser wire mesh was pressed into the soft mortar and the entire surface troweled over, completing the hull.

In 1909, German shipbuilders constructed a 220-ton concrete freighter at Frankfort on the Main. The ship was formed in the manner of a conventional concrete structure. The main hull had parallel sides but it is said that the lines were otherwise quite good. In 1912 in Dresden a concrete sailboat was built.

In the period from 1912 to 1917 England constructed a large number of concrete barges for use on the canals. The largest of these were of 1,400 tons capacity. Twenty-four concrete tugboats were also built prior to and during World War I.

The Sydney Harbor Trust Company in Australia constructed a pontoon 110 feet in length, from 53 to 57 feet beam, with a draft

*The relation between cargo capacity and displacement should be noted here. The displacement of a ship is the weight of the water she displaces, and is therefore the sum of the self-weight of the vessel and its cargo capacity expressed in tons. The cargo capacity is referred to by naval architects as the "deadweight," while in the usual structural engineering vocabulary the self-weight is the deadweight. Whether displacement, deadweight, or self-weight, the unit is the "long ton" of 2,240 pounds, which is the weight of 35 cubic feet of seawater.

of approximately 8 feet. The pontoon withstood severe treatment received from ferries using it as a landing stage.

About 1914 the Fougners Stall-Beton Skibsbygnings Compani of Christiania, Norway, began construction of a number of small pontoons and barges. In 1917 they constructed a boat of about 200 tons capacity which made at least one round-trip voyage to the English coast. This boat was in all probability the first sea-going concrete vessel. The Fougners Company followed this success with a number of small yachts and commercial vessels, as well as a concrete floating dry dock of sufficient capacity to handle any of the boats they constructed.

The first concrete boats built in the U. S. were a 525-ton concrete scow, built for San Francisco harbor traffic, and some barges built for use in the Panama Canal in 1910. In 1914 a concrete barge was launched at Mobile, Alabama, having a length of ninety feet, twenty-six-foot beam, and nine-foot draft. The construction was carried out by Luigi Valpi using the Gabellini system of construction described earlier. In 1914 several 500-ton barges were constructed in Baltimore by O. Lackey.[3]

In 1917 the San Francisco Shipbuilding Company, of Redwood City, California, undertook the construction of an ocean-going cargo vessel rated at 5,000 tons, with length overall of 300 feet and 46-foot beam. She represented a pioneering effort in the use of reinforced concrete for large, sea-going vessels. Christened the *Faith* she was launched on 14 March 1918 and on 22 May began her maiden voyage to Vancouver, British Columbia, loaded with 4,300 tons of rock salt and copper ore.[4] She was a straight-sided, hard-chined vessel considerably more primitive in her lines than later designs. It was reported in 1920 that she was in good condition after 12,000 miles of voyaging, and was at that time in service in the South American trade.[5]

In summary, it can be seen that, with the single exception of the *Faith*, no concrete ships had been contemplated or constructed of size remotely comparable to those proposed by the Concrete Ship Section of the Emergency Fleet Corporation in

The *Faith*, a 330-foot concrete vessel of 5,000-ton capacity. She is shown under tow, shortly after launching on 14 March 1918, before the installation of her superstructure. (Author's photo)



1918. There was no design technology, and no construction industry skilled in concrete shipbuilding techniques.

There was, however, a Joint Committee of the American Concrete Institute and the Portland Cement Association. In spite of a rather distinguished membership, committee proposals were modest and its accomplishments meager. In its first and main report, presented on 27 November 1917, the committee recommended that, to test the suitability of concrete hulls for open ocean use, a small, 2,000-ton-capacity barge should be constructed. In its cautious approach to the problem, the committee made five specific recommendations, of nature typified by the first: "Both cement and aggregates should be selected with great care to insure a concrete of maximum efficiency."[6]

Meanwhile, events were galloping ahead of the committee. In Washington, Wig, Hollister, and Bates were laying plans for a large fleet of vessels, all self-propelled, the largest with a capacity of 7,500 tons. This program of ship design launched in January of 1918 by the Emergency Fleet Corporation was unprecedented, both with respect to the size of the vessels proposed and the number of ships to be constructed. Design and construction technology did not exist. In spite of this, the first of the planned ships were launched less than two years after the land was acquired for the shipyards in which to build them at Long Island City, New York; Wilmington, North Carolina; Brunswick, Georgia; Jacksonville, Florida; Mobile, Alabama; San Diego and Oakland, California.

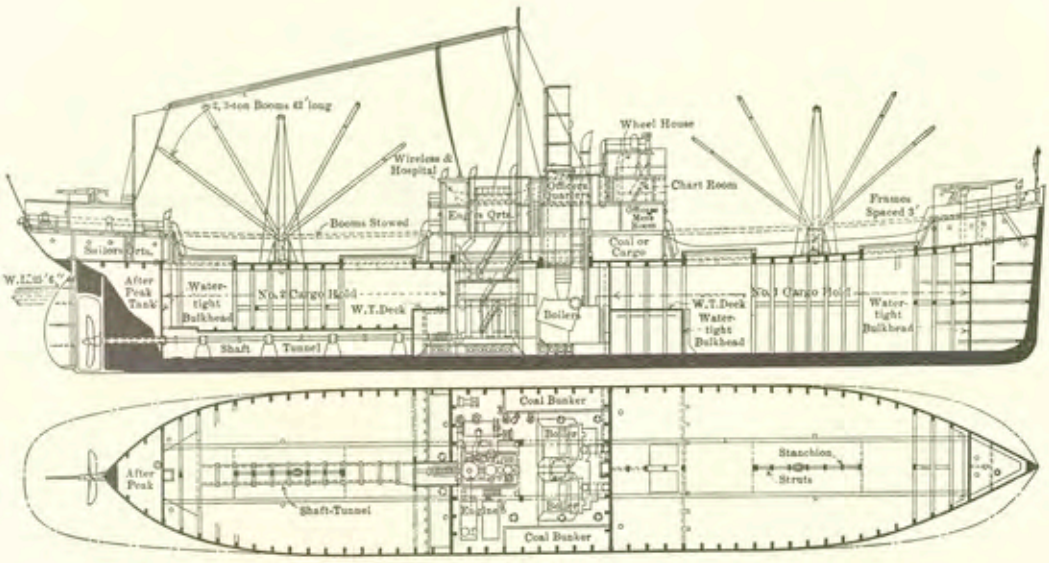
Many had advanced the opinion that concrete ships should be formed with extremely simple lines: hard-chined construction with square knuckles and bilges, and surfaces curved in only one direction. The reason they gave for this was the resulting simplicity of formwork. The first large concrete vessel, the *Faith*, had these extremely simplified lines. However, James L. Bates, the chief naval architect for the concrete ship program, held out for the more seakindly shapes produced by doubly-curved surfaces. After consultation with Hollister it was concluded that there should be no particular construction difficulty introduced by long, easy curves; in fact the placement of steel reinforcement and concrete might even be facilitated by smooth transitions.[7]

The resulting shape of the concrete vessels did not differ in any substantial way from that of similar ships built of steel. The 3,500-ton ship design was, in fact, nearly identical to the standard wooden ship designed by the Emergency Fleet Corporation in 1917. Cross sectional drawings show round bilges with small deadrise, nearly vertical sides, and a crowned deck surface. Bow and stern sections were likewise similar to steel ships of that era, and the bow and stern both showing substantial flare.

It is obvious that the weight of a concrete ship is a prime factor in its design. The self-weight of the proposed vessels could be reduced by reducing the density of the concrete material and by reducing the thickness of the concrete shell and bulkheads to the absolute minimum. Both paths were followed.

If concrete of ordinary weight were used, the bottom and side walls of the vessel would weigh about 12½ pounds per square foot of surface per inch of thickness, or about 75 pounds for six-inch walls. Intensive efforts were undertaken to reduce this. It was decided to use lightweight aggregate which was made by vitrifying a clay slurry in a kiln and then crushing the vitrified product.[8]

In the U. S. Southwest, the brick-making industry happened at that time to be experiencing a tendency of some clays to swell on burning, causing gas bubbles to be vitrified in the structure of the material. The action appeared to be caused by organic gases being formed on heating the clays used in forming the brick slurry. It was found in the laboratories in Washington



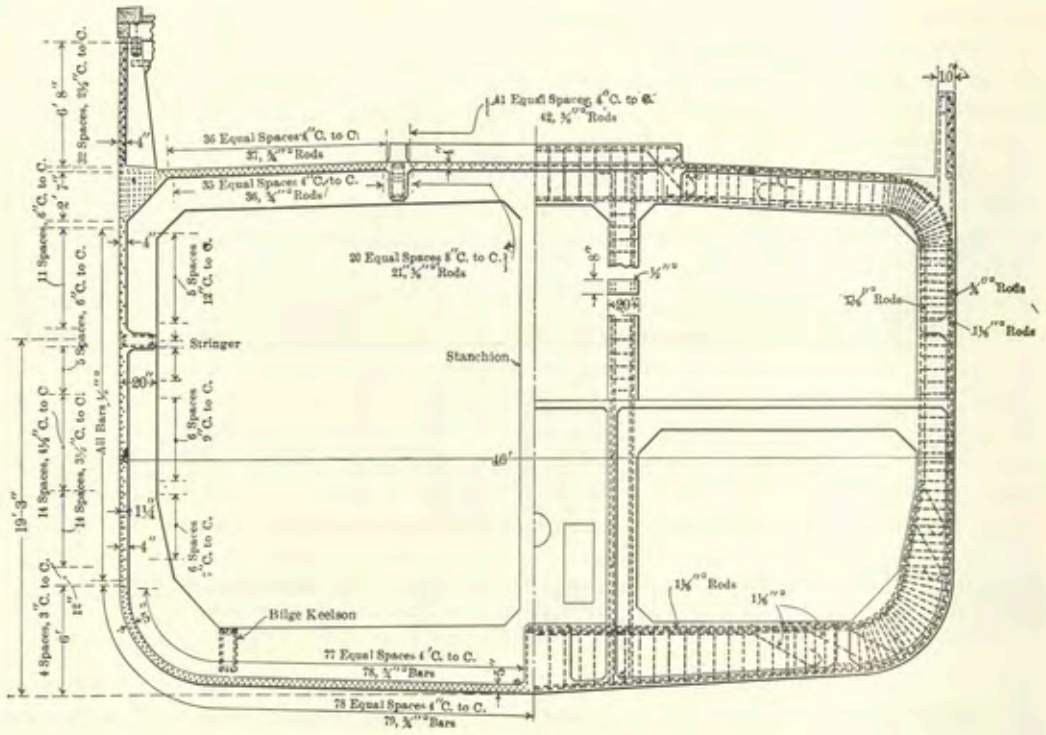
Inboard profile and hold plan of the 3,500-ton concrete ships. They were designed with four watertight bulkheads. The power plant was a triple-expansion steam engine. Light armament was included in the design. (*International Marine Engineering*, August 1918)

that steam introduced into a slurry would accomplish the same purpose and afford a means of control. Sand made from crushing the clinker thus formed was hard and glass-like. The ⅜-inch maximum size of coarse aggregate contained enough vesicular voids to produce the light weight without producing connecting voids. The Government researchers patented the process and made it public. Concrete made using the new aggregate had a density of 106 pounds per cubic foot, about two-thirds that of normal concrete.

At the same time, high strength was required in order to minimize wall thickness. Instead of the 2,000 to 3,000-pound-per-square-inch compressive strength generally used for buildings of that era, it was decided to go to 5,000-pounds-per-square-inch strength when measured on the twenty-eighth day of curing. R. J. Wig, being a specialist in cement technology, worked closely with Hollister on this part of the program.

At that time, specifications called for standard Portland cement to be ground so that 78 percent would pass through a 200-mesh sieve.[9] It was known that not all of the cement was hydrated when water was added; hence there was a residuum that did not contribute to the binding process. Experiments were made with burning a second time and regrinding. On the second grinding a fineness such that 96 percent passed a 200-mesh sieve was obtained. A higher percentage of hydration was possible with this finer grinding, and higher strength was obtained, as well as a more plastic mixture.

To obtain higher strength required richer mixes with lower water-cement ratios than had been used before. Such concrete behaved in a more brittle manner than ordinary material, and was more dependent upon the reinforcement for ductility and resistance to impact. An additional benefit was obtained, however, beyond the higher strength. The new high quality concrete was impervious not only to seawater intrusion but to leakage of stored liquids such as oil and kerosene. The vesicular structure of the high-strength lightweight concrete did



Midship section of a 3,500-ton concrete ship, showing shell reinforcement and frame details. Dots and dashed lines indicate reinforcing rods. (*International Marine Engineering*, August 1918)

not contain communicating cells, so no integral waterproofing agents were needed.

Using concrete of 106-pound-per-cubic-foot density, with high strength permitting thinner sections, resulted in concrete ships with ratio of deadweight (i.e., cargo capacity) to total displacement of 52 percent, compared with 65 to 68 percent for steel ships of the time, and 53 percent for wood ships.[10]

Both round and square reinforcing bars were used, conforming to American Society for Testing Metals standards for billet steel. Plain round bars were considered easier to fabricate than deformed bars, but on account of the uncertainty of the effect of reversal of stress, deformed bars were used wherever calculations indicated high bond stresses. The largest bars, 1¼ inches square, had maximum fifty-foot length. They were butted together as required, not lap spliced, and the butt joints staggered to avoid planes of weakness.[11]

It was known that a ship in a seaway would encounter severe stress situations. A ship spanning from one wave crest to another across a trough is caused to sag. The amount of this sag depends upon the depth to which the ship settles before acquiring enough buoyancy to equilibrate the weight. As the ship progresses in the seaway a half length, it is then supported at its midlength by the wave with its two ends hanging each way over a trough. This produces a tendency for the ends to droop, an action that is known as hogging. The amount of hogging, too, depends on how deeply the ship settles in the water before achieving enough buoyancy to equilibrate its weight.

As a ship progresses through the sea, it alternately hogs and sags. The tendency in this alternate action is to bend the ship first in one direction and then the other, producing reversal of stresses at the most highly stressed section amidships. The effect of such load reversal on reinforced concrete was not well known.

Dr. H. M. Westergaard had joined the Concrete Ship Section for the summer of 1918. Hollister asked him to attack the problem of a ship crossing waves on the diagonal. This action produces a torsional moment on the hull. Westergaard produced a solution to this difficult problem which was incorporated into the design.

The problem of analyzing bending stresses in the hull resulting from the perpendicular force of the water was studied by Hollister. Using plate theory modified as required to suit conditions of continuity and edge restraint, he set up a method of analysis which he applied to the rectangular components at the midsection of the ship and to the triangular portions at the ends. Concrete thicknesses were determined and the appropriate reinforcement specified.

The structural design proceeded on the basis that stresses in the materials under any foreseeable service condition should be kept within stated limits. Such stress-based design was the rule throughout the construction industry at the time. An allowable flexural stress in the concrete of 1,500 pounds per square inch was selected. Bond stress of 200 pounds per square inch was permitted for the reinforcement, which was deformed to provide positive mechanical interlocking in critical regions. Anticipating present-day procedures for control of concrete cracking, reinforcing bar stresses were limited to 12,000 pounds per square inch in places where formation of cracks would lead to seepage, and to 16,000 to 20,000 pounds per square inch in places not exposed to the water.[12]

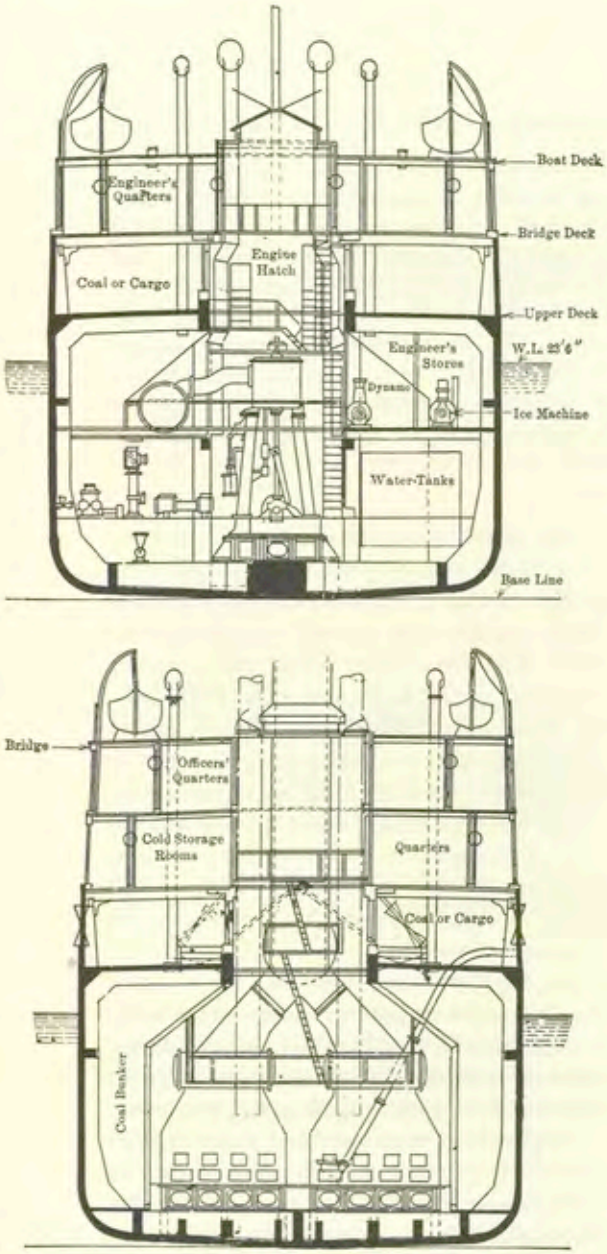
In laying out the arrangement of structural members and in the detailed design, Hollister noted:

> In every phase of the design of the concrete ship, the principle of continuity cannot be overemphasized. The path of stress should be as direct as possible, and there is ample evidence that sudden change of section of the member carrying the stress results in failure of varying magnitude. The transfer of stresses around openings in the deck must require far more attention than would similar ones in the floor of a building. The design of the connection of either end of any deck section likewise requires the greatest care.[13]

The problem of construction of the concrete ships was no less difficult than the design. In effect, construction work of laboratory quality was carried out on a field scale. Walls five inches thick, over 400 feet long, and 35 feet high were to be built without defect of any kind. Strict specifications were developed to avoid segregation of the mix, honeycombing, or planes of weakness. A rule was established that concrete was not to be introduced in the forms farther than eighteen inches above the final resting place, and in no case was concrete to be dropped through a screen of reinforcement. Shutters were built into the walls of the formwork to permit the concrete to be chuted directly in place without dropping from above. The vibrator was introduced to obtain fluidity in the mix during placement.

Originally it was specified that no cold joints were permitted. When this proved to be impractical, techniques were developed for thoroughly cleaning laitance (residue) from the hardened concrete, after which a high strength cement grout was placed before resuming the pour with the normal mix. Construction using these techniques and restraints produced concrete of a quality superior to anything produced commercially before.

On the first hull, a 3,000-ton cargo vessel, the reinforcing bars were placed against the outside forms. After concreting and stripping the forms, a layer of gunite concrete ¾ inch thick was sprayed in place and



Sections through the machinery space of a 3,500-ton concrete ship. Above, looking forward through the engine room; below, looking aft through the boiler room. (*International Marine Engineering*, August 1918)

troweled smooth to form the outer surface of the hull and to provide protection for the bars. On the second hull the steel was blocked out from the forms. Great care was taken to position the reinforcement accurately to guarantee the desired concrete cover. This procedure was followed for all subsequent construction, as it provided a smooth surface that was integral with the structure.

No minor consideration was the accurate positioning, prior to casting the concrete, of all the necessary inserts, fittings, and anchorages for engines, boilers, and other machinery and equipment essential to the function of the vessel.

The construction of a 7,500-ton tanker required 2,660 cubic yards of concrete reinforced with 1,550 tons of steel bars. It required less time than a comparable steel ship for its completion. Average construction time for the hulls was seven months.[14]

Although the concrete ship program was cut back severely as a result of the armistice, twelve ships were launched. The first was apparently the *Polias*, launched at Long Island City, New York, in February 1919. By February 1920 four small cargo ships were in service: *Atlantus, Polias, Cape Fear,* and *Sapona,* the first with displacement 3,000 tons deadweight, and the remaining three at 3,500 tons. Of the 7,500-ton tankers, three had been launched by February 1920: *Palo Alto, Selma,* and *Latham*. The *Cuyamaca, Moffitt, Peralta, San Pasqual,* and *Dinsmore* were at various stages of completion, and were launched at Jacksonville, San Diego, and Oakland in June, September, and October 1920.[15]

Forces to be withstood by the vessels during the launch were as severe as those expected in service. Two methods of launching were used, endwise and sidewise, depending on the exposure of the yard to the harbor. Some difficulty was experienced during one of the end launchings due to settlement of the piles supporting the ways, and the side launching method was preferred.

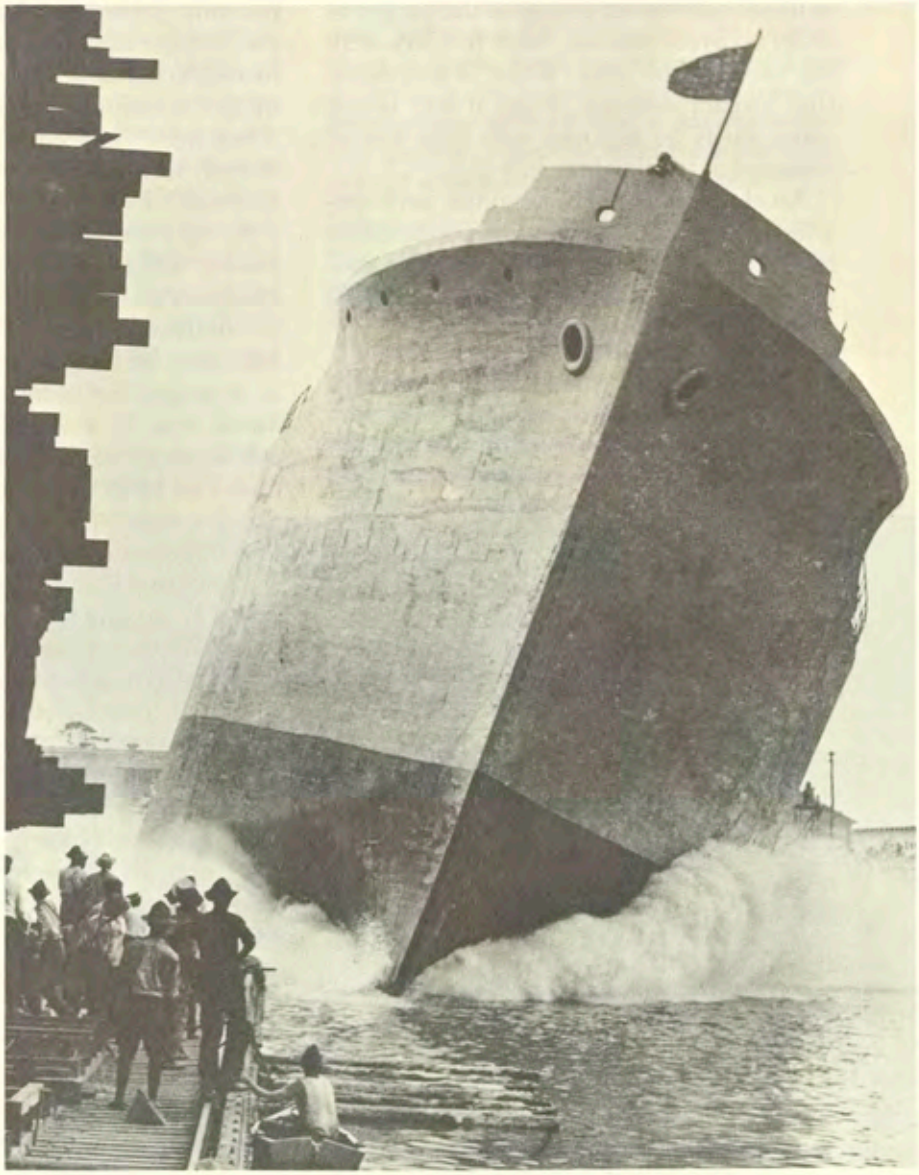
Experience with the concrete ships in service indicated that they were good sea boats. The ships behaved admirably in heavy weather, winning praise from previously skeptical officers and crew. The sur-

face of the concrete ships was smoother than that of steel ships with riveted joints, and they were therefore faster in the water by a couple of knots than the steel ships. In heavy seas there was a considerable increase in the period of roll, producing an easier motion. This resulted from the relatively larger moment of inertia about a longitudinal axis for the concrete ships, either loaded or unloaded.[16]

Some concern had been expressed regarding vibrations of the propulsion machinery and the effect on the concrete hulls and ship's crew. There was, in fact, less vibration in the concrete ships than in steel vessels, and in some cases the vessels were practically free of any vibration whatsoever. It is said that one ship's captain, upon coming aboard, was unaware that his engines were turning.

In none of the vessels was any leakage reported in service. A few shear cracks were

Side launch of the 7,500-ton tanker *Selma* (420 x 54 x 36) at Mobile, Alabama, in the fall of 1919. Despite Hollister's warnings, the persons in the foreground were engulfed by the back wave from the launching, and narrowly escaped drowning. (Author's photo)



noted in the shell and bulkheads of all the ships in service, but these had no apparent effect on strength or serviceability.

One undesirable characteristic of the concrete ships was recorded. The vessels were apparently unable to withstand concentrated blows on the shell without some shattering of the concrete. Impact sustained, say when docking a ship, which would merely cause indentation of the plates of a steel ship, would in the case of the concrete ship cause considerable damage over an area adjacent to the point of impact. The problem was more serious for concrete barges in service on inland waters than for the seagoing ships; it was found necessary to install oak fender strips for the barges in order to avoid trouble. Such fenders were not used on the larger ships. It was noted that impact damage, when it did occur, could easily be repaired with little loss of time and at negligible cost.[17]

An eloquent testimonial to the performance of the concrete ship was provided by the captain of the *Cape Fear* upon the conclusion of her maiden passage from Wilmington to Jacksonville.

> My expearence on the cement ship Cape Fear I feel it my duty to say something of our most delightful trip on that beautiful ship. Wee left Wilmington, N. C. August 26th with a very neat and powerful iron tug belonging to Government and as she crossed the bar raising her beautiful bow high up as if to give farewell bow to her name sake wee diserpared down the cost and there never was a more graceful ship has never been seen. I myself has bin going to sea this 40 years and abeerlutely I would rather take my chances on one of concrate. Well now wee sighted Jacksonville bar. I believe it is 24 miles up river but never the less wee were soon at the city when the tug droped us comeing up our starboard side and noticed she was comeing head on wide open think she was going to sink us I steped back and my god what a ram and I sware I never felt it I was standing directly over it and I was sure wee were ruined that was some lick and I tell right here if it had bin an steal or woden ship I am sure it would sunk her but it did not hurt us much they tell mee it can be repaired at a very little cost or delay and I do know aney sort of ship sure would have to go on the dock...[18]

In the early 1920s, with twelve concrete ships in service, classed by the American Bureau of Shipping for coastwise and West Indian trade, the U. S. Shipping Board prepared to deactivate and offer its ships for sale. At the same time there was a fleet of several hundred surplus steel ships to be sold by their owners. Under pressure from these owners and from the steel industry, it was agreed that the engines were to be removed from the concrete ships, and a guarantee was given that upon purchase new engines would not be installed.[19] Apparently there was also prejudice against the concrete ships among marine insurance firms, particularly after the *Cape Fear* broke up in a collision with a steel ship in 1920.[20] They were thus consigned to service as towed barges or alongshore storage facilities.

By 1927 most of the ships had been abandoned, scrapped, or otherwise removed from service. It is known that one was sunk in shallow water off Cat Cay in the Bahamas. Although used by the U. S. Navy as a target for bombing practice during World War II, the hull survived and may still be seen, barely awash.[21] The 3,500-ton *Cape Fear* broke up and sank in Narragansett Bay with the loss of nineteen men after colliding with the steel steamship *City of Atlanta* in October 1920, as a result of piloting error. Two of the 7,500-ton tankers ran onto a breakwater at Tampico, Mexico; it is reported that one was salvaged and returned to service. Similarly, the 3,500-ton *Polias* was put on the rocks at eleven knots speed near Rockland, Maine, in February 1920.[22] The *Atlantus*, abandoned in 1923, was towed to Cape May, New Jersey, in 1926 to form part of a ferry slip. Concrete cores taken from that hull some years later indicated compressive strength of 13,000 pounds per square inch.[23] Even allowing for the usual gain of strength with age, it is evident

that the quality of the concrete was significantly better than specified at the time of construction.

Between the two world wars there was no opportunity commercially for further trials with concrete ships. However, just before World War II was declared, the U. S. Maritime Commission under Admirals Land and Vickery established a concrete ship program. By this time, J. L. Bates had retired from his position as chief civilian naval architect of the U. S. Navy. He was at once appointed Technical Director of the U. S. Maritime Commission, and among other things was charged with the development of a concrete ship program. Hollister was asked to serve as consultant to the program and accepted that appointment.

The program consisted of 100 ships, all built to the same outside form. They were 375 feet long, with 54-foot beam and 28-foot draft. The total program amounted to about one million tons of shipping, about half of the ships being tankers and half dry-cargo vessels. The hull thickness of 6½ inches was somewhat greater than for the earlier generation of ships, and longitudinal fenders or rub strips were incorporated below the load waterline to reduce the vulnerability to impact that had proved troublesome before.[24]

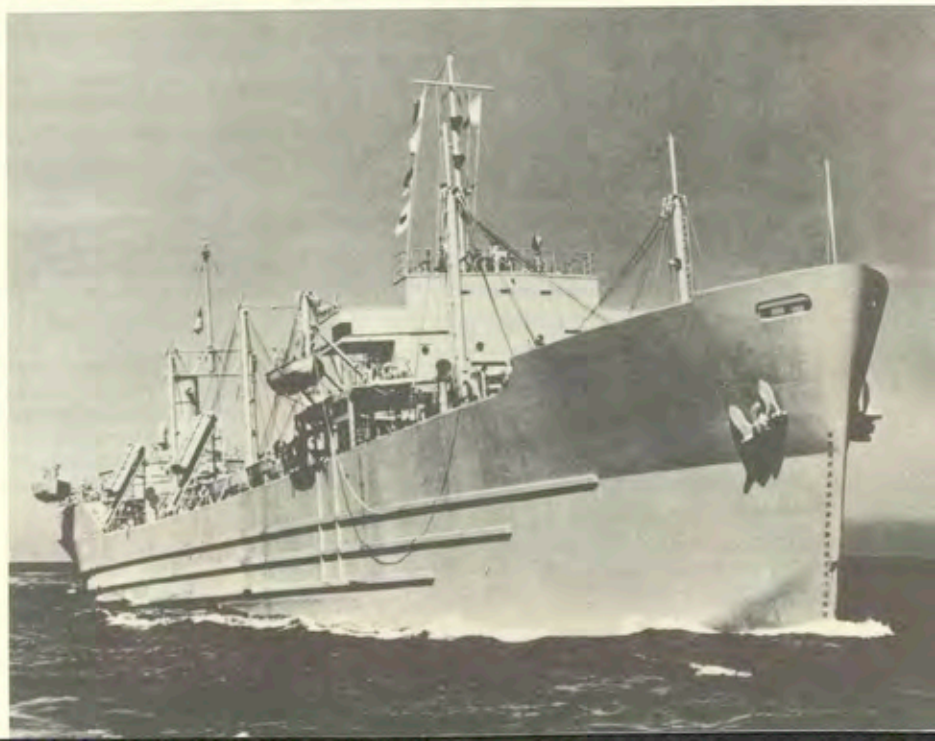
The tankers were to transport aviation fuel and fresh water for drinking, both desperately needed for the war effort in the Pacific. It was found that in some cases in service a 3½-inch bulkhead that separated tanks had water on one side and 100-octane gasoline on the other.

Hollister recalls that some interesting experiences were had with these concrete vessels in the Pacific:

> A small Japanese submarine attacked one loaded with aviation gasoline and set one tank afire. That tank burned dry, calcining the hatch coaming, but the fire did not spread to the next tank, which was full of gasoline. On another attack, a depth charge was released from a tug accidentally, and exploded close to the concrete vessel without setting it afire. It was also loaded with gasoline. These two experiences did much to build respect for concrete as a material.[25]

Other concrete ships of the fleet, after service in the Atlantic, were used to establish the beachhead at Normandy during the Allied invasion of the European mainland. The ships were deliberately sunk just off the

One of the 375-foot concrete cargo ships built by the U.S. Maritime Commission during World War II, under way with an empty hold. (Author's photo)



beach to establish bulkheads extending out into the water, in this way providing shelter for the landing craft which followed.

Since World War II a bifurcation has taken place in the methods of construction used for concrete vessels. The method known as "ferrocement," derived from the Gabellini method and later refined by Nervi and others, has been used extensively for the construction of commercial fishing craft and yachts. For larger vessels, such as the remarkable floating facility for liquified petroleum gas storage built in the 1970s, precast prestressed concrete has been adopted.[26]

Given present-day energy shortages and the need for shipment of oil and other goods great distances at sea, together with improved technology and changing economic circumstances, is it possible that our times may see further development of the concrete ship?

• • •

NOTE: *Reinforced concrete from which cargo ships were built during World Wars I and II is not to be confused with ferrocement. The two are quite different materials although their essential components, steel and Portland cement, are the same. Ships built from reinforced concrete are essentially molded structures in which the concrete bulks larger with lesser amounts of steel reinforcement. Ferrocement is principally steel in the form of an internal preformed structure of wire mesh, bars, and rods bonded together and covered with a very thin (less than ⅛") surfacing of concrete mortar. In its structural make-up ferrocement closely resembles fiberglass. Strength in the former derives from steel wire and rods embedded in hardened cement; in the latter, from glass fibers embedded in hardened plastic.*

–John Gardner

NOTES

[1]Unpublished lecture notes by S. C. Hollister.

[2]S. C. Hollister, "A Brief History of the Development of Concrete Boats," *The Wisconsin Engineer* 25 (December 1920): 37-39.

[3]*Ibid.*

[4]R. J. Wig and S. C. Hollister, "Problems Arising in the Design and Construction of Reinforced Concrete Ships," *Proceedings of the American Concrete Institute* 14 (1918): 441-64; "Report of the Joint Committee of the American Concrete Institute and Portland Cement Association on Concrete Barges and Ships" *Proceedings of the American Concrete Institute* 14 (1918): 505-16; Hollister, "Brief History of the Development of Concrete Boats."

[5]Hollister, "Brief History of the Development of Concrete Boats."

[6]"Report of the Joint Committee on Concrete Barges and Ships."

[7]Wig and Hollister, "Problems Arising in Design and Construction of Reinforced Concrete Ships"; unpublished lecture notes by S. C. Hollister; interview with S. C. Hollister, 11 January 1980.

[8]Unpublished lecture notes by S. C. Hollister.

[9]*Ibid.*

[10]Wig and Hollister, "Problems Arising in Design and Construction of Reinforced Concrete Ships." See also "Concrete Ship of 3,500 Tons Deadweight Designed by Emergency Fleet Corporation," *International Marine Engineering* (August 1918): 446-49.

Once in service, it was found that actual deadweight (cargo capacity) of the concrete ships fell short of the expected figure. Since they were 15 percent heavier than a steel ship of the same tonnage, they were more suitable for bulky, light cargo, with which they would not exceed their deadweight tonnage before filling the hold. "Report of Special Committee on Concrete Ships and Barges," *Proceedings of American Concrete Institute* 16 (1920): 161-66, abstracted in *International Marine Engineering* (May 1920): 408-09.

[11]Wig and Hollister, "Problems Arising in Design and Construction of Reinforced Concrete Ships"; interview with S. C. Hollister, 11 January 1980.

[12]Wig and Hollister, "Problems Arising in Design and Construction of Reinforced Concrete Ships."

[13]*Ibid.*

[14]Unpublished lecture notes by S. C. Hollister; "Report of Special Committee on Concrete Ships and Barges."

[15]"Report of Special Committee on Concrete Ships and Barges."

[16]*Ibid.*; unpublished lecture notes by S. C. Hollister.

[17]"Report of Special Committee on Concrete Ships and Barges."

[18]*Ibid.*

[19]Unpublished lecture notes by S. C. Hollister.

[20]"Developments in Marine Insurance," *Marine Engineering and Shipping Age* (November 1921): 805.

[21]Interview with S. C. Hollister, 11 January 1980.

[22]Hollister, "Brief History of the Development of Concrete Boats."

[23]Interview with S. C. Hollister.

[24]S. C. Hollister, "Sixty-two Years of Concrete Engineering," *Concrete International* 1 (October 1979): 63-66.

[25]Unpublished lecture notes by S. C. Hollister.

[26]A. R. Anderson, "World's Largest Prestressed Concrete LPG Floating Vessel," *Journal of the Prestressed Concrete Institute* 22 (January-February 1977): 12-31.

Puritans at Sea

The Seventeenth-Century Voyage to New England

DAVID CRESSY

Christopher Levett, who sailed from England to New England in the 1620s, reassured prospective migrants of the safety of the Atlantic crossing. "Once in seven years a ship should be cast away, which is more than hath been usual, for I dare say that for every ship that is cast away in those voyages there is one hundred which cometh safe."[1] This could not have been a comforting statistic for seventeenth-century travelers, any more than one hundred-to-one odds would calm any of us embarking on an airplane. Yet more than fifty thousand English men, women, and children took passage across the Atlantic in the course of the seventeenth century. Most of them were landlubbers, with no previous experience at sea. Most of the emigrants had fearful expectations, dreading the mysteries and terrors of the voyage.

Stories of storms and wrecks effectively kept some prospective colonists from going to America; others battled anxieties as they encountered the strange and terrifying world of the sea. To the landsman the ocean suggested drowning, or at least discomfort. At the very least he faced "daily expectations of swallowing waves and cruel pirates."[2] Even the sturdy Pilgrims feared "the casualties of the seas (which none can be freed from)" and "the length of the voyage . . . such as the weak bodies of women and other persons worn out with age and travail . . . could never be able to endure."[3] Puritans among the travelers found comfort in prayer, for did not their God weigh the winds and hold the waves in the fist of his hand? "If he did not watch over us, we need not go over sea to seek death or misery, we should meet it at every step, in every journey; and is he not a God abroad as well as at home?"[4] Trust in Divine Providence, rather than confidence in the ship and its crew, saw most of the Puritans safely to New England.

Most of the emigrant vessels of the 1630s were converted merchantmen with limited facilities for human freight. Overall dimensions rarely exceeded a hundred feet. The *Warwick,* in service in the 1640s, measured eighty feet in length and twenty-three feet, nine inches in beam. She was rated at 186 tons. The *John and Abigail,* a typical merchantman of the 1660s, measured seventy-nine feet long, twenty-nine feet beam, at 356 tons. John Winthrop's *Arbella* in 1630 was rated at 350 tons, and carried 52 crewmen and twenty-eight guns.[5] Richard Mather's *James* in 1635 was 220 tons. The *New Supply,* which brought John Josselyn to New England in 1638, was a 300-tonner, manned by 48 sailors, with 164 passengers on board.[6] These were the big ships. Other vessels ferrying immigrants to New England in the seventeenth century ranged in size down to the tiny *Woodhouse,* with its crew of 6, and the forty-foot *Sparrowhawk* which beached at Cape Cod.[7] In normal circumstances, some fifteen hundred square feet

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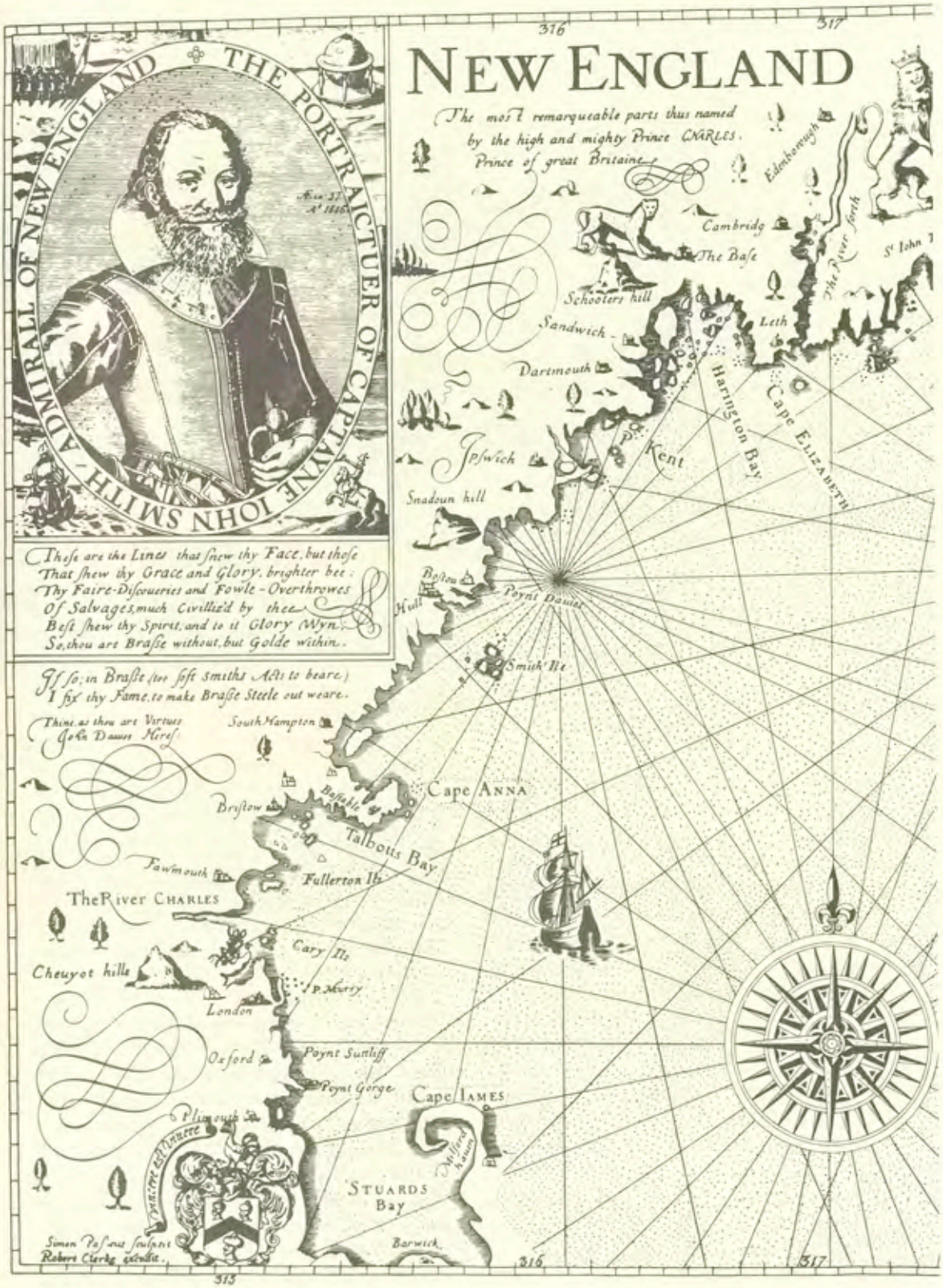
of decking and a hold in which one could barely stand had to accommodate passengers and crew for a journey that could last from six to sixteen weeks. In confined space and insanitary conditions, with wet hammocks and festering bilges, the travelers had repeated opportunities to regret leaving the familiar shore.

Nearly every immigrant was seasick. There is hardly an account of transatlantic travel in the colonial period which omits mention of "spewing," seasickness, and the unaccustomed suffering of the passengers. Pitching and rolling provided an unpleasant novelty, with miserable effects. Passengers on the *Talbot* in 1629 reacted badly to "the tossing waves of the western sea." Richard Mather's party aboard the *James* was similarly afflicted. "The ship danced, and many of our women and children were not well, but seasick, and mazy and light in their heads, and so could scarce go without falling." Seasickness so reduced Edward Taylor on his journey to New England in 1668 that on some Sundays it kept him from his religious duties. Only the Quaker leader George Fox remarked on not being seasick when all around him were indisposed, and he attributed his immunity to the damage already done to his internal organs by long imprisonments. By way of compensation, Fox suffered pains, swellings, sweats, and rashes during his crossing of the Atlantic in 1671.[8]

Seasickness was no joking matter. It sapped the travelers' strength and weakened their morale. For some migrants the experience was so distressing as to dissuade them from ever going to sea again. Ingenious remedies made their appearance, including "conserve of wormwood," and a concoction of sugar, gum-tragacanth, cinnamon, ginger, and musk, made up into gilded pills. The best remedy was activity and exercise, and the symptoms rarely persisted for more than a week or two unless the weather was especially boisterous. On board the *Arbella* in 1630 seasick victims were brought on deck to play a game with a rope stretched from the steerage to the mainmast, to "sway it up and down till they were warm and by this means they grew well and merry."[9]

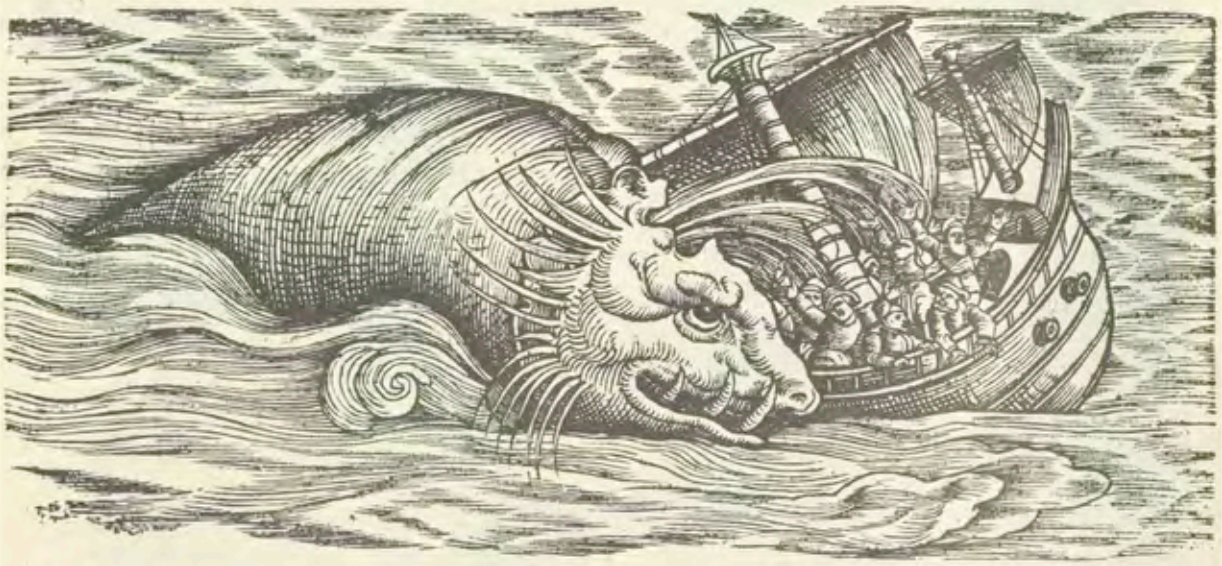
Passengers were shocked by the fury of Atlantic storms. Edward Johnson memorialized "hideous waves" in the "dreadful and terrible ocean." Francis Higginson remembered a night of darkness and terror when "the wind blew mightily, the rain fell vehemently, the sea roared and the waves tossed us horribly." Lights went out, cooking was impossible, chests and equipment were bounced and broken, and the ship seemed out of control.[10] Nearly every emigrant experienced such moments. Puritan writers never tired of telling how prayer had silenced these storms, or brought deliverance when all seemed lost. When "the Lord sent a most dreadful and terrible storm of wind from the West" against the *Hope of Ipswich* in 1634 Thomas Shepard and the other ministers on board began devotions, and "immediately after prayer the wind began to abate." Escape came with "the Lord showing his dreadful power toward us and yet his unspeakable rich mercy."[11]

Along with storms came leaks, accidents, and injuries. The Pilgrims on the *Speedwell* believed that "if we had stayed at sea but three or four hours more she would have sunk right down." Only strenuous bailing and pumping enabled them to limp back to England. One of the emigrant ships of 1633 leaked so badly she had to put in to the Azores for emergency repairs. The *Defence*, bound for New England in 1635, was "very rotten and unfit for such a voyage," and she took in water in every storm.[12] Bad stowage, misplaced ballast, or inappropriate sails caused swamping. Poor construction or weak caulking allowed water to seep into the bilges even under calm conditions, and a dangerous inundation was likely when the weather became rough. On board the *Diligence*, carrying passengers to New England in 1677, "the men . . . did for the most part of



Detail from Captain John Smith's map of 1614, showing a typical English ship of the period approaching the New England coast, to which familiar English names have already been applied. (66.253)

Volgend etliche Figuren auß der Tafel der beſchreybung mittnächtiſcher landen des Olai Magni: wie wol vnd recht aber die ſelben conterfeetet ſyend/laſſend wir den Olaum verantworten.



Balana erecta grandem nauem ſubmergens. Videntur & alia quædam Cete ex eâdem Tabula Balænis adnumeranda, quæ ipſe ſimpliciter Cete nominat, cum præter magnitudinem Balænis præcipuè conuenientem, nullam in ſe corporis partem raram aut monſtroſam habeant: ut ſunt quæ ſequuntur aliqua.

Europeans had many preconceived notions of the terrors of the sea.
(Conrad Gesner, *Nomenclator Aquatilium Animantium* . . . , 1560)

the time the storm continued stand up to the knees, and sometimes up to the waist, in water at the pump, with very much jeopardy to be washed overboard every minute." The frigate *Rose* in 1683 had three feet of water in her powder room, and the pumps would not work because they were blocked with carpenters' shavings.[13] Landsmen who saw water below decks found it immeasurably disconcerting, and often imagined the danger to be greater than it was.

Storm damage necessitated ingenious repairs. Clothing, bedding, animal hides, or sail cloth would be stuffed into cracks to hold leaks.

> If a leak endanger the ship, what care is there to find it, and stop it! How nimbly is the sheet lead, or the plug wrapped in canvas, applied, when the leak may by easily come at! If it be below among the ground timbers, or hooks, and there may be hope to stop it within board, with what solicitude then do they sink down their bag, and their various mixtures of tallow, and coals, and other things! If it be over-low, and yet there be hope to stop it, without board, how solicitously do they sink their bag with oakum or rope-yarn, that the indraught may lodge in that port-hole of death! What prayers are to be made in such perils by sea![14]

After a storm struck Bradford's *Mayflower,* "one of the main beams in the midships was bowed and cracked," and was repaired with "a great iron screw the passengers brought out of Holland." This may have been part of a printing press, sacrificed to secure the integrity of the ship. The *Hopewell* bringing John Norton to New England in 1635 became so shaken by the waves that the crew had "to undergird the ship with the cable, that they might keep her sides together." Similarly, the *Fox* could

only complete her voyage in 1646 with three hawsers bound round below the keel to keep her planks from splitting. Bad weather cracked the foremast of the *New Supply* in 1638 and left her mainmast "twisted and shivered."[15] Before they reached New England the emigrants learned makeshift survival skills which would later serve them well in frontier conditions. Nevertheless, their religion disposed them to attribute deliverance to the providence of God, rather than the hard work of the mariners. When an emigrant ship in 1636 "met with great distress of weather, which broke off the rudder" the Puritans on board claimed that prayer and preaching, rather than ingenuity and sweat, brought them through the crisis.[16]

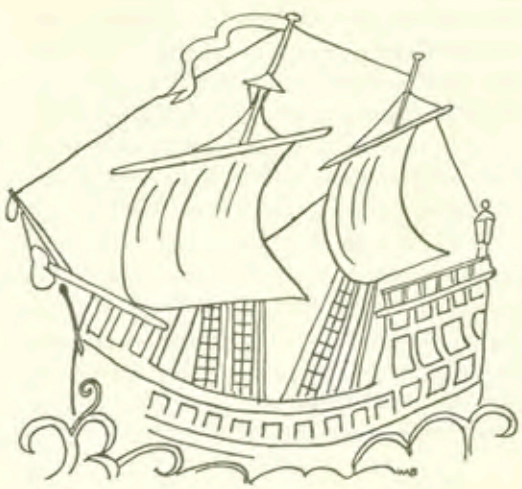
Bruises and minor injuries were common. "The shaking of the ship in a violent storm" threw Margaret Shepard off balance and "her head was pitched against an iron bolt." A physician aboard the *Hannah and Elizabeth* treated people for bruised and broken fingers, a broken shin, cut and blistered hands, and for the impact of a rusty nail. Poor Richard Becon, a passenger on the *James*, "lending his help to the seamen at the hauling of a cable, had the cable catched about his arm, whereby his arm was crushed in pieces and his right hand pulled away, and himself brought into doleful and grievous pain and misery."[17] Nor was this the worst that could happen. John Howland fell into the sea from the *Mayflower*, but fortunately grasped a trailing halyard and was pulled back to safety. Not so lucky was the sailor of the *Lion* "who in a tempest having helped to take in the spritsail, lost his hold as he was coming down, and fell into the sea, where, after long swimming, he was drowned." The *Lion* also lost a carpenter who was swept to his death while caulking a port, and a passenger fell from the *Griffin* while fishing. In the same way the sea also claimed Samuel Gaylor, an indentured servant who "fell overboard and was lost by the way" coming to New England in 1662.[18] Fortunately, tragedy of this kind was rare, but tales of such episodes heightened the passengers' apprehension about the voyage.

Much more common was the specter of sickness and contagion. The cold and dampness of the ship, cramped and insanitary living conditions, and the rigors of diet and motion, could accelerate the course of an illness in someone who was already infected, and reduce the resistance to disease of the rest. The *Elizabeth Dorcas* reached New England in 1634, "having a long passage, and being hurt upon a rock at Scilly, and very ill victualled, she lost sixty passengers at sea and divers came sick on shore."[19] Typhus and dysentry, flux and bloody flux, could ravage a ship's company, but the greatest concern was reserved for smallpox. Smallpox hit the *Talbot* in 1629, and four-year-old Mary Higginson died of the disease within two weeks of leaving England. Her funeral at sea was "a terror to all the rest as being the beginning of a contagious disease and mortality."[20] Parts of the Winthrop fleet suffered similarly. John Pond, who sailed to New England in 1630, reported to his father, "we were wonderful sick as we came at sea with the smallpox. No man thought that I and my little girl would have lived, and my boy is lame and my girl too; and there died in the ship that I came in fourteen persons."[21] It was a miserable introduction to America. A servant on board the *New Supply* exhibited smallpox symptoms just a week out of London in 1638, and ten days later the victim was dead. Two more passengers died of smallpox before the ship reached Boston, and another died of consumption.[22] Well might the travelers wonder who would be next as they saw the corpse knotted in a shroud with lead weights at each end. Prayers and salutations accompanied the body into "the bowels of the great Atlantic sea.[23] No marker but the memory of fellow passengers honored these ocean casualties.

Few voyages were as healthy as that which

brought Richard Mather and his family to New England. "Fevers, calentures, smallpox, and such diseases as have afflicted other passengers, the Lord kept from us, and put us no grief in our bodies but a little seasickness at the beginning."[24] But even on this blessed journey the passengers suffered from scurvy. Deficiency disease was a natural accompaniment to long weeks at sea. Hundreds of migrants suffered scurvy symptoms: aching joints, painful gums, and general lassitude. Nor were professional sailors immune. The lack of fresh vegetables and vitamins in the shipboard diet could weaken anyone after ten or twelve weeks, and scurvy was almost inevitable if the voyage took longer. The master of the *Sparrowhawk* lay "sick and lame of the scurvy"and could not come on deck. Scurvy hit passengers on the *Talbot* after only six weeks at sea, while many who arrived with Winthrop were suffering from the disease. Some were so weakened that they could not carry their baggage ashore. A land diet brought most sufferers back to health, but in the early years of New England fresh food stocks were limited and some people died of scurvy after their voyage had ended.[25]

This sketch of a plaster ceiling relief at Hook House in Wiltshire, England, illustrates the pinnace *Dove*, which brought colonists to Maryland in 1633. She was representative of the small vessels that made the long transatlantic passage. Drawn by William A. Baker. (Courtesy of Ruth S. Baker)



Remedies were legion, and most had the sense to include fresh lemons. Captain John Smith prescribed "the juice of fresh lemons for the scurvy" as early as 1626. John Winthrop advised his wife, "remember to bring juice of lemons to sea with thee, for thee and thy company to eat with your meat as sauce."[26] One enterprising New Englander was fined five pounds in 1631 "for taking upon him to cure the scurvy by a water of no worth nor value which he sold at a very dear rate."[27] A concoction of scurvy grass with saltpeter and nutmeg was believed to be excellent physic. Scurvy grass (*cochlearia officinalis*) was of dubious value but easily found; lemons were effective but dear. As part of a food parcel for her emigrant son, Muriel Gurdon sent over in 1636 a "conserve of scurvy grass and some syrup of lemons." John Josselyn advised travelers to carry lemon juice among their personal supplies. The valuable lemons were more likely to be kept by the ship's surgeon than the cook, to be treated as medical supplies rather than as food. On board the *New Supply* a servant "was whipped naked at the capstan with a cat of nine tails, for filching nine great lemons out of the surgeon's cabin, which he eat rind and all in less than an hours time."[28] At least he had some notion of antiscorbutic diet supplements, no matter what damage he inflicted on his digestive system.

By way of compensation for the misery and fear attending the ocean crossing, the travelers gained a privileged and uplifting view of God's creation. The Bible had primed their expectations, for "they that go down to the sea in ships, and do business in great waters, these men see the works of the Lord and his Wonders in the deep."[29] Journal after journal speaks with delight of the dashing of dolphins and porpoises. Richard Mather and friends "saw with wonder and



For their safe arrival and prosperity in New England the Puritans gave frequent, fervent thanks. Nineteenth-century artists idealized the Puritan thanksgiving. Drawn by J. W. Ehninger. (*Harper's Weekly,* 30 November 1867)

delight an innumerable multitide of porpoises leaping and playing about the ship." The Puritans were moved to prayers of gratitude, "so marvellous to behold are the works and wonders of the Almighty in the deep."[30]

Fascinating novelties like these distracted the passengers from the rigors of life at sea. Christopher Levett thrilled to "the strange fish which we saw there, some with wings flying above the water, others with manes, ears, and heads, and chasing one another with open mouths like stone horses in a park."[31] Francis Higginson remarked on the strange fish – bonitos, carvels, grampuses, sunfish, and whales – which inspected the rolling *Talbot*.[32] Other travelers noted albacores or tunny, calamaries or squid, jellyfish, flailfish, torpedofish, swordfish, sharks, and threshers. Christopher Jeaffreson delighted in the unfamiliar animals he saw, "which, though common at sea, may be a subject of wonder to such as are homebred."[33] To Richard Mather, "it was a pleasant thing to behold the variety of fowls and mighty fishes."[34] A virtual aquarium of exotic creatures disported itself, to demonstrate the diversity of God's creation so far from English waters. Sea turtles could be taken in the vicinity of the Azores; cod and mackerel were plentiful further north. A swordfish broke its sword against the hull of the *New Supply,* John Josselyn related, "and one of our sailors dived and brought it aboard." A souvenir like this would confirm the existence of unicorns. John Dunton even claimed to have encountered mermaids![35]

Crossing the ocean tested and toughened the seventeenth-century immigrants. Their voyage made a lasting impression, providing them with a store of salt-grained memories. Not surprisingly, the ocean became a powerful emblem in New England Puritan literature. Images of a storm-tossed vessel suggested the Christian in a sea of sin. Episodes from recent experience gave immediate force to the traditional idea of "the ship of state." As early as 1638, Thomas Shepard reminded the settlers, "the Lord hath brought you by a strong hand and brought you and blessed you, and he hath when you cried to him saved you from sins, from storms.... The sins of men are like [the] raging sea, which would overwhelm all." This image was especially potent to those, like Shepard himself, who had recently "passed through the waves... and stood many a week six inches from death."[36]

NOTES

[1]James P. Baxter, *Christopher Levett* (Portland, Maine: 1893), p. 136.

[2]J. Franklin Jameson, ed., *Johnson's Wonder-Working Providence* (New York: 1910), p. 52.

[3]William Bradford, *History of Plymouth Plantation* (Boston: 1912), 1: 56.

[4]Massachusetts Historical Society, *Winthrop Papers* (Boston: 1931), 2: 198, 209.

[5]R. C. Anderson, "Lists of Men-of-War 1650-1700. Part 1, English Ships, 1649-1702," *Society for Nautical Research Occasional Publications* 5 (1935): 3-4, 62-63.

[6]*Winthrop Papers*, 2: 239; John Josselyn, *An Account of Two Voyages to New England, Made During the Years 1638, 1663* (Boston: 1865), p. 5.

[7]Robert Fowler, *A Quaker's Sea-Journal*, in Caroline Hazard, *The Narragansett Friends' Meeting in the XVIII Century* (Cambridge: 1899), p. 180; *Ye Antient Wrecke. Loss of the Sparrow-Hawk in 1626* (Boston: 1865).

[8]Francis Higginson, "A True Relacion of the Last Voyage to New England," in Massachusetts Historical Society, *The Founding of Massachusetts* (Boston, 1930), p. 64; "Richard Mather's Journal," in Alexander Young, *Chronicles of the First Planters of the Colony of Massachusetts Bay* (Williamstown, Massachusetts: 1978), p. 449; "Diary of Edward Taylor," *Proceedings of the Massachusetts Historical Society* 18 (1880-81): p. 9; George Fox, *Journal* (London, 1694), p. 351.

[9]*Winthrop Papers*, 2: 246.

[10]*Johnson's Wonder-Working Providence*, p. 49; Higginson, "A True Relacion," p. 67.

[11]Michael McGiffert, ed., *God's Plot. The Paradoxes of Puritan Piety, Being the Autobiography and Journal of Thomas Shepard* (Amherst, Massachusetts, 1972), pp. 59-60.

[12]Bradford, *History of Plymouth Plantation*, 1: 140-41; McGiffert, *God's Plot*, p. 63.

[13]Samuel E. Morison, ed., "Records of the Suffolk County Court 1671-1680," *Publications of the Colonial Society of Massachusetts* 29/30 (1933): 830; "Sea Journal of John Knepp, 1683-4," pp. 17-18, Massachusetts Historical Society, Boston, Massachusetts.

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[15]Bradford, *History of Plymouth Plantation*, 1: 150; Cotton Mather, *Magnalia Christi Americana* (Hartford, Connecticut, 1820), p. 264; Josselyn, *An Account of Two Voyages*, p. 8.

[16]Robert Fleming, *The Fulfilling of the Scripture* (London, 1669), p. 283.

[17]McGiffert, *God's Plot*, pp. 63-4; *Records and Files of the Quarterly Courts of Essex County Massachusetts* (Salem, Massachusetts, 1919), 7: 304; "Richard Mather's Journal," p. 475.

[18]Bradford, *History of Plymouth Plantation*, 1: 151; "Dudley's Letter to the Countess of Lincoln," in Young, *Chronicles of the First Planters*, p. 330; James Kendall Hosmer, ed., *Winthrop's Journal* (New York, 1953), 1: 92, 105; "The Diaries of John Hull," *Transactions of the American Antiquarian Society* 3 (1857): 153.

[19]Hosmer, *Winthrop's Journal*, 1: 128.

[20]Higginson, "A True Relacion," pp. 65, 66; John Duffy, "The Passage to the Colonies," *Mississippi Valley Historical Review* 38 (1951-52): 28-31.

[21]*Winthrop Papers*, 3: 19.

[22]Josselyn, *An Account of Two Voyages*, pp. 6, 9, 13.

[23]Higginson, "A True Relacion," p. 65; John Smith, *An Accidence or Pathway to Experience, Necessary for All Young Sea-Men*, in Edward Arber, ed., *Travels and Works of Captain John Smith* (Edinburgh, 1910), 2: 797.

[24]"Richard Mather's Journal," p. 477.

[25]Bradford, *History of Plymouth Plantation*, 2: 13, 89, 113n; Higginson, "A True Relacion," pp. 68, 74; *Johnson's Wonder-Working Providence*, p. 65.

[26]Smith, *An Accidence*, p. 804; *Winthrop Papers*, 3: 20.

[27]Nathaniel B. Shurtleff, ed., *Records of the Governor and Company of the Massachusetts Bay* (Boston, 1853-54), 1: 83.

[28]*Winthrop Papers*, 3: 294; Josselyn, *An Account of Two Voyages*, pp. 14, 9.

[29]*Psalm* 107; cf. *Psalm* 136.

[30]"Richard Mather's Journal," pp. 463, 467.

[31]Baxter, *Christopher Levett*, p. 85.

[32]Higginson, "A True Relacion," p. 68.

[33]John Cordy Jeaffreson, *A Young Squire of the Seventeenth Century* (London, 1878), p. 179.

[34]"Richard Mather's Journal," p. 479.

[35]Josselyn, *An Account of Two Voyages*, pp. 7, 9, 12; John Dunton, *Letters Written from New-England, A.D. 1686*, ed. W. H. Whitmore, (Boston, 1867), pp. 40, 24, 32, 35, 39.

[36]Thomas Shepard, "Election Sermon in 1638," *New England Historical and Genealogical Register* 24 (1870): 366, 363; Peter N. Carroll, *Puritanism and the Wilderness* (New York, 1969), pp. 29-36.

The Festive Board

Recipes for a Nineteenth-Century Thanksgiving

SANDRA L. OLIVER

"Our great holiday was Thanksgiving Day," wrote Mary Channing in 1894,

to it we children looked forward as soon as autumn began. We were willing helpers in all the preparations–the chopping of meat and apples, the picking over of currants and raisins for mincemeat pies. All the good things that could be got together must find a place at the feast. A turkey was the principal dish; then there were chicken-pies, and vegetables, sauces, pickles, preserves, pie of mince, apple, squash, pumpkin and custard; nuts, apples, and raisins.

It was a royal festival, chiefly, and above all because of its afternoon and evening, in which for once in the whole year, our elders unbent, and in place of the strictness and severity of other days, acutally played games!–a blind-man's bluff, fox and geese, hunt the slipper and twirling the plate.[1]

The Thanksgiving that Mary Channing recollected was the same one celebrated by

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Thanksgiving at a New England farmhouse. Drawn by F. A. Chapman. (*Harper's Weekly*, 9 December 1871)



most New Englanders, for nearly all the nineteenth century. It has hardly changed in this century. Channing's family in Great Falls, New Hampshire, would have set aside Thanksgiving Day for feasting, fun, and family reunion as the major holiday of the year.

With this in mind, you can imagine the poignancy of the following quote from Mary Chipman Lawrence's journal, kept aboard the whaleship *Addison*, cruising in the Pacific in 1857:

> Nov. 26. Probably this is Thanksgiving at home, and as Father, Mother, brothers and sisters gather around the festive board, may they bestow one thought on their children who are wanderers on the sea. As it was blowing quite fresh and a heavy sea, we made no preparation for a special dinner. We were intending to be at Raratonga about that time, but the wind changed so that we could not fetch . . . I am much disappointed, for I depended upon the nice fruit we could get there for trade, also pork and fowls.[2]

Had Mary Chipman Lawrence been at home rather than at sea, she might have used the following recipes for preparing a turkey and for making mincemeat and pumpkin pies.

ROAST TURKEY

Prepare the stuffing with bread, salt, pepper, butter, cinnamon, or nutmeg, or a little lemon peel, or parsley and thyme; chop, and mix all well together, with one or two eggs, beaten well. With this dressing stuff the body and the breast, and sew with a strong thread. Also fill the crop; then draw the skin of the neck over the back, and fasten it with a skewer; turn the legs close to the body, and run skewers through each hip joint, and tie the ends of the legs together. Roast the turkey to a fine brown; baste it frequently with the liquor in the pan. It will be done in one hour and a half; or, if old and very large, two hours or more. Make a gravy of drawn butter and the

A well-to-do family of Puritan descent at their Thanksgiving dinner. Note that one son has lost an arm in the Civil War. Drawn by W. S. L. Jewett. (*Harper's Weekly*, 30 November 1867)



dripping. Another sauce is made of half a pint of oysters, boiled in the pan, thickened with a lump of butter rolled in flour. Only let it boil once. Serve this by itself, in connection with other gravy, for every person does not like oyster sauce.[3]

In her 1860 cookbook Elizabeth M. Hall does not specify the size of turkey that should be bought, which leaves us in the twentieth century wondering how large a bird would be finished roasting in an hour and a half.

COMMON MINCE PIES

Boil a piece of lean fresh beef very tender; when cold, chop it very fine; then take three times the quantity of apples, pared and cored, and chopped fine; mix the meat with it, and add raisins, allspice, salt, sugar, cinnamon, and molasses, to suit the taste; incorporate the articles well together, and it will improve by standing over night, if the weather is cool; a very little ginger improves the flavor. Small pieces of butter, sliced over the mince before laying on the top crust, will make them keep longer. A tea-cup of grape sirup will give them good flavor.[4]

Though she does not say so, Mrs. Howland may have been a Temperance supporter, which could account for the substitution of grape sirup for the more traditional brandy. Sometimes at Thanksgiving, pies, especially mince pies, were baked in great quantity and put away in a cold pantry for use in coming months, which, I believe, is why Mrs. Howland recommends butter to "make them keep longer."

PUMPKIN PIE

Take out the seeds and pare the pumpkin; stew, and strain it through a coarse sieve. Take two quarts of scalded milk and eight eggs, and stir your pumpkin into it; sweeten it with sugar or molasses. Salt it, and season with ginger, cinnamon, or grated lemon-peel, to your taste. Bake with a bottom crust. Crackers, pounded fine, are a good substitute for eggs. Less eggs will do.[5]

The crackers, pounded fine, were recommended to thicken the pie instead of using eggs for a more custard-like consistency. That would have been a good thing to know for a family who had fallen on harder times. The well-to-do cook could have used the eggs, more or fewer, and sugar. The economical cook could have used fewer or no eggs and the cheaper molasses for sweetening.

NOTES

[1] Mary J. Channing, "Sixty Years Ago," *Youth's Companion*, 13 December 1894.

[2] Stanton Garner, ed., *The Captain's Best Mate: The Journal of Mary Chipman Lawrence on the Whaler "Addison," 1856-1860* (Providence: Brown University Press, 1966).

[3] Elizabeth M. Hall, *Practical American Cookery and Domestic Economy* (New York: Saxton, Barker & Co., 1860).

[4] Mrs. E. A. Howland, *New England Economical Housekeeper and Family Receipt Book* (Worcester: S. A. Howland, 1845).

[5] *Ibid.*

BOOK REVIEWS

Philip Chadwick Foster Smith. *The Empress of China*. Philadelphia: The Philadelphia Maritime Museum, 1984. 331 pp., illustrations, appendices, bibliography, index. $17.50 paper, $35.00 cloth.

The epic voyage of the *Empress of China* is one of the most famous ventures in the annals of American maritime trade. As the first of the voyages to the mysterious East, that of the *Empress of China* is described in nearly every survey of American maritime history. In fact, the China trade itself has been described by innumerable historians, so much so that its relative historical importance has been completely skewed by the sheer weight of its literary importance. And now, in addition, we have a new book about the most legendary voyage of a truly legendary trade. And so much the better for us, as it is one of the most informative and readable works on the China trade published within the past fifty years.

Chad Smith's work is a case study which brings life and humanity to the fabled story of the *Empress of China*. The reader discovers that there are no sirens or argonauts in this tale, and yet the first voyage to Canton was something of an odyssey. It was, however, an odyssey conceived and carried out by real men, both talented and frail. Theirs is more than a sea story, for the land-bound machinations before, during, and after the voyage are every bit as intriguing as any passage through the Boca Tigris.

The adventure began when–sparked by the flint of John Ledyard–Philadelphian Robert Morris, Daniel Parker and Co. of New York, and a group of merchants from Boston formed an alliance to back a trip to Canton. This undertaking began in 1783, even before the peace treaty ending the Revolution was signed in Paris. For many months the wilderness of America was scoured to find our only saleable product for China, ginseng. Delay followed delay and by the time the *Empress* was ready to set sail those involved in the venture were frustrated and divided. The Boston consortium had backed out months before, and those still involved found their lines of credit and their patience stretched to the breaking point.

At last, as the ice finally cleared in New York Harbor and volleys of salutes rolled across the dark water, the *Empress of China* departed her native land bound for unknown seas. Good fortune went with the seafarers, however, for although they learned as they went, those onboard the stout ship arrived in Whampoa without serious mishap. The Chinese and the Europeans in Canton all proved to be most helpful, and by the time the *Empress of China* reentered New York's East River fifteen months after her departure, the officers, supercargoes, and crew had amassed enough knowledge to guarantee the future growth of this exotic trade.

Unfortunately, for the investors who backed the voyage a number of legal and financial complications had tarnished their joy at the ship's return. For one thing, what appeared to be a conflict of interest had been exhibited in Canton by the vessel's young supercargoes, Samuel Shaw and Thomas Randall. Meanwhile, Robert Morris and his partner in Philadelphia had dissolved their partnership after charging each other with improper conduct. These and other difficulties paled, however, in comparison to the actions of Bay State expatriate Daniel Parker.

Unbeknownst to any but Samuel Shaw, Parker had boarded the *Empress* shortly before the voyage began and taken $2,300 of the $20,000 in specie that had been laded for use in Canton. He made no record of the action and asked Shaw to trust him, as he would shortly make matters right. When Shaw arrived in Canton, he found that the money had not been replaced and he had been compromised. Mayhap those Boston merchants avoided getting entangled in the China undertaking for good reason!

Even before the *Empress of China* had reached Java Head on her outward passage, events had come to a head back in America for Daniel Parker and Company. It had become increasingly apparent that Parker's veracity was suspect, and his creditors had closed in on him. Their attempts to unravel his Gordian finances all came to naught when he silently boarded a ship and departed for Mother England. Parker's perfidy left many of those involved in the venture eternally embittered.

The detail and humanity that breathe life into this tale come from a variety of sources, both imprint and manuscript. The papers of some of

the venture's principal characters have been drawn upon extensively. The private and business records of Robert Morris, John Holker, Daniel Parker, and others have been tapped. These are mixed with published sources like Josiah Quincy's *Journal of Major Samuel Shaw.* The catalyst that brought this study to fruition, however, was the journal of John Green, captain of the *Empress of China.* The wealth of information buried in Green's journal has barely seen the light of day previous to this work. Green's notations about the voyage to the Far East are extensive, and they make a wonderful companion piece to Shaw's popular journal. By placing these two records side by side, the author has allowed the actors in this drama to speak for themselves. At the same time, Smith's timely and informative narrative makes the story flow with ease. The copious illustrations and handsome design are further delights.

If this work deserves any criticism it concerns the use of informational footnotes in the back matter. It becomes disorienting when one must continually refer to the notes sections to see if additional information is buried there. If this information is important enough to be in the work at all, then it would be easier on the reader if it were included in the body of the piece.

But, such criticism is of little consequence when considering the study of *Empress of China* as a whole. With it we add another title to the long list of China trade books. But, with it we are treated to a refreshing and scholarly addition to that library. Chad Smith has offered to the reader a tale of high adventure, a story of a year long voyage to an unknown land. Within that story we find famous people and infamous deeds. Such are the elements of an entertaining yarn. When combined with in-depth scholarship and an easy style, that yarn is transformed into good history, meaningful and informative.

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Thomas G. Lytle. *Harpoons and Other Whalecraft.* New Bedford, Massachusetts: The Old Dartmouth Historical Society, 1984. 256 pp., illustrations, appendices, bibliography, index. $40.00.

In his preface to this volume the author states his intention "to provide an accurate source of information on harpoons and other implements of the American whale fishery." Mr. Lytle is a man of his word. This is a comprehensive catalog of the tools peculiar to Yankee whaling. All whaling implements that received U.S. patents in the nineteenth century are included with the exception of bomb lances. Photographs or sketches based on patent specifications accompany each description. Appendices include biographical sketches of whalecraft manufacturers in the New Bedford area, a descriptive inventory of the New Bedford Whaling Museum's collection, a catalog of U.S. patents for whalecraft, and a glossary of terms relevant to these implements.

Curators and collectors are the obvious beneficiaries of Mr. Lytle's efforts. The only previous catalog of American whaling tools is James Templeman Brown's *Whale Fishery and Its Appliances,* published in 1883 by the U.S. Fish Commission. Mr. Lytle has improved on Brown by dealing with more information and adding illustrations. The author has also provided relevant and sometimes amusing anecdotes concerning the history of whalecraft. Lytle's notes concerning the abhorrence of whalers for harpoons that carried prussic acid read like today's headlines on ecological disasters. The account of the introduction of the tow iron illustrates the fear and suspicion that new technology aroused in the untrained. Hyperbolic claims of inventors, testimonials of whalers and the angry cry of the customer that considers himself misled ("I got two single shanked harpoon guns from Aberdeen upon trial, which proved a complete failure. I would not allow one to be put into my boats . . ."), show Mr. Lytle's sensitivity to the story behind this technology.

There is little to fault in this book. Mr. Lytle does claim that blubber hooks were "cast at foundries, not made by blacksmiths" while examples of forged hooks can be found here at Mystic Seaport Museum's collection, and on page 248 Mr. Lytle shows blubber hooks with forged eyes. Small inconsistencies in the abbreviated index do not detract from 256 pages of well-organized, carefully researched material. Mr. Lytle has provided yeoman service to those who are interested in whalecraft and its place in American maritime history.

Ken Donovan-Peters
Shoreside Industries, M.S.M.

American Whalers in the Western Arctic: The Final Epoch of the Great American Sailing Whaling Fleet. Watercolors and drawings by William Gilkerson,

introduction and text by John R. Bockstoce. Fairhaven, Massachusetts: Edward J. Lefkowicz, 1983. 54 pp., 12 colored plates, drawings, notes. (Limited edition of 400) $1,250.

Designing this volume must have provided artist Gilkerson an unusual creative opportunity. Printed by prestigious Meriden Gravure Company, set in Sabon at the Stinehour Press, and elegantly hand bound in Boston at the Harcourt Bindery, what better team could one possibly imagine.

Page size is a lavish sixteen inches (on the binding edge) by nineteen inches, chosen no doubt to enable reproduction of the artist's watercolor wash drawings as close to the original size as possible. These huge oblong sheets posed design problems for the forty-eight pages of text, but with careful attention to point size and line length, as well as clever text placement, the narrative never gets lost on the page. In addition, most text pages are beautifully embellished with dark blue line drawings which march across those vast white margins with great authority and charm. In all of this I discovered one surprising blemish. Given the huge page areas in which to work, to hyphenate the word "dog-" and have to turn the page to realize "gerel" seemed a crudity which surely could have been avoided in such an elegant presentation.

John Bockstoce has written a lively narrative on American sailing whalers from 1848 to the beginning years of this century; and he should be given full credit for his contribution. However, the colored plates and drawings are the obvious feature of this production, which seems destined for the serious collector of fine books rather than the student of whaling history. Whatever the market, Edward Lefkowicz, the antiquarian bookman who has made this jewel possible, has performed a notable service for maritime painting.

Plum Gut

Carl C. Cutler. *Greyhounds of the Sea.* Third edition. Annapolis: Naval Institute Press, 1984. 688 pp., illustrations, notes, appendices, bibliography, index. $32.95.

No one doubts that *Greyhounds of the Sea* is the classic work on the American clipper ship. In the fifty-four years since first appearing, it has been recognized for its solid documentation and encyclopedic appendices of clipper statistics, as well as for its stirring narrative of the clipper era of the 1850s and its antecedents. One might even venture that Mystic Seaport owes its existence to this book, since Cutler was inspired to found the Museum when, during his research, he discovered how little regard there was for maritime artifacts at the time.

This third edition of *Greyhounds* has been updated and amended by the inclusion of *Five Hundred Sailing Records of American Built Ships,* originally published by Mystic Seaport in 1952. This list corrects and expands the records of numerous clippers. It includes, of course, the fastest known passages between well-known ports–New York to Liverpool, San Francisco, or Canton; Liverpool to Calcutta; etc.–but also passages by a variety of vessels on lesser-known runs, such as Newburyport to Puerto Rico, Boston to Cadiz, and Glasgow to New Zealand. The data, drawn from log books and newspaper reports, is a useful reference tool for scholars as well as fascinating reading for maritime trivia buffs.

Fifty new illustrations, including eight in full color, augment Cutler's narrative. The only apparent flaw in the volume lurks in the index, which follows the original pagination despite the fact that the appendix of sailing records has been inserted before the original appendices, throwing off their citations in the index by ninety-four pages. Nonetheless, the Naval Institute Press has done us a great service by reissuing *Greyhounds of the Sea.*

The Wherry Oarsman

William A. Baker. *The Mayflower and Other Colonial Vessels.* Annapolis: Naval Institute Press, 1983. 180 pp., illustrations, photographs, plans, appendices, notes, glossary, bibliography. $15.95.

Among marine historians, William A. Baker stands out as a leading authority on colonial-era vessels. His three main studies of that period, now out of print, were *The New Mayflower: Her Design and Construction* (1958), *Colonial Vessels* (1962), and *Sloops and Shallops* (1966). This, his last book, published shortly after his death in 1981, includes the most essential information from his earlier books, together with revised thinking and the results of more recent research.

When Baker designed *Mayflower II,* based on the best available knowledge of seventeenth-century vessel construction, the practice of re-

production building was new. The *Mayflower II* was really a test case, revealing much evidence of how seventeenth-century vessels behaved, and the author included this as well as information derived from his study of other colonial types and some of the replicas built therefrom. Baker's concern was to put form to words like pinnace, shallop, bark, and ketch. What did they mean in the seventeenth and eighteenth centuries? How much could they hold? How did they sail? These questions and more he answered, and the result is essential reading for model makers and marine historians interested in that period.

Since the construction of the *Mayflower II*, there has been a trickle of other reproductions down the ways, including several built to the author's designs. They require the maintenance of any vessel, and the author would be pleased to see that the *Mayflower II* is now getting it, and that it has become an important item for all reproduction projects. His work remains the inspiration and a model for those who would build other vessels along historic lines.

For those readers and scholars who are interested in the career of the author, *William Avery Baker: A Tribute from His Friends*, by Erik A. R. Ronnberg, Jr., makes a fine volume. It contains a full bibliography of Bill Baker's work, together with photographs and drawings. Mr. Ronnberg's essay is based on a talk he gave before a meeting of the Council of American Maritime Museums, who joined together with the National Trust for Historic Preservation to publish this handsome little volume (64 pp.). Copies may be obtained through the New Bedford Whaling Museum at a cost of $5.00, plus postage, and from other CAMM member museums.

Paul Forsythe Johnston. *Steam and the Sea*. Salem: Peabody Museum of Salem, 1983. 90 pp., photographs, appendix, bibliography. $15.00 paper, $25.00 cloth.

The New England Fisheries: A Treasure Greater than Gold, The Russell W. Knight Collection of New England Fishing Scenes. Salem: Peabody Museum of Salem, 1984. 52 pp., photographs. $15.00.

The Peabody Museum of Salem continues its practice of publishing brief but elegant catalogs to accompany its exhibits. *Steam and the Sea* is a well-written introduction to the subject. Illustrations, many in color, show quite a few of the objects in the exhibition. It gives the reader a good overview, with chapters on "The Impact of the Steamship," "Pioneers of Marine Steam Technology," "Coastal Steamboats," and "The Atlantic Ferry." The rather complete bibliography, broken down by subject, is a useful guide and a good starting place for someone interested in pursuing a subject further. The volume is most handsome, with good color and black-and-white photographs, and fine design.

A different type of catalog, but equally handsome, is *The New England Fisheries*. It accompanies an exhibit of paintings collected and commissioned by Russell W. Knight in an effort to document visually the industry that first brought Europeans to the American coast. Dr. Johnston briefly introduces the reader to the history of New England fisheries, and then describes each of the seventy-four pieces in the show, fifty-six of which are illustrated (many in color). Through these descriptions, and the illustrations, the object of Mr. Knight is achieved: the reader comes away with a good picture of the New England fisheries.

J. David Farmer et al. *Rowing/Olympics*. Santa Barbara: University Art Museum, University of California, Santa Barbara, 1984. 66 pp., illustrations, photographs, suggested reading.

Many ex-rowers, if asked to think about it, would consider rowing, art—the beauty of dawn on a river, the grace of a shell moving down it, and the coordination and elegance of the rowers. Artists too have recognized the art in rowing, and the University Art Museum in Santa Barbara decided to do a rowing exhibition as a part of the Olympic Arts Festival, Los Angeles, 1984. The exhibition was pulled together from disparate sources: art museums, history museums, university and club boathouses, and private collections of oarsmen. Items in it ranged from sculpture and paintings by artists like Thomas Eakins, to photographs, lithographs, trophies, and cartoons. Seventy-four are illustrated, and the remainder are listed. The exhibition and the essays in the catalog make clear both the history of competitive rowing and its one-time popularity as a premier spectator sport. Rowing as a participatory sport is steadily becoming more popular. For those who have never tried it, and for those who have, this catalog helps to explain its artistic and physical appeal.

Seabag

The American Neptune. Peabody Museum of Salem, Salem, Massachusetts 01970. Annual subscription $20.00.

For over forty years this quarterly journal has served the community of American maritime scholars and enthusiasts. Under a succession of distinguished editors—Walter Muir Whitehill, Ernest S. Dodge, Philip C. F. Smith, John S. Carter, and now Archibald R. Lewis—it has offered a fascinating blend of topics each year.

Volume forty-four now introduces a new, expanded format, with more illustrations and an avowed intention to broaden the scope of its material. Sometimes the *Neptune* of old seemed to get a bit precious, with little of general interest. The new *Neptune* will continue to provide a forum for the esoteric, but will expand its range to include marine archeology, ship models, maritime art, the fishing industry, the teaching of maritime history, and the history of yachting. The editor plans to include annual listings of the major current exhibits in American and Canadian maritime museums. *The American Neptune* should attract a larger share of those with a passion for New England and the sea.

ACQUISITION

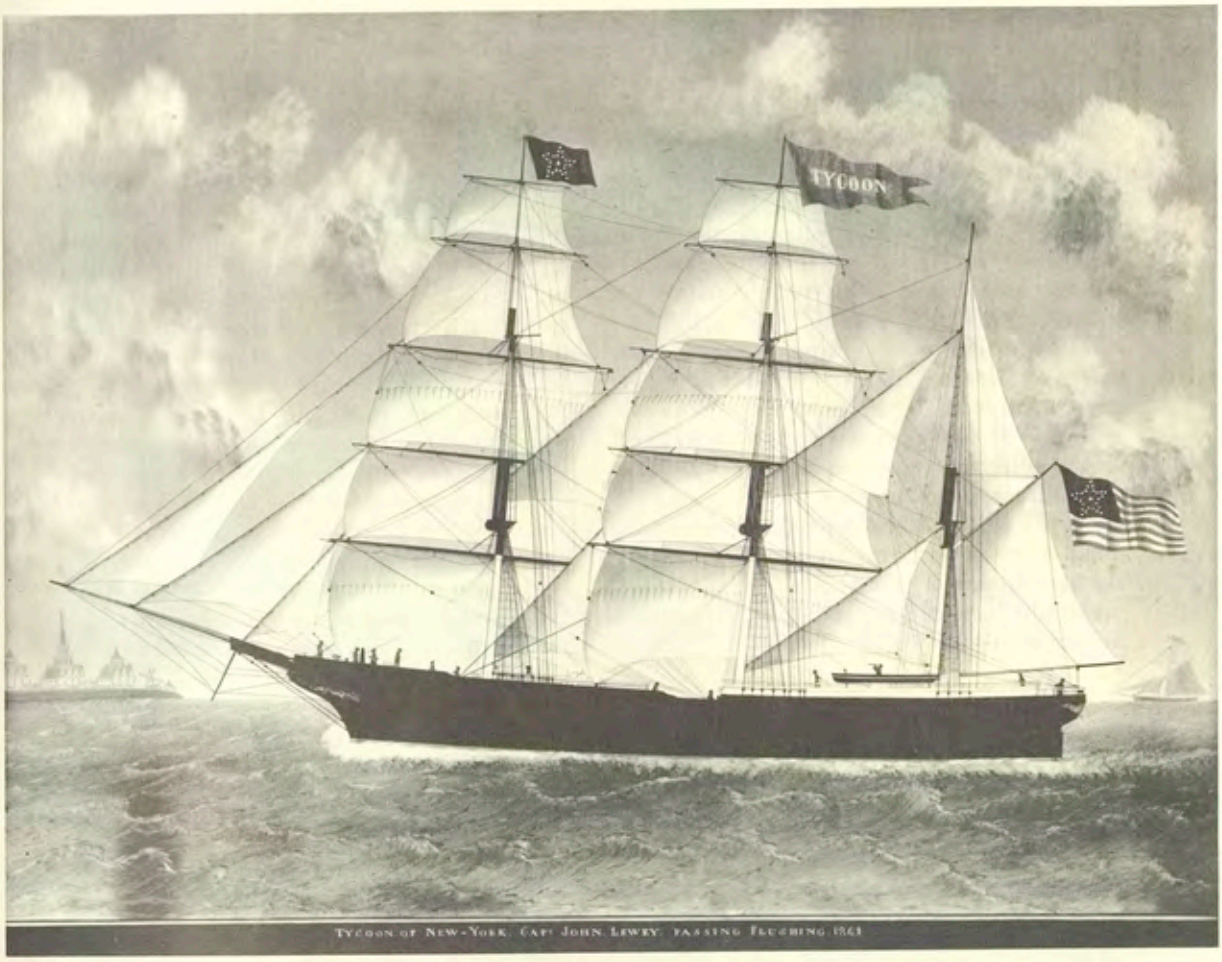
Mr. and Mrs. David Hatheway recently presented the Museum with a reverse painting on glass of the Mystic-built bark *Tycoon*. The painting depicts the vessel passing Flushing (Vlissingen), Netherlands, at the mouth of the Schelde River in 1861.

The *Tycoon* was launched in the summer of 1860 at the Charles Mallory & Sons yard, where the Museum's preservation shipyard is now located, for the Mallorys and other New York investors. Charles Henry Mallory described her in a letter while she was still under construction on 1 May 1860.

> She is in length 150 feet, in breadth 35 feet and 17 feet depth of hold—10 feet lower hold & 7 feet between decks, about 800 tons Register—can be registered at Custom House about 700 tons She is calculated for the Galveston & European trade. Will carry a large cargo, sail well, and be a sightly vessel, being sharp above water, round stern, and every thing to give her a Clipper appearance.
>
> Is of heavy frame of oak and chestnut, heavily fastened, and in every respect a first class vessel & I think will carry more cargo on the same draft than any other vessel in the States. Will be finished with a full roof to mainmast with capacity for say 300 bales of cotton & room in deck house for 40 bales of cotton. . . . I place her as not less than 2,200 bales compressed cotton on 10 feet of water.
>
> The price will be completed with one suit of every thing excepting copper and cabin furniture, 34,000 dollars, if finished with full roof.

Under Captain John Lewey of Noank, Connecticut, her first voyage took her to Galveston in the fall of 1860, and on to Liverpool, returning to New York via Galveston in May 1861. She departed for Antwerp at the end of June, arriving one month later. She was at Antwerp from 26 July to 17 September 1861, during which time this portrait must have been painted. She arrived back in New York, via Naples, at the end of January 1862.

Other than two lucrative government charters in 1862 and 1863, there is no evidence of her service until she departed for San Francisco in March 1864. Off Brazil on 27 April she was intercepted and captured by the Confederate commerce raider *Alabama*. In his *Memoirs of Service Afloat*, Captain Semmes of the *Alabama* noted, "the whole thing was done so quietly that one would have thought it was two friends meeting." The *Tycoon* went to the bottom in flames that night, the last of the *Alabama*'s sixty-four prizes.



Reverse painting on glass was a specialty of several Belgian artists living in Antwerp, Ostend, and Dunkirk during the nineteenth century. The technique was rather involved as the works were painted on the back side of a sheet of glass and viewed through the front. The sequence of painting was the opposite of that used to paint on canvas. First, the artist would complete a detailed drawing of the scene on paper. Placing this beneath his prepared sheet of glass, he would begin to paint the details: wake, planking, bow decoration, shading, rigging, sail seams, and stars on the flags. He could then proceed to overlay (underlay when seen from the front) these with the hull and sails, then the background details, and finally the sea and the sky. Any lettering had to be done backwards to appear correct when viewed from the front.

In Antwerp, members of the Weyts family were the foremost practitioners of this technique. Petrus Cornelis Weyts (1799-1855) moved to Antwerp from Ostend in 1837. His sons Carolus Ludovicus Weyts (1828-1876) and Ignatius Jan Weyts (b. 1840) carried on after their father's death, Carolus being the more prolific. This unsigned painting is almost certainly the work of Carolus Ludovicus Weyts. It closely resembles an example in the Museum's collection signed and dated 1862. Glass 22¼ x 28¾". [84.71]

HISTORIC SHIPS AFLOAT

The *Mayflower II*

Despite her mere twenty-seven years of existence, the *Mayflower II* is historic in several respects. She was not the first reproduction of an early vessel, but she set standards for reproduction that are followed to this day. She stands as a tribute to William A. Baker, the late marine architect and historian who gave her form from shreds of evidence. Her presence at Plymouth is a testament to Alan Villiers, former skipper of the *Joseph Conrad* and master of square-rigged shiphandling, who commanded the *Mayflower II* on her transatlantic passage. The passage itself was a unique workshop in obsolete vessel handling. And lest we forget her primary purpose, she has educated a generation on the conditions under which the Pilgrims and other early settlers arrived in the new world.



Mayflower II (Courtesy of Plimoth Plantation, Inc.)

Plimoth Plantation, Inc., established in 1947, first approached Baker in 1951 to request plans for a reproduction of the *Mayflower* to accompany their representation of the Pilgrim settlement at Plymouth. Baker had very little concrete evidence to go on; no pictures or descriptions of the original *Mayflower* exist. Beginning with Governor Bradford's estimate of her tonnage, the assumption that she was built about 1606, and some knowledge of the trades she engaged in, he planned her as a typical conservative, deep-draft general cargo vessel of the time. Several period shipbuilding treatises and shipbuilder Mathew Baker's notebook, ca. 1586, provided the principles by which early-seventeenth-century vessels were designed, as well as proportions for spar dimensions. Deck arrangements were based on illustrations, plans, and Sir Walter Raleigh's recommendations. Evidence for the rigging came from studies of ships of the period. The result was not *the Mayflower*, but it was a typical vessel of the period and as close an approximation of the original as could be fashioned.

In 1955 an English group collaborated with Plimoth Plantation to sponsor construction of a full-scale reproduction. The keel was laid at the yard of J. W. and A. Upham Ltd. in Brixham, Devon, England, in July 1955. Launched in September 1956, she was prepared for her transatlantic passage in April 1957.

Such a vessel had not been seen at sea for perhaps 250 years. Many were skeptical that she was even seaworthy, let alone able to make a transatlantic passage, but Villiers and his crew soon learned to handle her well. Because of steady headwinds and steep seas that strained her rigging and made her leak, Villiers could not follow the course of the original *Mayflower* directly across the Atlantic. Rather, he dropped down to find the trade winds, sailing 5,400 sea miles to make the 3,000-mile passage. At one point she stood up to a fifty-knot gale. The fifty-four day journey taught the crew a great deal about early vessel handling and why sailing vessels evolved so far beyond this seventeenth-century design.

The *Mayflower II* has been on exhibit at Plymouth, Massachusetts, since her arrival in 1957. As part of the living history museum of Plimoth Plantation, she is staffed by role-players. She is generally open for visitation year round. The admission fee helps support the nonprofit Plimoth Plantation.

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We should like to extend a cordial invitation to like-minded individuals to join with us in programs dedicated to the preservation of our national maritime heritage. Annual dues materially strengthen Mystic Seaport Museum. At the same time, a member receives tangible benefits and privileges, including:

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Receipt of the WIND ROSE, the Seaport's newsletter, reporting on current Museum activities and personnel.

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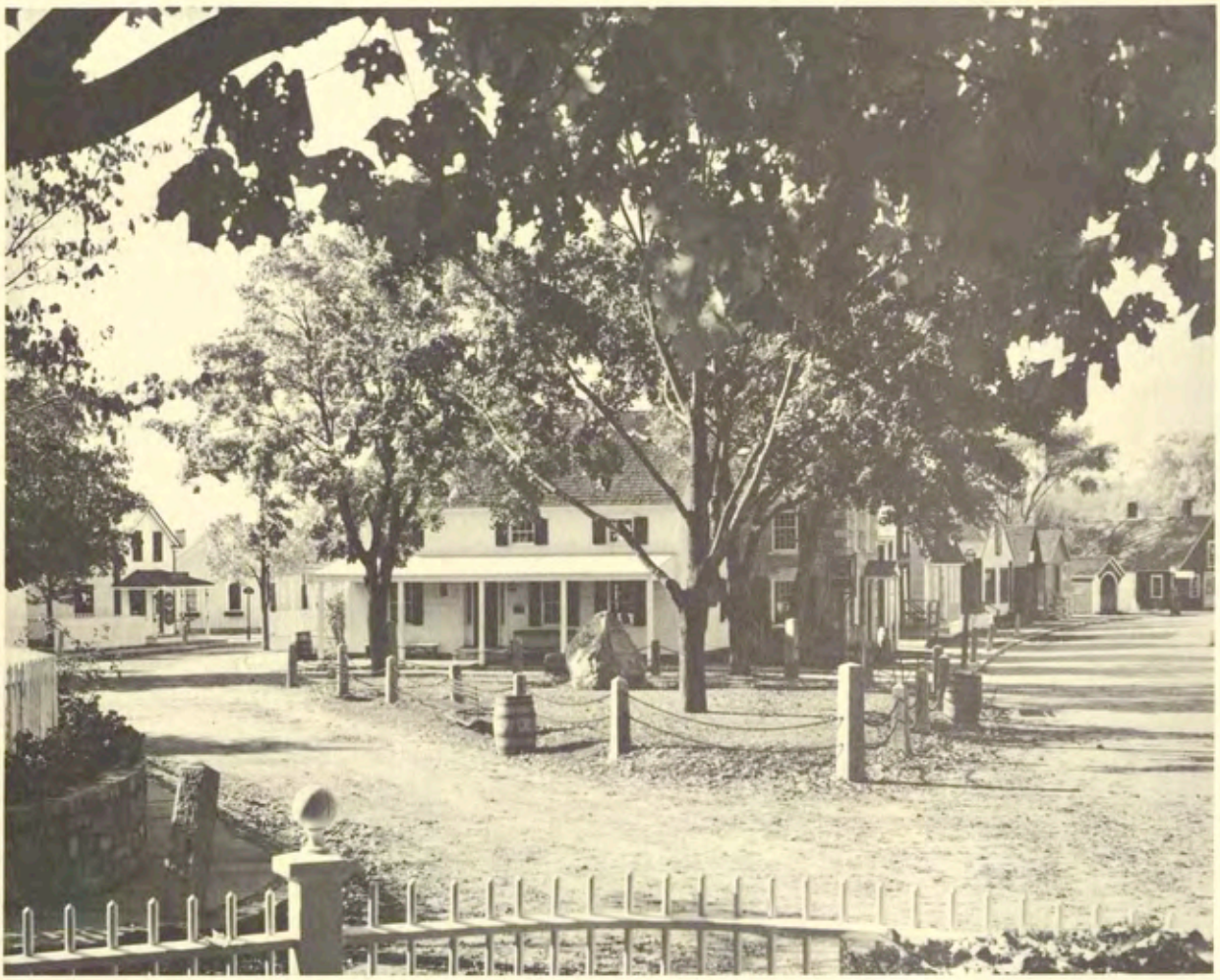
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