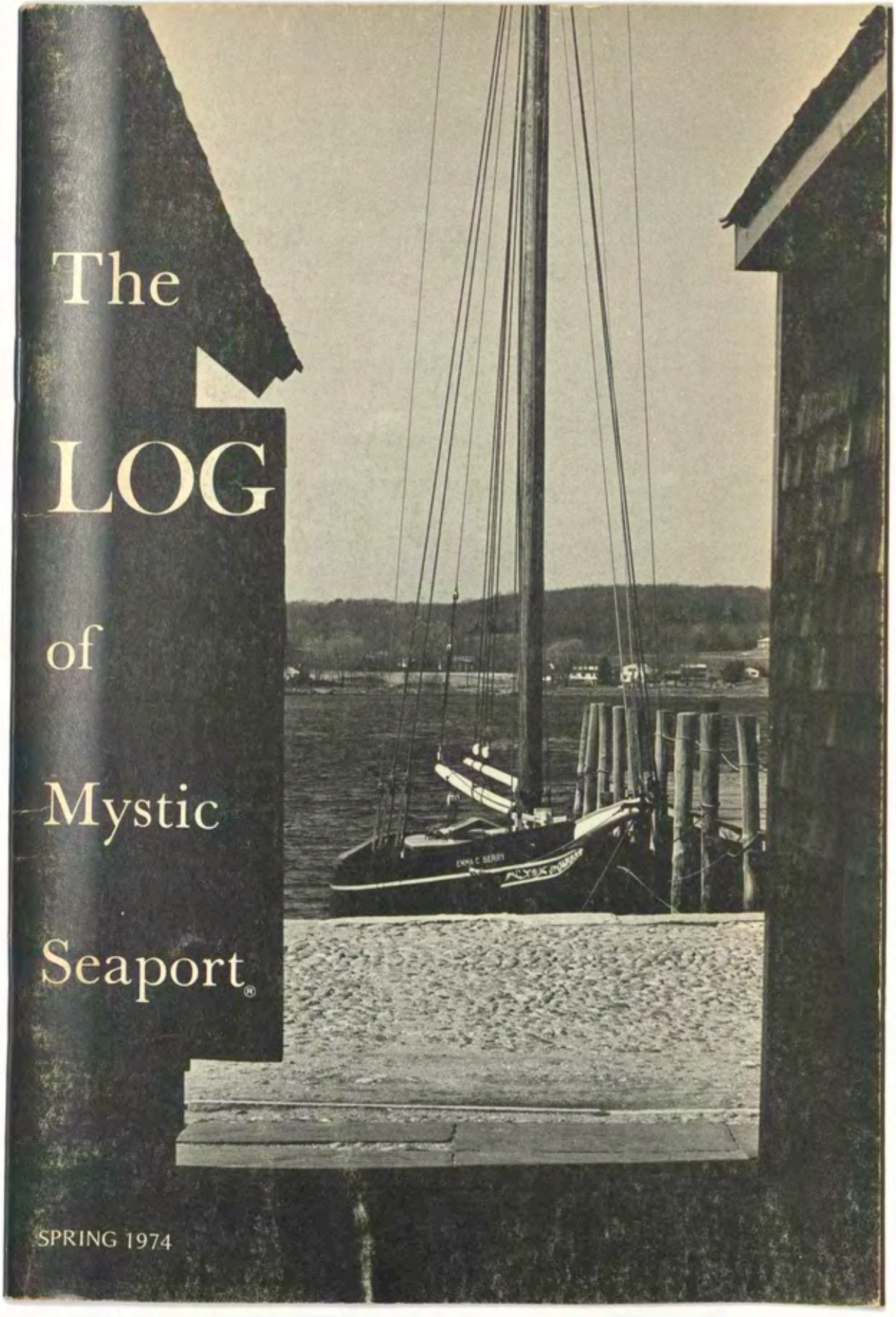
# The LOG of Mystic Seaport®




SPRING 1974

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# THE MAGNIFICENT *MORGAN*

BY MAYNARD BRAY
Shipyard Supervisor



*Dredged out and rigged up for one of the early attempts at floating in November, 1973. Photograph: Les Olin.*

The *Morgan* is a great old vessel, and it was her strength more than anything else which made the operation of refloating and hauling successful. Nothing I can write could equal our reaction when we inspected the *Morgan* as soon as she was lifted from the water on January 7th.

"She's beautiful, amazingly fine lines!"

"There's the *only* leak, a butt in the garboard plank."

"Look at that rabbet line – as straight as can be! She sure hasn't changed shape much."

"No wonder she lasted so well, most of her planking is yellow pine and she's fastened with locust treenails and bronze spikes."

"Isn't she smooth!"

"Some of those planks are 15" wide and 40' long."

"The outer stem looks like the worst part of her. The worms must have got to it long ago."

"Not much left of her sheathing now, only bits of pine and copper with some nails sticking out."

"I don't see any planking to be renewed, and most of it is original!"

"The seams look good; we shouldn't have to recaulk much more than the butts, hood ends and garboards."

"Look at the keel. With that big piece of shoe missing aft it's no wonder she pulled off hard."

"It makes you feel kind of humble to think that we couldn't build one as good today. What a magnificent vessel!"

But let's go back to last fall when Bob Holbrook arrived with his steam-powered lighter to dig her out. Already, accessible areas of the *Morgan*'s hull had been refastened and recaulked with a new plank here and there. Topmasts had been sent down and, along with the davits, were ready for him to remove from the deck. Calculations showed that thirty-five tons of ballast should be lifted out of her hold. The digging itself began on October 16th.

To get her afloat appeared easy, provided we had the usual wind-driven high tides of autumn. All that was needed, once the permanent ballast had been removed and she was excavated, was to await such an extra high tide, pump her dry, whereupon she should float clear. Naturally we wanted her to float high so she would lift well out of her berth and not hang up when pulled aft. The numbers showed that a 4' tide (about 1½' above normal) should be sufficient with the stern lifting first; thus as she was pulled off the clearance under her keel should increase, as shown in Fig. 1.

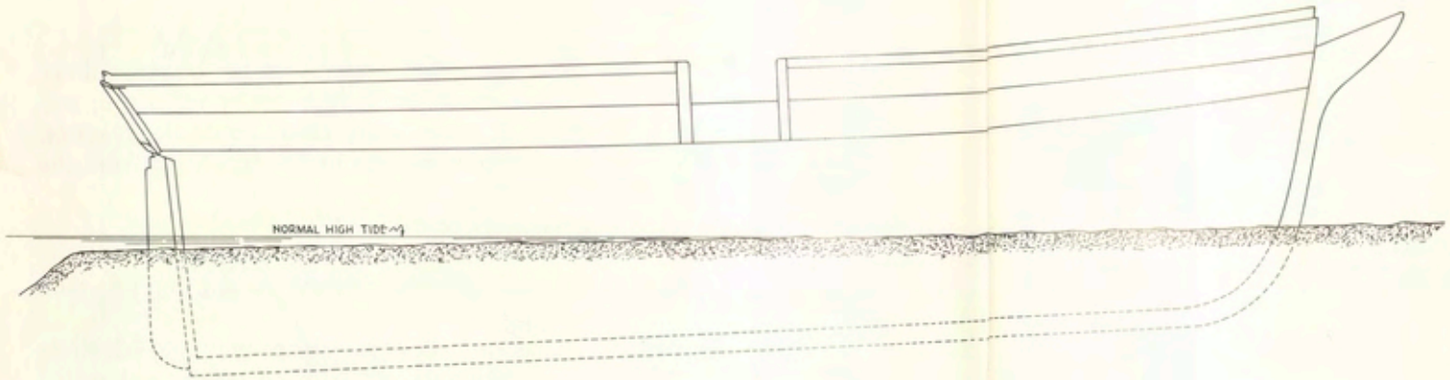



*Fig. 1a—Before digging commenced*

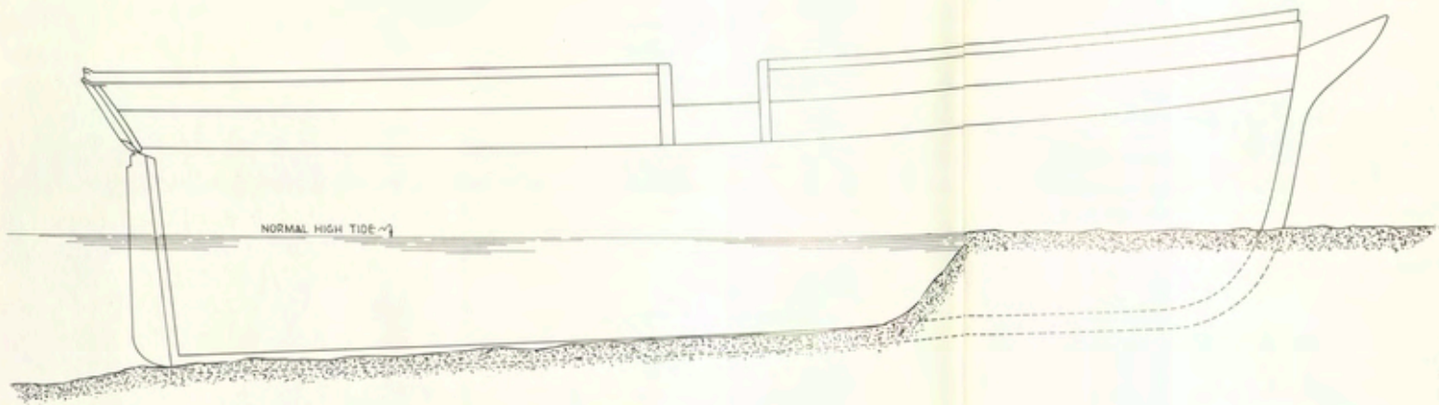



*Fig. 1b—Extent of digging – first scheme*

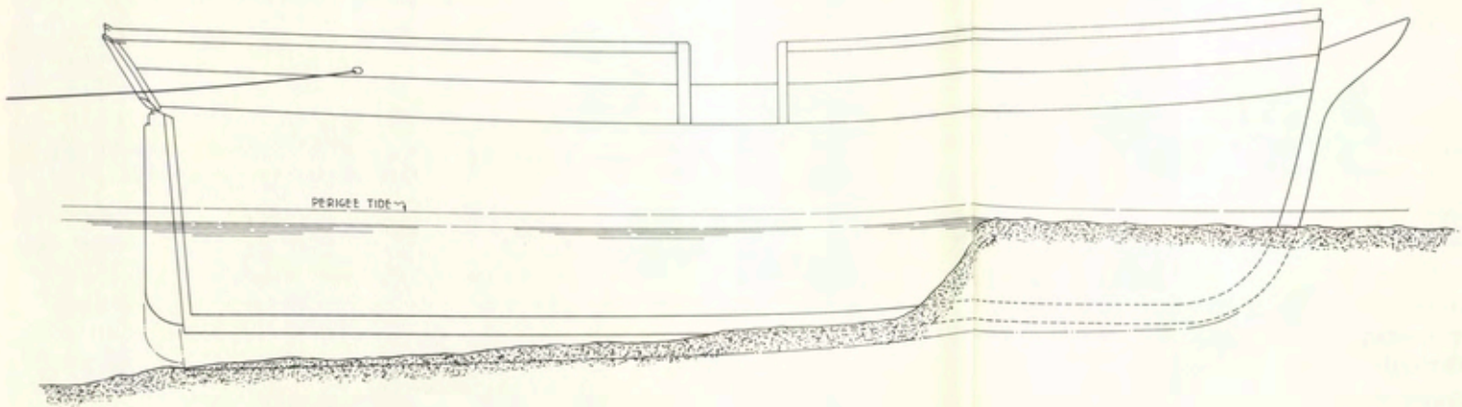



*Fig. 1c—Expected conditions for floating out, first scheme. Ship is floating, lightened by removal of concrete and water ballast.*

Tests with a scale model showed that she could be completely dug out on both sides as far forward as the fore rigging without danger of shifting around in a windstorm. Dredging was done with a ¾-yard clamshell bucket which proved ideal for the job. It was small enough to fit between the *Morgan* and the adjacent docks; and because the sand would run to the bucket from beneath the hull, suction equipment was never necessary. Dredging commenced on her port quarter, then aft across the stern and back up the port side. The remainder of the stern area and starboard side were then done once the lighter shifted to that side.

Dredging took about two-and-one-half weeks and, when complete, water depth in the areas dredged was about a foot below the bottom of the keel. In under the hull the sand sloped uphill generally to the rabbet line. With over half of her surrounded by water the *Morgan* looked almost afloat. She began to feel alive as well, since now the rudder could be turned.

Each fall there are always several storms with wind-driven tides exceeding what little extra we needed now, but this year the weather was perfect for everything except floating the *Morgan*. There were nothing but clear westerlies with periodic cold fronts whose high pressure and fresh northwest winds prevented even the predicted high tides from occurring. The normal tide range of 2½' seemed to be permanently with us but we decided to make a try during November's full moon when tides of up to 3'6" were forecast.

Two additional pumps had been put aboard enabling us to pump her dry in about a half hour. The lighter was positioned astern so its steam winch could pull from a bridle we had rigged off the *Morgan*'s quarters. Separate quarter lines had also been run astern to the dock on one side and a dolphin on the other, and were made up to six part tackles on deck. Although there are many more forceful ways to drag a vessel off the beach, these three lines provided about all the pull we wanted to impart.

Without going into detail, six attempts were made in hopes of having enough tide to float her, but each time the attendant cold fronts were more successful than we were and we just didn't get the needed tides. Minor refinements were added with each attempt — such as more digging with a backhoe around the bow to relieve the stem friction, making waves with powerboats, shifting ballast aft, pulling with a second winch from the lighter, and adding more purchase to the quarter tackles. Although the stern lifted about 14" and she rocked a good bit, the *Morgan* would have none of it — she needed more water to float in and that was that!

We waited a couple of weeks for that elusive easterly, but still

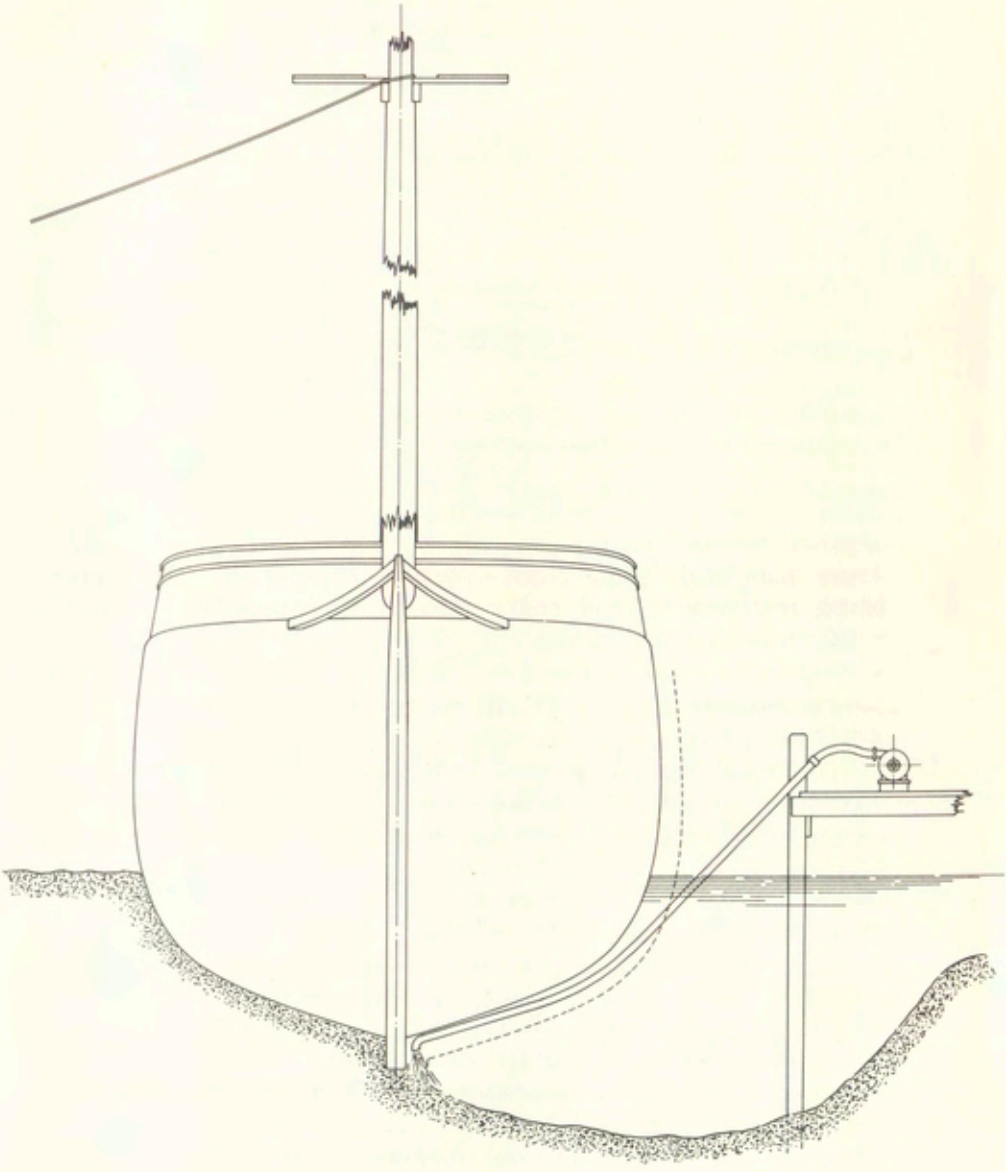


*Fig. 2—Scheme used to lower* Morgan *so she would float more readily. While masthead preventers held her upright, excavations along her port side allowed a shift sideways of 12" and downward of 15".*



*Fig. 3–Dislodged worm shoe jammed the* Morgan *firmly in her berth until it buckled and dropped free. Note also the actual profile of the keel to which the lift dock blocking was matched. Missing sections will be replaced before she goes back overboard.*

lovely northwest weather. Finally, at Bob Holbrook's suggestion, we decided to do some more digging – this time undermining her port side while holding her upright by lines run out to starboard from the mastheads. To be sure, this was more risky than our previous actions; but now with the approach of winter there was more risk in waiting. The river could ice in as it sometimes has, aborting the move until next spring. Although the vessel had appeared very stiff even with minimal suport aft, this was not a good place to leave her for any length of time. Clearly it was a case of lowering the vessel by digging the sand out from under her or risk damaging her where she was. But, as Holbrook said about this scheme, "once we start we've got to keep going." True, because no longer could she be held down with water in her. She would have to be pumped out to be stable in case she suddenly shifted position. But with the water out her stern floated with each high tide making her vulnerable to a strong wind. However, the forecast was for good weather and the entire process took less than a week.

A line was run out from the heads of her fore and mainmasts and taken up with tackles on an adjacent dock. As the lighter dug, the *Morgan* shifted to port and settled lower. We helped by washing along her keel with a water jet, as in Fig. 2. She was



sliding very slowly down the side of the trench and when digging was completed on December 5th she had shifted to port about one foot and her bow was 15" lower.

At this time morning tides were running highest as a full moon was making up, and although an exuberant but predictably unsuccessful attempt was made on Wednesday night, the morning of Thursday, December 6th, was really the first time there could be any assurance of success. A fresh southerly wind blew Wednesday night and a couple of us stayed with her, sleeping in the fo'c'sle – just in case. By 3:30 A.M. the wind had abated and, as scheduled, things started happening. The Holbrooks came to get up steam to run the lighter's winch. It was raining but the cameramen came just the same. "Charlie" Andersen's deck gang began to arrive. The tide looked good: 3½' already and an hour to go until high. We pumped her dry (not much there anyhow) and took a strain. The masthead tackles were released, freeing her from the one remaining bank of sand under her starboard bow. The tide was above where she should have floated but as yet she didn't budge. It was too dark to check her with the transit but she must have lifted and be completely afloat. Why didn't she move? Knowing that the stern was free as was always the case, I called for a line run straight abeam from her port quarter, hoping that by pulling her stern into the trench her bow would follow. Meanwhile, Holbrook was "working" his winch cable by alternately slacking and taking up, causing the *Morgan* to pitch noticeably.

Suddenly she began to move without resistance both astern and to port; and from then on, it was only a matter of tending lines. She was free! Shouts of joy arose from the faithful onlookers – most of whom were here for the sixth time. The tide stick read 3' 9", the clock 4:50 A.M.

She came hard even with much more than enough water theoretically to do the job. I still don't know whether it was due to her being jammed by a section of her worm shoe, which we later found in the mud, or the sudden appearance of Waldo Howland on the scene. He of all persons was responsible for her refloating: within less than two minutes after his arrival, the *Morgan* was free. As to the worm shoe, we can only speculate that it acted as shown in Fig. 3. We know the separation was vertical because of an unbent bronze drift pin, and suspect that the shoe remained attached by its scarf joint forward until it could stand no more pulling and twisting, whereupon it doubled up and broke in two, releasing its grip on the *Morgan*. Just what dislodged the shoe in the first place is problematical, but we feel the suction of the mud and sand around it must have been more than the bronze fastenings could stand. In any event, the profile of the keel even with the shoe in place severely hampered our attempts at pulling her astern because of its being deeper forward than aft.

Besides the worm shoe, other factors — each fairly minor — combined to make the original scheme of simple floating a virtual impossibility in all but the highest of tides. The *Morgan* floated about 3" deeper in the water than we expected, due possibly to the debris in her frame bays being compacted and dense. It is also possible that her lower hull was more water-soaked than assumed. Said another way, an additional 3" of water would have been required to float her, so that the tides of November didn't come close. As it turned out, she could have been lightened by removal of all the ballast, as was later done, since the factors which kept her low in the water also increased her inherent stability. Without carrying assumptions to extremes, those used in the calculations were conservative and indicated a metacentric height of 23", the minimum we thought prudent for stability when afloat. Residual bilge water was estimated at twenty tons for calculation purposes. The displacement of the *Morgan* at the time of her floating was calculated to be 310 tons; the actual figure based on her draft marks afloat was 330, a close correlation and certainly a credit to Bob Allyn, who made all the numbers.

The hull leakage which was feared, prophesied and awaited by some, never materialized. With a bit of oakum stuffed in near the stem on the starboard side, audible leakage was arrested. Twelve hours elapsed before she was pumped with her 1¼" electric bilge pump. Again, I slept aboard, just in case, but pumping was not needed until another twenty-four hours had gone by. During her month afloat she continued to tighten up until she required pumping only twice a week. The ¼-mile trip to the lift dock was made with gasoline and diesel pumps removed and with the

electric one out of commission. Quite a performance for a 132-year-old ship whose bottom hadn't been caulked in more than fifty years! The mud in her seams helped keep her tight and obviously she would not withstand a sea voyage, but for those who said she was all gone below the water and would have her filled with cement, she was putting on a show even exceeding the hopes of those who believed in her most: Henry Jarvis, the *Morgan*'s master shipwright, who left all his tools aboard and even offered to put them in the bilge; Elwood Bogue, who was for floating her four years ago when the lift dock was nowhere near ready; Waldo Howland, who put himself on the line to see her float; Ed Lynch, who stirred belief in her integrity as well as our own; and Irving Johnson, who said she wouldn't need any salvage pumps to keep her afloat.

All along, Cal Bogue, Phil Rogers and Tom Krieg – skin divers who we were fortunate in having on the staff – were put to good use. First, to check the extent of dredging and generally assess the appearance of the *Morgan*'s bottom, and now, to measure the keel's lower edge so that the lift dock blocking could be set to conform to it. A nylon twine run along the starboard side of the keel provided a base from which distances up to the rabbet as well as down to the bottom of the keel were taken at the 4' blocking stations. Plotted on her lines plan the rabbet line was nearly straight, another comforting bit of information. But the bottom of the keel was very irregular, not only missing the 15' piece of shoe we had recovered but another 23' of this 8" × 13" timber as well. Forward it looked as if another 4" piece had been added below what we had called the shoe.

Now for the first time an event could be scheduled. Thursday at 9:00 A.M. was set for her move downriver to the lift dock. Much was to be done before, however. First, her mizzen lower mast was pulled to be reshaped and become the topmast of her new bark rig. Then, as much additional ballast as possible was to be taken out without the ship becoming noticeably unstable. By Tuesday afternoon there remained but five tons, only enough to trim her a bit by the head so she drew the least depth of water.

Thursday dawned an ideal day, and with invited guests aboard we got her away from the dock promptly at 9:00 A.M. with Holbrook's tug *Chaco* made up to the *Morgan*'s port quarter and our own *Two Brothers* controlling her bow. Underway once again and moving against the incoming tide at a good rate of speed, the second major event was taking place. Much film was shot as she came downriver and made up starboard side to the lift dock to await hauling out. Among those present were Lawrence Lopes who, as a small boy with his family, had immigrated from St.

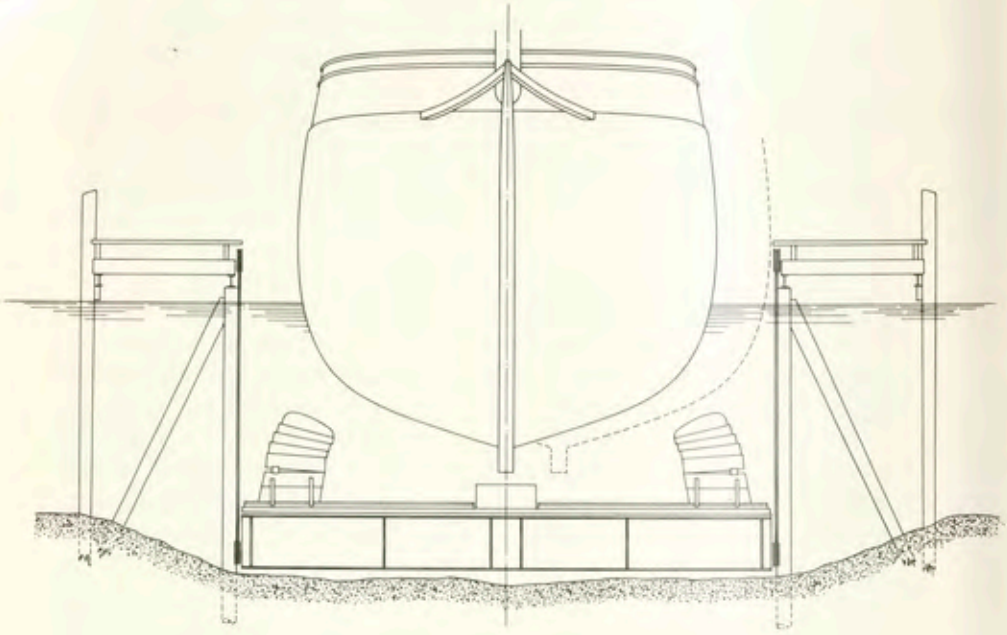


*Fig. 4* – Morgan *in position over lift dock platform just prior to being raised from the water. All plans by Robert C. Allyn, shipyard naval architect.*

Helena aboard the *Morgan*, and Louis Sylvia, who was aboard during her trip from New Bedford to Mystic in 1941.

Getting her in place over the lift dock platform also had to await an extra high tide partly because of the extra blocking aft. We developed a positioning jig and planned if necessary to take her into the dock alongside rather than over the keel blocks, then shift her sideways when she was all the way in. In this way the deep forward part of her keel would not have to pass over the highest keel blocking, as in Fig. 4. Additional dredging and jetting during December got the platform down so that docking could be at a normal high tide if we brought her in as described above. Everything was ready shortly after New Year's, but we had to wait a few days to get a high tide during daylight. Luckily the tides were making up and when we arrived at 7:00 A.M. Monday morning, January 7th, everything looked ideal. Ice, which had formed on the river the previous week, had melted; there was no wind; the tide with an hour and one-half left to come was already more than we needed. We pumped her dry, took a tow line from her port quarter aboard *Two Brothers*, cast off the dock lines, and soon she was in the stream.



*Port bow of* Morgan *shortly after hauling, showing remains of wood and copper sheathing. Scum line indicates the difference between the predicted and the actual line of flotation. Note heavy lead sheathing on face of stem. Photograph: Ken Mahler.*

Within an hour and one-half after our arrival she was in position over the keel blocks; luckily the tide was high enough to come in over them. And by 10:00 A.M. she was up. Both keel and bilge blocking fitted perfectly, thanks to Bob Allyn's drawings; Basil Tuplin, the dockmaster; and Cal Bogue, who led the underwater work. The lift dock itself operated without a hitch, certainly a credit to Al Bates, its designer, and to Gene Baudro and the others who built it. This phase of her restoration was finished.

Next to the vessel's strength two other factors played a major role in the success of this operation. Working-level control of the job was one, and availability of genuine good advice was the other.

The experienced opinions of men like Waldo Howland, Major William Smyth, Pete Culler, Bob Holbrook and Henry Jarvis were heavily drawn upon and constituted a vital input to the project.

Messrs. Carr, Robinson and Johnston showed wisdom (although at times I questioned it) and restraint in authorizing us, who had nothing but the *Morgan* on our minds, to make the decisions. Never once did they or the trustees interfere with this administrative setup; in fact they repeatedly reinforced it.

# THE BARRIER BEACH

## MORE VULNERABLE TO MAN THAN TO NATURE

BY PAULA L. MAGNUSON

The geological history of barrier beaches and their dunes reveals that they are continuously involved in a contest with the sea, and that their shapes are dynamic. Because of this flexibility of shape a barrier beach is the best possible protection from the sea. Often, it provides the only protection from fall hurricanes and winter Nor'easters to the estuarine bays inside and the human habitation on their shores. It accepts the waves and absorbs their force rather than trying to keep them out as man-made dikes are designed to do. When viewed in terms of its constant subjection to the violence of natural forces, the barrier beach is uniquely rugged and relatively stable; however, when subject to use by man and his machines, it is rendered an extremely fragile strip of sand. This is because its relative stability depends entirely upon anchoring vegetation which is fatally vulnerable to passage by either man or machine.

Once a barrier beach has been formed by waves and wind, dune-building begins. The wind carries sand up from the beach and piles it inland.

The primary anchoring mechanism of dunes is beach grass, which is amazingly tolerant to the conditions of high salinity, sun,



lack of soil and uncertain water supply. It is so adapted to its dune-building function that as sand piles up around the neck of the plant, the stems lengthen to raise the leaves above the sand. The roots extend deep into the ground and form a dense mat which stabilizes the dune. There is only one condition which this remarkably hardy pioneer cannot survive: being broken by the passage of man.

As part of its resistance to salinity and dessication, the plant has evolved a thick cuticle, which makes it quite brittle near the base. It is therefore easy to snap, particularly as compared to lawn grass. The breaking of a blade may be enough to destroy its system of internal adaption to salinity and possibly to kill the whole plant. Also, the fine root hairs, which are the essential part of the water intake system, are highly vulnerable to compaction. Thus there are several ways in which the plant is fragile, which are compounded by its slow rate of self-replacement by offshoots.

Different parts of a barrier beach are more tolerant of use than others. The hard lower beach is highly tolerant of almost every use. Even though it becomes heavily rutted, there is no evidence that it is destroyed by vehicles. Limitations of vehicular use are recommended, however, through consideration of the safety and health hazards created by numbers of vehicles travelling and

camping in the same area where people are sunbathing and picnicking. It is no minor consideration, also, that the aesthetic quality which draws many thousands of people to the beach every day is easily destroyed by the passage of a few hundred vehicles. Last, it is not an easy matter to restrict vehicles to that part of the beach which can sustain their use.

The dunes are absolutely intolerant of any use by vehicle or by man on foot, as they are stabilized solely by fragile beach grass. The troughs in between dunes are somewhat more tolerant; however, they are vital because several stages of dune vegetation rely on their dampness for germination.

Inside of a barrier beach the salt ponds and marshes constitute one of the most productive environments in the world. It is the nutrient-rich nursery for many of the important fish. The estuary is teeming with life, frequently including shellfish which are another important natural resource. Therefore, the marsh inside the barrier beach must not be disturbed – dredged, filled, polluted, or exposed to the ocean's force.

There are several ways in which the use of a barrier beach can jeopardize the marsh inside. When wide, straight paths across the beach are laid bare by heavy foot traffic, the wind whips through and carries sand onto the marsh. A heavy deposit of sand from a storm may be enough to smother the marsh vegetation and consequently to expose the marsh itself to erosion. If many of the dunes are blown away in this manner, the sea will be able to break through and potentially to destroy the vulnerable marsh and estuary system.

Another cause of such a break in the beach is a "blowout." The death of a single clump of beach grass, especially on the crest of a dune, may be enough to free the sandhill from its bonds and set it in motion. When a break in the mat of vegetation occurs, the wind greatly enlarges it, whipping through the bare area and exposing the roots of neighboring plants. As clump after clump dies, the sand will quickly be carried inland and a deep depression will be formed. Storm waves and wind will quickly undermine the slopes far back from the beach, and possibly cut through it completely.

In summary, it is not merely the beach and dunes themselves which are at stake, but also the bay inside and related fishing industries. Basically, these are all dependent upon preserving the beach grass and other vegetation from destruction.

Editor's Note: *Paula Magnuson is director of Programs and Research in the Association for the Preservation of Cape Cod, Inc., Orleans, Massachusetts. Her article, from the NEMRIP Newsletter, is reprinted here with the Association's permission.*



*Seventeenth-century shipbuilding.*

# SHIPBUILDING IN COLONIAL CONNECTICUT

BY JOHN F. LEAVITT
Associate Curator

From almost every cove and inlet along the Connecticut coast, as well as elsewhere in New England, a fleet of dugouts, shallops and other small craft emerged in the early days of the settlements. With four walls and a roof to protect them from the elements provided, many settlers turned their attention to boat- and later, shipbuilding.

There is a record of a ketch built at New London as early as

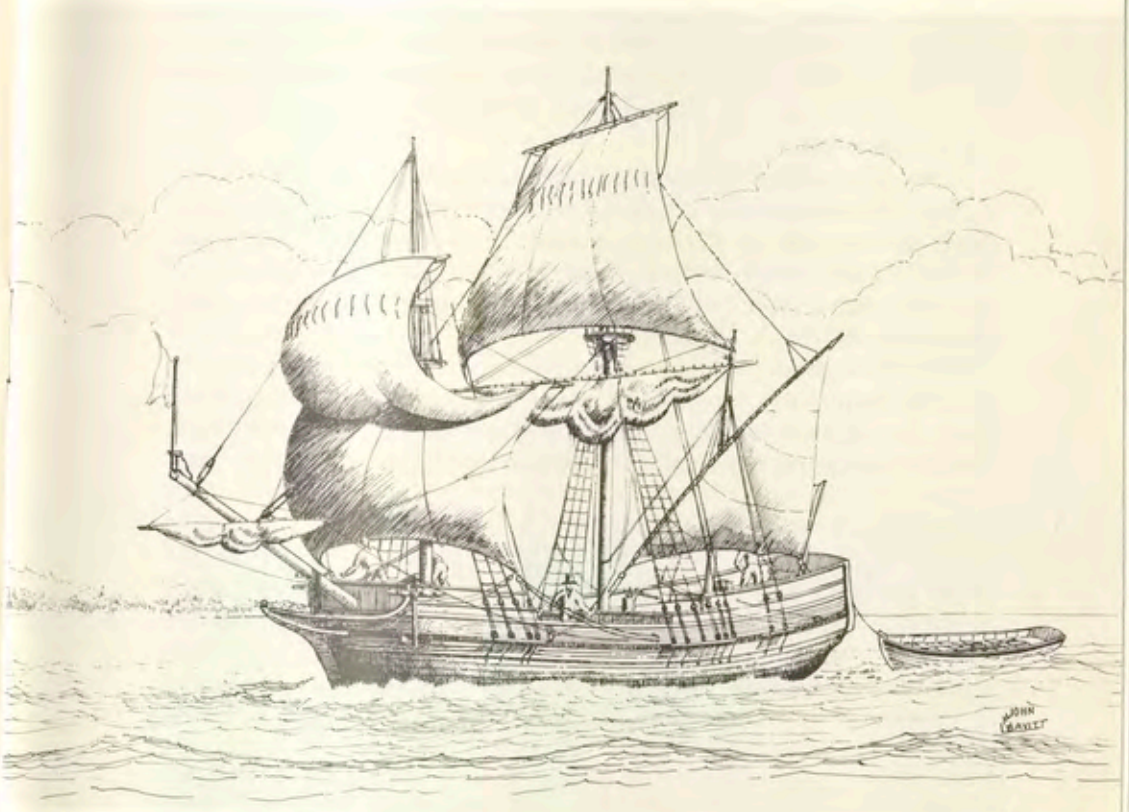
1664 by John Coit, who was one of the earliest commercial shipbuilders to establish a yard in the area, but most of the very early craft were built by the men who were to use them. A settler lacking boatbuilding skills could obtain advice and assistance nearby, for many of the early colonists were familiar with the use of broadaxe and adze as well as other necessary tools.

Only small craft were built at first, for the lack of capital and high labor costs were no incentive to the establishment of shipyards. In 1680 Governor Leete wrote to the Lords of Trade in England that only twenty-seven vessels of any size were at sea from various Connecticut ports.

However, that year marked the beginning of larger commercial construction in the eastern Connecticut area when Thomas Wells, and his sons Joseph and Thomas, set up a shipyard in the Pawcatuck River area and began building operations. The cost of vessels at the time was about £4 per ton and frequently the builder had to accept goods or services in part payment. The vessel to be built by Wells was described as a "shipp or vessel" of forty-one-feet length of keel for owners in Stonington and New London. Thomas Wells, Sr., did not finish the vessel but his sons took over and it is possible they built a second one at the same time. No definite further record appears to exist regarding other activities in the field, but it is true that Joseph Wells moved to what is now Mystic and was referred to as a ship builder at the time of his death in 1711.

By the turn of the eighteenth century commercial shipbuilding was in full swing on the upper Connecticut coast. The rasp of the saw, the thud of the axe and the ring of the treenailing (pronounced trunneling) beetle or maul were commonplace sounds along the shore. Timber was plentiful and the demand for tonnage was such that yards were hard pressed to supply it. Beside the need for local coasting craft, a growing trade with Europe and the West Indies flourished from the beginning of the eighteenth century. As early as 1725 Captain John Jeffery (or Jeffereys) launched the largest wooden ship to be built in the New World up to that time. Her name was never recorded but she was reported to be of 700-tons burthen, a truly tremendous vessel for the period. Joshua Hempstead, the diarist-shipwright, worked on her in a yard which was on or very close to the site of the present Electric Boat plant. By strange coincidence, on this site in 1900 were built the two larger freighters of their time, the *Dakota* and *Minnesota* of 13,305 tons each. The yard was then the Eastern Shipbuilding Co., and the owners were the Great Northern Steamship Co.

"Jeffery's Great Shipp," as she was usually referred to in contemporary accounts, was apparently sold in England, for



*Colonial "shippe or vessell" such as* Alexander & Martha

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there is no evidence that she came back to New London. Although the builder launched several other very large vessels, he never equalled the size of the first one.

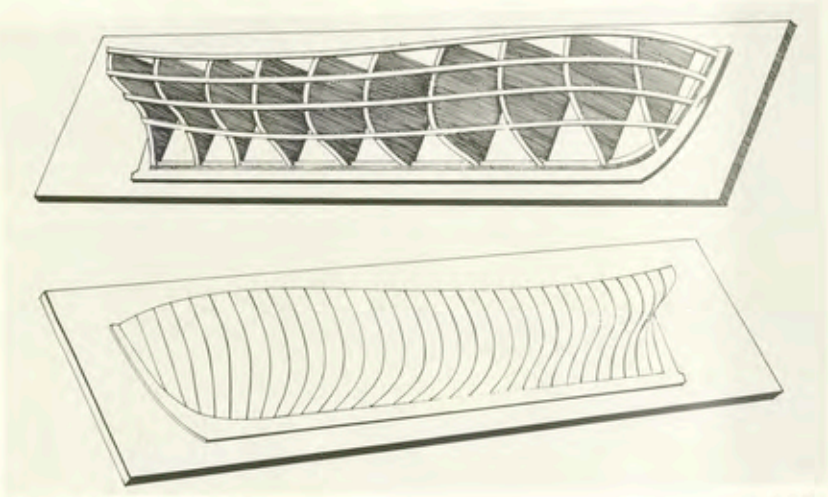
Not only was European demand brisk for colonial-built vessels but a growing trade with the West Indies saw a flotilla of pinnaces, barks, brigantines and sloops crowd the anchorages of Barbados, St. Kitts, Martinique and other southern ports.

Few of the new craft were designed in advance except by the simplest processes of modeling. Even then, the vessel more often than not was built by what was called "whole moulding." This method was used generally in small boat building, but in early days some of the larger colonial vessels were constructed by a similar process. The stem, sternpost, a midship frame and perhaps two others would be set up to establish the basic shape, fore and aft battens being sprung around the moulds or frames so that offsets could be taken for the balance of the frames. In building,

the floor timbers and a certain number of "flatte" timbers were installed first, then the first or lower futtock timbers at the turn of the bilge, and then any upper futtocks and top timbers in turn, with the planking and ceiling being installed and fastened as the work progressed.

In England, naval architecture had become fairly formalized and designs were worked up on parchment by rules which established a series of segments of circles and elipses laid down in a certain way to define the shape of the frames. Such lines as buttocks and diagonals, so common for fairing lines in modern naval architecture, were unknown at that time.

Even though preliminary planning was well known in the old country, there was probably very little work of that sort done on early colonial craft. As a matter of fact, as long as commercial wooden shipbuilding was carried on in this country, the vast



*Top: Hawks nest model*
*Below: Vertical section model*

75.178

majority of builders preferred to work from half models from which the offsets were taken and the vessel "laid down" full size on the mould loft floor.

When models did come into general use in the eighteenth century, they were frequently of the "hawks nest" or vertical section form. The use of the hawks nest type was virtually whole moulding in miniature, although more sections were worked out. These sections were then mounted on a backboard and battens sprung around them from stem to stern, allowing measurements of

half breadths to be taken for working out full-size frames. Once the full-sized frames were made and set up, battens could be sprung and any other intermediate frames worked out to finish the job. The same process could be followed from a vertical section model which could be taken apart, the sections measured and laid down full size or, more commonly in colonial vessels, it is probable that frames were made up directly from the offsets taken from the model.

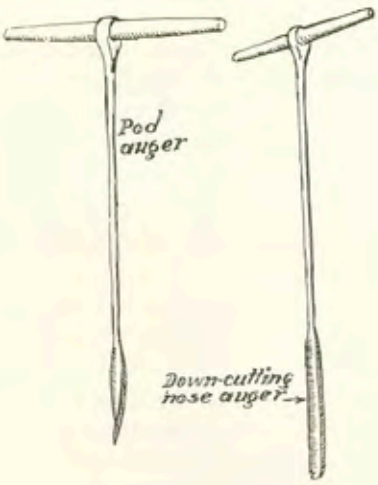
The horizontal lift half models so common in later years were not used in the earliest period of shipbuilding, but made their appearance in the nineteenth century and continued in use as long as wooden vessels were built. As a matter of fact, there is very little written information on the processes of colonial design and construction and the subject has to be a matter of much conjecture. Vessels of fairly large size have been built in later years more or less by the whole moulding process, and it is not unreasonable to assume that similar procedures were followed in the early periods. Many of the colonial boat- and ship builders were skilled in construction but not too many of them were well versed in the techniques of design and "lofting." To work out a model and take a complete table of offsets in order to reproduce accurately the model in full size seems to have been beyond the skill of the average ship carpenter of the day.

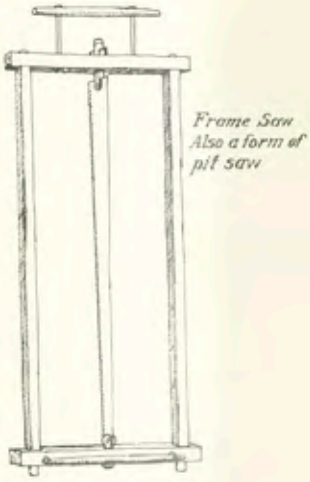
In the process of building, frames could be made oversized and "dubbed" (cut down) to fit within the longitudinal battens for a fair "run" of planking. Even in the last years of wooden shipbuilding in the twentieth century, the most carefully worked-up frame of a vessel was subject to much dubbing and, in some cases, "shimming" (padding out), as the planking job progressed.

Shipyards in the early years were hardly more than good launching sites. Preferably the land sloped toward the water so launching ways could be laid with a minimum of digging down and blocking up. The ways were usually laid at such an angle that the declivity was approximately 5/8" to the foot or somewhat steeper for small vessels. With the proper slope of the banking, there was less digging near the shore and less blocking up of the inshore ends of the ways.

Launching bow first was a common practice in Europe but it does not appear to have been continued in this country. Most vessels were launched stern first so far as colonial records seem to indicate, although there may have been some bow-first launchings in the earliest days. However, it became the general practice to launch stern first by the eighteenth century.

In the early days nearly all work was done by the use of simple hand tools. Planks were sawn from balks of roughly squared



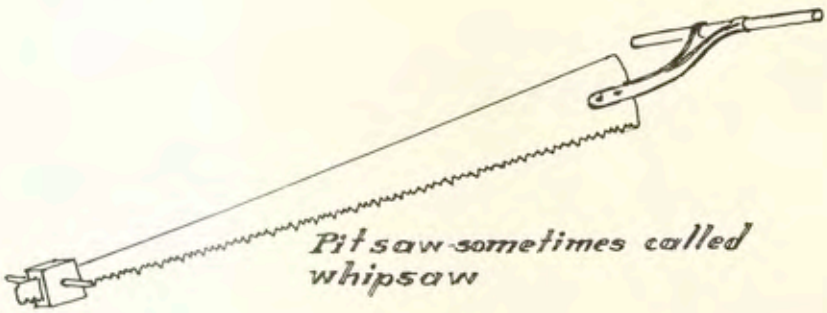




timber by pit saw, although water-powered saw mills were in use in various parts of New England even before the turn of the century. By the early 1700s, most planking was mill sawn but shaped to fit the vessel by pit or frame saws. This practice was continued in smaller New England yards up to the twentieth century. Heavy timbers were usually hewed out with broadaxe and adze.

Boring was done at first with pod augers, which were similar to large gimlets, having shafts of various lengths and wooden cross handles. Spoon bits were also used for shallower holes. The "down cutting nose auger" was a later development and a somewhat more efficient tool, but it was the double twist auger with center spur — like that patented by Ezra L'Hommedieu in 1809 — that was the real breakthrough. These double and single twist augers speeded up the process of boring and fastening a vessel, resulting in much greater production in the nineteenth century.

After the planks were fastened to the frames it was necessary to smooth them off to some extent before planing. This process was called dubbing and the tool used was the adze. The frames had previously been dubbed to insure a fair run of planking across all the frames. Once planked, the dubbing assured the removal of any gross inequities and the job was finished with handmade planes.

Plank fastenings were usually copper or wrought iron bolts at the hood ends and butts where the plank landed on stem or stern post and where the ends came together. Intermediate fastenings were wooden treenails made of locust or oak in the shape of long pegs driven into holes bored through plank, frame and ceiling and having the ends split and wedged. In the earlier colonial days,

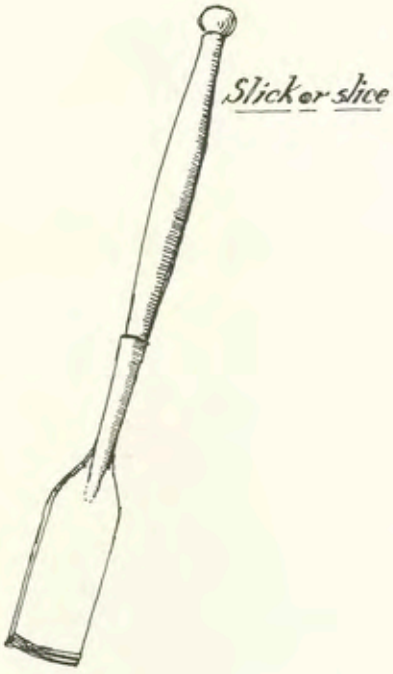


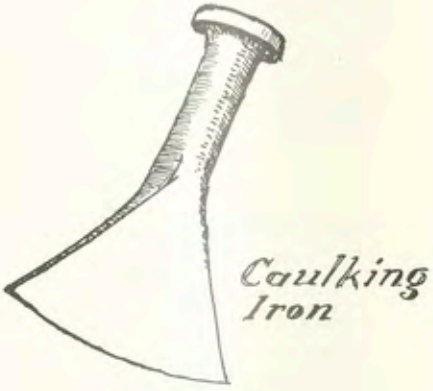

many craft were built with wooden fastenings only, for metal was scarce and hard to come by. Also, instead of a full double sawn frame, one might be built up of single futtocks (or sections) which overlapped sufficiently to be fastened to the sections above and below it.

The same type of lumber the settlers had known in England was not always available, forcing substitutions at times, some of worse material and some of better. Oak grew in quantity all over New England and some of the best for shipbuilding came from the vicinity of Ledyard. In later years, live oak from the south was the most desirable but little, if any, was available to colonial builders. Elm and beech were obtainable to some extent although not of the quantity or quality to be found in England. What was called larch in the old country came to be termed hackmatack or juniper here. It was valued for knees because of the way its roots grew outward and for its resistance to rot. In Connecticut the virtues of chestnut as shipbuilding timber were soon discovered and the wood was widely used all up and down Long Island Sound until a blight in the early twentieth century wiped out the growth. It never seemed to grow in quantity in other parts of New England and consequently was used very little in the shipyards of Massachusetts and Maine. Locust was in general use in all east coast shipyards, for it was ideal for treenails and wherever tough, rot-resistant wood was necessary.

White pine, yellow pine, fir and spruce were abundant as well as cedar, although the latter has always been regarded primarily as small boat lumber in New England. Most valued for spar timber and decking were the tall white pines which grew all over northern New England, rising straight into the air for a hundred feet or more and ideal for making masts, yards and booms. Greedily, the British admiralty sent surveyors to search out and mark the trees with the king's broad arrow, and woe be unto him who dared cut any such timber for his own use.

Because of the enormous supply of timber growing all along the




east coast, attempts were made in the early days to build both naval and commercial vessels for the old country, but the lack of seasoning soon proved that although the vessels were built more cheaply and with greater dispatch, they also rotted faster and seldom lasted as long as vessels built in England. William Sutherland, the early British authority on shipbuilding, set the average durability of a man-o'-war at fifteen years and that of merchantmen at an even shorter span.[1] The early colonial-built craft sometimes showed signs of incipient rot before they had completed more than one or two voyages. As time went on, however, ship timber was cut and seasoned in more leisurely fashion and the longevity of ships increased to a marked extent. By the middle of the nineteenth century some vessels were built in the Stonington-Groton area which were to last for forty or fifty years and in some cases even longer.

Very often the timber, particularly knees and compass timbers for frames, was cut in the woods during the fall or winter and hauled to a launching site to be assembled. Joshua Hempstead of New London, the well-known early-eighteenth-century shipwright and diarist noted that each winter he spent long periods in the woods hewing ship timber.[2]

Occasionally a vessel was built in the woods and hauled to the shore for launching. This happened in the early days only and then

seldom, if there was a good supply of timber adjacent to the shore line. Richard A. Wheeler in his *History of Stonington* describes how vessels were built in the woods owned by Joseph Denison and Jonathan Wheeler.[3]

Oddly enough, few attempts were made to mechanize the various processes of shipbuilding. Part of the reason probably lay in the fact that so many of the tools had to be portable. On the other hand, sawing heavy timber, one of the most arduous tasks facing a shipwright, was done with mill saws to some extent as early as the seventeenth century.

The band saw was first patented in 1808 in England but remained largely unused because of the difficulty in forging blades that would not break. It was rediscovered in this country about 1849 by Lemuel Hedge, but even though the process of blade making had vastly improved, making it practical, the invention was not used extensively in shipyards for many years. It began to appear in the larger yards more frequently when it was discovered that by making the table to tilt, bevels could be sawn in frames. Even so, some of the small yards in Maine and around the Chesapeake Bay area continued to handsaw or hew timber until well into the twentieth century.

Very little could be done about boring until electrical power came into use and there, again, shipwrights appeared to ignore its possibilities for much of the remaining time of wooden ship construction. As previously noted, hand-boring tools had improved through the years until the final evolution of ship augers, which became standard in all shipyards. Actually, most of the boring in the larger shipbuilding centers was done by one or more men who subcontracted the job in exchange for fastenings from the ship builder. Each man had several augers and fine files to keep them sharp. In a vessel of average size, they were boring through oak plank and frames and hard pine ceiling, making a total cut of 12" to 16" and, in larger vessels, much more.

Planing or "joinering off" a hull never got to be anything but a hand job, even in the last days of commercial wooden shipbuilding. The rough plank, once fastened to frames, were dubbed with adzes all over the hull to cut down protruding plank edges and the heads of treenails which might be sticking up. Metal fastenings were always countersunk. Next began the work of planing. These planes were almost invariably of home manufacture, for wooden planes were lighter and could be made to fit exactly the hands of the man who was to use them. They were made of beech, maple or other hard wood and often the bottom or sole of the plane would be of lignum vitae or some other unusually hard wood. Even the blades might be homemade, if not by the carpenter, then

by a shipsmith friend who might be adept at making edged tools – and many of them were. Abrasives were known to some extent even in the earlier times, but were seldom used. Once a hull was planed, it may have been scraped for a final finish but nothing else.

When the hull was planked and joinered off, the caulkers took over. Here again the job was often done under contract, few shipyards having enough vessels under construction to keep a gang of caulkers on the payroll. Caulking was a specialized job and few caulkers would do any other work although many of them could if necessary. In fitting the plank it had been edge-planed to leave a v-shaped seam open at the outside, about 1/16" for each inch of planking thickness. Into this seam were driven several threads of oakum, usually two threads for each inch of thickness.

The tools used by the caulker have changed very little over the years. Oakum was made by picking out strands of old rope (often done by convicts in the old days) and soaking them in tar. The iron most commonly used has a flat head and a shank that widens and flattens at the bottom something like a chisel but with a wider, concave edge. The final development of the mallet was as illustrated, and varied very little from caulking mallets of the seventeenth century. Made of hard wood and metal-bandèd, they can stand years of hardest use and, to a professional caulker, a good mallet was his most valuable tool. The long mallet head allowed him to hit the head of the iron with a shorter stroke, making it unnecessary to bend his body so far toward his work. And the split head in the mallet absorbed some of the shock of the blow and increased the rebound each time, thereby eliminating some of the act of lifting the mallet for each stroke. It also made the mallet "ring" more loudly, although this was not a desirable feature as it tended to make many caulkers deaf as they grew older. It was, however, one of the distinctive sounds of a shipyard. Another was the cadence of the mauls used by the launching crew in "wedging up" a vessel to lift her weight from the ground ways to the sliding ways. There was always much pounding and hammering in any shipyard, but the ring of caulker's mallets and those of the launching crews were heard nowhere else.

NOTES

1. William Sutherland, *The Ship Builder's Assistant*, 1794, and *Britain's Glory*, or *Shipbuilding Unveiled*, 1717 and 1727.
2. *Diary of Joshua Hempstead of New London from September 1711 to November 1758*, New London County Historical Society, 1901.
3. Richard A. Wheeler, *History of Stonington*, 1900.

# DIRECTOR'S MESSAGE

The uncertainties of today's times and national mood lead me to report to the membership on plans we have made at Mystic Seaport to face the immediate future. As you can imagine, our deliberations last fall were not lightly undertaken – they never are; but this time, as the outlook deteriorated, new factors had to be programmed into our decisions on plans and budgets for 1974.

Some of these factors, such as the Energy Crisis which quite unexpectedly pierced some balloons, became visible; others, growing directly out of the developing energy crunch and the contradictions from Washington pertaining both to the extent and effects of gasoline shortages, rising unemployment and soaring prices, made it extremely difficult for us to plan intelligently.

Our primary concern was to develop an operating budget for 1974 that would enable the museum to continue to function effectively, but as the year-end approached, we were compelled time and again to reduce projected income for 1974 and to face, simultaneously, prospects of sharply rising expenditures for fuel, utilities, insurance, etc.

The final budget, as worked out by the staff and budget committee and approved by the trustees early in December, called for sharp curtailments in expenditures all along the line, based on an estimated 30 percent drop in attendance in 1974 (which would result in a loss of income of more than half-a-million dollars).

To conform to this budget we have had to lay off a number of our staff – mainly part-time employees – and realign responsibilities and functions of all remaining staff members. Even so – and although offset by extensive reductions in every area of museum activity – we face a very large operating deficit at the end of 1974. To reduce this projected deficit by further curtailment of expenditures would critically impair the performance of Mystic Seaport, its services to visitors, and would reverse the momentum gained over the years.

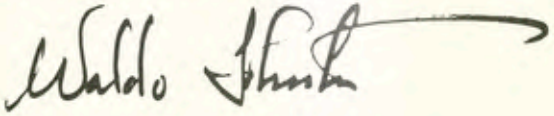
Our goals for 1974 under this budget are fourfold and we believe attainable. They are not listed in order, because each carries the highest priority if the Seaport is to maintain strength and viability:

1. To preserve what we have, making certain that our collections are safeguarded.
2. To safeguard the welfare of our staff to the fullest extent possible and by every means we can.
3. To maintain the action and vitality of the Seaport by continuing to present to our visitors a living, dynamic museum without curtailment of opportunities for visitor education and enjoyment.
4. To prevent loss of momentum of plans, projects and activities that were already underway in 1973, but to undertake no new projects in 1974.

I cannot adequately express my gratitude to the staff for its magnificent response to the situation. Every one has pitched in and taken on extra assignments so that the work performed by those who had to be laid off can be continued. Interpretation is being carried out by various staff members (I'm relief interpreter in the ship carver's shop, or wherever else I'm needed). Volunteers are being asked to take on more jobs and responsibilities, and next summer's dock boys may turn out to be wives of staff members. No one knows at this moment who will row the whaleboats or man the breeches buoy, but rowed they will be and skywards some soul will soar. Wherever and whenever needed, staff members are being called on to lend a hand and perform some task so that our offices, buildings, grounds, exhibits and craft shops remain orderly and functioning.

Obviously such a program spreads our staff thin and cuts into the time its members can spend on their primary work. Thus much of our work has slowed, and completion dates for projects face delays.

But because of staff cooperation Mystic Seaport will offer the visitor in 1974 a museum in full operation and an experience we hope will be as pleasant and memorable as ever. We are doing everything we possibly can to bring this about.



February 4, 1974

# BOOK REVIEWS

CLINKER BOATBUILDING by John Leather. *International Marine Publishing Company, Camden, Maine, 1973.* $8.95.

This little book contains much useful information clearly presented and is worth the attention of amateur boatbuilders, both experienced and inexperienced.

For someone who has never built a boat, but thinks he would like to start with something not too large and not too ambitious but still of authentic traditional design, a boat that would give good service and one that he need not be ashamed of, *Clinker Boatbuilding* could put him on the right track. Not every question is answered, but a lot of them are, especially things experienced boat builders take for granted but which the beginner needs to have explained to him.

Mainly one type of boat is dealt with: small, round-sided, clinker-built dinghies as are commonly rowed and sailed in Britain. Specifications and line sketches, but no offsets, are given for three representative boats: a 11′ 6″ rowing and sailing dinghy, a 15′ sailing dinghy, and an 18′ sailing boat of enlarged dinghy lines, partly decked with a Bermudian rig.

One of the book's strong points is its numerous sketches and good photographs of construction details. No attempt is made to cover all of the many variations in building methods used by professionals to be found in different localities in the British Isles and elsewhere. For instance, Leather shows his boats set right side up for planking, although in the West of England some professionals prefer to plank bottom up, claiming it goes quicker this way and is easier to fit the lap.

There is a brief final chapter on cold molding, that is, glued composite construction combining several layers of thin wood strips or veneer. Apparently Leather believes that in time clinker planking will be superseded by cold molding, for he says, "it is the wood boatbuilding method of the future."

This is the first book on boatbuilding by a British author that I have seen which recommends the use of epoxy adhesives. Leather has kept abreast of recent developments in small craft construction in the United States, as is reflected in his combination of traditional ways with the latest up-to-date methods.

It should be understood that this is not a history of clinker boats either in modern or ancient times, nor is it a survey of their wide occurrence throughout the world, but rather a manual of building basics written for amateurs and focused on a particular type of craft, and well adapted to the needs of beginners.

JOHN GARDNER
Associate Curator
for Small Craft Studies

THE CATBOAT BOOK edited by John M. Leavens. *International Marine Publishing Company, Camden, Maine, 1973.* $12.50.

Seldom does one see as authorita-

tive a collection of fact and opinion on any one subject as is contained in *The Catboat Book*. Edited by John M. Leavens, Mr. Catboat himself, this book is a wealth of information – historical, technical and practical – for the catboat owner, prospective owner or just plain enthusiast.

The list of contributing authors is impressive, all either recognized in the field of American small craft, or as specialists in catboats or in special construction techniques.

Being somewhat biased on the subject, having sailed them since I was eight years old and now being the present proud owner of the Wilton Crosby catboat *Dolphin* (1917), my enthusiasm may be excused but not overlooked.

The book itself is evidence of the painstaking effort expended by the editor to get the story straight: the story of a unique type of American small craft perfectly adapted to her environment and, incidentally, to others around the world, even including Japan.

Very few work boats are readily convertible to pleasure boats. The catboat is an exception, as pointed out in the text. She has also a strong appeal to Yankee thrift, being the most boat per linear foot that you can get.

Among the delights of this volume is Fenwick Williams' chapter on design, which candidly admits that the matter of small craft naval architecture is still at least 50 percent art and not all exact science. Of particular value to me are the remarks of Oscar Pease on the care and feeding of ancient catboats. Mine was engaged in the same trade as his in the same port, Edgartown.

I should like to have seen more attention paid to the Block Island boats – a great stronghold of catboating – but, of course, they were built elsewhere anyhow.

To sum up: nobody who owns a catboat or ever expects to own one can afford to be without this book. For others it might be just plain entertaining.

A.K. LANE
Master Mariner

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Attention all Members

ANNUAL MEETING

of

Mystic Seaport, Inc.

Friday, August 9, 1974



Above, a 1/8" scale model of *Intrepid*, successful defender of the America's Cup in 1967 and 1970, as she looked when redesigned by Britton Chance, Jr. for the 1970 race. The original model, as designed by Olin Stephens for the 1967 race, was the gift of J. Burr Bartram. Ray Pendleton did the conversion job for the Seaport. Photograph: Mary Anne Stets. Front cover, the *Emma C. Berry*. Photograph: Otto Liebig. Back cover, the *Morgan* up on the lift dock on the morning of January 7, 1974, with *Sabino* nestled alongside. Photograph: Thomas Lamb.




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