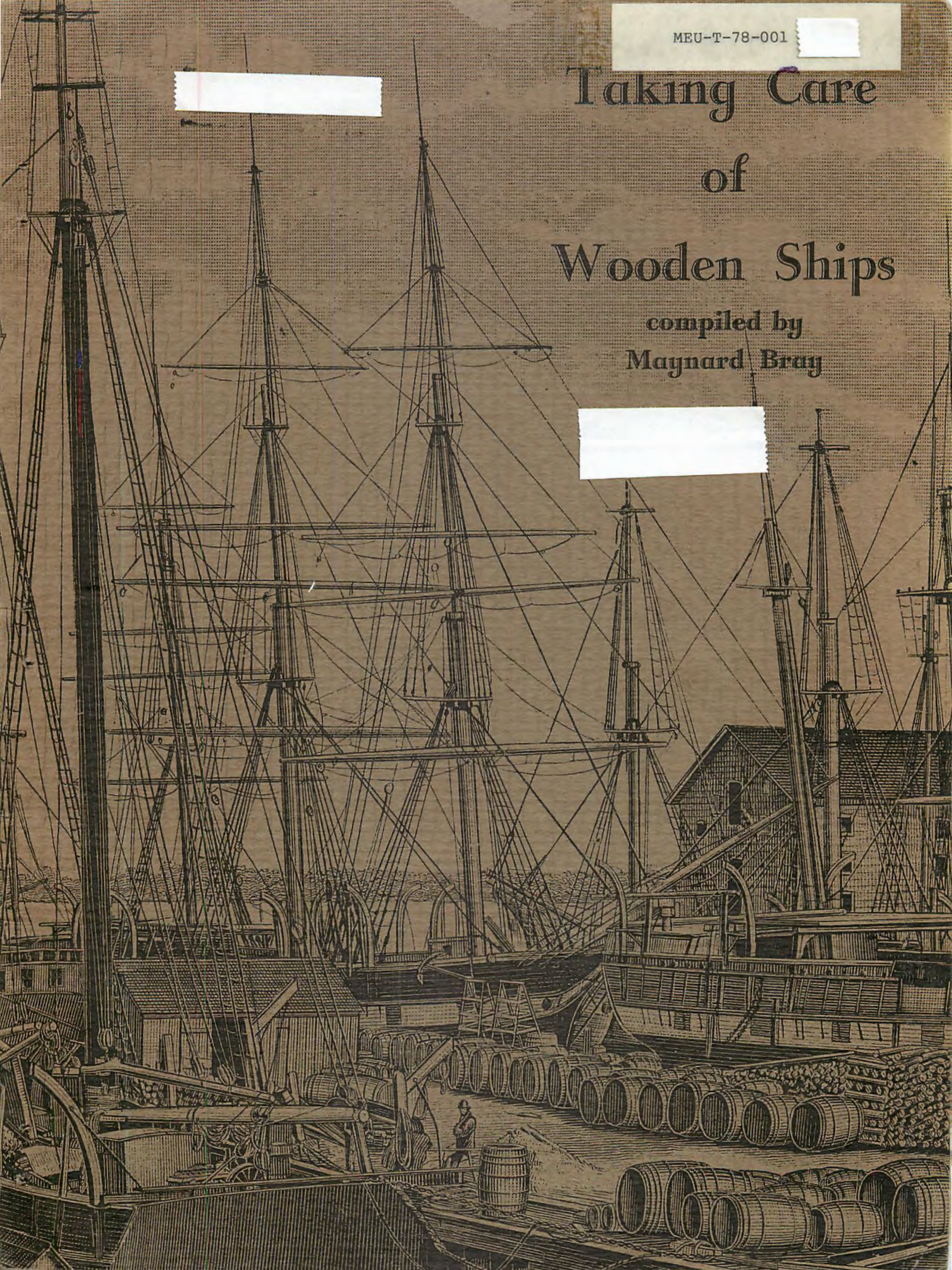
Taking Care of Wooden Ships

compiled by
Maynard Bray



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Cover picture from The Fishery Industries of the United States by J. Browne Goode et al, Government Printing Office, 1887.

Phyllis Coggins – Sea Grant editor, designer

DEDICATION

This publication is dedicated to the memory of

Capt. Robert D. "Pete" Culler
(1909 - 1978)

Designing and building, using and caring for wooden boats and ships of all sizes absorbed Pete's talents for most of his life. Sharing what he had learned took much of his time in later years. Pete loved good watercraft of all kinds and believed they should be more widely appreciated and better understood and cared for. He was totally generous with his knowledge and encouragement. The pages of this booklet are filled with Captain Pete's wisdom.

M.B.

And the stately ships go on
To their haven under the hill
Tennyson

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*Excerpted with minor editing from the proceedings of the Bath Marine Museum's Symposium on American Maritime History held on May 6-8, 1977.

FOREWORD

Reliable material on the details of routine ship maintenance is hard to find. As more and more wooden ships, both old and new, are coming up for serious preservation, the need for good maintenance techniques makes itself felt again and again. A daily routine, most experts agree, goes far toward giving a vessel a long, healthy life. Some operations which could be made part of a routine, as well as the reasoning behind them, are described in this booklet.

A skipper usually has his own favorite way of taking care of his ship, and if he is a conscientious man who has been at it for a while, his vessel will look about as good and last about as long as the next man's, even though different materials and methods were used. There is probably no one right way. In fact you will read about several different ways of achieving the same end on the following pages.

If many people are involved with the work on a vessel, or if there are frequent crew changes, I think it helps to have an agreed-to plan for all the workers to follow. This gives a known basis so if, for example, later on the paint starts to peel, you'll know what surface treatment was used and you can intelligently go about changing it to something better. The *Clearwater* maintenance manual, included herein, is an attempt at guiding and controlling the many willing hands who report aboard for weekend work and assures that she isn't neglected in between times. Mystic Seaport is developing a painting manual which specifies which paint to put on which boats, what to use for fillers, and how to prepare surfaces for painting. A manual for the routine maintenance of *Constitution* is also in the works.

Today, more than ever it seems, there is interest in acquiring old ships for preservation. But acquiring them and preserving them are two quite different things. Preserving and saving them means working on them almost every day, using the ways which have been proven through long usage.

Maynard Bray
Brooklin, Maine
January 1978

THE APPROACH TO SHIP MAINTENANCE AT MYSTIC SEAPORT

(Adopted by Ships Committee, October, 1977)

It is our understanding and wish that maintenace be carried on in accordance with the practices followed at the time the ships were used.

In general, we feel we have the knowledge of the methods and the materials and surface coatings. Further information is available from books and living individuals. The problem is to get all hands in the habit of using this information consistently.

No one preparation or method of maintenance will fit every job. Each ship and craft, together with its use, has to be understood before the best program and maintenance can be organized for that ship or craft.

Basically, wood subjected to weather will never last forever. However, the correct selection of wood, the proper joining of same, and the succeeding maintenance can prolong the life of wood substantially.

Our strength at Mystic Seaport lies in our live fleet, so that repair and maintenance form an integral part of our exhibit. Substantial effort (and hence funds) to improve our system of repair and maintenance along the above lines is essential.

Waldo Howland
Chairman, Ships Committee

View of the Mystic Seaport waterfront. The whaleship *Charles W. Morgan* dominates the picture as she is being warped in alongside Chubb's Wharf. Some of the small craft in the Seaport's collection are in the foreground. The *Morgan* was built in 1841 and has been the hallmark of Mystic Seaport for many years. (Photo Mary Anne Stets, Mystic Seaport)

PRACTICAL APPROACHES TO WOODEN VESSEL MAINTENANCE

(Excerpted with minor editing from the proceedings of the Bath Marine Museum's Symposium on American Maritime History held on May 6-8, 1977.)

Introductory Remarks - Maynard Bray

This session is about practical approaches to the routine maintenance of wooden vessels outdoors. The subject is particularly dear to me because I've worked for Mystic Seaport for a number of years, and a year ago last winter I had charge of the repair of the Hudson River Sloop, *Clearwater*. That last was a mighty expensive repair; it cost about half as much to repair her as it did to build her in the first place - and she was only seven years old at the time! Why? A big part of the answer is that she wasn't properly maintained, daily, by people who did the mundane chores like cleaning and keeping the decks tight. Such a routine doesn't cost much, but it takes a good bit of know-how and dedication.

In the last few years there has been a renewed interest in saving old ships. Acquiring them isn't even the first step toward this end, nor is hitting them once in a while with a paint brush. An example of the harmful results of such an approach is the schooner *Bowdoin* which, after having been taken on by Mystic Seaport for preservation, had to be given up about six years later in such poor condition as to be an embarrassment to the museum. During her stay at the Seaport, the *Bowdoin* just didn't get proper daily care; there was no great amount of money required. Being ignored, as the *Bowdoin* was, becomes the fate of many of these old ships that people want - but don't know how - to save.

I'm happy to say that in the years following the *Bowdoin* incident, Mystic Seaport has been more selective about which big old vessels it obligated itself to care for. Nearly ten years have elapsed since then, and I believe only two watercraft over forty feet, *Emma C. Berry* and *Sabino*, have come into the fold during that time. The Seaport has developed a program of restoration and rebuilding and has recently begun to work on a program of routine maintenance. I'm hoping that this session will present some ideas on the care of ships to people at the Seaport and other institutions and to individual owners.

The first man I'd like to introduce represents the largest vessel, the oldest, probably the most famous, and certainly the most expensive to maintain. He's her commanding officer and I'm very pleased that he could schedule his attendance here today. I'd like to introduce Commander Tyrone Martin of the *U.S.S. Constitution*.

Maintenance of the *U.S.S Constitution*

Cdr. Tyrone G. Martin, USN: Thank you very much, Maynard. It's a pleasure to be with you all today. I always like to talk about money, and maintaining this ship is an expensive proposition, certainly. But one of my favorite stories is that *Constitution's* original cost was $302,718.84. That sounds today like a pittance, but in checking the records I find that figure represents a cost overrun of 260%.

From March of 1973 through June of 1976, *Constitution* was given a 4.4 million dollar overhaul. Because of the conditions found in the ship when she was opened, and with an awareness of the sort of maintenance done since the 1927-1931 restoration, we were determined early on that a regularized maintenance program be instituted immediately after the end of the overhaul, that is on July 1, 1976. Happily, selling that concept presented no difficulties that weren't readily overcome.

Organizationally, of course, *Constitution* is in full commission; that is, she is in the same status as any of the nuclear warships that have more recently joined the U.S. Navy. Her immediate supervisor is the commandant of the 1st Naval District, now located in Philadelphia. Our restoration and maintenance facility, which consists of twelve artisans headed by Don Turner, is subordinate to the Navy Supervisor of Shipbuilding, Conversion and Repair in Boston, and farther up the line to the Naval Sea Systems Command in Washington. Its sole mission is to ensure the continued existence of "Old Ironsides." Planning, estimating, and design work, purchasing and administrative functions of Don's facility are done in-house. Outside support is forthcoming, when needed, from the Portsmouth Naval Shipyard and the Forest Products Laboratory in Madison, Wisconsin. All funding, of course, is a part of the federal budget.

Ordering and Inspecting Wood

The timber used in construction today, insofar as possible, is the same as was used in her original construction. All species of hardwood lumber purchased for the work are ordered in accordance with the National Hardwood Lumber Association rules for measurement and inspection. By ordering stock according to these specifications for a particular grade of hardwood we are better able to control or limit sapwood, worm holes, knots, bark and other unacceptable defects. The material is inspected on receipt by the facility to insure that it is of the specified grade. We don't hesitate to turn it back if we're not satisfied with it. Having verified the grade, we also check on the moisture content; we prefer 12% on most of the stock we use. The exceptions are materials required for bending, such as the boat frames or planking at the bow or stern of the ship herself. Defects such as sapwood, boxed heart, and worm holes will shorten the service life of all wood products. High moisture will cause shrinkage, heavy checking and susceptibility to early decay which will in turn require early replacement and increased man-hour and material costs. With the cost of labor today, being fussy about your materials is worth it.

Planking

During the middle 1950's *Constitution* was replanked with red oak on the outer hull. All the material was shipped to a local company for pressure treatment with pentachlorophenol preservatives. The red oak was used because of its open cell structure in the expectation that it would more readily accept the treatment. However, within ten years decay was obvious in isolated pockets throughout the hull planking. Investigation by the Forest Products Laboratory revealed the retention of the preservative was not equal throughout the planking. Because of this experience it was decided to revert to the use of white oak throughout the ship during the

recent overhaul. All planking installed was dipped into a tank of pentachlorophenol after shaping and prior to installation. When possible these planks were stored in the dip tank until the work force was ready for installation. Penta-Grease, a product of Chapman Chemical Co., was used between the inner face of the hull planking and the exterior of the framing. The butt ends of each new plank and its outboard face were painted with logseal. This was done to prevent heavy checking of the plank due to exposure to the sun prior to the final sanding and painting.

A word of caution when using any of the pentachlorophenol preservatives: extended contact with the skin will cause irritation, sometimes severe. Mask and goggles should always be worn when sanding pieces that have been dipped or coated with a penta-based preservative.

Knees

The knees installed during the last restoration fifty years ago were of live oak. About 15% of these have been replaced since then. During the early 1950's the shipyard experimented with hackmatack knees (this wood was available in the required shapes), and a number of these were exposed during the recent overhaul and appeared to have weathered reasonably well. However hackmatack does not appear to have the durability and strength of the oak, and laminated knees of white oak are now being used as replacement members. The oak is laminated in ¼" to ½" strips in the exact shape of the part to be replaced. After the member is fitted to the location the fastenings add to the strength of the laminations by locking in the laminated shape.

The use of laminated members has some very positive aspects. The moisture content of each laminate can be closely controlled, and the finished knee, beam or waterway is less likely to develop decay or to check due to rapid loss of excess moisture.

Causes of Deterioration

It should be noted that almost all of the decay found aboard *Constitution* during the recent overhaul could be directly attributed to fresh water wetting. Leaks in caulking seams on the weather deck, hull plank, mast coats, hatches, spars, and gun ports combined with insufficient use of preservatives created the situation that necessitated this latest overhaul.

Decks

Originally long leaf yellow pine was used for the spar deck planking while white oak formed the gun and berth decks. The latter decks were last replaced in the early 1960's and are wearing very well. However, air-dried, rift-grain fir has replaced the long leaf yellow pine previously used in the spar deck. The fir was stored and air dried three years prior to installation aboard the ship. The primary reason for this change in material is to avoid the slivers created by the short or wild grain checking that created a poor condition for visitors in open-toed shoes and sandals, and we do have to take that into consideration. Since I've had command of

the *Constitution* more than two million people have been aboard. The disadvantage is that the fir is much softer and is damaged more quickly than the yellow pine was. Two years of visitors have thoroughly antiqued it.

The current spar deck was put on in October of 1974. The deck spikes during this installation were set quite deep to allow for multiple sandings of the deck. This will permit continued good appearance, eliminate surface imperfections, and we hope it will extend the serviceability of the installation. The long leaf yellow pine deck removed was in excellent condition, although the grain on this deck was lifting from the continuous foot traffic and presented a hazard, albeit minor, to the visitors. It was not possible to refinish the old yellow pine deck because of the depth of wear and the exposure of the deck fastenings. Again, visitors' safety is something we stress aboard the *Constitution*.

All deck seams aboard the ship are caulked with cotton and oakum and payed with marine glue. Preservation of decks includes semi-annual application of 60% pentachlorophenol and 40% linseed oil. Weathered deck seams are reefed out, made in, hawsed and repayed on a case-by-case basis.

Dolphinite double planking compound is used throughout the interior of the hull on all faying surfaces.

Spars

The yards being replaced aboard *Constitution* are manufactured of laminated clear Douglas fir with moisture content not to exceed 12%. Because Douglas fir is readily available and easily controlled, the majority of laminates of this material are excellent, provided the contractor knows what he is doing. Our facility itself has had excellent success in laminating units up to 25 feet in length. Another major consideration in using laminates is that it is feasible to preserve each laminate separately prior to assembly. The yards aboard *Constitution* are removed from each mast in turn every three years. They are sanded down, checks are reefed and brushed heavily with two coats of pentachlorophenol. Priming is next, and then the checks are filled with Sterling glazing compound. Heavy checks are filled with a PRC rubber compound that had been developed for use on aircraft carrier decks. A yard is test bored if we think it is necessary, and three final coats of paint are applied along with a finish coat of polyurethane varnish.

That is our routine. However, all of the masts, spars, and rigging are inspected in place annually, and we have found that any part of it that is painted black has to be repainted every year; the sun burns the paint right off.

The masts, fighting tops and bowsprit are refinished in place. The procedure, similar to the work accomplished on the yards, is done with personnel working from safety buckets suspended from our mobile crane.

The lower masts are assembled from four separate timbers. The mainmast proper was manufactured from four pieces of 104-foot-long, 18" x 18", Douglas fir that were air dried under cover for over three years. With

shaping it became apparent that very little was gained by this period of storage as the interior of the sticks exposed by shaping exceeded a 25% moisture content. Subsequent evaporation of this moisture has caused the mast to shrink and has caused loosening of mast bands and wedges, especially below the weather deck. We have installed drains in each of the mast steps to carry away fresh water driven through the four quarters by high winds, and consideration is now being given to installing stopwaters at a level above the weather deck to further reduce this fresh water contamination.

Rigging

We changed the *Constitution's* rigging over to black polypropylene (manufactured by the Boston Navy Yard) in 1963. Most of it is still in service and is virtually maintenance free. We have found that as it weathers it takes on a sheen and a feel that has actually misled some people familiar with tarred hemp. The smell of the Stockholm tar is missing, however, and I haven't been able to solve that yet. In round numbers about 61,000 feet of polypropylene, in sizes from 3/4" to 10", are used in the rigging. The only disadvantage we've found, which isn't very important in our circumstances, is that the polypropylene doesn't stand up as well as hemp in chafing and running situations. The normal leather chafing gear largely prevents the one concern and we've employed Gold Braid Sampson cord for our signal halyards etc. to solve the other.

Rails and Gratings

The fife rails and pin rails were manufactured of laminated white oak and are finished semi-annually with three coats of polyurethane varnish. A clear epoxy compound that can also be used for laminating is used for filling the checks in these fittings prior to finishing. All the gratings on the ship are of white ash and are also refinished semi-annually with three to four coats of the polyurethane varnish.

Guns and Carriages

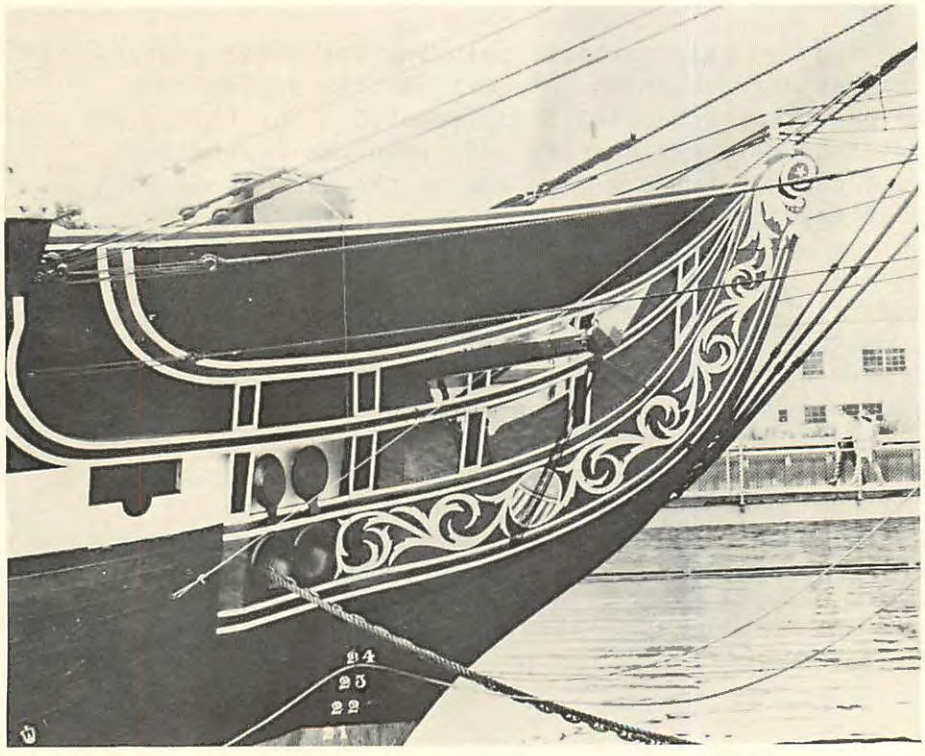
The cast iron guns aboard require only periodic painting for their preservation. As for the carriages our present plans call for the replacement of two or three annually once that schedule is implemented. The thirty on the gun deck obviously will have longer service life than the twenty-two on the spar deck. All are painted twice a year due to the effects of both weathering and hundreds of eager children.

Boats

Of the four boats we presently carry, the 28-foot captain's gig was newly constructed to the old design in Wells, Maine, during the past fall and winter. The 36-foot pinnace was taken in hand during the winter and we found that it had been built dry about forty years ago and more than simple refurbishment was needed. As a result, only the keel, stem and sternpost and fifteen of her thirty-nine frames remain after this overhaul. That's a vivid example of how the work scope can escalate when you begin to open things up. It is planned that these two boats, together with two 28-foot quarter boats, will be cycled regularly for overhaul. Painting and refinishing the brightwork will have to be done annually if not semi-annually.

Stepping the mizzenmast - through three decks. The traditional coins, including a 1797 penny, have already been placed beneath the mast. The intensity of expression on all present is indicative of the care and precision needed to bring it off successfully.

Caulking the new spar deck forward. Planking is fir 4½ inches thick. A temporary roof has been installed over the work area.



The bow head area as rebuilt to the 1812 pattern: open above and below, and with "four-hole" facilities on either side of the bowsprit behind a light bulwark. The upper side of the cutwater and knee are sheathed in lead sheet.

(Official U.S. Navy photographs)

Underbody

Constitution was in dry dock from April 1973 through April 1974 - dry dock number one. She was the first to use it in 1833 and the last to use it; it's now decommissioned.

During her drydocking all her copper and felt sheathing was removed and replaced. Six strakes of hull planking, three above and three below the copper line, were also removed and replaced. Three alternate planks, port and starboard, and approximately eight stern tuck planks were also replaced. The underwater body was found to be in excellent condition. To maintain the moisture content in the wood and to prevent hull planking from shrinking excessively while she was in dry dock, a salt water spray was used by means of perforated garden hoses that were strung all around the ship and run continuously when we weren't actually working on it.

This was the first time the underwater body of the *Constitution* had been completely exposed since the 1927-1931 restoration. Her hull is copper fastened with the head of the pins flush with the plank. All plank seams in her underwater body were reefed, recaulked, and hawsed to be flush threaded. Seam compound and putty were not used. A thick red lead mixture was used over bolt heads, checks and any indentations on the planking surface. After caulking the hull during this most recent period, three coats of creosote were applied before installing the Irish felt and copper sheathing. The old copper line reflected her hog so we straightened it. Historically *Constitution* has been docked about every seven years. She'll be 180 years old this coming October. These docking periods were based on availability of dock space and manpower within the shipyard. Underbody work during these periods was limited to spot removal of copper and inspection of hull plank. Replacement of damaged copper was undertaken in the area of the waterline, and repairs that could not be accomplished waterborne while many visitors were aboard were also done at this time.

Controlling her hog

To monitor any shifts in the hull structure during the above-water, outer-hull plank replacement phase, we established a reference plane on the berthing deck. Our major concern, of course, was that the hog would increase as we pulled the outer layer off the ship and that when we replaced it these new timbers would then lock in this increased hog. As a step to further control this tendency, twenty tons of temporary ballast were installed midships, and we removed the fore and after thirds of the gun batteries so that all their weight was midships. The hog in the *Constitution* definitely reflects the loading condition of the ship and did fluctuate when the temporary ballast was removed and all the guns returned. The reference plane continues to be monitored on a monthly basis to check her hog. At present it's 14 inches. This condition is quite stable although a slight degree of fluctuation extending from the main hatch aft has been noticed; we are looking into that more closely.

Inspection and Work Lists

An annual inspection of the ship has been performed each fall. The inspection board is composed of myself, some of my crew, Don Turner and some of his associates and representatives from the Planning and

Design Division. The inspection encompasses every item alow and aloft. The group notes all instances of deterioration, missing items, and the general appearance of the ship. Armed with this report and integrating it with the established maintenance cycles, a detailed work schedule is developed for the following year. With the schedule completed, material requirements can be identified and purchasing initiated. Preservation is our main concern, and the weather is the prime factor in scheduling what will be done when.

A number of specific items are being researched and documented in order to return the ship to its 1812 appearance in accordance with Congressional directives. This type of work will be accomplished as each specific item requires replacement due to deterioration. The list includes such things as opening up the waist, installing a curved main fife rail and a circular mizzen pin rail, and the lowering of the forecastle and quarter deck bulwarks.

A discussion of this type can be endless. I have attempted to make some valid points on restoration and maintenance of wooden hull vessels. A good portion of the work accomplished is done routinely and has not been addressed here. Those items that were addressed reflect the experiences and solutions of a dedicated group of employees.

Observations on Materials and Products Used in the Preservation of *U.S.S. Constitution*

1. Pentachlorophenol preservative in a petroleum base. This preservative is used extensively throughout the ship. It is not compatible with all paints and glues and can create irritation of the eyes and lungs of employees.

2. Penta-Grease is used on all exterior faying surfaces of the hull. This product is black and should be avoided in areas where bleeding might develop. It is extremely irritating to exposed skin and should be applied or worked under controlled conditions.

3. Feed Salt. Salt is a natural preservative and has been used for packing between the frames of *Constitution* from the keel to the copper line. Salt was also used on white oak hull plank stored at Portsmouth for future use. This will delay moisture loss, reduce checking and avoid pockets of decay.

4. Dolphinite double planking compound. This product has been used aboard *Constitution* for many years, and its value is apparent every time it is exposed. This product will not bleed and is excellent throughout the interior of the vessel on all faying surfaces.

5. PRC #3096 (Products Research Company). This is a two-part flexible rubber compound developed for aircraft carrier decks and hull seams on naval minesweepers. All of the hull seams above the waterline and major checks in yards and masts are filled with this compound. Temperature control is important since this compound cannot be used below 65°.

6. Marine glue, oakum and cotton. All deck seams (as stated earlier) are caulked with cotton and oakum and payed with marine glue. Cotton and oakum should not be left exposed in open seams as they have a tendency to hold moisture. They should be kept payed with paint and seam compounds such as Interlux, or with marine glue or #3096.

7. Epoxy and resins. Various formulations have been tried aboard *Constitution* throughout the past fifteen years. We have had success with scarfing yards and fiberglassing the scarf for additional strength and using the various compounds as fillers. Experience with these products has taught us that application of epoxy compounds and resins to solid, dry lumber can be accomplished satisfactorily. However, when these mixes are used to fill voids or cavities in yards and masts that can not be continually inspected, the relative inelasticity of this material sometimes causes pockets to form alongside the filler as the wood shrinks.

8. Sterling Caulking Compound. We have used this product throughout the ship as a filler on minor checks in hull planks and yards. It is flexible and is applied after preservation and priming of the stick.

9. Laminated material. This product has been discussed previously. Success can be achieved and a greater longevity of the member can be realized if the material is constructed to good specifications. Temperature control, moisture content, preservation, scarfs versus finger joints, material grade, glue type, lay-up time and control of end joints and seam line locations should all be addressed in the specifications.

10. Polypropylene rigging. Black polypropylene replaced the existing hemp rigging aboard ship in 1963. All the rigging aboard the ship, with the exception of mooring lines and halyard lines, is polypropylene. This material does not stand up well when exposed to friction but for resisting the elements and general strength and endurance, it seems indestructible. Sampson Cord 2-in-1 Gold Braid is used for halyard lines, and nylon mooring lines are used to berth the ship.

Capt. Havilah S. Hawkins

Maynard Bray: The next man I'd like to introduce is someone for whom I have a very great personal respect. He has had about thirty years experience with wooden boat maintenance, and I think experience is what counts most. He has owned the old coasting schooners *Alice S. Wentworth* and *Stephen Tabor* and he designed the one he has now, the *Mary Day*, which was built for him about fourteen years ago.

I've invited him here today to represent the windjammer fleet from Camden, Rockport, and Rockland. These passenger-carrying schooners have been well-maintained by their owners over the years, and some are old vessels. Anyone interested in learning about caring for old wooden ships would do well to heed these men. Other related activities such as sail making and hauling and repairing of wooden vessels have grown out of the existence of the Penobscot Bay windjammer fleet - and it's all a wonderful thing to see. It's also gratifying that old-fashioned traditional methods are being used.

Without further delay, I'd like you to hear from Capt. Havilah Hawkins.

Capt. Havilah S. Hawkins: Thank You, Maynard. My claim to fame is that I've owned two of the oldest commercial sailing vessels in existence. Along with that experience I was the first one to build a new wooden vessel for the windjammer trade. She (the schooner *Mary Day*) was the first wooden vessel to be built of that type since the *Endeavor* was built in Stonington, Maine, when I was a sophomore in high school.

The fact that these vessels in Camden are commercial sailing vessels is, I think, of particular interest. They are actually earning their way, and I think this adds a dimension which is lacking in those tied alongside wharves and opened to visitors. For this reason I am pleased that Maynard has chosen to call attention to the Camden windjammers. Even though they aren't museum pieces, they come pretty close to them. The *Stephen Tabor*, as far as I know, deserves the title of the oldest active documented sailing vessel in the country. This is really quite something to contemplate. I think it is very sad that the *Alice Wentworth* fell into disrepair and bad hands after I owned her and no longer exists. This was totally unnecessary. She would still be going strong if she had been in the windjammer business instead of being used as an attraction and advertising gimmick. A few years ago there was a movement afoot to resurrect her, but it came too late - there wasn't enough left to save. But it makes little sense to bemoan the fate of the *Wentworth*.

Maintaining a wooden vessel and living with it at the same time has been my business for many years and perhaps I can inject some new information in this regard. Unlike the *Mary Day* and other working windjammers, vessels like the *Constitution* and *Charles W. Morgan* are subsidized. The amount of money spent on them doesn't depend on how much they can earn, but rather on how much the museums can scare up to support them. Nor does major work on them have to be scheduled to fit into their off-seasons.

When I bought the *Stephen Tabor* in 1950, I was new in the windjammer business. I paid just under $9000 for her, but it seemed like a lot of money to me at that time and I had to scramble around to make this vessel pay. I couldn't take the time to haul her out and completely rebuild her or do all the other things I wanted to - money wasn't available, nor was the time. To keep the vessel out of circulation could mean losing anywhere from $20,000 to $60,000 per season; that is an expensive proposition.

One of the ways I have managed to squeeze frames in here and there, some new planks, and a certain amount of other repair work, and still be ready in the spring to carry passengers on schedule is a method of replacing frame sections without having to remove great areas of planking or ceiling. Basically it consists of opening up the planking only in the way of the affected frame, using a pattern to pick up the shape of the new frame section, and temporarily cutting the new frame, once made, into pieces in order to get it into place. Once there, it is bolted together and thereafter acts as if it were a single piece of wood.

Something that should be kept in mind in rebuilding a vessel is that anytime you tear out a section of her, that section, even though it may not have been in A-1 condition, was undoubtedly lending its support and helping hold the shape of the vessel. It is important to realize that

as soon as you remove that wood, she is perhaps going to sag a little. Therefore, you should be very careful not to do too much construction while the vessel is afloat. For major repair work she should be hauled out and shored up at her ends enough to get rid of some of the hog.

One of the problems with any vessel is her tendency to hog. So in replacing a piece of rail, I think it is awfully important to use lock scarfs at the joints. Well-fitted and well-fastened, lock-scarfed rail caps are effective structural members in preventing hog as they are so far above the keel. In other words, the keel will be under compression in a floating vessel because of the weight thrown on it by her overhanging bow and stern. Working with the keel in the opposite direction are the uppermost longitudinal members such as the clamps and shelves and top-side planking - all of which are under tension. Since the rail cap is the uppermost of all these tension members, it is most effective in preventing hog, and I think the importance of having lock scarfs there can't be overemphasized.

During the wintertime, when the vessel is idle, waves slapping against the rudder can cause a lot of wear in the bearings and steering gear. I'm in the habit of securing the rudder to the sternpost down near the waterline in order to prevent any back and forth motion.

We had an ice floe come into Buck's Harbor one year and pass down by the schooner. It froze there during the night and the wind came off north-west blowing hard, leaving her the following day locked in the ice, stern to the wind. When I got out to her, the rudder was jammed hard over, and I still don't know why it didn't break the rudder post. This experience has caused me to anchor the rudder against any movement during the off season.

To maintain a vessel properly, I'm convinced that you have to have a cover over her in the wintertime. I didn't do this myself until about four years ago. I was reluctant to go to the trouble, so I rationalized this by saying that the cover would prevent proper circulation which normally occurs when the air is sucked out of the companionway and flows forward through the bilge and out through the forward companionway. This natural airflow is pretty helpful in keeping a vessel dry below decks and I didn't want to hamper it with the cover. However, I paid the price with a lot of repair work on the *Mary Day*, a direct result of not having a cover. Now I rig one up each winter. One of the gimmicks I guess I can lay claim to is painting the underside of the plastic cover with cheap paint, about $10.00 worth will do it, and a paint roller. It takes only about half a day and will keep out the sun's radiant heat so that the temperature never gets above 70°F. I run the plastic about halfway down the topsides over spacing battens where it protects at least part of the hull from rain, snow and ice. Here again, with this part of the cover, I paint the clear plastic so the topside planking won't heat up and dry out too much.

Ventilation is very important when it comes to preserving vessels - more important than wood preservatives, I think. Winter covers should, of course, have openings at each end. The Camden windjammer fleet is lucky in that not many of them are required to have watertight bulkheads. I

can't think of anything more detrimental to air circulation in a vessel than watertight bulkheads which are now required by Coast Guard rules. In such cases, I would consider putting a separate fan in each compartment to keep it well ventilated.

I've always been against painting a vessel black, but my son may have a point when he suggests that the additional heat attracted by a black hull may promote faster circulation of air behind it. In any event, it is important to have a space between the sheer clamp and the ceiling, not just a few small holes, so rising air can escape at the top. We should be careful not to fool ourselves into thinking that with a few holes in the ceiling everything will be fine and she will be well ventilated.

There are certain areas that are always difficult to ventilate, way up in the bow or back aft in the stern. In these areas there is no reason for the air to move at all, and I think that is the reason the transoms are everlastingly falling out in these old vessels. When I was a kid, there was always a vessel in on the beach somewhere with her stern being rebuilt. I wondered why, and when the *Mary Day's* stern showed signs of going bad, it occurred to me that, while the structure is open to air circulation at its lower part, it is encased at all sides and at the top. With no place for the rising air to escape the space is not kept fresh through ventilation and soon begins to rot. Lately I've bored some holes in each bay of the *Mary Day's* stern bulwark planking to correct this situation.

The spring is a good time to go over your topsides and other woodwork; then tell-tale signs, like discoloration or peeling paint, tell you there is trouble and that you should start digging around before the rot advances. When you find bad wood it's better to dig it out and do some large-scale dentistry than to delay the job until it becomes a full-scale operation. I dig out small chunks of rot here and there as long as the plank isn't seriously weakened by it, let the area dry out for a few days, squirt it with Cuprinol, and then patch it up with some roughly fit graving pieces and plenty of Bondo auto body putty. The idea of Bondo being used here may shock some people, but I've found it does a good job, is easy to mix up and hardens quickly. You smear on the Bondo, squash in the graving piece, and the Bondo penetrates the wood grain in all directions making a weathertight seal. I am not proud of doing something like that if it's just going to postpone the agony of a large repair job.

On the old *Stephen Tabor*, I was constantly being faced with the decision of how far to go with a repair. There was never a well-defined stopping place, other than that dictated by the available time; it certainly wasn't when I ran out of rotten wood. Occasionally I came across planking to be refastened which had started to rot from the inside out, and it was necessary to use carriage bolts with their heads standing proud on the hard outer surface of the plank. This trick has often seen me through one more season.

Perhaps these stop-gap measures are not ideal, but approaches like these are necessary to make an old vessel earn her way if she is in business.

Capt. R.D. (Pete) Culler

Maynard Bray: The next speaker has had a very significant influence on my life and on the direction Mystic Seaport has taken during the last half dozen years. In 1969 when I first started work there, the place needed all the help it could get - and so did I. The two people I turned to were Waldo Howland and Pete Culler, and neither of them ever let me down. I think probably Pete's reputation is pretty well known by the audience here, but I'll go over it briefly. He's a professional yacht captain who has maintained his own and other people's vessels for a number of years. He is a designer of yachts and workboats whose work is always admired. He is a boat builder with his own shop, and he's a ship builder as well. Everything he does seems to come out looking absolutely beautiful. I've got a great deal of respect for his philosophy of how to take care of boats and ships and that's why I asked him to come speak today. I'd like to introduce Pete Culler.

Capt. R.D. Culler: Thank you, Maynard, ladies and gentlemen. You notice I came up the hard way, not jumping up like the two previous speakers; I'm getting a little old for that. On the other hand, with a little age you get a little more insight. Maynard said he wanted me to talk about the nitty-gritty of maintenance. Maintenance of vessels that are making a living, vessels that are yachting, vessels in a museum - I've had a little exposure to all of it. I think there's a big difference between these situations.

You take a cruise schooner, a Maine schooner, of which there are thirteen or fourteen now operating. As Capt. Hawkins said, they operate four months of the year. That has a lot to do with not only their methods of upkeep, but how they age. I know something about that myself. I ran charter boats, similar in nature to the schooner only smaller, for a number of years.

You have museum type craft that are on exhibit. If they're small the museum is fortunate; they can be kept inside. As for the large vessels, nobody's been able to afford a ship house yet. It's obvious that these present problems you don't have in a vessel that works every day. Commander Martin pointed out that the millions of people tramping across his decks do things to them that would not happen to a ship at sea. There the decks would just not have to take that kind of beating.

Then you have the yacht that operates four months of the year, sometimes, especially in the past, owned by a very wealthy person. In the past, for a big yacht, the methods were different; I was exposed to some of that. The older people here may remember some of the great yachts of the past, like the great *Guinevere* and the *Hussar*. Some of them wore ship houses in the winter - beautifully built houses out of solid stuff that must have cost a fortune to erect and take down. The yachts even had stoves on their main decks, and all sorts of maintenance went on with the crew on half pay all winter. The crew didn't work very hard, and they were working under ideal conditions. There were no unions - one of the things we have now - and the boys were well paid in summer, so it paid to stay on and work for half pay in winter. The captain and the mate were there and they'd watch over things and keep it all going

along well. I've known some of those men. You can't imagine a wheelhouse that took four hours of brass polishing every morning when the vessel was in commission. They were great vessels, but they are gone now.

Then we get to the vessel that works every day the year round. Nowadays she's usually a motor vessel; that's something entirely different. Take a deep sea scalloper. Scalloping is a hard life. Her dredge is big; her top timbers suffer, and her top work takes an awful beating. A scalloper goes an awful long time as long as she isn't laid up. Lay her up one summer and her top work soon goes. Why? It loosens and leaks. It was mentioned earlier that fresh water causes the greatest damage to any vessel and that is, of course, what rots out the scalloper. When a vessel is sailing all the time, the sea water takes care of her even if the crew is careless. She gets dirty; the sea washes over and she's washed down. If the old man is a little fussy about the way the vessel looks, she is automatically taken care of. She also ventilates better while being used.

Lying in port. No cargo. Lying light. The crew is paid off and, at most, there is a caretaker. Because they can't afford to keep a full crew, she starts going downhill right away. A situation like this makes it difficult to do anything to keep a vessel from "going backwards," as the old timers used to say.

Even a museum piece is very difficult to keep up. It takes labor. It takes a crew, and it takes somebody who has experience to lead that crew.

The materials for good maintenance are simple. Pine tar is one, and it's still readily available. I don't see why "Old Ironsides' " synthetic rigging couldn't actually be tarred if the tar smell is wanted, and I think it would make it last longer even though it is synthetic. Synthetic nets nowadays are tarred because fishermen find it well worthwhile to keep the sun off them. Synthetics tend to harden with sun and age, so it still pays to use pine tar regardless of your material. Pine tar is even available inland at purveyors of animal husbandry materials, in other words, fellows who supply to farmers. It is used for livestock, under horses' hooves, in setting of pads and all that.

Earlier we were talking about mast coats. One of my methods is a solid mast coat of the old-time type made up of wooden wedges, caulked to make them watertight and kept well salted. I've had very good luck with that.

We're getting into the subject of salting these vessels. I think a lot of vessels built today should be salted. We won't go into the technical aspects of it now because it's a little complicated and I don't want to take too much time with it, but the use of salt was common in the old days. It is essential in a vessel like the new schooner *John F. Leavitt* being built at Thomaston because perhaps she's going to have days, weeks, and months when she won't get a cargo. She'll lay around and her topsides would dry out if she weren't salted. Unsalted, she might suddenly get a cargo, go to load it and begin to leak. A salted vessel would not do that; she can lay up for several months with a ship keeper aboard her

and can be loaded right away when she gets a cargo. That's something that's been forgotten. I've heard it said that salt rusts out the fastenings. Yes, it does. It takes about twenty-five years and at that time it's much cheaper to refasten than to re-wood.

We were talking about colors of paint. Commander Martin mentioned the problem of black paint not lasting. Capt. Hawkins mentioned that it might create circulation. I have my own feelings about it, but I will quote Capt. Nat Herreshoff who, I think, knew as much about it as anybody. What he said was, and I don't want it to reflect on any of the previous speakers, "There are two colors for a boat," (a "bot" he called it), "one is white and one is black, and only a damn fool would paint a boat black." Whether he was right or not I don't know.

Which brings us to ventilation. I agree that ventilation, especially in a commercial type vessel with a lot of timber in her, is the next most essential thing to preventing fresh water leaks. Perhaps some folks get carried away with the idea of ventilation in smaller boats. Sometimes they even want to leave out the ceiling. When these suggestions come up I tell them about Capt. Nat Herreshoff's day boats, like his little 12½ footers or Buzzards Bay 15 footers. They had watertight bulkheads, sometimes forward only or, if they were big enough, they had one aft too, with no way of getting into it and no way of draining it. You might say that's impossible; the boat won't last. Yet they did last, and there are a lot of them around yet. How do you explain it? Crosby's in Osterville, Massachusetts, used the same method in the old days. I've rebuilt on these boats. Their keels were gone, and this or that was gone, but never the bow compartments. What went on there? I think it was two things. Both in Capt. Nat's time and in the Crosby's time they had the most excellent of materials; there is no question about it. You take those boats apart and you'd find it was the very best. The other thing was, and this is hard to believe, they had no ventilation at all. It could be that very slight circulation of foul air is bad, but if you can make something completely tight, maybe it is okay. I don't know how to explain it completely, but it is interesting to know about.

When you salt a vessel as soon as it's built, you stop up the air passages that Capt. Hawkins mentioned. Without salt the air does circulate - I've tested it with smoke - but salt in the frame bays drips. It's interesting to note that the salt does not make a vessel damp. It tends to make it dry; this again is hard to understand. It was explained to me when I was a boy. My dad was a surgeon and, like a lot of medical men in those days, he had an office alongside his house. Distances were far and autos were poor, and that's the way a lot of them did. He had a little cabinet with some wicked looking instruments in it to open boils and other little things that you do in a doctor's office. In the bottom of that cabinet was an ordinary dish out of mama's kitchen with some salt in it. His instruments were all steel and they never rusted. The salt in the dish would turn to water, and then he'd throw it out and put some new in. It was taking the dampness out of the cabinet, and things did not rust in there. The same thing happens

with a vessel. I had a little vessel that was salted and I lived on her for many years. I kept books, clothes, everything - she was home. That proved it out; she was dry. I think one of the things we should consider now, especially in preservation of vessels around museums, is the use of salt.

As Maynard said, I've had considerable to do with Mystic Seaport. I saw the *Bowdoin* go to pot. Although it hurt me to do it, I had to write a report condemning her. I heard from Admiral MacMillan about it. He was brokenhearted. He couldn't talk over the phone; his wife had to do the talking. But it was so. Fresh water leaks and lack of ventilation got her. Now, as I think most of you know, Mystic has turned over a new leaf. Through Maynard's efforts, and those of some of the others there, they have a working shipyard. They've used a lot of my methods. They use pine tar; they use linseed oil, turpentine, some of the ochre colors. They are even using what the government said is bad for us, white and red lead - which, by the way, you can still get if you promise not to feed it to little children.

It all goes back to the simple ways. How many museums, besides Mystic, have geared up so they can wet the vessels down every day - especially in summer? We know in the dead of winter, especially a winter like the last, the water just turns to ice. You don't do it. It's not so important then, but if you can do it once in a while in winter, it helps. Up a river like the Kennebec or the Mystic, or any of the other places where ships are apt to be laid up, it is wicked hot some summer days. The Seaport has a nice little motor barge - it's named after you, is it not, Maynard? - equipped with a power pump and a brine-making device because Mystic River water isn't very salty up that far. I think one of the greatest improvements they've made there is to have a crew go around every day and wet those vessels down with salt water.

Something else I've suggested at Mystic, another cheap method, requires nothing more than work in the hot sun. A lot of those vessels have pitched seams in their decks. During the long winter it's cold and damp. Then we have a lot of fog and rain come spring, and then in summer you begin to see the decks shrink out. The pitch stays swelled out. It gets stepped on and all spread about, but that's not enough. I've suggested whittling out a hardwood butcher knife with a dull edged blade that is just about seam width. Then you sit yourself down on your fanny on the deck on a hot day and rub those seams back down. Rub the pitch back into the seams and any checks or cracks automatically close up. That was an old method they used down on Chesapeake Bay. It was considered boys' work. The captain would get his boy - or some neighbor's boy - by the scruff of the neck, take him out, whittle the sticks and tell him, "Now, sonny, we're going to rub down." Back when the old pungies and bugeyes were around, and they used pitch in their deck seams, this operation was done every year.

When those boats in the oyster trade were laid up in the summer, they kept all the hatches off and all the companionways open. They didn't seem to mind it raining in, and they had plenty of rain in the evening squalls in that part of the world. The water from the squalls would dry up, and they wanted that ventilation. They had somebody come

aboard, of course, to pump out when necessary. They were looked after much more, maybe, than we look after vessels now...

(Editor's note: The last few minutes of Capt. Culler's talk were not recorded.)

Most Important Steps in Vessel Care

Panel discussion in response to written questions from the floor. The panel was composed of Captains Culler and Hawkins. Commander Martin was unable to attend.

Maynard Bray: We've got a number of questions here. First I'd like to ask the panelists what they consider to be the five most important steps that should be taken to properly care for a vessel.

Capt. Hawkins: I guess we'll all agree that keeping fresh water out is number one. Ventilation may be number two. I said earlier I am convinced that putting a cover over the vessel in wintertime, which in my case is eight months out of twelve, is vitally important - provided that you paint the underside of the cover so that excessive heat doesn't cause more damage than the cover can offset. Inspecting every area of the hull and trying to visualize in what way the air could circulate through it should be high on the list. If you see there is no way that it can, then do something to facilitate the circulation of air. Keeping all cracks puttied and sealed to keep fresh water out is also important.

Capt. Culler: I think, without a doubt, keeping down fresh water leaks (you never get them all, you've got to figure it's a constant battle even keeping them to a minimum) and providing good ventilation are the first two steps. The next is, I think, cleanliness. Don't let dirt accumulate in corners or in pockets in the bilge; if you carry cargo and you've got to clean your hold out each time, make sure it's really clean. In other words let fresh air and ventilation do their work in the corners too. As for the cover, I agree it is a great thing for certain vessels. If you own just a small boat, as many of us do, and can get her inside a barn with a dirt floor, then a dust cover is all you need. If you have a small vessel or small boat outside in the winter, a nice fitting cover is the ideal thing. I prefer canvas to plastic because it doesn't sweat so much. However its cost is pretty terrific now and when you get into vessels like "Old Ironsides" or the *Morgan* or the *Dunton* or have a fleet of very big vessels like those at the South Street Seaport in New York, covers become sort of impractical. Also a cover might spoil the effect of a vessel on exhibit. They used to lay up warships with very stout wooden covers, but I am not sure that is a good idea because often those covers develop leaks and you spend much of your time maintaining the cover.

For the vessel up around 150 feet or more where a cover may not be practical, I think a routine should be figured out to protect it in other ways. From your mastheads to your keel, you should go over your

vessel in detail and inspect everything. Vessels that leave their fidded spars on end - that is, t'gallants royals, topmasts, whatever - would probably do well to send them down now and then, if only to let air into the tops, into the doublings. Sometimes I've noticed birds nesting in the tops of laid up vessels. If masts in unattended vessels are not properly taken care of - painted and slushed - woodpeckers move in. It's no joke!

Salting a Vessel

Maynard Bray: There seem to be more questions on the subject of salting than any other; maybe we should discuss that a little bit. One person asks, "How much salt do you need, and how often should the application be repeated?" Another asks, "How do you go about salting a mast where it passes through the deck? How do you pack salt around the mast wedges? How is salt used? Is it put in bilges? How often must you use it?"

Capt. Culler: I think most of you know how a big vessel was built. From 40 feet up, they were usually sawed frame. In between the room taken up by these big frames are spaces; salt goes into these, from a little above the waterline up to the sheer. While she's in frame, and before she's planked or ceiled, pieces of wood called "salt stops" are put in these spaces. They are not nailed in as the salt would soon corrode the nails and the whole thing would fall out. Instead, the frames are scored like the bottoms of the staves of a barrel where its head goes in, which I'm sure you're all familiar with. The salt stops - shelves really- are built to fit these scores in the frames. They are beveled top and bottom on each end so as to come to a point and driven in between the frames. On the quarters and up around the last cant frames forward there are no stops. Because the frames die out against the transom or against the stem or knightheads, stops are not needed there and the salt is run in so it fills the whole space. Once the vessel is ceiled and planked each space, or bay, between the frames - still open at the top because there is no waterway or covering board on them yet - is filled with salt. The time to do this is just before the covering board goes on; it's easier then than afterwards. You get the bags of salt up on the staging and pour the salt into the bays. How much does it take? A 40 foot boat, a cruising type of schooner, will take maybe a ton. A larger vessel will take lots more - five or even ten tons for a big one. For the *John F. Leavitt* now building at Thomaston, I haven't estimated the salt capacity; it's going to be a lot.

Somebody asked how long a salting like this lasts. It's going to settle after it picks up moisture, and it trickles down along the frames and planking. Way aft in the stern they often make special salt boxes because, as Capt. Hawkins said, the stern is a vulnerable spot. Up around the knightheads there are often special provisions made to get some salt in around that area. How long all that salt will last depends on how tight the vessel is, how much time she spends laid up, how much at sea. When the salt settles some, the thing to do is get in there with a can and bags of salt and top the boxes off again. I had a little vessel which I used to have to top off every five to seven years and she gave no trouble. Salting helps but it is not a cure-all. It is not going to get to your top timbers very well or up in other high places of your rail. You still have to keep after leaks.

Mast Coats and the Use of Salt

Somebody wanted to know about salting around the mast. If you're going to use salt, the mast wedges should be tight rather than spaced. I agree with Capt. Hawkins that if you don't salt mast wedges, space between them is a great advantage. If you salt they should fit reasonably tight, although they don't have to be watertight because they're going to be covered with a mast coat. I used to screw a wooden collar on deck, clear of the mast wedges which were trimmed off a little above the deck. A nice fitting canvas mast coat was made. The whole area inside the wooden collar was packed with salt, mounded up against the mast. The collar was slit and sewed on. To secure the coat to the mast I used to use a lead flashing. Sometimes a lashing of marline is used for the big mast. I think a lead flashing is all right except for small masts where the tacks used to fasten it make a very fragile point. Once secure to the mast, the coat was pulled down over the wooden collar and another lead strip was run around it and tacked in place. The salt here always seemed to last as long as the mast coat which would eventually deteriorate. If somebody accidentally punched a hole in the coat it had to be replaced, and you would replace the salt at the same time. That salt, of course, would trickle all the way down to the heel of the mast in time, but we also used to put some around the heels too - even though it was going to corrode the iron bands there. We would also put it under the heel if the mast was in a new vessel. The main thing we wanted to preserve was the stick itself because oftentimes the mast is fairly green when it's first put in the vessel. A really thick timber like a mast or a great keel always goes in a vessel semi-green so salt down under its heel was figured as beneficial.

Question from the floor: The English custom with coastal schooners when they were building them a few years ago was that every shipyard had a great big pool of salt, not just sea water, but salt-saturated water. In this place known as the "pickle pond" they used to put mast hoops, the keels, and other timbers. They laid there for years before they went aboard ship. The timbers themselves were salted this way before the days of rock salt. Was this ever the custom in America?

Capt. Culler: I think on this coast they tended to use a fresh water pond. Many of the saw mills were around ponds, partly for the water power, but they put the timber in there too. I've worked on spars from the West Coast that were fresh from a timber pond in Brooklyn, New York. That water must have been something like Gowanus Canal or some semi-salt and sewage water, judging from the smell, but that was the only objection I ever found. A salt-soaked stick gives you a lot of trouble when you are going to paint it because you have trouble making paint stay on forever after. If it's been soaked in fresh water, which just excludes the air and prevents decay until the time it's sawed, it will dry out and you can get a good paint job. I think one reason they avoided salt in this country was that the way they used paint might have been different from the English way.

Wood Preservatives

Maynard Bray: The next subject that seems to be of interest is wood preservatives. Someone asks how linseed oil compares with Cuprinol. Another asks if perhaps all kinds of wood preservatives aren't bad

because they lock the moisture inside the wood. Another person asks whether the panel feels that wood preservatives are prime factors in preventing rot.

Capt. Hawkins: I don't think there is any question that Cuprinol - I haven't had any experience with Penta but I suppose it's pretty much the same thing - is effective in preventing decay. I've been told that Cuprinol has a tendency to seal surfaces where Penta doesn't, so Cuprionl may have the advantage in that it takes paint better than the Penta.

This spring I've been doing little odds and ends of repair jobs on the *Mary Day*. One of the most alarming was repairing the deck in front of the steering wheel where fresh water dripping off the steering wheel shaft coupling had rotted two main deck beams almost half way through. As I dug out this rotten wood I came to the top of the sternpost which I clearly remember having saturated with Cuprinol when the vessel was being built. The main sternpost is an essential structural member and would have been expensive to repair. As it turned out it was not rotted at all, although everything around it was. This proved conclusively to me that the Cuprinol which I had put into the end grain of that sternpost was very effective.

Another trick that I like to do in any repair is to bore holes into the remaining wood and fill them with Cuprinol. When you dig out rotten wood you are going to have to stop somewhere. When you are reasonably satisfied you're getting out shavings instead of mush, bore holes further into those structural members and take an oil can and fill the holes with Cuprinol so that it has a chance to penetrate. It doesn't do much good to coat Cuprinol on the outside of a frame because it doesn't penetrate more than perhaps 1/16 or 1/32 of an inch unless there is some kind of seasoning crack there. But if you can bore a hole into a timber - or numerous holes (you can spare the strength, usually most timbers in a vessel are much larger than they need to be) - this will allow the Cuprinol to penetrate lengthwise into the end grain.

Capt. Culler: Most timbers are larger than they need to be; that's correct. The great Palmer fleet of white schooners, the four and five masters, were very heavily constructed. Why? To allow for decay. That's something we must allow for, you just can't stop it altogether. I think Cuprinol is very effective; the Penta I don't know so much about. I think most of these products use kerosene or mineral spirits as a vehicle which makes them very penetrating. I think kerosene by itself does a good job. If your money is short and you've got plenty of kerosene, don't worry about spilling it around on the wood; it doesn't do it any harm. If it has some other preservative mixed in, so much the better. I think we don't realize in this country how old Cuprinol is. Apparently it's been used in Europe, especially in the north countries, for many, many years, long before we began to use it. Since it has stood the test of time it must be effective.

Linseed oil has some advantages, but there are times and places where it could be a disadvantage. I notice that once in a while - and I don't know whether it's the location, the wood, or the oil (as the oil does vary a little bit from time to time) - it wants to mildew. It is a vegetable product and subject to mildew sometimes, which isn't good

At other times linseed oil seems to be fine. Some of the old boat builders insisted on every piece that went in the boat being oiled. In England I understand they used whale oil. It's said around New Bedford that one reason whalers lasted so well was that they were soaked in whale oil. That may be part of it, but I think it was more because they were owned by careful men, most of them Quakers who tend not to waste. They take care of their vessels. I know because I've worked for them.

There are other preservatives. Some of them, I think, may be detrimental to your health if you use them in large quantities - something to be taken into consideration. Some contained mercury compounds which are outlawed now and, although they were very good, they were also very dangerous. Such things as that I don't know whether it's good to use or not. They were certainly effective.

There is something fairly new called "Git Rot" or some such thing. You bleed it into rotten wood and it's supposed to turn the wood solid again. From what I've seen of it, it doesn't work very well. I would think that by sticking to the tried and true preservatives and things that are a barrier to moisture, like paint, you can't go wrong. They're none of them perfect. I would like to make one last observation which, like a lot of the opinions of famous men, will leave you as dumbfounded as you were before. Capt. Nat Herreshoff, a famous builder, said that every piece of wood that went into a boat or vessel should be coated. I think he used red lead. George Lawley, who built equally fine vessels that lasted just as well, said to coat only one side because the wood has to breathe. I don't know the answer.

Surface Coatings, Caulking and Paying of Seams

Maynard Bray: There are several right and successful ways of doing the same thing; we are listening to a number of them here today. The discussion of salt versus ventilation can go on forever, and there have been successful vessels built using both concepts. The next area that seems to be of interest is that of surface coatings. Everyone seems to want to know about linseed oil, caulking and painting compounds and bedding compounds and fillers. I guess probably a free-for-all discussion on surface coatings would be the best way to handle it. Each panelist can talk about his favorites and where they should be used.

Capt. Hawkins: I think we're still searching for a good seam compound. Boat Life is probably the most satisfactory thing I've found so far, but it certainly is not a cure-all and it won't stick to wet wood. Nothing that I know of will stick to wet wood. Lately I've been thinking that solving the problem of maintaining seams may have to begin before getting around to using seam compounds. That is, after the vessel is caulked with cotton, thoroughly saturate that caulking cotton with Cuprinol before the water has a chance to get to it. I think the biggest problem with seams is the fact that caulking cotton never dries out once it gets wet. As long as it's wet it's going to freeze in the winter, and when it freezes it pushes the seam compound out. Whatever product you use to replace the compound doesn't stick because the seam is still wet

from the cotton. So maybe we ought to think about saturating the caulking cotton with Cuprinol before the first rain storm wets it, then putting some oakum on top of that. Then maybe you'll have better luck with keeping the seam compound where it belongs.

Maynard Bray: I am now replacing a stem for the Brooklin Boat Yard on a boat that is about twelve or fifteen years old. Her whole stem had rotted due to water-saturated cotton. Pete, do you want to comment on filler and surface coatings? I'd like to know about deck coatings such as oil and paint, and someone has also asked about pickling the decks with brine.

Capt. Culler: We'll discuss the decks and, of course, the fillers that go in them. Bright decks, or bare decks, are very nice but take an awful lot of maintenance. Fancy boats have teak decks. I have various reasons why I don't care for teak decks on most boats. One is that teak is heavy and, if used for a deck, you're putting weight up high. I think the East India Company - which owned most of the teak in India - showed some sense when it built a vessel out of it. But it's sort of unnatural to use it now, particularly where its cost is so high.

Oil works fine on decks in certain latitudes (if you take care of it), but bear in mind that it gets scarred. It takes a lot of scrubbing to keep it up, and you've got to keep it fairly light-colored or it gets so black that it absorbs a lot of heat, and when that happens it's going to draw open. There are objections to painted decks, but one of the advantages of a light-colored one, I think, is its reflection of heat. I've known people in the South who have had white decks; they reflected wonderfully and murdered your eyes - but the principle was good. In Chesapeake Bay in the old days there were a lot of light, seasick green decks. They looked sort of horrible but they stayed cool. If you were to paint a bunch of panels light gray, light green, light blue, light buff, and put them all out in the sun, the light green would stay the coolest. They knew what they were doing.

As far as filling the seams, I think that what Capt. Hawkins has said about keeping the cotton dry is essential. I've tried various methods and have found that none is perfect. I've come to the conclusion that nothing lasts forever. I've tried the soaking technique with linseed oil back when linseed oil was cheap. I've soaked the cotton till it could not possibly take any more, in fact it was showing oil through on the undersides, but I couldn't see that it helped much more than using the old time seam brush with red lead on the cotton which has been standard in boat yards for many years. There again you find what works in one place, like Maine or Massachusetts, may have to be changed some for Chesapeake Bay or the Gulf Coast. I found that out the hard way.

When I first started building boats we used an awful lot of linseed oil, mostly to prevent checking, but it was thought of as a preservative too. I didn't know whether it was or not and stand unconvinced to this day. When I got to building in Massachusetts, we found that linseed oil did not prevent checking as well as red lead did. To this day I've used red lead in my own shop. On small boats I find it prevents checking,

especially on oak, better than any oil that I've ever tried. I don't really know why. Now in another part of the world it may not work.

Maynard mentioned tallow and white lead. Well, there's a great filler for cracks, especially when a vessel is being built and the wood dries and checks some. After she's built, if there are checks in the rail, or in another piece of timber, tallow and white lead is good there. It's no good in a vertical check in the mast because the angle is such that it runs out. But it has a tendency to bottom out in a horizontal crack, which is just what you want. It goes to the bottom of things and it can be flushed off and painted over later, and I think it's one of the very best things to use in the construction of a wooden vessel. You can't help getting checks in the big timbers of any wooden vessel when you build her (if she's any size at all), and sometimes you even have them in small boats.

For checks in the mast, all we used to use was Masteline which was rubbed into checks to fill them. When the mast was being built on the ground, I would take a can with a bent spout and turn the mast so that the checks were facing upward and squirt them full of linseed oil, then I put a board over them so the rain didn't get in. I would turn the mast around a few days later and pour some oil in another check. But when the mast was once upright in the vessel all we used was Masteline. Today I would use what we call industrial Vaseline. It's available at farm suppliers for treatment of animals. Spray painters also use a lot of it on their hands and faces before they start spraying so they'll clean up easier afterwards. It still seems to be about as good as anything on masts that are going to be slushed. I understand that in Mystic they have colored theirs up a little bit, taken the Vaseline and added something to it. It looks very nice and seems to do the job.

As far as the store-bought seam compound goes, I think what you buy depends, to some extent, on the amount you're going to use or the size of the vessel. If you're going to use some of this stuff in large quantities, it gets very, very expensive. For small craft I've found that Dolphinite 2005 - which has been around at least since World War II - is quite effective for bedding compound. It also makes a good seam compound where you need a very soft filler for a certain seam. International #31 is a good seam compound; I use it all the time for small boat building. As I said earlier, for big vessels this stuff can get too expensive, and you go to something else. Pine tar and whiting makes an awful nice bottom putty, and there is nothing wrong with that at all. Black asphalt shingle stickum is another wonderful underwater seam compound, and it will come as near as anything will to sticking to a wet seam. Unfortunately, above water it doesn't take kindly to being painted over, at least not for a long time, as the black asphalt tends to bleed through the paint. However, for underwater use it's cheap and it can't be beat. In the old days I saw old vessels on which spending a lot of money for seam fillers couldn't be justified. Ordinary beef tallow and lime were used; mixed together and heated, they made a cheap filler. The vessel was going to have to be recaulked and tinkered with every time she was hauled out,

so there wasn't much sense in putting anything expensive in. Down South they used copper paint mixed with Portland Cement - of all things - for bottom seams in big vessels, and it seemed to be quite effective, especially against worms. It was one thing the worms couldn't gnaw on, and it was cheap. I've since tried it with some of the new copper paints but found it doesn't work as well. The new copper paints are quite different from the old ones which seemed to be mostly creosote and pine tar. I've also seen patch work on old vessels that was just Portland Cement and linseed oil. You have to be careful how you mix it; don't get it too thin, and don't nail a board over it till it sets because it tends to sag out. There were always methods around for patching old vessels.

Not long ago I got a call from a fellow who had restored a schooner down South. He asked about pitching the bottom seams and said he could get green pitch. I said, "That's just the thing! You know how it goes in?" He thought he did. We talked some and I learned that it's available from some outfit in Brooklyn. It takes a little skill to put it in, but it's a good thing for bottom seams and it's not too expensive.

On large decks use ordinary black pitch, run in hot. With it you've got to figure on the climate it's going to be used in. Around where I live - New Bedford and Cape Cod area - we temper it a little bit with pine tar; otherwise it's too hard and gets brittle in the winter. You can't temper it as much in southern climates or it will be too runny. Just how much you would temper it around Maine, I wouldn't know. I would say not too much different from the way we do it in Massachusetts, but still you would have to learn to handle it. All those old tried and true compounds and glues are still comparatively cheap, and if you are doing a big vessel you've got to consider the cost. As far as what's good and what's bad for big vessels, I don't think we've come ahead much over what the old timers used. I really don't.

Treatment of Decks

Maynard Bray: There is one subject that I'd like to have both of these gentlemen touch on and that's the treatment of wood decks.

Capt. Hawkins: The *Mary Day* has a deck covered with fiberglass. It's made of 2" x 4" cedar, sprung to follow the curve of the waterways, and covered with fiberglass. I'll never live it down, but it's easy to keep clean and it hasn't been unsatisfactory. I got tired of patching some of the cracks in the fiberglass after a while, so I started treating it like a wooden deck, just puttying and painting it, but the day of reckoning has come and we are having to go back again and remove the paint and patch the cracks with fiberglass. I realize maintaining a wooden deck is out of my area - I've no experience at all - so I'll let Pete take care of that.

Maynard Bray to Hawkins: Can I ask you this - if you were going to build another vessel would you do the same thing?

Capt. Hawkins: Well, I think the fiberglass deck on the *Mary Day* hasn't given any more trouble than a comparable wooden deck would have. It's certainly a lot easier to keep clean, and for a passenger-carrying vessel I think it's hard to beat. There is no problem at all in painting over fiberglass either. Polyester resin or any kind of self-respecting paint

will stick to it. There is no moisture coming up through it so you don't have any peeling; I have no blistering or peeling of any kind on the fiberglass deck. But a fiberglass covered deck is hard on the feet. Even though the cedar under it is a fairly soft wood, once a layer of fiberglass is put on top of this cedar you might as well be walking on a cement pavement. I spend a lot of my time sitting down so my feet won't get tired, and I put my sneakers on for half an hour and take them off for half an hour. To get back to your question: My sentiments now, perhaps due to the influence of my two boys, have turned in the direction of the traditional. Even though a pine deck with its pitched seams and linseed oil/turpentine treatment isn't ideal for carrying passengers, I think I might sacrifice the condition of their clothing in order to get back to a traditional deck. I would go back to a wooden deck next time but I can't say it's any better, or any more trouble-free, in the long run.

Maynard Bray: What would you coat a traditional deck with? Paint? Oil?

Capt. Hawkins: I would not consider painting a deck. I've seen too much trouble with painted decks in the existing windjammers. I would certainly use linseed oil and turpentine. You can slobber it on in great quantities any time you want to. It will obliterate any crack you can find. With a painted deck you don't get that kind of penetration. The paint will disappear probably a 1/16 of an inch below the first crack and you still have a crack below that.

Maynard Bray: Maybe Pete will comment on the surface coatings for decks. The reason I am so interested in this is that I've heard a lot about a pickled deck - that is, one given nothing but a brine washdown about once or twice a day depending on the time of year. The crew on *Clearwater* started using this about a year ago, just after her repair in Stonington, and I think it's been fairly successful. That's the only experience I've had with it, but I'm sure you've seen other vessels that have had that treatment. It's something one certainly has to do on an almost daily basis, but it may have some advantages. If the deck leaks, at least it's brine that goes through the leak and not fresh water.

Capt. Culler: Brine treatment was the old way of doing it when vessels had white pine decks. Capt. Nat Herreshoff was a great believer in it. It was beautiful and it was customary when there were big paid crews and a paid captain - the whole works. At five o'clock in the morning you'd hear "Ki-Yi" brooms going. In case you don't know what a "Ki-Yi" broom is, it looks like a witch's broom; they also used to call them deck brooms. I don't know where they got the name "Ki-Yi." From five to five-thirty in the morning you could hear the brooms going back and forth. They did make a sound like "Ki-Yi, Ki-Yi, Ki-Yi." Then they were sluiced down with salt water, then the fresh. Then, of course, the sun came out and when they dried they were a very light yellow. Then the bright work was chamoised over. But for passenger-carrying boats, all that may not be practical.

I think if anybody is considering building a vessel for whatever trade, and we're speaking now of wooden vessels, he's got to figure right away on costs. But he should not stint on his deck. A good deck prevents most of the fresh water leaks. He should have his deck thick. When I

design a boat or a vessel, I prefer to design my deck so that the deck planking is square. I always get some jazz that she's going to cost a lot to lay because there are so many more fastenings to drive in. I agree. On the other hand, no matter how the stuff is sawn, you're going to have four sides to pick from, usually two of them with fairly good edge grain, to become the top and bottom surfaces. Besides that the narrower planks will each shrink less.

Now this may sound foolish, but the day your contract is signed for your new boat, the builders ought to start sawing the deck and stacking it. Don't plane it; just saw it, stack it, and stick it. Try to get it as dry as possible. When the wood is to be used is the time to plane it and lay it out. This gives you another good start on a tight deck. By all means employ a professional caulker. A new deck is no place for a fellow who's learning the trade. Have your deck thick, thicker than you need. It's usually white pine so it's light weight, and a thick deck is good insulation against both heat and cold.

So now you've got your deck on the vessel. It's caulked and all, and you have to decide how you are going to finish it. With crews living aboard, I've kept linseed oil treated decks in good shape even in summer, but they were religiously scrubbed down every morning and wet down again every night - just as Maynard says the *Clearwater's* doing. That works fine. We didn't care whether the oil wore off the deck or not in summer. If it wore off the surface the deck was not taking any harm. She was getting wet down almost like a fishing boat. We did run into some opposition at night when we were chartering the boat to people who like to sit out and goggle at the moon; they didn't like the wet deck. Fortunately we had canvas covered houses, so we said, "You sit on top of the houses; the deck gets wet down - period. It's an old sea tradition." It kept the vessel tight around her top timbers, her pawl posts, the edges of her house and all those places where trouble develops.

If I were to do it again I would go to a light-colored, painted deck. As much as I like an oiled deck, it's simply too hot, too long in my part of the world for an oiled deck to be very successful. It depends a lot on the latitude you're going to work in. Here in Maine, I think a linseed oil and turpentine deck is fine as long as you keep at it. Further south, from the Middle Atlantic States down into Florida, I think a painted deck is needed. Don't use what most people use for deck paint - not what says "deck paint" on the can. It's full of varnish; it's high gloss. It will build up and chip off and crack. I use what I call oil-base house paint. It's neither glossy nor flat, and will lose what gloss it has in a little while. If it wears off it doesn't matter as long as the vessel is working. When she stops work, then the coating wants to be repaired. If you're going to use paint, you can't use pitch in the seams because it bleeds through. If you're going to oil the deck, pitch is okay. Or, if you don't like pitch, you can do something that was done in the past. When the seams were primed after caulking, they were heavily red leaded or painted with some other favorite paint. While the vessel was being fitted out nothing was ever used but more paint; on a dry day a fellow would be down on his knees with a little pouring can filling them right up. It's awful messy, but when the vessel was all fitted out and they were done dropping tar from aloft, you got some fellows with good strong backs

and had them push the big deck scrapers. I tell you it was arduous work; but when you were done, by golly, it was a handsome job. I remember years ago at City Island there was a professional deck scraping outfit. They were mostly from the north countries, Swedes and Norwegians. A lot of the fellows that weren't from that part of the world used to make fun of them. They'd say they were all shoulders and bone heads because scraping decks is the most difficult and trying work in the world. They'd scrape those pine decks every year. The whole harbor would be covered with fine fuzz, the shavings, but the decks were beautiful after that. For working craft, for party boats and all we didn't go in for that sort of thing.

I'd say you've got to treat your decks according to the material you use and the climate you tend to operate in. A museum has got to treat the decks of its vessels as they were when the decks were in service, and that sometimes puts them at a disadvantage. I think some of the decks that are oiled or bare in Mystic are historically proper and I wouldn't want to see them changed. As far as maintenance goes I think they would do better if they were painted a light color, but it would spoil the effect.

Maynard Bray: We've probably kept people long enough. So I would like to thank the participants. Thank you all for bearing with us. I hope there will be some benefits from the remarks heard here today.

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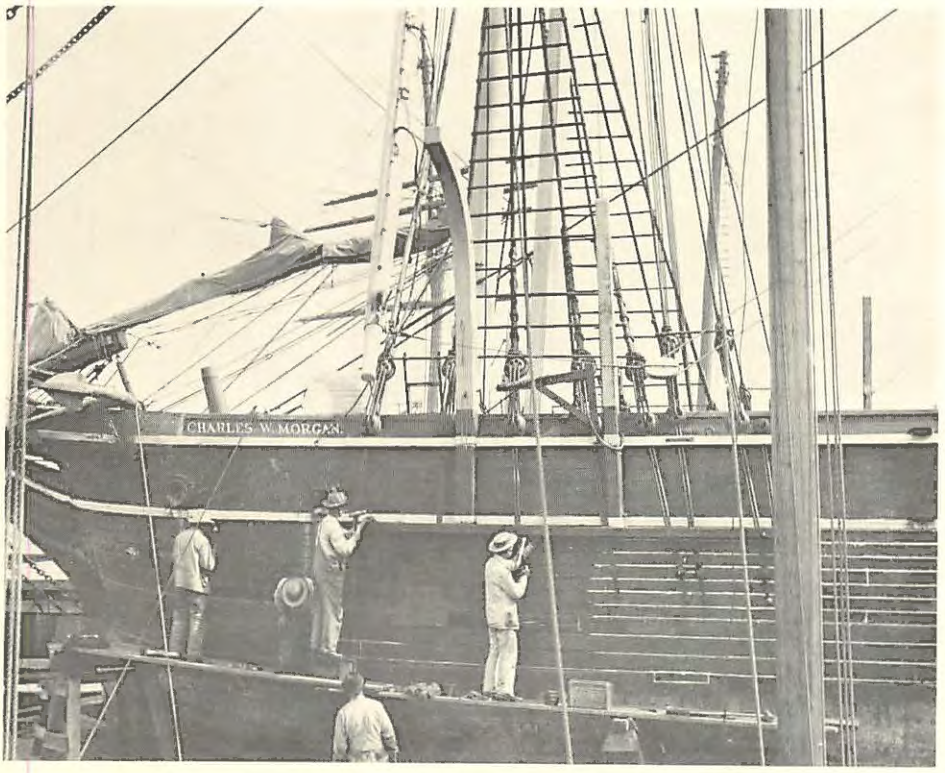

Caulkers at work on topside seams of the whaling bark *Charles W. Morgan* at New Bedford, Massachusetts, June 1906.
(photo courtesy of Kendall Whaling Museum)

BIOGRAPHICAL INFORMATION ON THE SPEAKERS

Maynard Bray is a well-known authority on ship preservation, formerly in charge of Mystic Seaport's Ship Preservation Facility. Mr. Bray is now a private consultant. He was in charge of the repair of the Hudson River Sloop *Clearwater* which was done in Stonington, Maine in the winter of 1975-76.

Capt. R.D. Culler combines his successful career as a designer and boat builder with a well-deserved reputation as a first class historian of traditional vessels. Pete Culler is the author of Skiffs and Schooners and one of his latest designs, the 95' schooner *John F. Leavitt* is being built in Thomaston, Maine.

Capt. Havilah S. Hawkins is skipper and owner of the windjammer *Mary Day*, an 80' schooner which he designed himself. *Mary Day* was the first of a series of replicas built over the years by Harvey Gamage. "Buds" Hawkins has been in the cruise trade nearly thirty years. His previous vessels included the *Alice S. Wentworth* and the *Stephen Tabor*.

Cdr. Tyrone G. Martin, USN, is commanding officer of the Navy's oldest ship, the *U.S.S. Constitution*.

Clearwater: How to Take Care of Her

Prepared for Hudson River Sloop
Clearwater, Inc.

By Maynard Bray

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ACKNOWLEDGMENTS

Two people from whom I have learned a great deal about caring for a wooden vessel are Mr. Waldo Howland, chairman of the Ships Committee at Mystic Seaport and former owner of the Concordia Boatyard, and Capt. R.D. (Pete) Culler who has worked with and on wooden boats most of his life and has recently written a book on his experiences and viewpoints, Skiffs and Schooners, published by International Marine Publishing Co., Camden, Maine.

Captains Robert S. Douglas and Havilah S. Hawkins, of the schooners *Shenendoah* and *Mary Day* respectively, were both very helpful in preparing this manual. Their vessels, built by Harvey Gamage of about the same materials as *Clearwater*, have been well maintained, thus avoiding the major repair work documented here.

Clearwater: How to take care of her

1. What happens if you don't

In 1969, it cost$160,000 to have *Clearwater* built. Only seven years later she was found to be so extensively rotted that it took about half her original building cost to put her back in reasonably good condition. Even then the needed work could not all be done because there wasn't time. For the next several winters it will have to be picked away at.

Her appalling condition after such a short time can be blamed on several things, but lack of care has been one of the major causes, and at this point is about the only factor over which we have any control.

The photos in the appendix tell the story of what was done to *Clearwater* during the winter of 1975-76 and of how the affected pieces looked before they were ripped out and renewed. It was a costly and bitter experience, and one of its chief lessons was that routine maintenance is vital.

2. The most important things to remember

*Fresh air is good, but fresh water is bad.
*A clean vessel is good.
*Bare wood, exposed to the weather, is bad.
*Daily maintenance is better than weekly, is better than monthly, is better than yearly, etc.
*Common sense and a practical approach are every bit as necessary as brute strength and ambition. People with both are what *Clearwater* really needs.
*Wood is organic, and like a human it needs its share of understanding and attention. No two pieces of it are exactly alike.

3. The kinds of woods in *Clearwater*

Her hull was built of native (Maine) red oak and western (Douglas) fir. The 1975-76 repairs were made with white oak and long leaf yellow pine, both of which are known for their longevity. She is decked with eastern white pine and is sparred with sticks of western fir. Although there are exceptions, chances are that any piece of wood you point to will be red or white oak, white or yellow pine, or western fir.

Oak is strongest and holds fastenings well so it is used for *Clearwater's* backbone and framing. It will also bend easily if steamed, so the planking near the bow is of oak. Both fir and yellow pine come in long lengths and wide widths and are used for planking and ceiling (inner planking). White pine doesn't shrink and swell as much as many other woods and it is available at a reasonable cost, so most vessels built in New England are decked with it.

My experience has been that on this coast western fir rots very quickly and that our native oak is about as bad. Of course if they are kept dry or saturated with water so the rot fungi either dehydrate or

drown, they last quite well. Obtaining these conditions is part of what ship maintenance is all about, but before getting into that, let's look at what makes wood rot.

4. Why wood rots

"All forms of decay and many kinds of stains as well, are caused by primitive plants called fungi that grow in the wood."[1]

These fungi may be easier to understand if we look at things from their point of view. Wood is both a home and food for them. They like to work when the wood is moist, but if it is saturated with water they can't get enough oxygen to keep going. If it is cold fungi don't move very fast, and below freezing they become inactive altogether. On the other hand, when they get warmed up they get quite turned on, and the process of deterioration, like almost any natural action, is speeded up.

The fungi are much more enthusiastic about eating spruce than yellow pine. Their appetite varies greatly depending on the kind of wood. With its high sugar content the sapwood, or outer part, of any tree appeals more than the inert heartwood inside it. (Old growth longleaf yellow pine has a large proportion of heartwood and this, as much as anything, makes it so durable. The expression "heart pine" is often used in connection with the heartwood or durable part of yellow pine timber.)

One thing the fungi can't abide is dry wood (moisture content below 20%) or wood which has been saturated with "killer" preservatives. But they have found that if they stay in the center part of moist timbers, or near a joint between two pieces of wood which leaks, they can live pretty much without fear. They hate salt water and so usually don't set up housekeeping on fishing vessels which are almost constantly saturated with it.

They take great joy in living inside the pores of a red oak timber for these are unobstructed longitudinal tubes which will carry any life-giving moisture entering the end grain of the timber all along its length. These tubes are plugged up with tyloses in a white oak and fungi don't feel so much at home there.

One way to kill rot fungi is to season or otherwise dry the wood before it is used, thus starving them of moisture and other nutrients which are present in green wood. While this is practical in small or thin pieces, it becomes prohibitive with wood which is over 2" or 3" thick. Air drying takes about a year for each inch of thickness, and kiln drying is too expensive for most shipbuilders to engage in. Pasteurization with steam has been done occasionally but not as a rule. Therefore it is customary for most shipbuilders to use green wood, except for the decking, and *Clearwater* was no exception. Because of the incipient rot present in some of this unseasoned timber, there is a greater risk of decay in a large vessel than in a small boat.

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[1] Wood: A Manual for its Use as a Shipbuilding Material, Volume I, Navships 250-336), Department of the Navy, Bureau of Ships, 1957.

Mechanical defects, such as knots, cracks, checks, and shakes, not only weaken the wood, but are also good places for rot to get a toehold. They are to be avoided whenever possible, and in putting *Clearwater* together this has been considered - probably to a greater degree than is apparent when one looks at her. Numbers of pieces were rejected during the re-building and I'm sure the same thing happened when she was originally built. No piece of wood is ever perfect; it's a case of picking the best of what you have available for the job at hand.

There has been much written on the subject of decay in wood. One of the best references (see footnote on page 32) was prepared by the U.S. Navy in cooperation with the Forest Products Laboratory back in the 1950's when wooden ships were being built for the Korean War. Unfortunately none of the four volumes are now in print, but if you can get hold of this work it is worth reading. Remember that the recommendations in this and other publications, while excellent in terms of preventing decay, are often impractical for individuals and small organizations with limited funds and a time schedule to meet.

5. The swelling and shrinking of wood

When wood dries, it shrinks. This action first takes place when green wood starts to season, but a seasoned piece will even "come and go" with changes in its surrounding humidity. So what? Well, for one thing this means that the new wood in *Clearwater*, being green, will shrink some in drying. Joints that were once tightly fitted may open up. Wood surfaces may check and crack a little due to uneven drying, and considerable warping may take place since wood shrinks more in certain directions than it does in others. This is all part of the organic nature of wood, and being able to predict what it will do is necessary to one's understanding of it.

Ideally one should build from wood whose moisture content is already at equilibrium with its future environment in the vessel, i.e. decking should be dry, bottom planking wet, etc. But that is rarely practical, and while a vessel is settling into her surroundings, it is important that her crew keep an eye out for swelling and shrinking and take action to minimize its effects.

Just what does this mean? Let's take an example: The rail stanchions will shrink as they dry and the joints around their bases where they pass through the covering board will open up and start to leak. Chances are that the white pine wedges which were originally driven around the four sides of each stanchion to keep them watertight are loose. It may be possible to drive them down enough to stop the leaking, but it may be necessary to replace them altogether with new and larger ones. Sometimes running hot pitch around the base of each one will do the trick.

Railcaps might be another good example because as they dry out and shrink faster on the top than they do on the bottom, they usually cup, or curl, upwards so that the water can't run off. Seasoning cracks and checks on the surface only make matters worse as the trapped water will run

down into them and create a wonderful home for a new family of fungi. Corrective action in this case would probably be to plane down the top surfaces of the railcaps so they are flat, or even a little convex, fill all the checks with a tallow and white lead mixture (which doesn't dry and crack like putty) and prime and paint the bare wood to prevent further drying - or at least to make it take place more evenly.

Some checking will take place in timbers, such as deck beams, during the time they are seasoning. This should be of little concern since water can't get in and start rot. The checks which develop in masts are an example of this non-harmful seasoning; all but those near the deck, that is, for here they should be stopwatered so water can't get below. But more on this in the section on stopwaters.

There is an old saying that wood will last seven years or seventy.* Much of this has to do with the shrinking of the vessel's wooden timbers while they are seasoning and the resulting entrance of water. *Clearwater's* problems were largely caused by this, and it must not be allowed to happen with the recently renewed pieces.

6. Keeping the decks tight

Wood which has been moistened with fresh water always decays faster than that which has been kept dry. If the rain, dew, snow or river spray which falls on the deck is allowed to leak through seams, joints or checks in the wood where it can dampen the wood fibers for a time, rot almost always results - thus the need for tight decks.

It is rare that a deck doesn't leak somewhere. So the first thing to do is to find out where and to mark these locations. Whenever it rains, someone should make a run through the vessel and look for leaks. Deck seams aren't the only places where water gets in; penetrations, such as rail stanchions, the pawl post and the mast coat are often letting water get in. Then there are sills, hatch coamings and skylights. Unavoidably some water will come down through the companionways and hatches with the comings and goings of passengers and crew.

When the weather changes and the sun comes out, these leaks should be attended to. How you go about it depends to some extent on where the leak is. Caulking is maybe the first thing that comes to mind, but it is not always the best fix. Heavy caulking in one area will only spread the seam or joint next to it, so if you decide to caulk bear this in mind and take care. Many times some linseed oil, applied with an old fashioned oil can will do the trick; sometimes hot pitch is the answer. It all depends on the particular situation, but there is always a need for common sense and judgement. And if you don't stop the leak the first time, try it again with something else. Sooner or later you will get to know many of the leaks as old friends.

Keeping the deck from drying out and shrinking up in order to prevent leaking is a big part of good maintenance. Washdowns each morning and

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*This applies, as far as I know, to the wood in a ship and is sometimes limited to oak. On the other hand, I have heard it used in connection with the entire vessel if she is of wood.

afternoon with sea water or brine from the barrel on deck will help combat the drying effects of the summer sun. Not only will the water help keep the wood fibers swelled up but the salt, being hygroscopic, will keep the surface somewhat moist for a long while after most of the water has evaporated. Of course a vessel covered with salt streaks may not always be desirable either; so again, it is a matter of using good judgement on how much salt to use and what areas should be wiped down afterwards.

7. Keeping her aired out

When fresh water does leak below through the deck, it is vital to get rid of it as soon as possible. Mopping up puddles, wiping down wet areas and airing out the bedding may get rid of most of it, but fresh air - lots of it - circulating around below will do the rest. Even if the decks don't leak a drop, it gets damp below during a rainy spell and there is still a need to air out once the sun comes out and the dry west wind blows. As soon as this happens, take advantage of it! Open all hatches, open the lids, doors, and drawers, below to get things dry again.

Salt water, tracked below deck or arriving there by other means, will keep things damp just as it does on deck. But below you are trying to keep things dry, so keep the salt water out of the cabins and other spaces below deck unless there is a particular reason for its being there. It just makes things mildew and smell bad. Pete Culler, in his book Skiffs and Schooners, tells about hosing down the whole inside of one of his vessels when he laid her up in the fall, just to get rid of the accumulated salt. Sounds strange, I know, when the object all along has been to keep fresh water from below. But he was careful to pick a good drying day and to start early so that by nightfall all the water had evaporated.

You may find that some places on the vessel will need to have additional means of ventilation. More deck ventilators may do the trick, a canvas windsail rigged to drive air down through a hatch opening may help, and of course you may have to go to fans in certain places. It's all a matter of getting to know *Clearwater* and finding the places that won't dry under the existing conditions.

8. Keeping her clean

Dirt attracts moisture and moisture causes rot. Dirt often shows up in places that are hard to clean - in corners, under cushions, behind stoves and places like that. I could go on and on about the virtues of a clean ship because I feel it is tremendously important. There is no better way to get to know her and to discover areas needing attention than to clean her thoroughly and to do it often. There is a skill to cleaning that is usually overlooked; as a result the process is not always efficient or effective.

Sweeping, scraping, scrubbing and wiping are the usual ways to go about it. Time should be set aside every day for all hands to turn to and help with it. The mate or the bosun should organize it and set the standards. Needless to say, it is important to wipe dry everything that has been washed with fresh water.

A certain spirit goes with having a clean and squared-away ship. Pride is a wonderful feeling and *Clearwater's* appearance should always bring out that feeling in her crew.

9. Painting

Like cleaning, painting takes skill. Too often it is thought that anybody can paint, and the operation is downgraded to the level of "dogwork." Just remember that the appearance of *Clearwater* can be improved more quickly by painting than by almost anything else.

After watching people work at painting for quite a few years, I am of the opinion that too much time is spent preparing the surface. There is no reason not to enjoy almost every aspect of painting, particularly on a rough working vessel like *Clearwater*. Sanding, for example, is hardly necessary at all. The main thing is to scrape off the loose scale and to make sure that the surface is dry when you paint it so the paint will stick to it.

You will have to prime bare wood with flat paint (usually white or black, although it can be tinted) or with red lead (which on large surfaces of new wood seems to stop checking). Gloss or finish coats just won't work over unprimed wood - if you've tried it, you know what I mean - but primer dries quickly and there is no reason you can't put a finish coat over it on the same day. The professionals do it all the time, in spite of what the labels say, sometimes adding a little drier to one or both of the coats to hasten things along.

If you put on paint too late in the afternoon so it hasn't set up by the time dew falls, you're in trouble. The paint "flats out," particularly on flat surfaces, and looks horrible. So leave plenty of time for the stuff to dry some after you finish.

There are all sorts of paint products on the market and all sorts of claims made for them. Some may outlast others, but there isn't one of them that will last much more than a year on a vessel. With a crew that can be turned out during the season to keep up the paintwork, I think common oil-base marine or house paint is the thing to use. Don't, under any circumstances, use water-base or latex paint as water gets in under it without disturbing its film and you don't know where the trouble is.

It has always amazed me how many ways there are to do a job right. I think the approach to *Clearwater's* painting should be decided upon at the beginning of each season when the bosun's stores are being purchased - rather than trying each new idea that comes along during the year. Certainly there will be improvements you can make in painting methods and materials, but these can be worked in gradually at the beginning of each season. The important thing is to keep the surfaces protected and to always keep *Clearwater* looking good.

Paint and other surface coatings do a truly wonderful job of protecting the wood from weathering. They keep it from drying out and keep water from getting into its pores. Bare wood is bad stuff, particularly in cold weather when entrapped water alternately freezes and thaws, each time enlarging all the openings it has run into.

Although it doesn't reflect the heat like the lighter color paints, linseed oil has many advantages as a protective coating for wood. It is flexible so it doesn't flake off, it dries slowly so it soaks into the surface further than paint, and it requires almost no preparation between coats. *Clearwater's* deck has linseed oil on it. Use boiled linseed oil if you want it to dry and raw oil if you want it to penetrate. I personally favor raw oil for almost all uses. You can thin it with turpentine and add some drier (to boiled oil only) if you like. Sometimes pine tar can be added to it to give more body. But the basic ingredient is the linseed oil and you won't go far wrong in using it pure right from the can.

10. Use of preservatives

There is no doubt that preservatives will kill fungi - IF CONTACT IS MADE. Therein lies the problem. Not only is the initial penetration for brush-on preservatives shallow compared to the size of the timber, but very often the preservative leaches out in time.

Still, in spite of their severe drawbacks, these preservatives are a safeguard and I think their use is worthwhile. On the repair of *Clearwater*, we used creosote oil in areas which weren't to be painted (creosote bleeds through paint). This is a proven substance - telephone poles have been coated with it for years - and it is cheap. For pieces that were to be painted, we used pentachlorophenol concentrate (as sold by Agway) thinned with at least equal parts of kerosene. Pol-Nu (penta grease) was used when bedding one piece against another, as was white lead. The white lead makes for a more watertight joint and the Pol-Nu is more toxic to fungi and also is effective over wet wood. I'm sure there are other compounds and juices which may be better than the above but at this time I happen to prefer creosote, penta Pol-Nu and white lead.

Freshening up the preservative coatings should be done occasionally. At such times all the bare wood (normally unpainted) should be soaked with it, and in order to do so it will have to be sprayed as well as brushed on. There is a hand garden sprayer aboard which can be used to get creosote into the frame bays between the ceiling and the planking.

If you coat a small piece of wood with liquid preservative, then cut into it, you will see how little it penetrates. It goes deeper into the porous end grain and still deeper if the piece is soaked in it for a period of time. Pressure treating wood with preservatives seems to be the only sure way to get complete penetration, but this is impractical for shipbuilding timber. The government tried some pressure treated red oak as planking on the *Constitution* back in the 1950's but it didn't work out and has been replaced mostly with white oak. (White oak, because of the obstructing tyloses in its pores, cannot be effectively pressure treated at all.) Someday perhaps there will be an effective and practical way to chemically preserve ship timbers, but until then the best solution appears to be good care and occasional replacement.

11. Critical places that need special care

I've already mentioned the rail stanchions and given suggestions on how to keep them tight. Water leaking through them lands right on top of the hull framing, jeopardizing it as well as the stanchions

themselves. *Clearwater* already has a lot of rot due to leaking stanchions, and it will probably plague her for the rest of her life. We replaced the entire stern, and stanchion leaks were the main cause. She still has a number of "soft" stanchions along her sides and rot has started in the tops of her forward frames, SO KEEP THOSE STANCHIONS TIGHT.

The wood around the ice box rotted away once and it could happen again, so keep an eye out for dampness there. We sprayed foam insulation over the metal surfaces of the ice box which should help keep condensation from forming on it, but this is one of the classic areas for decay in any wooden boat or ship and should be kept in mind always.

We found a lot of rot in the fore peak, caused by fresh water from deck leakage and from wet line being stored there in the stagnant air. Ventilators have been added and we have removed the chainpipes in the deck above. This will help keep the renewed and remaining wood from rotting but, like the ice box area, this compartment is a vulnerable one.

Every five years or so the bowsprit should be unshipped, the kingplank under it lifted, and the condition of the stem and the apron checked. These were costly to replace in 1975-76 and will be even more so next time when the adjoining hull planking will probably be too riddled with nails to use again. If problems are detected early, there is a good chance of saving these timbers and eliminating the cause of their deterioration with minor repairs.

A continuing watch should be kept for standing water in the aft end of the vessel. It is apt to collect on top of the lower stern framing pieces, on the back side of the lower frame ends and on top of the horn timber. All of these areas had pockets of water in them before we bored new limber holes, cleaned out ones that were plugged up and ran some hot pitch into low places to make them drain. We improved the situation, but limber holes have a way of getting plugged up if not looked after.

The mast partners (where the mast goes through the deck) are very susceptible to decay since it is sometimes easy for water to get in through the wedges or canvas mast coat. Not only should this area be kept from leaking, but every few years the coat should be taken off, and/or the wedges driven out and the wood around them in both the partners and the mast examined. If a coat is used, pack it with salt before putting it back and renew it if damaged.

The mast, boom and gaff should be prodded occasionally for rot. The boom is new this year and should, if the paint surface is kept up and the checks on its top surface are filled, stay trouble free for some time. The mast, however, is a different story. We found quite a bit of rot near the hounds (where the standing rigging loops around the mast) and set in a graving piece after cutting out all the infected wood. Particular attention should be paid to this part of the mast in an attempt to keep rainwater out of the wood. Naturally a lookout should be kept for cracks across the grain of all spars. If one is found it usually

means that the stick has to be condemned, as was *Clearwater's* boom. Some old-time skippers used to salt their mastheads through a hole bored down the center. This custom would be good for *Clearwater* to adopt.

Take out the centerboard every few years to make sure the worms haven't gotten to it and that it is in otherwise good condition. It will need painting before it is installed.

12. Common sense

If you've got it, use it. If not, try your best to develop some - at least while you work on *Clearwater*. You need it all the time, from deciding what's important and should be done first, to determining how you must modify your idea of a perfect job to match the existing conditions. Tons of desire and long hours of hard work don't always mean that *Clearwater* is being well cared for. Just as an example, it may be better to get some tallow and white lead into all the open joints and checks than to spend hours cleaning one of them and gluing a graving piece into it while totally neglecting the others. Likewise, it may be better for a work party to scrape and paint all of the railcaps than to "wood down," sand and bleach a section and then put only one coat of varnish on it for the season.

13. Lead patches, graving pieces and stopwaters

Wholesale replacement of decayed wood or massive recaulking jobs can not be undertaken by the crew during the operating season, but minor repairs are very much a part of routine maintenance, and the examples that follow are well within the capacity of the crew.

When all else fails, covering a seam or joint with a patch of sheet lead may stop a leak. On *Clearwater* we covered some areas with lead patches bedded in white lead paste (under the bowsprit and along the knightheads and hawse timbers) because there didn't seem to be any other way to assure that they would stay tight. You may have to "metal" others as well. Sheet lead is also used over the end grain of timbers such as the pawl post and the stem. These patches should be looked at once in a while to make sure they haven't split or been otherwise damaged.

Graving pieces are also called "Dutchmen" and are set in voids where rotten wood has been cut out. Sometimes they are set in white lead and nailed or screwed in place; at other times they are glued. Unless the strength of glue is really needed, I prefer the first method because there is little danger of it cracking open and letting water get in. Also preservative, which would be incompatible with glue, can be soaked into the void beforehand. If the void is in a horizontal surface, it is easier to fill it with hot pitch than a fitted piece of wood. Two pockets in *Clearwater's* horn timber were treated this way.

Stopwaters are softwood dowels (usually white pine as it is easy to shape and swells fast) which are driven across the grain in the path of a joint or check to keep the water from leaking past it. You can see some stopwaters up forward in *Clearwater* between timbers that make up the knightheads and hawse timbers and their intersection with the

deck. There are also some in joints in the railcap on each of *Clearwater's* stern quarters. Inclined stopwaters should be put in the lower ends of vertical checks in the mast so that water which gets in can drain out. As with lead patches and graving pieces, you may have to use a stopwater here and there to keep out the water.

Keeping water out from under and between things is the function of bedding compound. I prefer white lead or asphalt roofing tar, although there are special bedding compounds one can buy. Always use a bedding compound if there is any chance of water finding its way in.

14. Traditional vs. modern methods

I am a confirmed traditionalist and anything you read in this manual is definitely slanted in that direction. I have little faith in the claims made by manufacturers of new "miracle" products because most of the people involved with them just don't understand the needs of a wooden ship. It is tragic that so many of the old and proven ways of caring for a vessel have not been recorded or passed on, and I believe it is more important to search them out than to keep abreast of every concoction that is promoted. As a whole, our twentieth century society has little chance of gaining much experience since there just aren't that many wooden ships around. Isn't it better to draw on tradition and do what the builders and sailors did for their ships back when wooden sailing vessels were in their heydey?

15. Pools of water

If fresh, they're lethal, so keep them mopped up.

16. Salting her down

Many old vessels were packed with salt in between their frames, at least above the waterline where rot was most likely to occur. While such an approach certainly has merit for a ship which has to be kept closed up during a sea voyage in the tropics, I feel that if there is a chance to ventilate, as there is in *Clearwater*, that is superior in all ways to salting down. Salt rusts iron fastenings. It is hard to keep it packed up high under the deck near the stanchions where much of the rot starts. And salt in the frame bays, or any other obstruction there for that matter, hampers the natural circulation of air.

On the other hand, I think a brine washdown on deck is helpful. Sea water is good too, if you are out of the Hudson. The salt will eventually work into the seams and pores of the wood and "pickle" the deck so that it will stay moist due to the hygroscopic nature of salt. If the deck stays swelled up it is likely to be watertight, and if any washdown water does leak below, the salt contained in it will prevent it from fostering decay.

17. Winter layup

All the cruise schooners in the Penobscot Bay fleet are covered with plastic during the time they are laid up. These covers not only keep

off the rain and snow, but also provide shelter for the winter work crew. *Clearwater* could benefit from such a cover during the three or four months she is laid up.

If she isn't covered, then by all means get the snow and ice off the deck as soon as you can after it falls. Accumulations of either constitute a reservoir of fresh water to leak into the seams, joints and checks and get under the paint.

A little heat below deck during the winter keeps condensation from forming. The difference between the *Victory Chimes* which is kept at about 40°F and the *Sherman Zwicker* which has no heat at all, is truly amazing. I doubt that much rot takes place in the winter, but if there is just enough heat to dry up the condensation, you will save on paint work in the spring.

Before the weather gets too cold in the fall for painting, the flaking paint should be scraped and repainted to keep the frost from damaging the unprotected surfaces of the wood. You probably won't get them all, and in the early spring the wet wood will show up as frost-covered areas even though the paint over them might look pretty good. These places should be dried out and carefully examined for signs of rot. At the same time something should be done to prevent dampness from getting to the wood again.

18. Inspections and major repairs

The crew should be on the lookout for and report any sign of weakness or damage anywhere in the vessel, and the bosun should keep a running list of items that need attention and repair. A formal survey may have its advantages, but I think that if the crew keeps its eyes open, it will know more about the needs of *Clearwater* than a surveyor can learn in the short time he spends aboard. Some of the items on the bosun's list can be taken care of by the crew, but others will have to wait for the winter layup and the assistance of professional carpenters and riggers. Winter work should be planned in the fall in time to have the materials on hand when *Clearwater* is layed up.

I think it would be beneficial to have periodic inspections to check on overall maintenance during the operating season, and to have a written report made of the findings.

19. Spar care

Most vessels have their masts slushed down with Vaseline or some kind of petroleum jelly so the mast hoops will slide up and down without sticking. This grease keeps water out of the wood as well and should be applied in the spring and again in the fall. Gaffs and booms are usually painted white so they stay cool and don't dry out and check. In spite of all precautions large checks sometimes open up in solid spars and the question of what to do about them then arises.

I don't think season checks in a mast are particularly harmful as any water that gets into them can usually drain right out, so they don't stay wet very long. The same is true for those on the undersides of boom and gaffs, but on top the situation can be serious.

Checks, splits and other openings in the top part of horizontal spars trap water and harbor rot. They should be filled up flush, and there are about 101 ideas on what stuff is best for the purpose. Many materials harden and crack with age and end up doing more harm than good. Beeswax is one common treatment, but in order to be successful it has to remain quite soft when it cools. Sometimes the right consistency is achieved by tempering it with pine tar. The old standby of tallow and white lead, thickened a bit with some whiting to keep it from running, works well in these places because it keeps on soaking in or "bottoming out." In any event it is probably a good idea to swab in some preservative before any filler is used.

The use of stopwaters in the mast and the need for and care of a mast coat are covered in other sections of this manual.

20. The rig

Little need be said here about the rig since it is usually kept in good condition by the crew's instincts for self-preservation. The standing rigging needs to be protected with a fresh coat of tar from time to time if it is to last, and the running rigging needs periodic replacement. The entire rig, down to the tiniest detail, needs to be under almost constant surveillance when the vessel is in service.

21. The bosun and his locker

The bosun is the ship's husband and should see to it that the items listed below are on hand for use in working on the *Clearwater*. I think it would be best if some things such as paint brushes, tools and similar items that have a habit of getting lost were locked up. For any item there should be a specified place to which it is returned after use.

There are many things that could be added to this list if the bosun has different ideas on how to care for the vessel, and there are probably some other things that I have forgotten to include.

Painting and preserving

Paint brushes and some cheap thinner to clean them with

Tallow for use as mentioned in Pete Culler's book (see Appendix III)

White lead paste for making putty and for bedding compound

Raw linseed oil (or boiled if you prefer it)

Kerosene

Turpentine

Pine Tar

Creosote oil

Red lead, flat black and flat white paint for priming bare wood

Steel deck preservative (fish oil) for metal surfaces

Pitch (marine glue) which can be heated and run into seams and voids

Japan drier

Paints to match the color scheme of *Clearwater*

Asphalt shingle stickum for bedding compound and underwater putty

An assortment of scrapers and sandpaper

Oakum and caulking cotton for keeping the decks tight

Whiting or lime to thicken putty

Cleaning

Salt water soap or detergent

Degreaser

Brine barrel and plenty of salt to replenish it with

Brooms (long and short) and dustpans

Scrub brushes

Pails and buckets (You can make some canvas ones.)

A good supply of cleaning rags

Rigging

Marline and houseline of different sizes

Sail twine and needles

Annealled seizing wire of various sizes

Canvas and dacron for parceling, sail repair and chafing gear

Bosun's chair

Assorted spares such as line, shackles, etc.

Come-along (1 or 2 ton capacity) and a couple of small tackles

(Each person who works on the rigging normally has his own knife, marlinespike, ditty bag, etc., so I haven't listed those things here.)

Carpentry and mechanical work

Tools and assorted fasteners will be needed for these activities, but they are so common I see no need to list them here. Things for carpentry should be under the care of the bosun, and those for mechanical and engine work should be the responsibility of the engineer.

22. Schedule for routine maintenance and inspection

Note: The schedule does not cover safety of the vessel (the Coast Guard handles most of that) or deal with the engine or mechanical gear (I don't know enough about these and a competent engineer will take care of them).

Every morning while she is in operation, weather permitting (1 hour)

Square everything away on deck and sweep the decks down.

Wash down the decks with sea water or brine, scrubbing the paintwork where needed with salt water soap. Wetting down the yawl boat is also a good idea if she is hanging in the davits.

Pump the bilges dry and check to see that the limber holes are clear. (If she isn't leaking enough to pump every day, let some water into her then pump it over the side to freshen up the bilge.)

Square away, sweep and scrub down thoroughly below decks. Open all hatches, turn on fans and do whatever else is needed to get lots of fresh air below deck. After washing and scrubbing, make a thorough check for entrapped fresh water and mop it up.

Every afternoon as soon as the sails are furled and she is tied up (1 hour+)

Square everything away on deck and sweep the decks down. Wash down the decks with sea water or brine and make a check below decks for leaks.

Scrub her topsides and waterline from the yawlboat. Freshen up the brine barrel for the next day's use. Scrape, paint and do other items on the work list. Deck leaks should be given priority.

Inspect vessel for other needs and add them to the work list. Put away all tools and materials and square away the bosun's locker.

During each rainstorm

Thoroughly check for deck leaks, mark them and add them to the work list.

Close hatches, ventilators and other openings to keep out the water.

After each rainy or damp spell

Open hatches, ventilators, doors, drawers, etc. Turn on vent fans, wipe or mop up standing water and do everything else you can think of to get her dried out as completely and quickly as possible.

In the fall before laying up

Scrape off loose paint, fill checks and open seams, prime the bare wood and if possible give these places a finish coat. This is a touchup operation, not a wholesale repainting. Spray preservative down behind the hull ceiling in each frame bay, in the forepeak where there is bare wood, around the horn timber and on up the run aft. Either brush or spray it wherever else it might do some good. Do this before frost gets into the wood.

Tighten down nuts where they can be reached, but don't wind them into the wood.

Send down the running rigging, rinse it out with fresh water to get out the salt and dirt, and store it under cover. Same with sails. Overhaul, repair or replace as necessary.

Remove anything that can be damaged by moisture or freezing and place it in suitable storage.

Tar down the standing rigging and slush down the mast. Build a frame and put on the winter cover if possible. If not, cover the upper surfaces of boom, gaff and jib sheet horse, making sure there is some space under the cover so that air can circulate. Do the same with anything else that could be damaged by freezing weather or let in water. Keep the ice and snow shoveled off. Rig some weatherproof ventilators over the skylight and the deck hatches. Also if she isn't covered, she will need a good coat of oil on her deck before cold weather.

Plan the winter work and arrange to have materials on hand when they are needed.

During the winter

Keep a fire, or some kind of low heat, going below deck so condensation doesn't form.

Mop up any water which gets below; if it freezes first get some salt on it.

If she isn't covered, keep the decks clear of snow and ice. Do the items on the winter work list in their agreed priority.

In the spring

While the frost is still in the wood, look for places where moisture has gotten under the paint. These show up as frosty places over the paintwork. Mark them and have a good look at them later on when you start scraping and painting.

Scrape, prime, fill and paint the entire vessel including the spars. Wherever you can, get this all done under the cover before taking it off.

Oil the deck. Wash down the mast with solvent and slush it down with petroleum jelly.

Tar down the standing rigging, making needed repairs and replacements.

Bend on the sails and reeve off the running rigging.

Restock the bosun's locker.

Approximately every five years

Drop the centerboard and inspect it. Repaint both the board and the trunk.

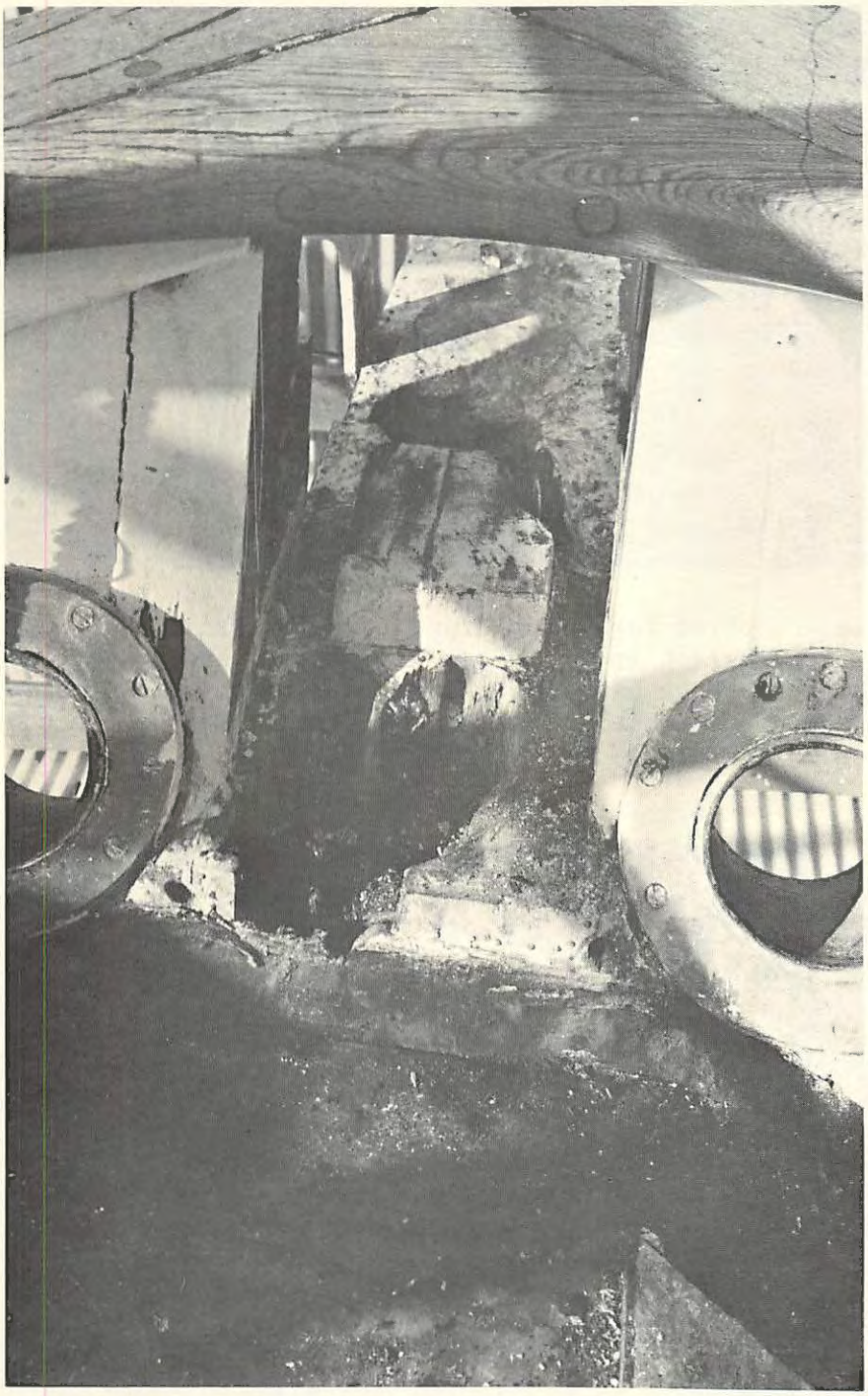
Drive out the mast wedges and inspect the surrounding wood of both the partners and the mast itself. Renew the mast coat if damaged, packing it with salt.

Unship the bowsprit, lift the covering board and inspect the top of the stem and the stem apron.

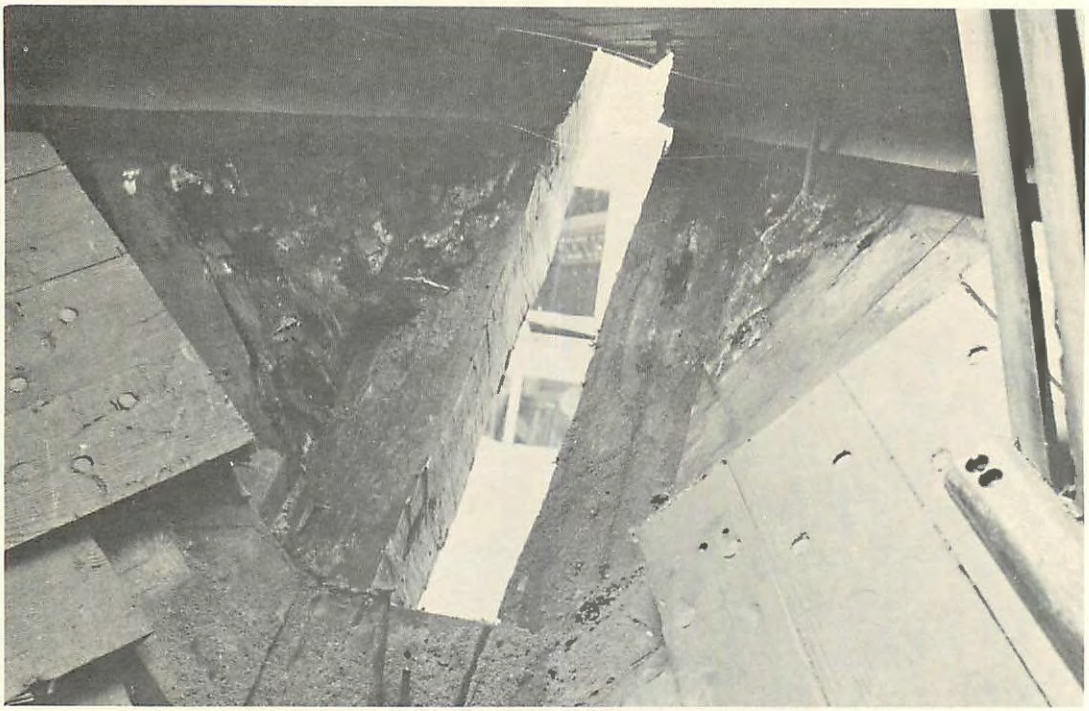
Remove all lead patches and lead caps and inspect the wood under them.

Take out the iron ballast, repaint it and clean the bilges.

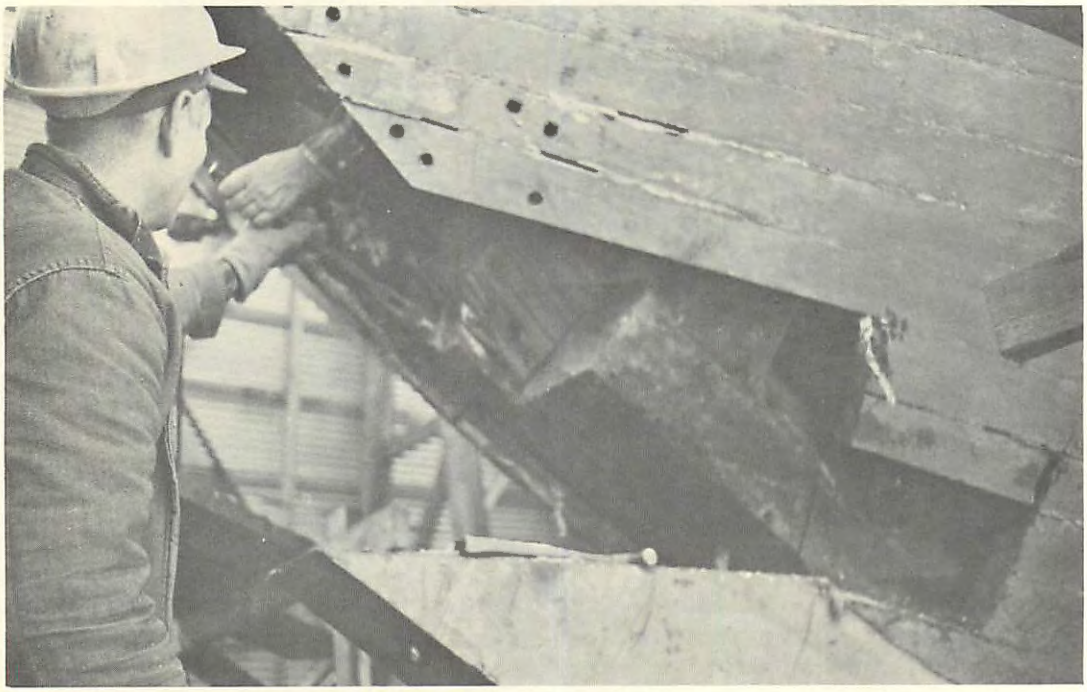
Appendix I. Photographic record of findings on and repairs to *Clearwater* at Billings Diesel and Marine, Stonington, Maine, Nov. 1975 - June 1976. (photos by Jorge Casteneda and Maynard Bray).



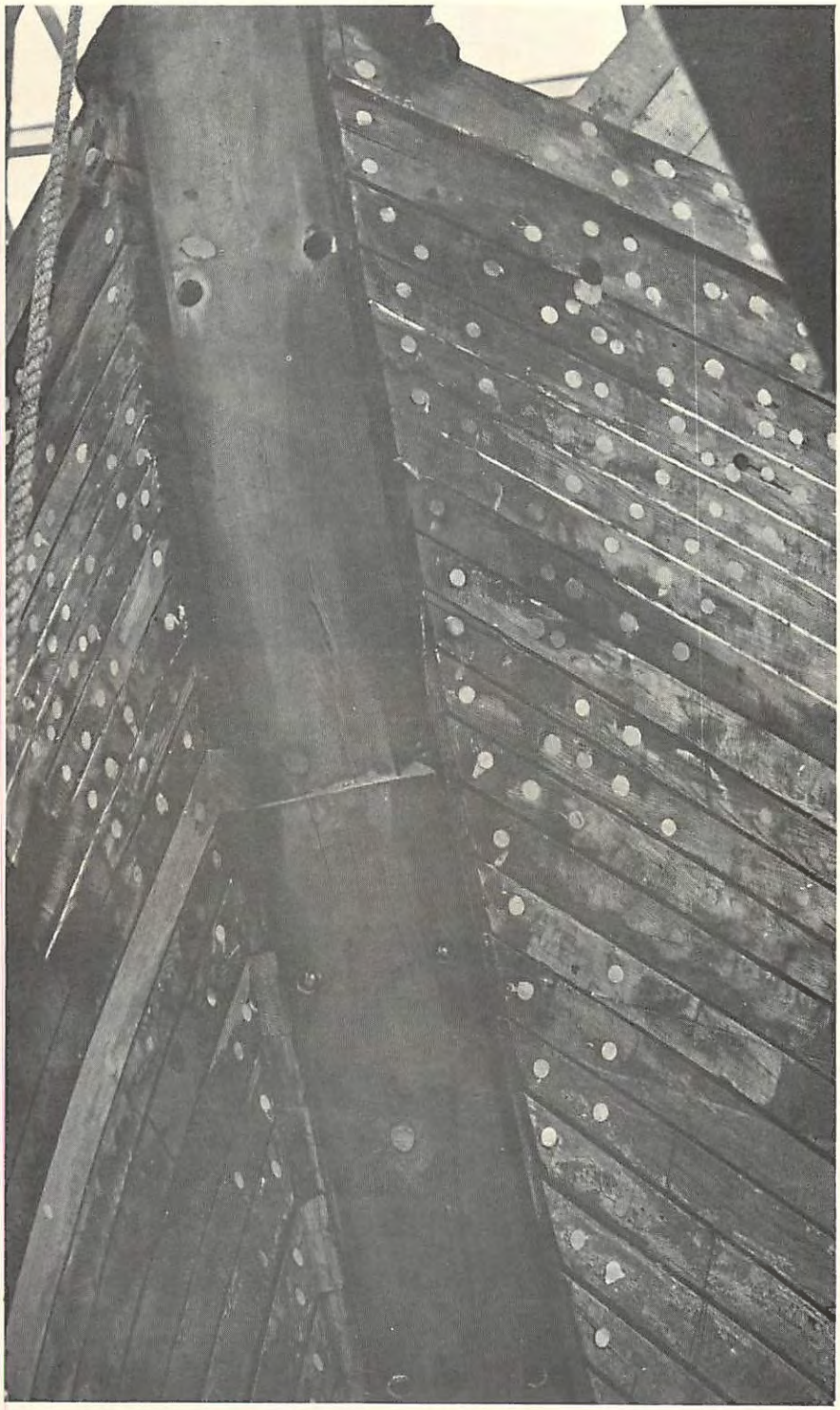
For the first six years of her life, *Clearwater* had no metal cap to keep water from leaking into the end grain of her stem and the stem apron. Cone shaped pockets of rot ran the entire length of these timbers.



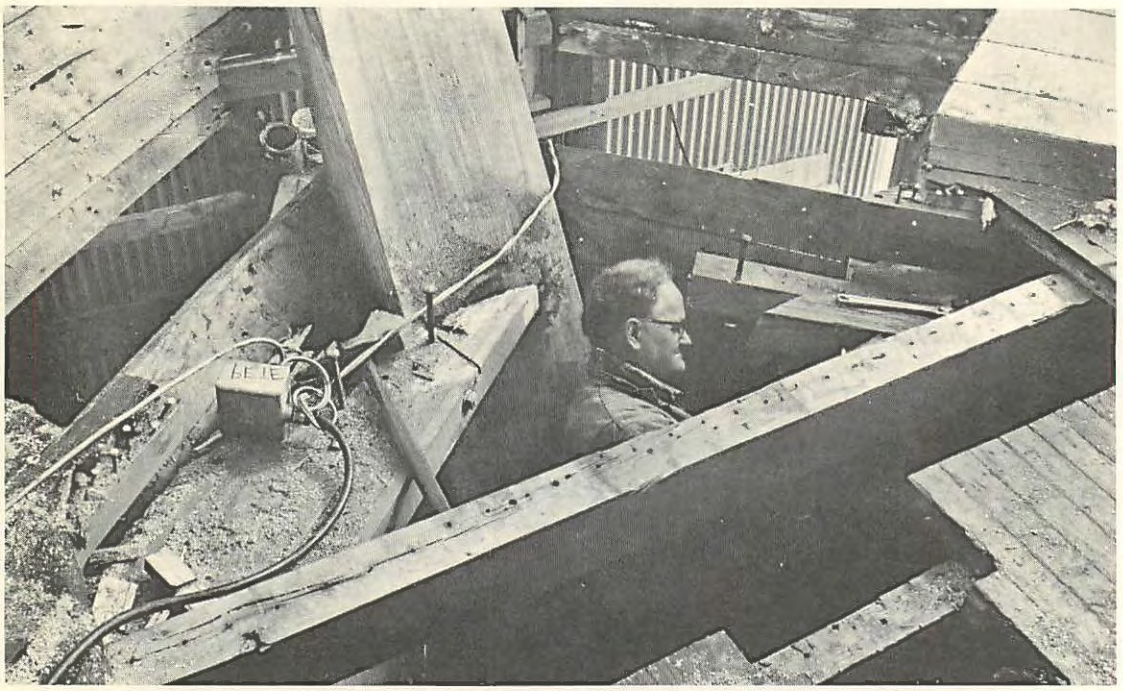
In the forepeak looking forward at the stem apron being sawn out and the cut back ceiling in way of the knightheads and hawse timbers. Leakage through the deck caused the lower ends of these pieces to rot, and the stowage of wet rope and inadequate ventilation in the compartment hastened things along.



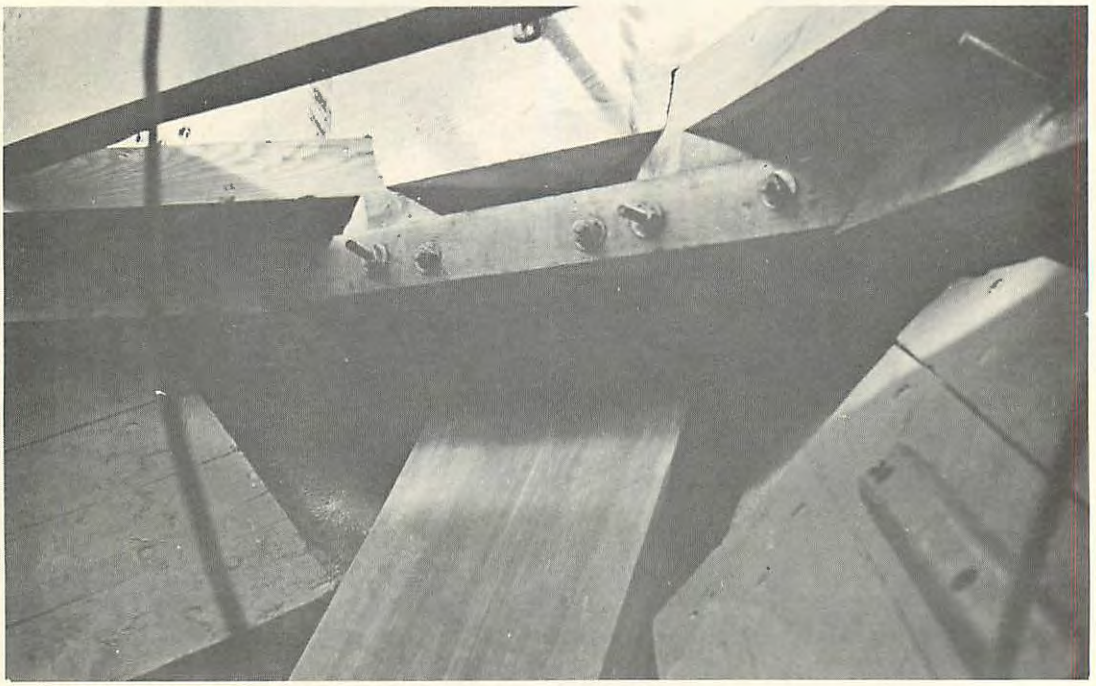
Splitting out the apron. An example of why it is often more expensive to repair than to build new.



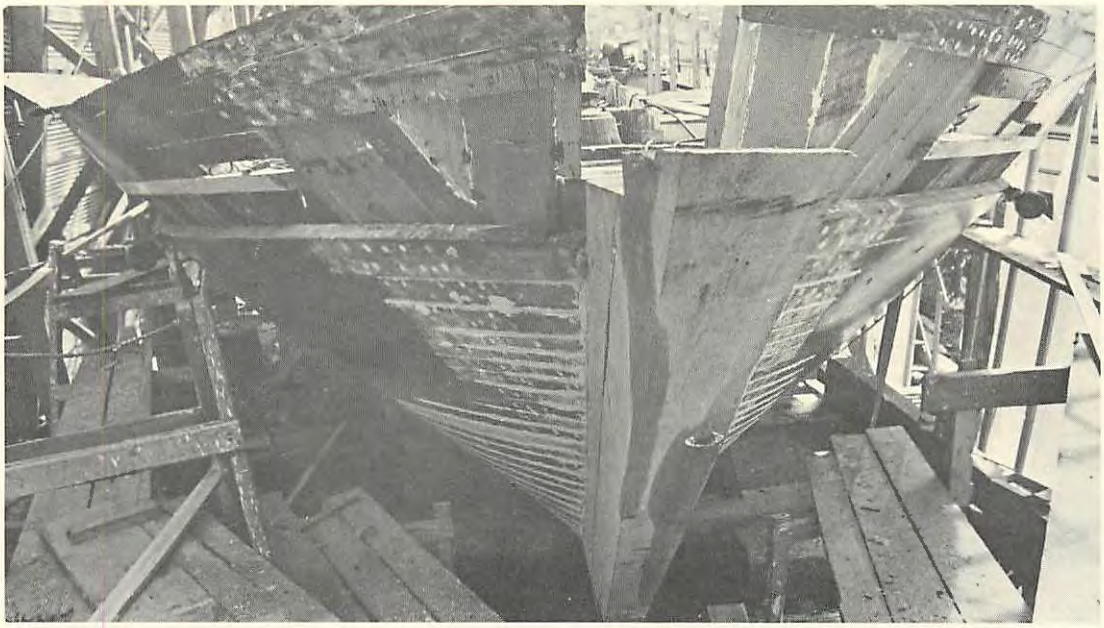
The new apron, like the original, was sided 18"; unlike the original it had to be put back in two pieces. The planking was in good condition but had to be quite riddled with fastenings to hold the new wood in place.



The laminated shelf was decayed at its forward end, both port and starboard. Here it is being cut back before piecing out with new wood.



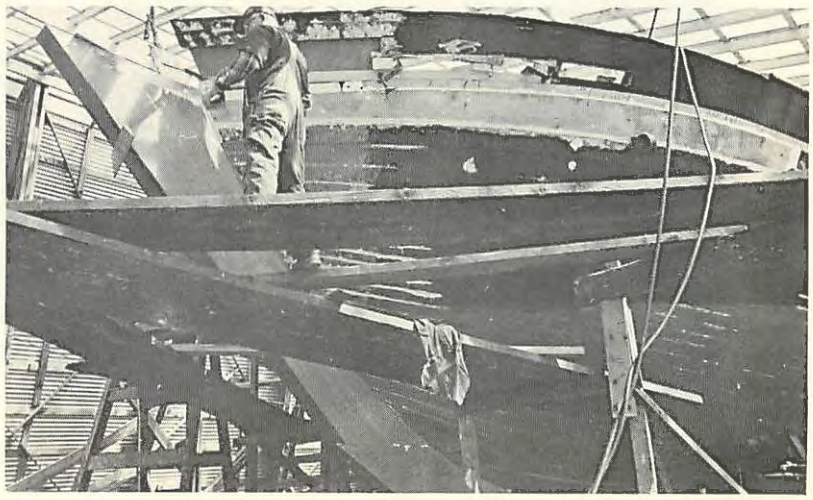
A second breasthook was added to connect the clamps to the apron as well as the shelves.

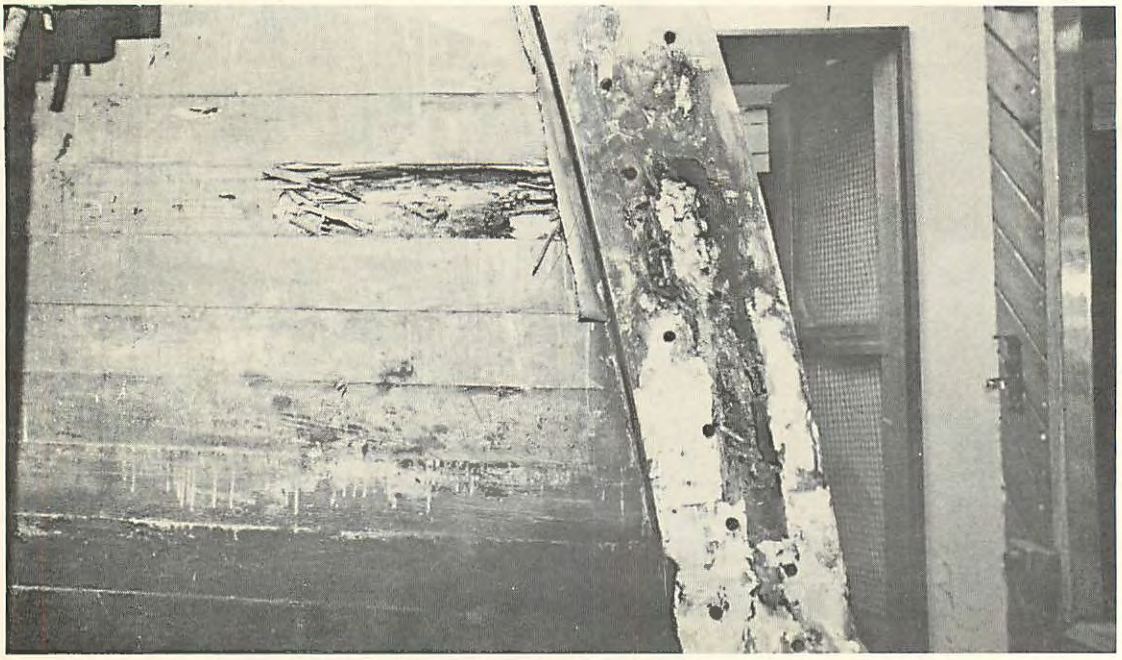


The forward piece of each sheer strake was rotted so that these planks had to be renewed. The new stem, cutwater and hawse timbers show up in the picture.

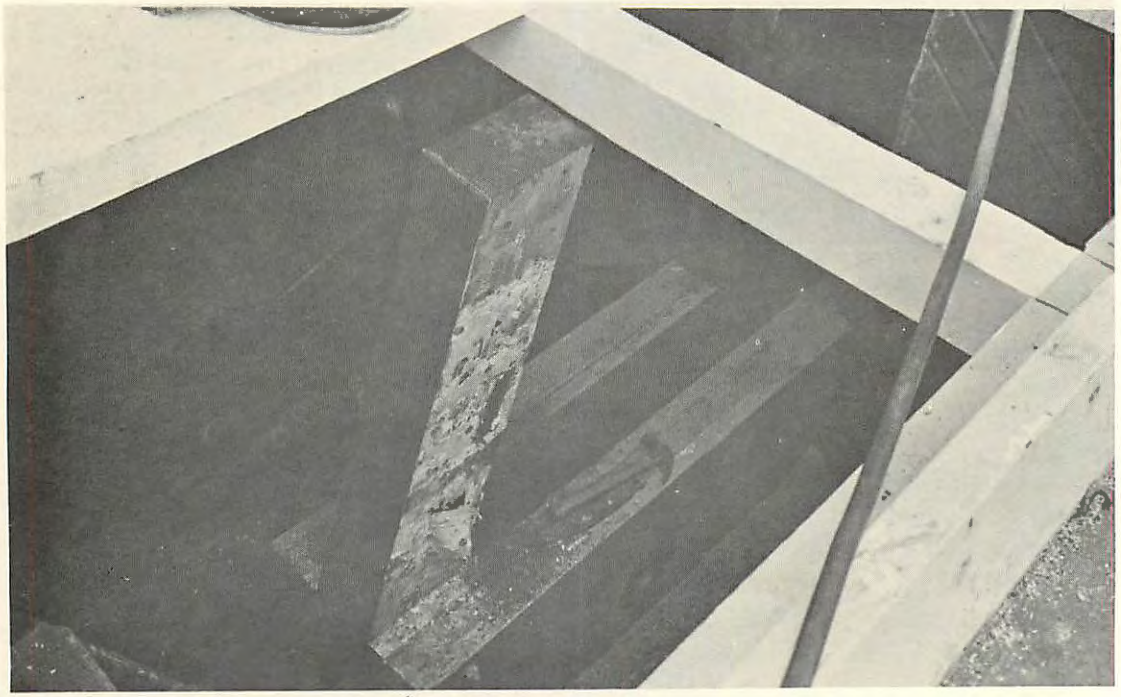
Hull framing behind the sheer strakes was found to be in the early stages of decay. The time and expense of replacing these basic timbers would have been prohibitive at the time, so they were liberally doused with preservative and planked over just as they were. Their condition is probably representative of the rest of the frame tops and bodes ill for the future.

Because of the flaring bow and full deckline, the fitting of the new sheer strakes was quite a chore, particularly as it was a "shutter" between two other pieces. And of course it had to be steamed before it could be bent into place.

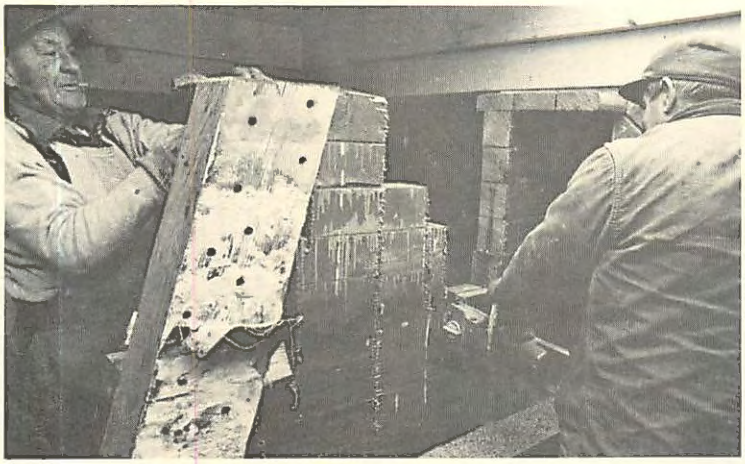




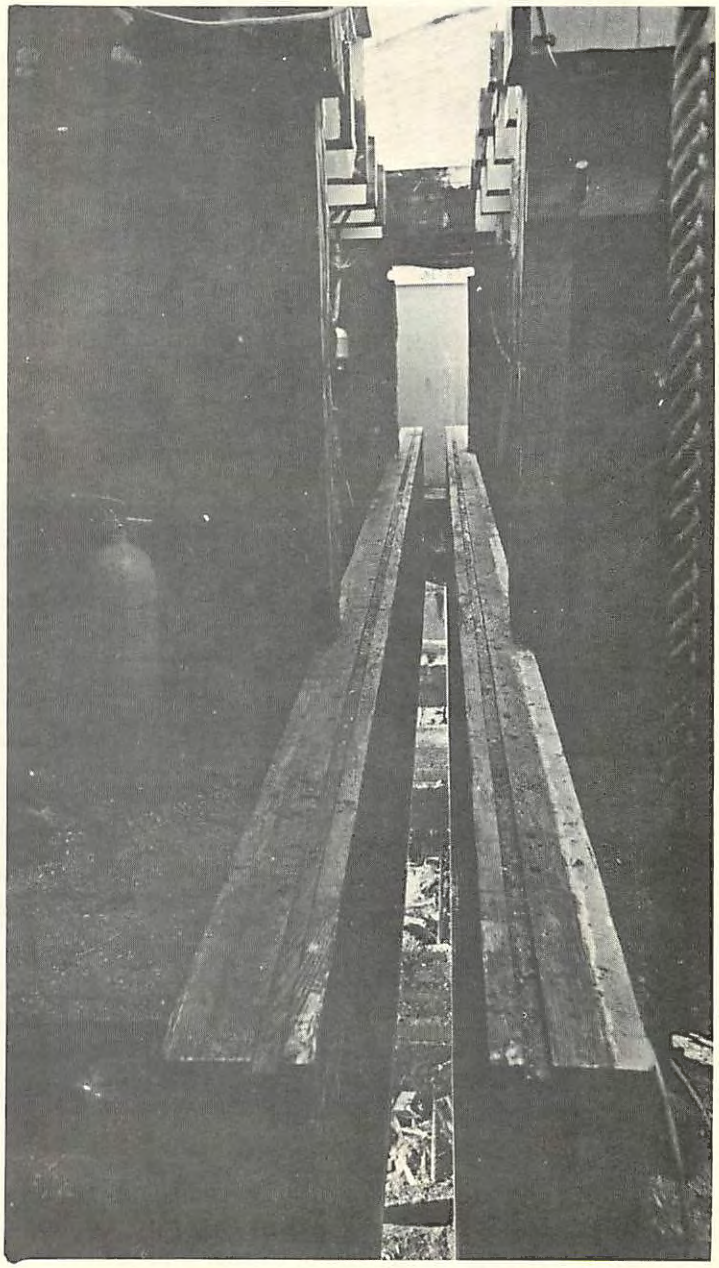
The aft post and both sides of the centerboard trunk were rotted severely. Heat from the galley stove, which was next to them, certainly shortened the life of these pieces, but the alternate wetting and drying of this area, which corresponds to the vessel's waterline, probably had more to do with their condition than anything.



The forward end of the trunk was also rotted, though not as much as aft.

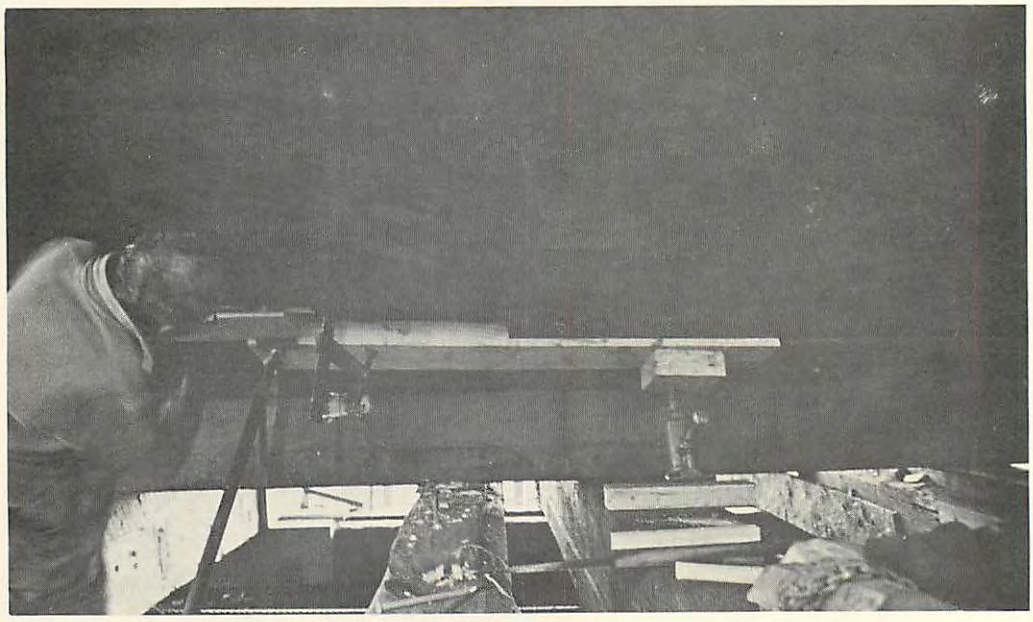


A chainsaw made quick work of ripping it out. . .

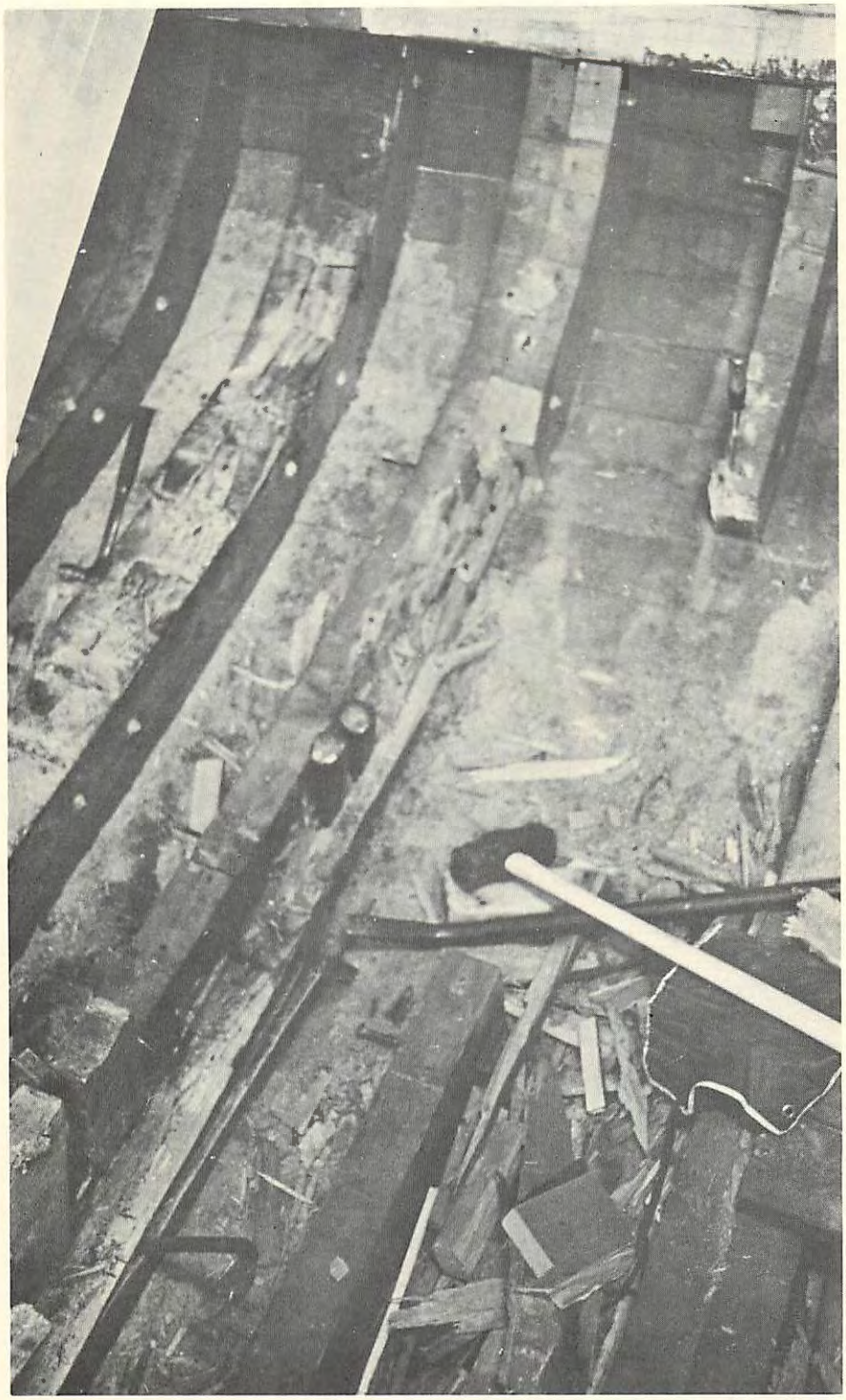


. . . all the way down to the bed-logs, including the forward and after posts.

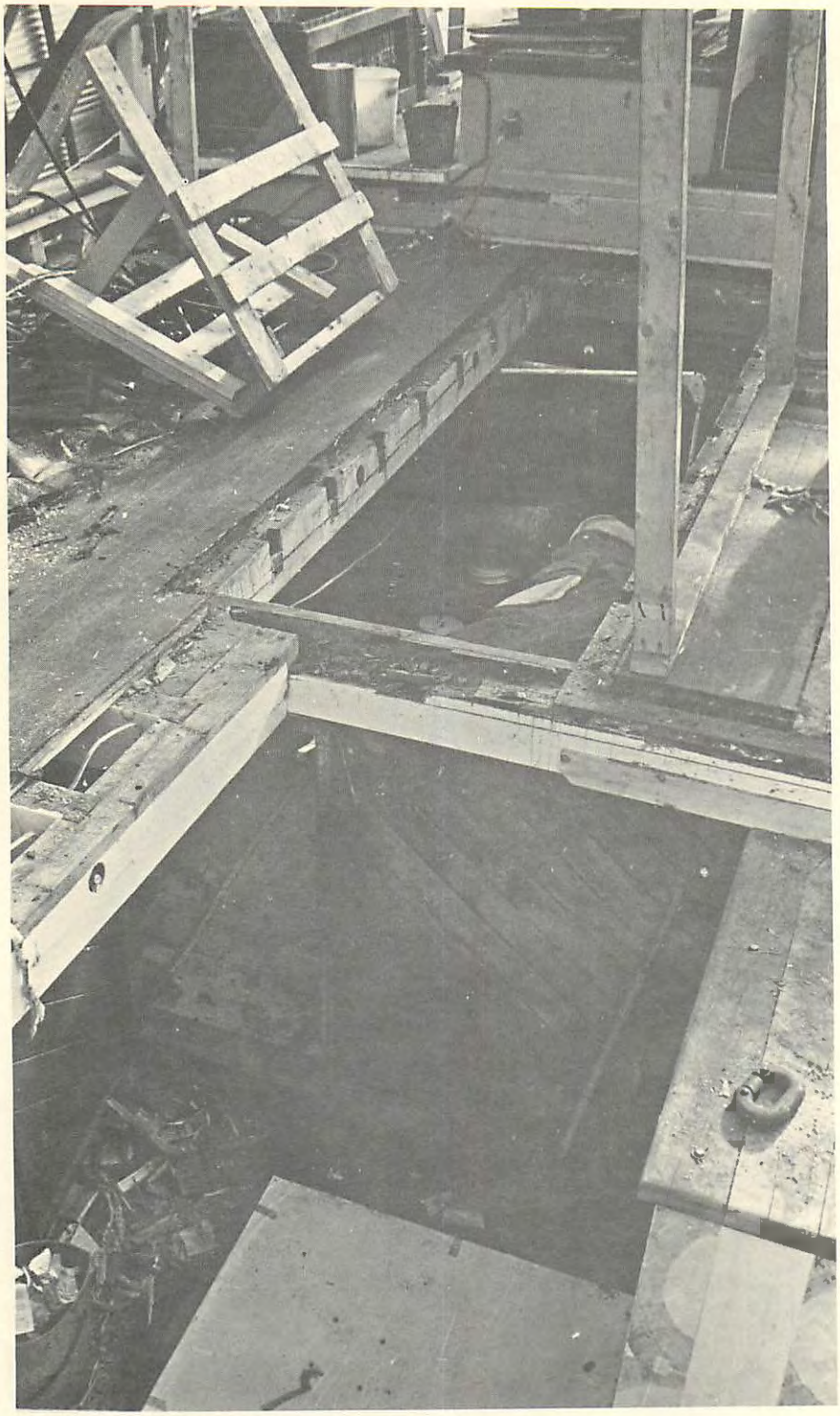
Yellow pine, rather than red oak, was used for the new centerboard trunk. Here the first piece is being installed on top of the old bedlog. Note the groove for the white pine spline, which keeps the seams from leaking. The white lead bedding helps also.



Getting access is a big problem in most repair work and here a couple of pieces of hull planking had to be removed in order to get at the fastenings near the lower end of the posts of the centerboard trunk.

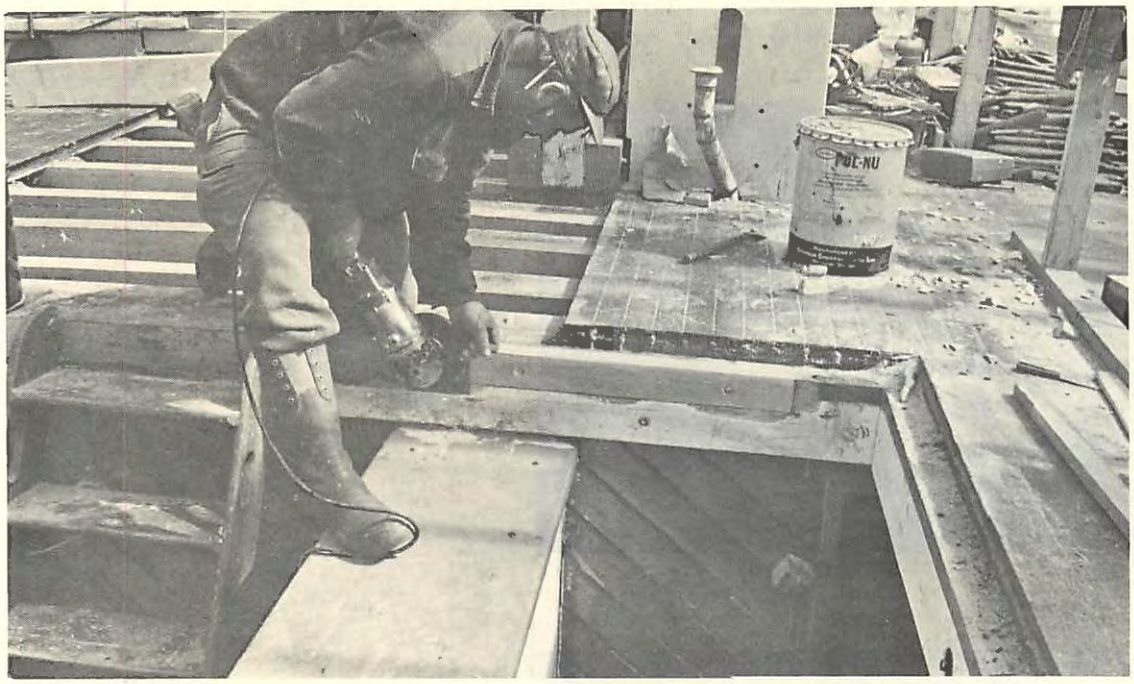


On the port side, in back of the icebox, much of two hull frames had decayed as well as the hull ceiling and watertight bulkhead in this area. Dampness from the condensation on the cold surfaces of the icebox and insufficient ventilation to keep the area dry were probably the cause.

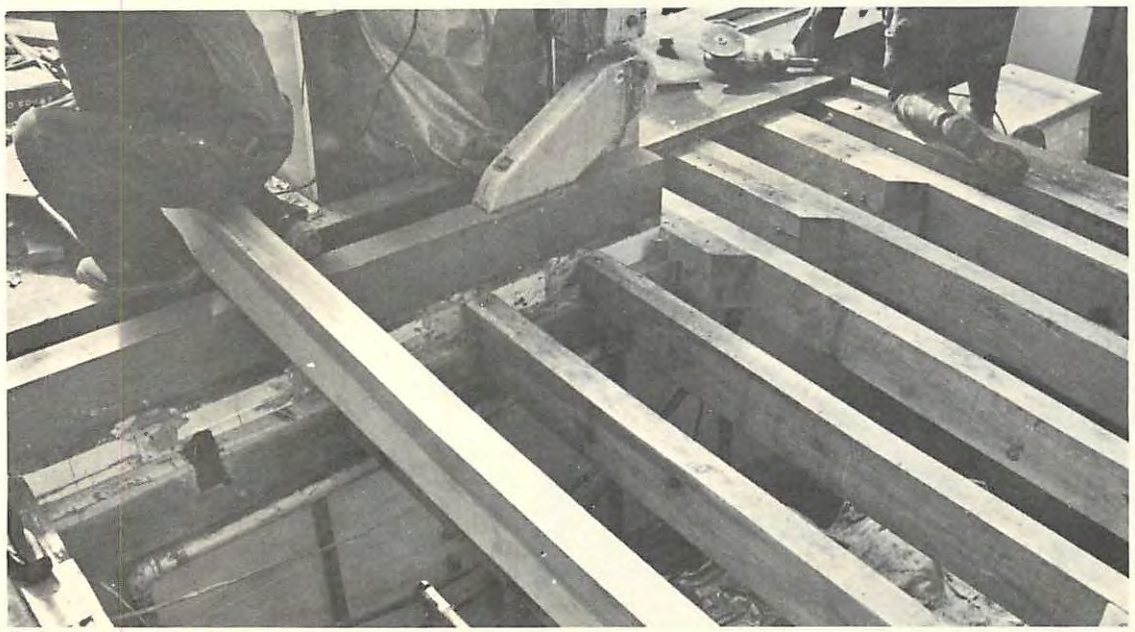


The deck beam between the cargo hatch and engine removal hatch had been supplied with fresh water through a row of butts in the deck above which leaked. Leakage through the deck aft of the hatch coaming also ran onto this beam and once again moisture was the villain and rotted out this very critical deck beam. (It is the only full length beam in that part of the vessel.) Heat from the engine had severely dried out the engine hatch carlins and caused them to check.

Graving pieces were set into the deck beam to fill the voids where the rot was cut out. This repair stops rot from spreading but adds little in the way of strength to the weakened beam, so. . .

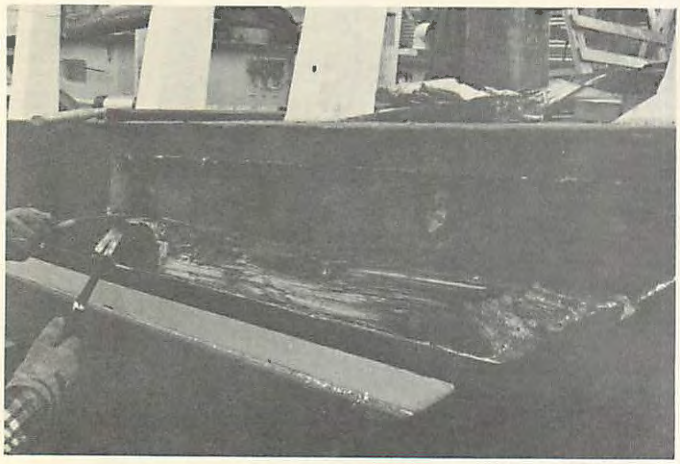


. . . a sister deckbeam was bolted to the aft side of the rotted one, and to help in tying the deck structure together, additional sister beams were fastened across the deck in the way of what used to be the engine access hatch. There is no longer the convenience of being able to easily lift the engine off its beds and out through the deck above but there was hardly a choice in the matter, and if its removal is ever necessary it can be rolled forward through the bulkhead and lifted out through the cargo hatch.

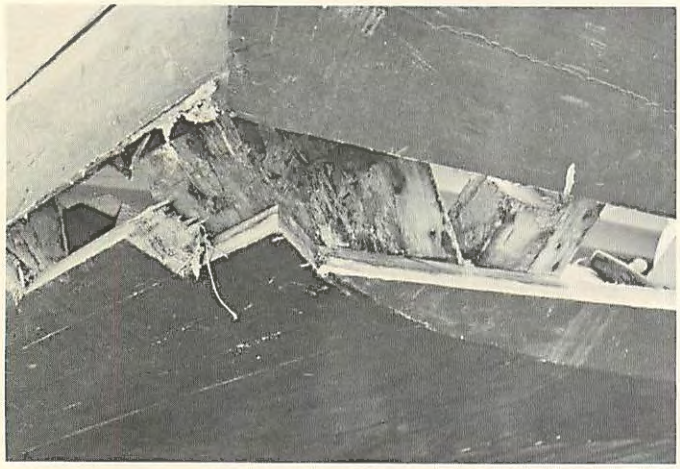


The Stern Area

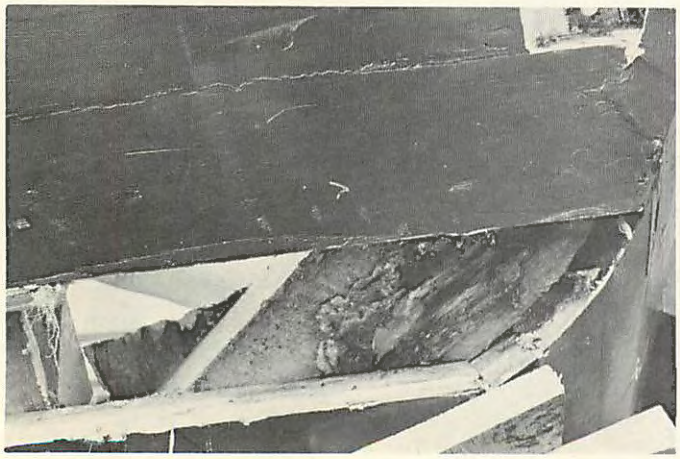
Fresh water leakage through the joints and seams in the after deck rotted the stern frame and the deck beams to such a degree that virtually the entire stern had to be renewed. Work in this area was, by far, the most costly of any of the repair tasks accomplished.



Leaking stanchions let water get to the topside planking which rotted. . .

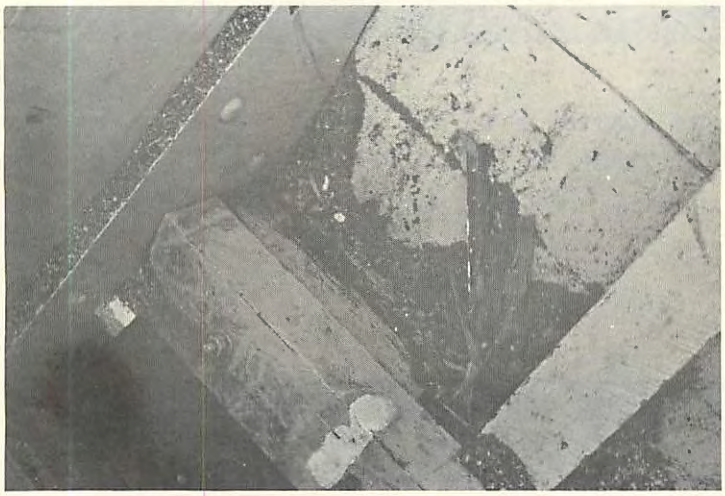


. . . and to the stern framing on the port side which rotted. . .

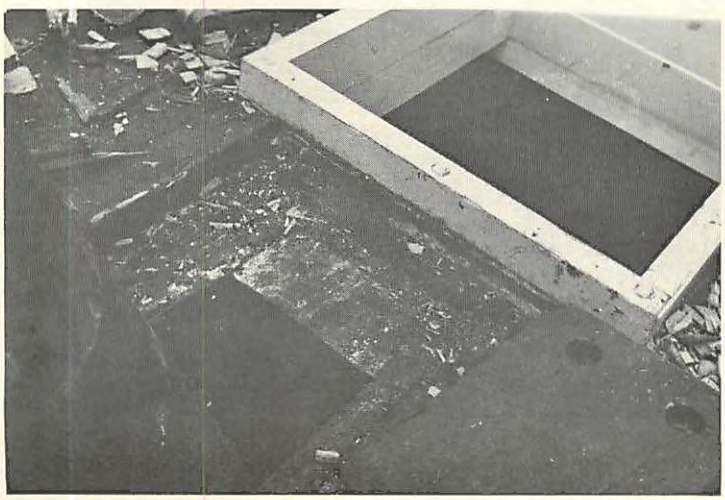


. . . and to that on the starboard which also rotted.

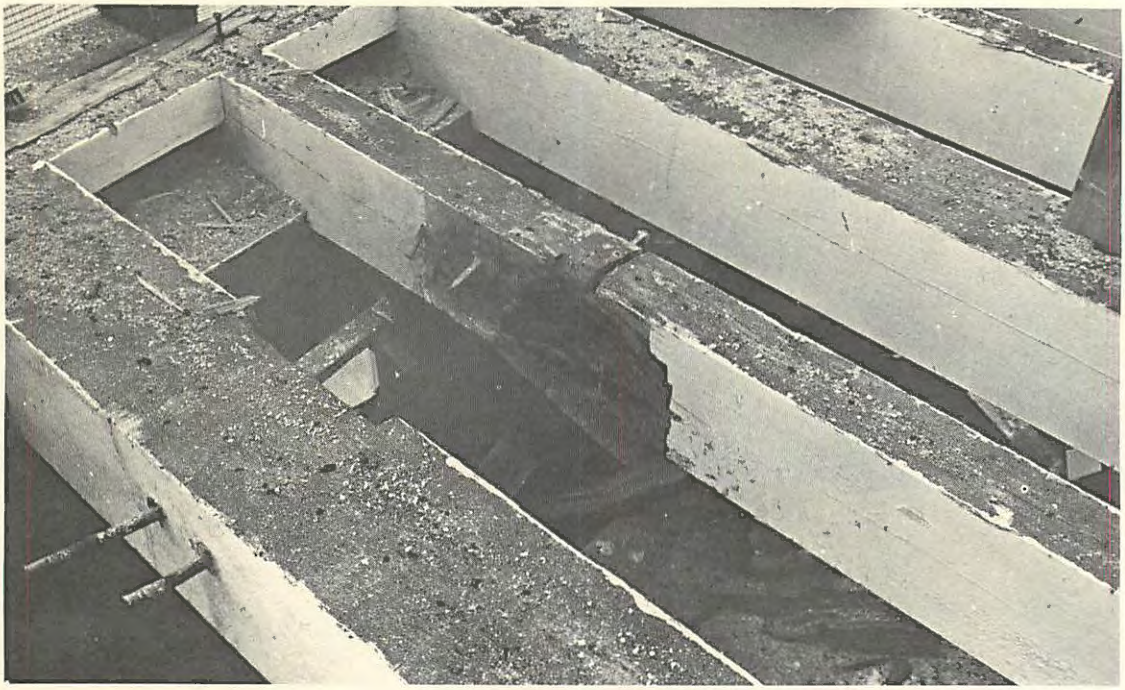
The stanchions themselves were rotted by this leakage around them as well.



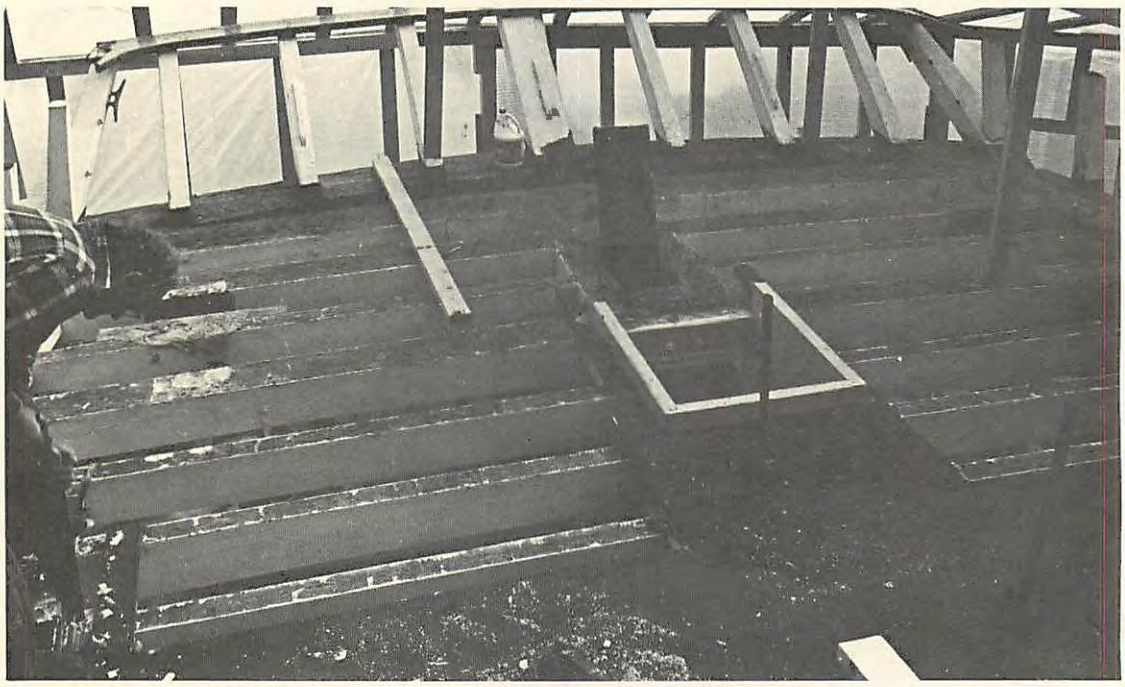
Accumulated dirt and moisture trapped beneath the leaks across her stern rotted out the lower framing of the transom.



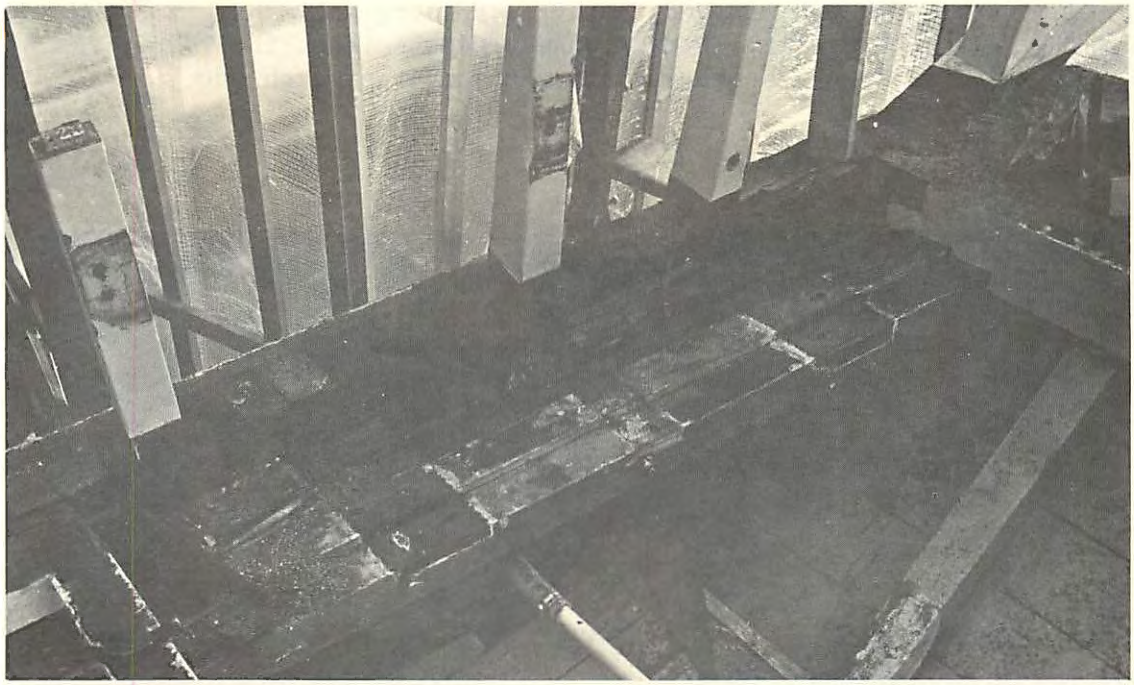
On the deck itself, leaks had caused the deck beam in way of the after hatch to deteriorate.



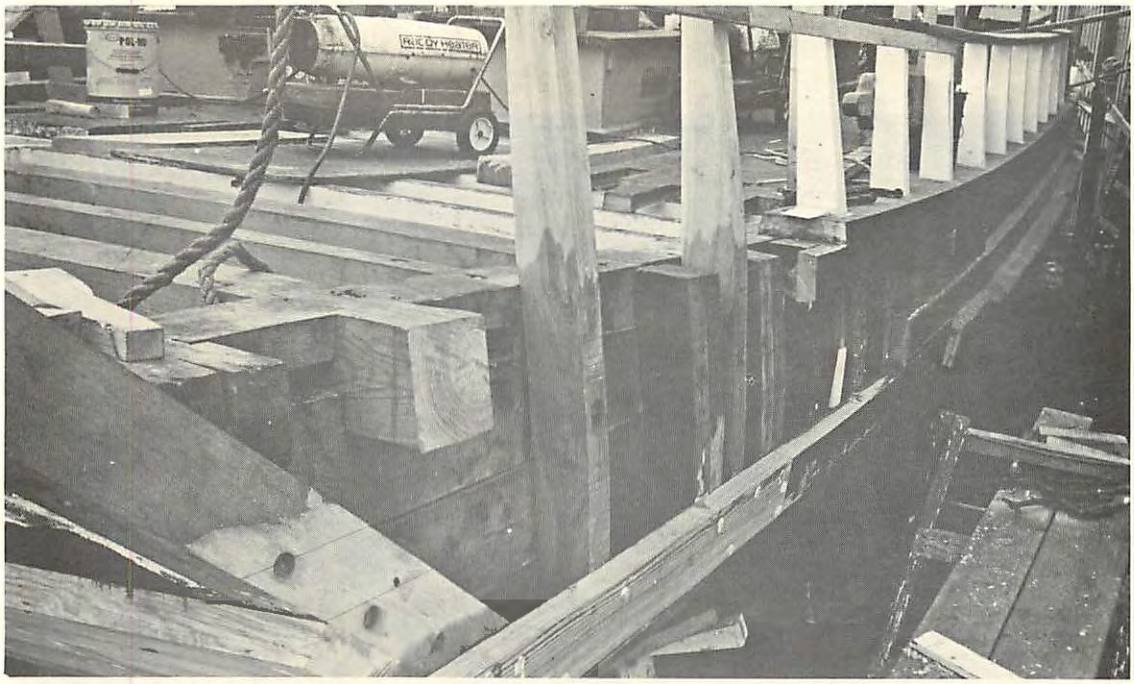
Leakage around the quarter bits had taken
its toll on the beams in that area.



The planking was completely ripped off the after deck.

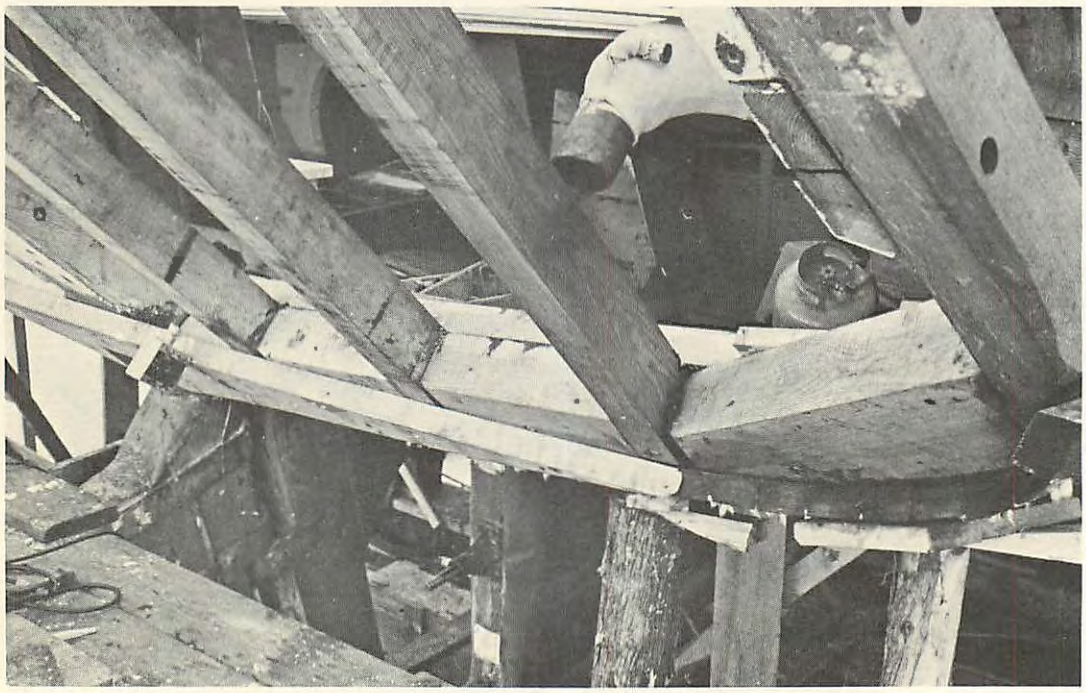


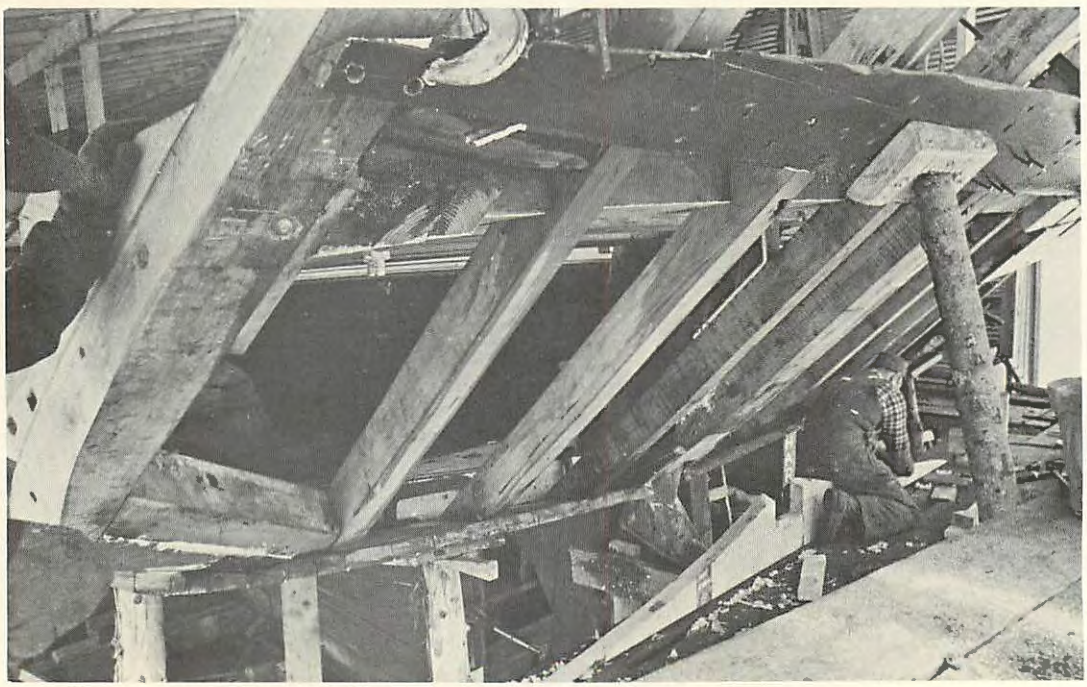
The three infected deck beams were removed.



These beams and the stanchions and topside planking on each quarter were renewed.

The entire transom was renewed, both the framing shown here and the planking which covers it. Provision was made so that the lower framing blocks would drain by chamfering off the corner of each one.





The new decking was run all the way aft, eliminating the covering board which originally ran across the stern. This arrangement should be easier to keep watertight.

This is what was left of a rot pocket in the horn timber after it had pretty well been cut back to good wood. Fresh water languishing in the small recess which had been cut for the nut and washer created a wonderful environment for rot fungi to start and spread.

This is the other rot pocket in the horn timber (from the same cause as above). The dark areas show where the wood is still somewhat softer than healthy oak. Rather than risk weakening the timber by more digging, the area was saturated with preservative (the recesses were kept flooded for several weeks) then filled with hot pitch. A complete replacement of the horn timber was considered, but given up as being too costly for this session of repair work--and there were other areas which rated a higher priority.

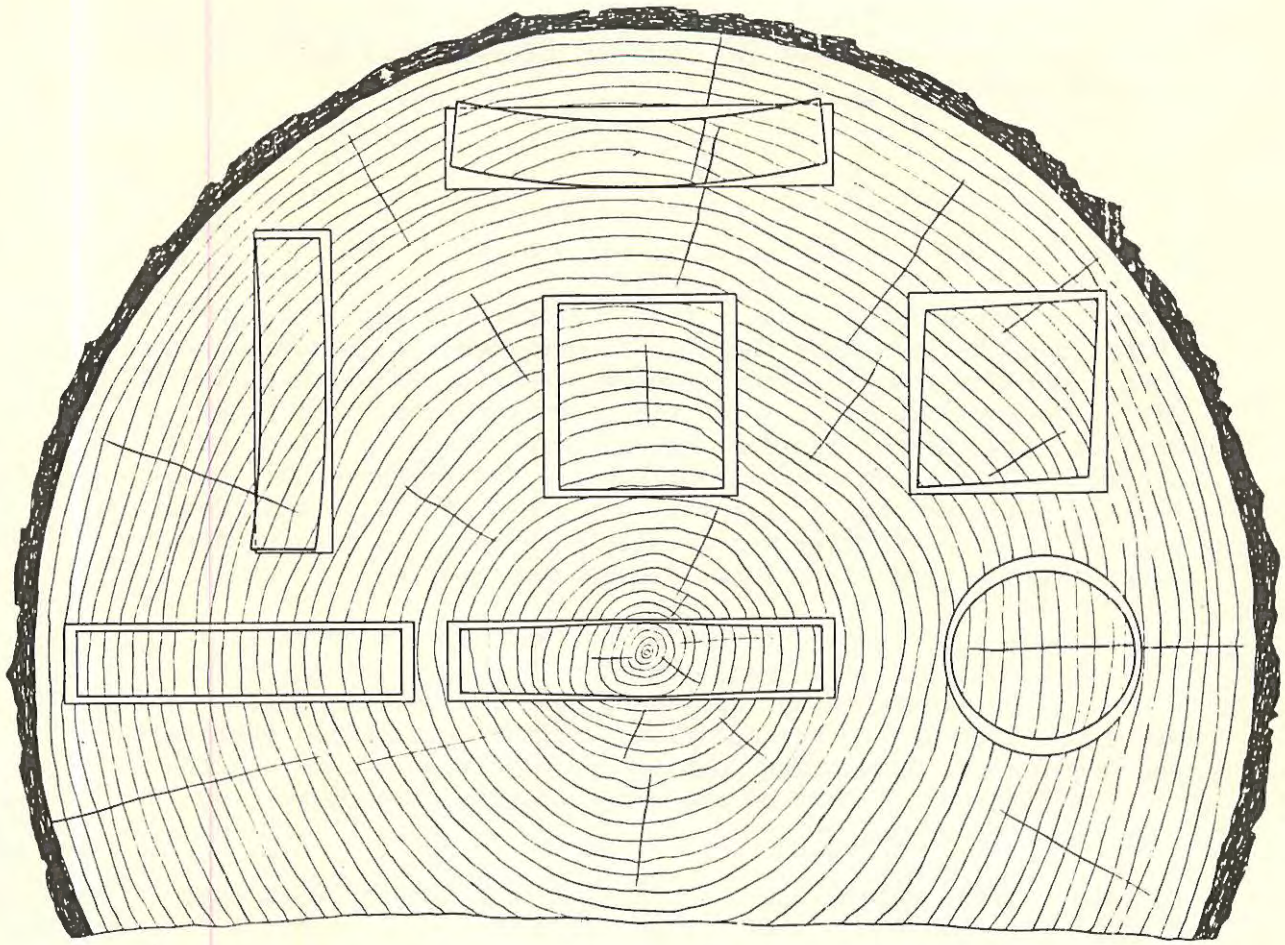


Figure 3–6. Characteristic shrinkage and distortion of flats, squares, and rounds as affected by the direction of the annual rings. Tangential shrinkage is about twice as great as radial.

Appendix II. from Wood: A Manual for its Use as a Shipbuilding Material, Vol. I (NavShips 250-336) prepared by the Department of the Navy, Bureau of Ships, 1957.

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XV

Paints, Oils, and Goo

Since the beginning of boats, there have been paints and such things used to help keep them tight, preserve them, and decorate them. Nowadays, we see almost unlimited products of this nature, nicely packaged in cans, spray tins, squeeze tubes, and other devices. In the not-too-distant past, there were a lot of these products too, not so prettily packaged. Few of these old standbys are still around, or, if they are, they appear in a different guise. I wonder if many were really much good. I also wonder about the new products and try one once in awhile.

The ancient goos applied to boats were what Nature provided. Asphalt was just fine. Animal hair, tallow, gums from trees, and no doubt, these things combined, were in use. Industrial development brought other materials, most of them still available and still good, though many are about forgotten in the rush to try something new. Most of these old standbys are cheap, and they are easy to use.

Kerosene is the boatbuilder's friend. Plank soaked in it overnight bends remarkably well. Even if you're going to put a plank in a steam box, it helps first to soak the plank in kerosene. The stuff will go right through thin plank in a short time. It probably is somewhat of a fungicide and seems to be the base of many wood preservatives. It tends to drive the moisture out of green wood. A large, green timber, if heavily soaked in kerosene and then placed in the steam box, though no bending is intended, seems to dry out remarkably well, and with little checking. I'm sure the sterilizing effect on the sap is a benefit.

Kerosene seems to come in three grades nowadays: lamp oil, which is water-clear and doesn't smell like kerosene; stove oil; and something that is quite yellow. They all seem to work on wood. Lamp oil costs the most, but I see no advantage to it, except for lamps and primus stoves.

I can't imagine a builder getting along without kerosene. I use it, with a very little lube oil added, for whet stones It's standard for freeing saw blades, hand or power, from gum. It's often used mixed with linseed oil to "drive the oil in the wood." It does. Mixed with melted tallow, it's most handy for keeping machinery tables in shape, and makes for an easy and steady feed. It's also fine for the temporary lay-up of a saw table or similar gear. The metal gets dusty, but there is no rust. This tallow mix, applied very sparingly to clamp screw threads works

just fine. It's also excellent for hand saws in use or laid up, and for any other tool to keep it bright. When working long leaf or any other fat pine, kerosene, with or without the tallow, is a necessity. Without it, tools gum up and become ineffective, and power tools wander and burn. A sanding disk, drum, or belt that gums up can be cleaned easily with plain kero and a wire brush, and this can be done several times. The kerosene seems to have no effect at all on the binders used in today's sandpaper.

Tallow is also most useful and was once much used. Nowadays not many folks know how to come by it or even know just what it is. It's simply grease from the trimmings of meat. Some few butchers still do some trying out. Most everyone eats some meat; the fat trimmings from it, saved and tried out, will make your own tallow. Heat the fat scraps slowly in an iron skillet; don't get it smoking much, if any. Pour off the grease into a container. It will be somewhat dark. Later on, simmer this grease in a big pot with plenty of water for quite awhile; the dark stuff will settle out. Don't boil, simmer. Like all good things, it takes time. Then let it get cold, and the solid tallow can be lifted out. There are, I suppose, three main kinds of tallow that are common. Mutton, which is said to have the best properties of all for some uses; beef, which may be the most common; and that from pig. There are no doubt many others, somewhat rare, and I've had no experience with them. There must be bat tallow, which might be useful in witchcraft!

Tallow is great stuff for adding to kerosene. It has launched no end of ships as grease for the ways. In the far South in the great heat of summer, it's often impossible to keep tallow on the ways, as it simply melts off. Other slippery stuff is then used, sometimes green bananas. No, I'm not kidding one bit! For oar leathers, the steps and partners of rotating masts, and for other crude shipboard lubrication, tallow can't be beat. It's great on gaff jaws, hoops, mast lace lines and such. It's also good as a grease for serving marline. When working with tallow while rigging, you never seem to get chapped hands or those splits common to much outside work. Most boat gear screams for lubrication; tallow does it.

Mixed with white lead, tallow has been the standard stuff in vessels for years for protecting metal, especially when laid up. For instance, large turnbuckles are packed in this mixture, parcelled with canvas, and painted. This mix is also fine for filling rents in big timber during construction; it has the property of "bottoming out" in the crack instead of just bridging and is most easy to work with. In the past, white-lead-and-tallow has been used as a bottom paint on iron vessels, as it seems to be somewhat anti-fouling, probably because it wears off as growth forms. Worm, of course, is no problem in a metal hull. Many steam engines and other bright machinery were smeared with this stuff on laying up; it gave fine protection, yet was not difficult to remove when fitting out.

Tallow and slaked lime make a good, cheap, seam filler for some old boat that is past her prime; you know she will need a lot of tinkering with the seams, and the stuff goes in easy and is simple to get out for recaulking. Boiling hot tallow will, more often than not, cure an unreachable leak, such as a split keel, or defective king post, centerboard well, or deadwood. This particular use of tallow takes some experience and knowledge of construction. A few holes are bored in likely places and the hot tallow run in. It seeks out rents, cracks, and worm holes. I've seen the tallow run right through at the start of a pour, which is fine, as you have found the trouble. Slack off, let it congeal, then pour slowly, slacking off again as necessary. When she shuts off, fill right up; you have it licked, unless there is another bad place somewhere along. This same system works fine in a split shaft log. Sometimes the conditions are such that you will want to use a high-pressure grease gun, using grease fittings screwed tightly into holes you think will catch the leak, and for the gun the best mixture is, again, white lead and tallow. The great pressure will tend to heat the tallow. Keep pumping until the stuff shows somewhere. If the pump fetches up, take it slow. Often the goo will begin to show in the most unlikely places, around nail heads, out of end grain of wood, and in seams you thought looked tight.

Though I've used tallow for years, I still marvel at its properties For some reason that I don't know, it acts as a dryer for an old-time canvas treatment that is famous for its slow drying. A chemist friend can't tell me either, though he knows it works. It does not get rancid if properly tried out, even though stored for years. I have a "gub" of tallow from a launching over forty years ago. It's a curiosity and sort of ossified now, but it does not smell.

A can of tallow kicking around the shop does not spill like oil, and is just the thing to dip an auger in, or the end of a long drift before starting. When moving a heavy weight, a couple of greased timbers under it makes things go real easy. I know of some yards who move all their craft on grease, though for a sandy, windy place like Cape Cod, it's impractical; ten minutes and the grease is full of grit. Tallow and white lead, or graphite and some light oil make a thread-cutting oil that is not bad at all, if you don't have the real stuff. I use this often in some metal turning, and it's fine for the lathe centers. This same mess, mixed rather stiff, is handy for assembling machinery, especially on threads; it comes apart easily a long time later, as there is no rust. There are so many uses for tallow I just have to keep it around.

Pine tar is another necessity, now little appreciated. Its main use was the protection of rigging, and nothing since developed does as well. It has many other uses, one being around pig pens which is sort of out of my line. If you put pine tar on the

threads of an anchor or mooring shackle pin, it can always be backed out easily even years later, and turnbuckle threads treated with pine tar never seize. Some uses of pine tar seem very odd; one old skipper of a handsome little schooner years ago was always complimented on the whiteness of his paint, and he was quite open about how he did it: one tablespoon of pine tar to a gallon white paint! No one cared to try it, but maybe that's just what he did.

Pine tar is still available; usually it must be thinned. Turpentine or alcohol work fine; kerosene or gasoline do not, unless very hot, which is taking a big chance.

Knowing few folks will be interested in tarring rigging nowadays, I wont' go into it much, yet if rigging is to last, it should be tarred. On new craft you can tar several times the first year to build it up; after that, tar once a year each early fall in northern climates, and don't spare it. I've known a vessel thirty-six years old with all original wire and hemp lanyards, all still in fine shape from being tarred. I've seen the serving lifted for inspection on a lower splice fifty-two years old; the rigger said it was a shame to disturb it. This was another monument to thorough tarring. Just how to make up a gang of rigging that will last, in the oldtime way, is explained in detail in works on rigging, all of them considered out of date. The rare person wanting to do this sort of rigging will find out all about it on his own and learn many interesting things, and his rigging job may well outlive him!

Some open boats require trimming ballast, not so much for stability, though that comes too, but to get them down in the water or balance against the weight of the crew. Lead costs plenty, is at times unhandy, and can be too concentrated a weight for many craft. For a boat that may haul up often, lead can sometimes be a finger-pinching business to handle. The old sand bag still has a lot going for it. If you want to get rid of the weight, open the bag and let her go. Some localities have only gravel or shingle, but it's just as good as sand. Some folks say a ballast bag filled with gravel or shingle lasts longer than a sandbag, probably because it ventilates better. Being in a sandy locality, I use sand, and the bags are pine-tarred. This tar seems to make them go five or more years with ease. The bags can be dipped or brushed; then let them dry well and they are not sticky. For tarring canvas, pine tar should be mixed quite thin. Any object tarred, ballast bag, rigging, or anything that should be dry to use should be placed outdoors. Drying in a building, especially in winter, just does not work. Often pine tar is put on too thick; several thin coats do much better. Like tallow, pine tar seems indispensable. I can't see just how a builder or boatman can do without it, or if he does, he's missing a lot.

Black asphalt paper-shingle stickum is readily available and cheap, and is most waterproof. It's very handy for underwater seams and nail holes, and it comes about as near to working in a wet seam as anything made; in fact it will work, though naturally a dry seam is better. Copper paint takes kindly to black asphalt stickum, though most other paints do not; the stickum will bleed through to some extent with ordinary paint, so stay below the copper line with it. Asphalt stickum tends to "settle," even in an overhead seam and in fastening holes, which is fine in a new boat. Any low places can be flushed up later when the craft has found herself. I assume this settling has something to do with the tenacious way the stuff stays in place. With care, and several shallow applications, a very bad gouge in a plank can be furred out with this goo and it lasts. It's very easy to apply even if the weather is sort of chilly, and it has the property of skinning over fairly quickly.

I've tried other similar asphalt compounds, but that made for sticking shingles seems to give the best results. It tends to flow when bedding down underwater fittings, so you get the fastenings tight right off and a good "bleed" all around is readily apparent. This is most useful stuff. In the past, a well-known maker of bedding compounds had a black one that stuck in wet seams and that was much liked by all who used it. It came in cans with his trademark. A pint cost about what a gallon of the shingle stuff does. I think it was the very same thing!

Linseed oil and turpentine are so old and so familiar to most folks that there is no point in dwelling on them. Many things I've mentioned here and in other writings require their use. You will always be using linseed oil and turpentine in various combinations. This is getting close to paints, on which much has been written in the past and is written yearly in many boating publications.

Paint manufacture has changed somewhat through the years, and many paints once much used are no longer around, at least in any quantity. Much is made of paints just for marine use, and in many ways these are fine. Most marine paints tend to a very hard finish, and for good reason. For the most part, they stay white or hold their colors very well. Many are difficult to refinish when that time comes and tend to "build up" through the years. Being hard, many marine paints are difficult to sand, at least to the point of keeping the surface from building up too much. The very high gloss of some of these paints tends to show defects in hull smoothness and, at times, even in fairness. I have no quarrel with these paints, or varnishes either for that matter, if they are used in the right places for the right effect. However, due to their nature, many of these marine paints have a short shelf life once the can is opened and a little used, for they all seem to dry quickly and there is often much skimming over in the cans. Lifting off these skins for short touch-up jobs must remove some of the important stuff in the make-up of the paint each time.

What I now say will no doubt be considered treason, but so be it. For many wooden craft, especially if more or less of classic model and with a fair hull, a high shine, or even a very smooth finish, adds little or nothing and often detracts from appearance. I'm aware, of course, that modern marine paints come in other versions than high gloss. But there is the consideration of do-it-yourself refinishing and the cost of materials. For many more years than I care to count, for exterior use on classic wooden craft, I've used nothing but good-grade, outside, oil-base house paints. The results have been first class; the boats look as they should, are easy to refinish, and the materials are economical. House paint seems to have a longer shelf life than marine paint, and so can be bought in larger cans with more economy. I think house paint is a must on a canvas deck, as, if properly done, there is little build-up.

Every time I bring up this approach, using house paints on a boat, I get a lot of noise from boat owners, paint salesmen, shipyard people, and others. Many boat owners are certainly experienced; I think I am too, by now. Paint salesmen and shipyard guys sell paint, and, to give them their due, they mostly have to do their work in unsuitable conditions and please some owner with shine--maybe this craft is the type for it--so quick-dry stuff that covers is just what they need, especially in spring.

I look at it this way: A fine 8-metre yacht should be dressed in the style to which her type is accustomed or she will look shabby. She is largely a big, unbroken surface of delicate line; any slight defect shows up badly. A classic craft, with much beading, bulwarks, seams that show, and other trademarks of her type, looks dowdy if highly glossed, yet if finished in the somewhat subdued effect of house paint, she looks the part. A 200-year-old colonial house finished in high-gloss marine paint will not look right; it cannot reasonably be made smooth enough. The fancy paint will not "chalk," and when the time for refinishing comes, there is real work to be done. My pitch for house paint is: First cost is less; refinishing is simpler; shelf life is usually longer; it looks fine on the right craft, though on the wrong one it does not.

Some of us still think oil-base paint, usually white, gray, or red lead, sometimes all three in some combination, well thinned with turps, is better as a primer on new work than the "under-coaters" often used, which dry quickly, are often hard, and "drive into the wood" not at all. Many old notions die hard, right or wrong; new ideas come along and require many years of use for acceptance. Some of these never make it, probably because they weren't practical to begin with. Turpentine has great ability to drive into wood, taking some pigment with it. Why, I just don't know, unless turps, being made from wood, just wants to go back where it came from! By the way, pine tar comes from wood too.

Compounds, paints, oils, and similar things can be gone into at length until it sounds like the "Book of Ten Thousand Formulas." What little I've mentioned here has stood the test of time, and works. Whether a person wants to use any of this or not is his own choice; the point is, these things are still around for those who do want to use them.

I think now I have stirred enough paint.

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A sad scene -- neglected vessels on the Fairhaven, Massachusetts waterfront, May 9, 1915. Photographer, probably W.H. Tripp (photo courtesy Mystic Seaport).

Appendix IV. from The Ways of the Sea by Charles G. Davis, published by the Rudder Publishing Co., 1930. Reprinted with permission.

Chapter VI

Washing Down Decks

One of the most cheering sights in the daily life of a sailor on an old sailing ship was the glimmer of light that appeared in the galley just before daybreak. It meant that the cook was already up and had started to brew a big pot of coffee - not a blend of Mocha and Java mixed in definite proportions to suit exacting tastes, merely a package of ground, burnt beans that gave the hot water a color resembling coffee and which was less injurious, as it contained no caffeine. (The latter is a much mooted question. However, there was no caffeine in our "coffee.")

The watch that had been on deck since four o'clock in the morning - except the man at the wheel and the lookout on the forecastle head - went into the forecastle and pawed around in their stall-like bunks among clothes and bedding looking for their quart tins and spoons. Finding them, they crowded close to the galley door at the after end of the forward deckhouse awaiting the darky cook's welcome call, "Coffee!" which was seconded by the mate's command, "Get your coffee, men!"

Eager faces were faintly outlined by the dim light as the cook poured steaming coffee into each man's cup and handed him a sea biscuit - a cracker the consistency of dog biscuit, about five inches in diameter and a half-inch thick. Some of the men would sit on the spare spars in the scuppers, while others would sit on the threshold of the carpenter shop if the weather permitted, eating and drinking the mess with more satisfaction than a gourmand at a banquet.

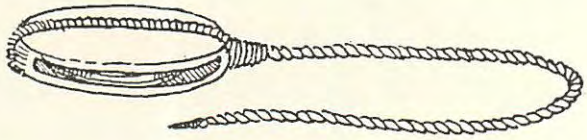
The "hot water" warmed chilled bones and put energy anew into fagged-out men. It mattered not whether the ship was gliding ghostlike over a smooth sea in the tropics or was threshing and jumping in showers of salt spray over a white-crested sea under topsails in the high latitudes. If the latter was the case they sought the protection of the forecastle head or lee side of the galley. The morning coffee was always gladly anticipated. The man at the wheel and the lookout grew impatient at this time of the day and hastened immediately to the galley when relieved.

Gray streaks of dawn appeared in the east. The ship's sails slowly became discernible. The mate pacing the poop like a caged tiger, took a careful look aloft to see that every sail, spar and rope had come through the night without accident.

In a few moments the light became clearer and the mate sang out, "Rig the draw bucket!" or "Get your buckets and brooms aft!" The process of washing down the decks was about to begin.

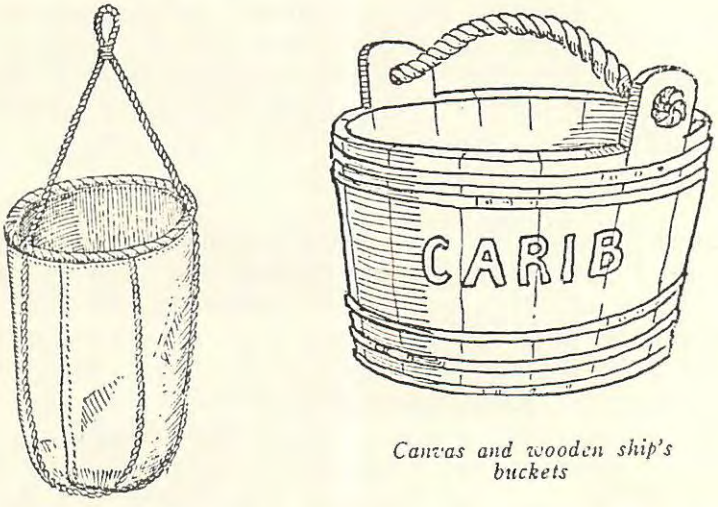
One man carried an empty beef barrel up from the forecastle head (where brooms, buckets and barrels were kept) to the lee waterways amidships.

Another man would get a tail block - a rope stropped single block with the end of the strop about four feet long - and, leaning out over the rail, would put a rolling hitch of the tail block around the lee forebrace.



A tail block

Passing the end of a rope through the block, he hitched it to the rope handle of a canvas bucket - made more like a bag than a bucket - then proceeded to bail up seawater from alongside, filling the barrel just inside the rail. Some days this was easy work. In calm weather the canvas bucket was easily worked and was brought up full of water, but in a stiff breeze the bucket didn't get time to sink - the water alongside, all effervescent with seething salt, rolled it over and over, the bow wave sending it spinning to one side in big rolls of white suds. It would jump and skit along as the ship made eight to ten knots.

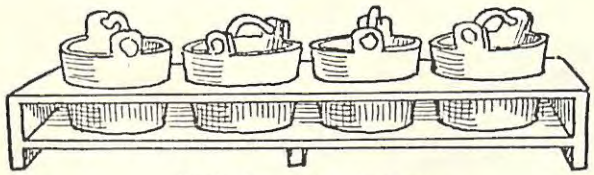


Canvas and wooden ship's buckets

The draw bucket man would have to overhaul his line and throw the bucket upside down into the water, bracing himself to prevent being yanked overboard when the rope tightened.

He was lucky indeed if he got half a bucket full each dip, for it fetched up with such a jerk, half the water went flying out, and hand over hand he pulled it as fast as he could. The bucket would whip and swing about so violently it never came over the rail full.

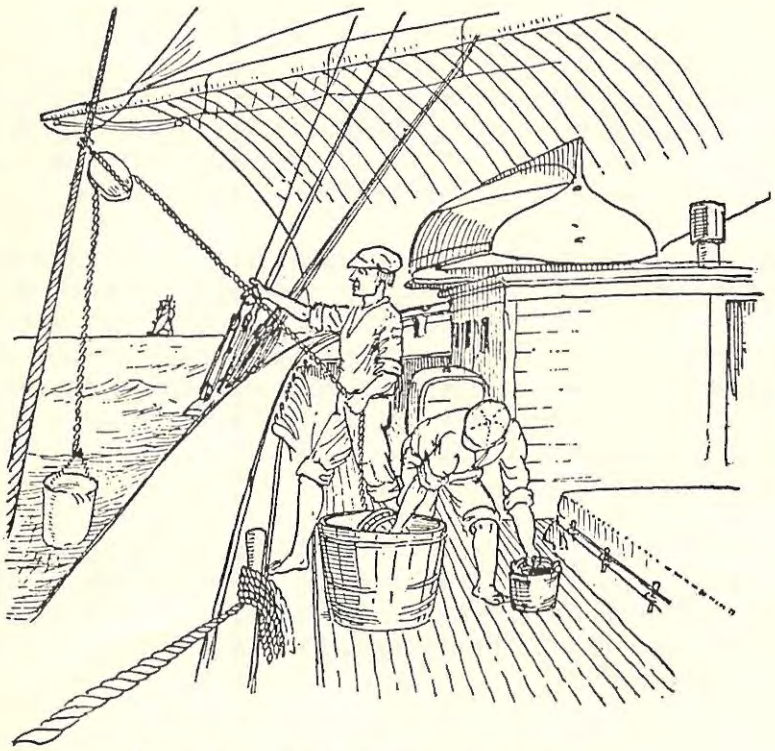
Ships' deck buckets were made of wood, bound with brass bands, about ten inches deep and nine inches in diameter. One stave on either side was left long enough to have a hole bored in it through which a rope was rove for a handle, a turk's head being worked in each end so it would not pull back through the holes. Some ships carried them in racks on the top of a deckhouse where they would be out of the way.



Rack for ship's buckets

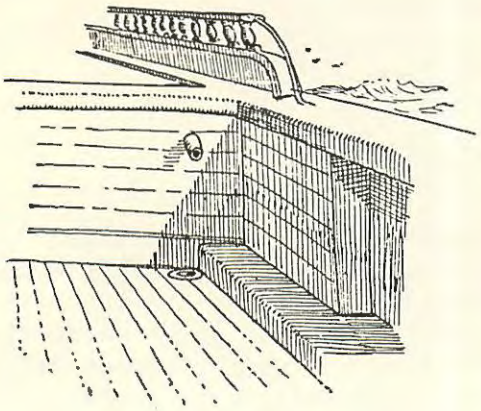
One man did nothing but dip water out of the barrel and carry it to the mate, two bucketsful at a time. That worthy lad removed his shoes and socks and rolled up his trousers to the knees. It was his function to dash the water where it would do the most good, while the rest of the watch, except one hand at the wheel, scrubbed the deck vigorously with brooms.

Beginning 'way aft, every inch of deck was scrubbed, every nook and corner poked into and cleaned and water swashed about so the scuppers were spouting a constant stream. This kept the water carriers busy. The exercise was good for the men. It kept them physically fit for any sudden emergency.



Hauling buckets aboard for washing down decks

Around the edges of each deck was a raised member of the ship's construction, termed the waterways, like curbstones on a street, and in the same manner formed gutters for carrying off the water, the decks being rounded up like the crown in the roadway and at each low corner lead-pipe drains were fitted to carry off the water. At the after end of the forecastle head, at the after end of the roof of the forward house, at the forward end of the half deck, or poop, and the forward end of the top of the after



Lead pipe drain to carry off water

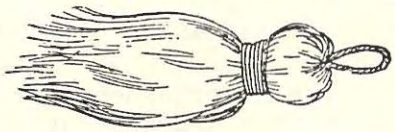
house, these pipes spouted their streams in rainy weather down onto the deck below, being drained off, all going eventually through two or three large scuppers on the main or lowest deck.

In washing down, the process began with the highest point first, the top of the after house, then the half deck or poop beginning aft. From there buckets and brooms were shifted to the forecastle head, and then the main deck beginning away up in the eyes of the ship under the forecastle head, around the bed of the bowsprit, under the windlass and out in the clear again working downhill made by the rise or sheer of the decks, ending at the scuppers amidships, the lowest point in the ship's deck.

Every day in the year, Sunday included, this washing down process was gone through, if it was humanly possible. Sometimes the seas were toppling over the rail in tons of green water; water came flying in such quantities over the weather rail as to knock a man off his feet and land him drenched in the water deep enough to swim in, in the lee scuppers. At such times the mate might forego the pleasure he seemed to take in working the crew and refrain from washing down.

Starting about 6 o'clock, the men would still be washing down when the man at the wheel struck eight bells, eight o'clock, and one of the deck watch would open the forecastle door and let out a yell at the top of his lungs, "Hay-a-a-a-a-a-a-a-a-a you sleepers, eight bells!"

As a rule the washing down was completed about seven-thirty. The mate would turn and go aft after ordering the men to "Get your swabs!" Each man went to the boatswain lockers and took a swab, made of cotton cords, and with a half bucket of water started aft, wiping off every inch of white painted woodwork so that it would not show salty encrustations as the sun shone, but would instead, gleam like marble. Brass work was then polished until the forenoon watch, having been allowed a half hour to eat their breakfast, assembled on deck. If they were the starboard watch, the second mate would give the order, "Relieve the wheel," and the mate would order his men of the port watch to "Get your breakfast, men," or "That'll do the watch!"



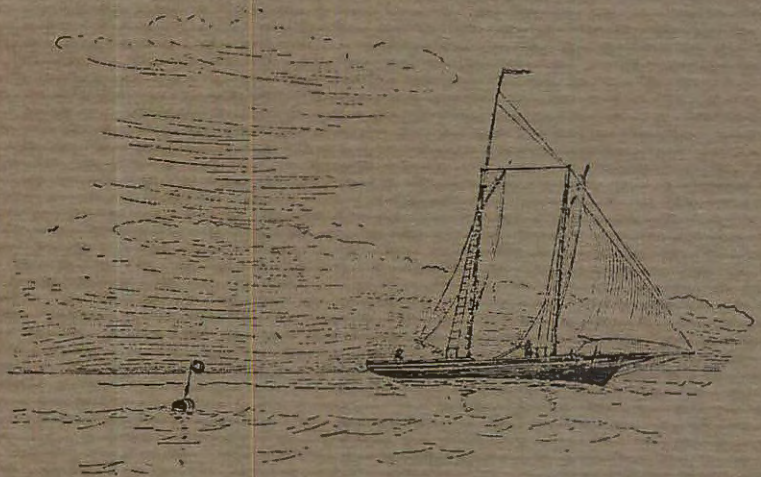
A deck swab

GLOSSARY

BRIGHTWORK	Wood which is varnished.
BUGEYES	Two-masted sailing craft, usually of log, rather than plank on frame construction, once common to Chesapeake Bay.
CANT FRAMES	The forward and after frames of a vessel which, because of their shape, do not run continuously across the keel, but are landed against the vessel's backbone on each side.
CLEAR (AS IN TIMBER)	Free of knots.
FAYING	Contacting, as with surfaces of two structural members which come together for fastening.
FELT SHEATHING	The underlayment which is applied to a vessel's bottom beneath the sheet copper sheathing. It is quite thick, loosely woven, and heavily tarred, giving it body.
FIDDED	Description of the way a vessel's upper masts are supported by the masts below. A wooden or iron fid passes through a mortise in the upper mast's heel and rests on tressle trees attached to the lower mast's head. The fid may be driven out to free the mast for sending it down.
GIG	A small fancy boat propelled by oars which is carried aboard a vessel. The ship's gig is usually fitted out and arranged for carrying the captain ashore.
GRAVING PIECES	Also called dutchmen, these are inset pieces of wood used to fill voids in larger timbers caused by rot or other damage.
HATCH COAMINGS	The boundary pieces of the hatch opening. Coamings are landed on the deck structure and project above the deck planking a few inches, keeping out water and adding strength to the opening.
HAWSE IN	To set the caulking tightly into the seam by driving it with a heavy wooden mallet called a beetle. Hawsing in is a two-man task with one man holding the long-handled hawsing iron, while the other hits it with a beetle.
HOG	A sagging of the forward and after ends of a vessel which, if excessive, creates a hump-backed look. The keel of a hogged vessel takes on a similar shape and has to be specially blocked whenever the vessel is drydocked.

HOOPS	Formed circular wooden rings which attach the forward edge, or luff, of the sail to the mast and allow the sail to be raised and lowered.
HORN TIMBER	The timber or timbers forming the aftermost part of a vessel's backbone and which extend it aft from the sternpost.
HOUNDS	The upper part of a mast where the eyes of the standing rigging are landed.
JIB SHEET HORSE	A rounded timber running from side to side a few inches off the deck and just ahead of the mast. A loose iron ring slides on the horse and the jib sheet block is attached to this ring.
KNEE	A crooked piece of wood with its arms about at right angles which, when carefully formed and fitted between other structural members of a ship's hull, acts as a brace against racking.
KNIGHTHEADS	Long timbers fastened to either side of the stem and parallel to it which rise through the deck to give sideways support to the bowsprit. Knightheads and the similarly-shaped hawse timbers just aft of them add great strength to the forward part of the vessel, but the vertical seams between these timbers are a source of fresh water leakage and rot.
LIMBER HOLES	Drainage holes cut or bored through frames, floors, and other timbers which allow trapped water to drain to the pump suction.
MAKE IN	Similar to hawsing in, but usually applying to smaller seams caulked only with cotton. Neither the hawsing iron nor the beetle is needed.
MARLINE	Light cordage of tarred hemp, used for serving standing rigging, for seizing larger rigging together, and for general service throughout the ship.
PAWL POST	A vertical timber into which the heel of the bowsprit is mortised. Its name comes from another of its functions, that of supporting the pawl for the ship's anchor windlass, located just aft of the pawl post.
PAY	To fill a seam up flush over the caulking with hot pitch or other compound.

PUNGIES	Two-masted schooner-rigged sailing craft which once carried cargo on the Chesapeake.
REEF OUT	To remove the caulking, or at least some of its uppermost strands, from a seam.
RIFT GRAIN	Grain in which the annual rings run more or less parallel to each other as viewed from the end of the timber. A rift sawn piece never includes the heart of the tree.
SCARFING	Joining two or more lengths of timber together to make a longer one, as in a keel.
SLUSH	A grease-like substance applied to the mast as a preservative and as a lubricant for the mast hoops. Petroleum jelly is usually used, although old grease from the galley was often used on working vessels.
STEM	The forward centerline timber which forms the bow of the vessel. Outboard of the stem and fastened to it is the cutwater; inboard of it and within the vessel's hull is the apron. Sometimes this entire assembly is referred to as the stem.
STERNPOST	The vertical timber stepped atop the aft end of the keel to which the aft ends of the hull planking are fastened. The ship's rudder is hung from the sternpost.
TOPGALLANT AND ROYAL MAST	The third and fourth masts from the deck, above the lower mast and the topmast. On most vessels, it is a single spar.
TUCK PLANKS	Hull planks near the intersection of the sternpost and the transom.



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