New Sails for an Old Ship—Building Sails for the *Charles W. Morgan*

by Deirdre O'Regan

When the *Charles W. Morgan* was hauled out in 2008 for a five-year reconstruction of her hull, the shipwrights at Mystic Seaport had a critical primary resource at their disposal for selecting materials, determining methods of construction, design, and repair: they had the ship. What they did not have was the original sail plan, or her sails from her whaling days. While the *Charles W. Morgan* has nearly always had a suit of sails to set at the dock for demonstration purposes, any sails she showed up with when she arrived at the museum in 1941 are long gone. The *Morgan* is setting sail this summer for the first time since her 37th voyage, which ended in 1921; the sails her crew will set will be as close to the original design, materials and craftsmanship as can be made in the twenty-first century.

In drawing up the plans for the restoration of the ship, the task of researching and building her sails went to the sailmaker most able to design and build sails as true to the originals as possible. Who better to ask than one of the world's foremost authorities on traditional sailmaking, Nathaniel S. Wilson of East Boothbay, Maine? Nat has built sails for USS *Constitution* and many of the historic sailing ships, replica vessels, and classic yachts you know about in the United States, and beyond. While he has extensive knowledge of every detail of sailmaking from the Age of Sail onwards, he still put considerable research into the job to ensure that the nineteen sails he would supply for the *Morgan* are the best and most authentic they could possibly be. These are not just for demonstrations at the dock; *Morgan*'s new suit of sails must perform properly at sea. While the ship will travel with a support vessel and tug on her 38th voyage, she has no engines and will rely on her sails for propulsion—just as she did for her eighty-year whaling career across every ocean in the world.

PHOTO BY ANDY PRICE, COURTESY MYSTIC SEAPORT

(left) Nat Wilson in the loft prepping materials for the Morgan*'s sails.*

The *Charles W. Morgan* wasn't exactly ready to go sailing when she slid down the ways at the Jethro and Zachariah Hillman Shipyard in New Bedford, Massachusetts, on 21 July 1841. Once the hull was completed, the ship needed to be fitted out with berthing areas, a galley and other interior spaces, plus deck fittings, tryworks for rendering blubber into oil, and finish work. Aloft, her masts needed yards, booms and gaffs, plus standing and running rigging and, of course, sails. The shipyard took care of the hull, but the sails would have been contracted out to a local sailmaker, and in 1841 in New Bedford, there were plenty to choose from.

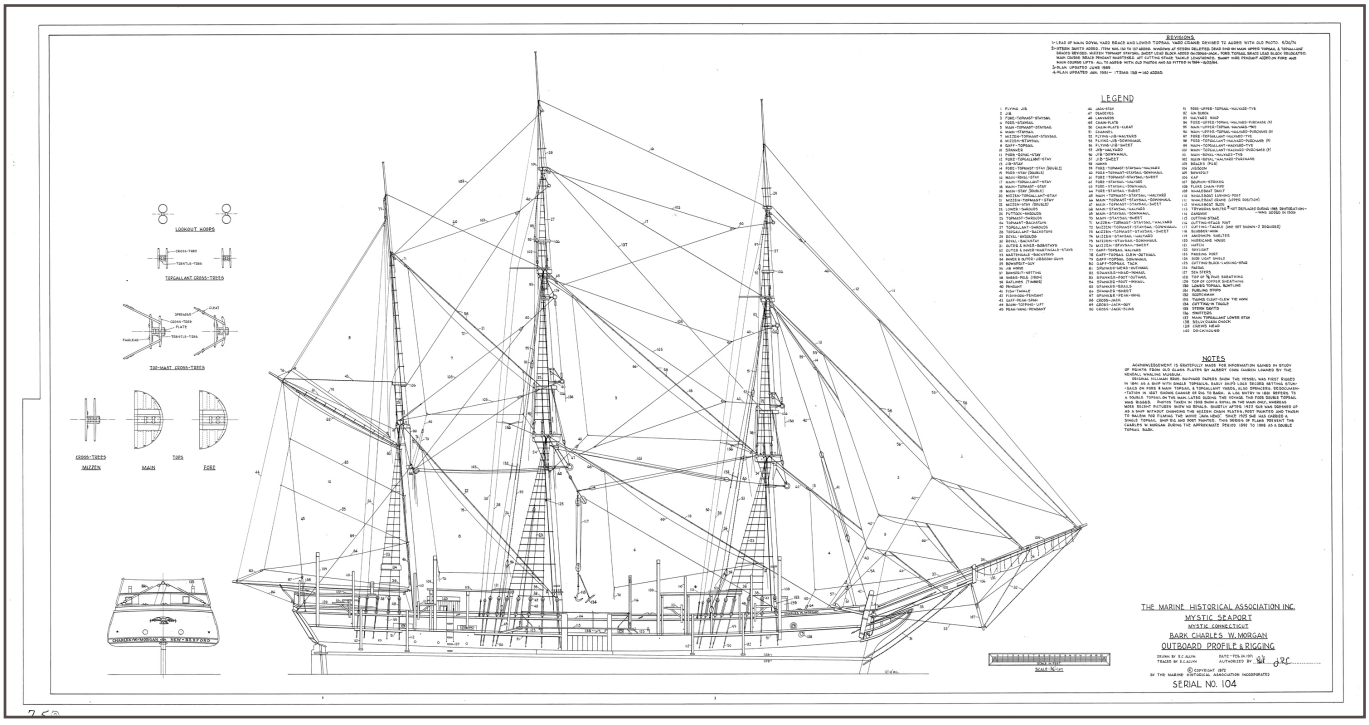
PHOTO BY BALDWIN COOLIDGE, P.D.

This undated photo by Baldwin Coolidge (1845–1928) captures a whaling ship at Merrill's Wharf in New Bedford. A stone's throw from her berth is a sail loft in the stone building, to the right of the frame.

In 1840, eighty-two ships arrived in port from whaling voyages from distant oceans. New Bedford had recently jumped ahead of Nantucket as the whaling capital of the world, and the fishery had yet to peak. At its climax in 1857, when ninety-five vessels set sail from New Bedford on multi-year whaling voyages, half of all world-wide whaling was tied to this one city. Population had more than doubled from what it had been at the turn of the century and was still growing. Business was booming. Whaling ships that called New Bedford home numbered in the hundreds, and, while most were out at sea at any one time, the streets and docks at home were scenes of constant activity. Down along the waterfront, ships in port were unloading cargo and preparing for the next voyage, while maritime tradesmen were busy receiving cargo and crewmen, and getting the ships ready to go out again.

At the time of *Charles W. Morgan*'s launch, there was a sail loft within two blocks of nearly every wharf in New Bedford. In 1836, twenty-seven sailmakers worked in New Bedford at six different sail lofts, and by 1859 their numbers had nearly tripled.

A common practice in nineteenth-century shipping was for sailmakers to accept shares in a vessel in lieu of cash, which not only could bring in a good return on their investment, but would also lock in that vessel's sailmaking work. New Bedford



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The rig and sail plan for the Charles W. Morgan, *drawn up by Robert Allyn in 1971.*

sailmaker Simpson Hart, for example, became part owner of ten vessels in his thirty-five year career between 1841 and 1876. Such an arrangement served the needs of a ship's other investors quite neatly by dramatically reducing the amount of cash it took to put a vessel to sea.

Sailcloth was sometimes supplied by the shipowner, but many sailmakers from that era provided the cloth, and would also supply sailcloth to ships and other sailmakers as part of their business. Sailcloth manufacturing in the United States had gotten off to a slow start; sailors and shipowners preferred the tried and true, and the flax linen used for sailmaking before the nineteenth-century switch to cotton typically came from the Baltics, with the most sought-after cloth coming from Russia and Holland. Cotton was grown the world over, but cotton fibers are short and fine, rarely more than an inch long, compared to flax fibers, which average eighteen to twenty inches long. Cotton wasn't suitable for sailcloth until the advent of new technologies: the Arkwright spinning machine, introduced in the late eighteenth century, and the power loom, which was introduced to American manufacturing in 1813, could spin and weave cotton fibers into a strong, tight, uniform cloth. New England's first cotton duck sailcloth was manufactured by Seth Bemis in 1809 in Watertown, Massachusetts. While cotton would, in time, replace linen as sailcloth in the United States, the transition took decades.

The merchant fleet was quicker to make the switch than the navy, and, in the 1830s, New England ships' and sailmakers' ledgers disclosed a marked shift to cotton duck. By 1841, New Bedford sailmakers were using more cotton than linen for sailmaking, depending, of course, on the desires and instructions of the shipowners paying for them. Remember that part of the hoopla caused by the schooner yacht *America*'s trouncing of the British in 1851 was the choice of cotton duck used for her sails, which was unheard of in Europe at the time. Boltropes sewn along the edges of the sails, meant to bear the load of heavy spars, were hemp throughout the Age of Sail, until the late nineteenth century, when the huge sailing ships of the grain trade and clipper era began using wire rope.

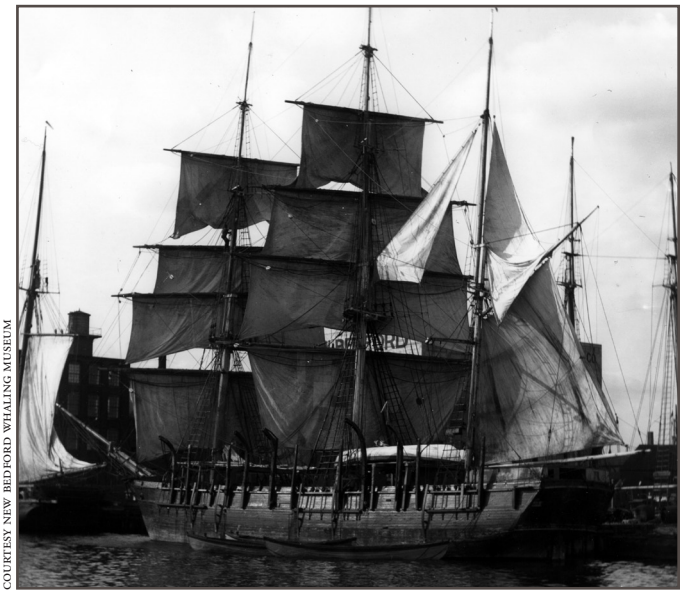
Confident in the knowledge of what materials would have been used to construct *Morgan*'s sails during her whaling career (cotton duck and hemp cordage) and where the sails would have been built (locally in New Bedford), Nat's next task was design. Luckily, during her heyday, the *Charles W. Morgan* was a well-known ship, and many photos have survived from her working life. While fewer photos were taken underway, there are dozens, perhaps hundreds, of photographs of the ship in port, both while she was employed in whaling and afterwards when she became an attraction vessel, before she was moved to Mystic in 1941. "There's nothing like a picture," says Nat, when trying to figure out what the sails looked like, and, if the resolution is good enough, one can discover details of those sails.

One of the *Morgan*'s part owners during her whaling career was a gentleman by the name of Albert Cook Church (1880–1965), who not only took thousands of photos of the *Morgan* and other whaling ships, he sent cameras and equipment to sea in the care of whaling ship's officers so they could document their work in real time. Mr. Church published *Whale Ships and Whaling* in 1938, a book of more than 200 photographs of whaling ships, mostly the *Morgan*. In addition, image collections at Mystic Seaport and at the New Bedford Whaling Museum include hundreds more. Also well documented was the whaling ship *Wanderer,* the last New Bedford square-rigger to set out on a whaling voyage, which wrecked off Cuttyhunk in 1924, just fourteen miles outside New Bedford Harbor. These historic photo collections provided critical information to Nat and his crew.

Mystic Seaport does not have the original sail plans, but they do have a detailed plan that was drawn up by naval architect Robert Allyn in 1971, based on measured drawings of *Morgan*'s rig and sails and extensive research from her history. Allyn also used information from the Albert Cook Church photographs and from original papers from the Hillman shipyard. When he drew

up these plans, the *Morgan* had been at Mystic for thirty years, most of that time landlocked in a sand pit, but fully rigged and with a sail inventory for demonstrations. The *Morgan* was originally ship-rigged with single topsails until 1867, when she was re-rigged as a barque with split topsails, and she kept that configuration for the rest of her whaling career. According to Allyn, early ship's logs mention the crew setting stunsails on the fore- and main topsail and topgallant yards, plus spencers. Split, or *double*, topsails are easier to manage by the crew, eliminating the need to wrestle with a huge sail area when setting and taking in sail. Instead of reefing a large sail, the crew could simply set one of the two. When the *Morgan* retired from whaling and became an attraction vessel in South Dartmouth, Massachusetts, in 1925, she was again re-rigged as a single topsail ship. During this era, she is shown with royals on every mast, but these do not appear to have been part of her regular complement of sails. There is a photo, dated 1906, that shows her flying a single royal on the main mast.

In addition to *Morgan*-specific material, Nat could depend on sailmaking rules, which in the Age of Sail were quite standardized and changed little before the introduction of synthetic sailcloth in the twentieth century. The British, in particular, were very consistent—and strict—about their methods, rules, and standards,



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especially in the Royal Navy. British sailmakers trained American sailmakers, and other than the Americans' quicker transition to the use of cotton sailcloth, their methods were very similar. While hull shape and deck equipment would have varied considerably between naval and merchant ships, aloft the sails and sail configuration were much the same. Rules were made and followed, and, while they evolved over time, in general they were very consistent throughout the Age of Sail. This body of rules was set down in treatises on seamanship and sailmaking; by the year that the *Morgan* was built, eleven treatises on seamanship and sailmaking had been published in English, and during the *Morgan*'s whaling career, another ten would be added to the list. These treatises provided tables for making measurements for every kind of sail being flown in the nineteenth century, plus they outlined

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(left) Drying sails at the dock, Charles W. Morgan *in 1917 with double topsails, when she was still in her working life as a whaling ship. (above) The* Morgan *was a dockside attraction at Col. Edward H. R. Green's estate in South Dartmouth, Massachusetts, between 1925 and 1941. Col. Green was chiefly responsibly for saving the ship after she retired from whaling in 1921. Here she is at his estate, restored and with full sails set at the dock.*

The many photos of the Morgan *with her sails set, from a variety of angles, helped Nat determine the details of her sails from her working life and shortly thereafter. A close-up look at photos like these reveal the number of panels in the sail, number of reef bands, how she was rigged with buntlines, clewlines, and sheets. You can even make out some of the hardware, chain sheets, and more.*

techniques, hardware, and guidelines for every detail, including cloth weights and widths. These technical manuals guided sailmakers or ship's officers who would have to repair and replace sails at sea or in distant locations.

With the Allyn plan in hand, the historic photo collections, and current measurements of the *Morgan*'s spars and rig, and armed with his own experience following tried-and-true sailmaking rules from the Age of Sail, Nat set to work making sail plans of his own from which he and his crew would build sails for the 173-year-old ship's 38th voyage.

Whenever they could, sailmakers would try to get exact measurements of the spars and rigging after a ship was launched and floating. If the angle of the gaff is off or the measurement of a yard turns out to be slightly different from what was on paper,

the sails will not fit or perform well. A sail can be short on the head or foot on a square sail, but not too long or you cannot stretch it out tightly—the same goes for the hoist. The sailmaker must also account for stretch for the same reasons, and sails do not stretch evenly. The sailmaker must be an expert in understanding his or her materials and how they will behave once they are stretched and stressed with use over time.

Nat's sail plan returns the ship to her double topsail configuration. The *Charles W. Morgan* will put to sea with 8,622 square feet of canvas set across nineteen sails on three masts. Nat's sail plans are hand drawn and, once his formal sail plan is drawn up, he hands off a "cut sheet" for each sail to his crew, from which they will roll out the bolts of sailcloth on the loft floor and cut the panels. Cut sheets differ from the sail plans in that their measurements account for stretch. You cut a sail for the dimensions you want it to be once it has been bent on and used, and has stretched.

The three lower staysails that you will be able to see from deck level are entirely hand sewn by Nat's three sailmakers who work in his loft: Sam Upton, Adam Yanchunis, and Mike Bartles; the remaining upper staysails, headsails, and squares are machine seamed and hand finished. The sails Nat makes for historic ships are typically made this way; only occasionally does an order come in for completely hand-seamed sails; *Mayflower II* in Plymouth, Massachusetts, got a full suit of completely hand-sewn sails in the 1980s. The decision to hand seam sails is mostly a financial one; it results in increased labor costs. In this case, Nat's crew, once they got into the groove of hand-seaming cotton sails—on a bench with a bench hook, the same way sailmakers stitched sails for hundreds of years before them—they stepped up the pace and were able to complete the job in a time not too much longer than if they had machine-stitched the whole job. For the crew at the loft, it was an experience they embraced, as cotton cloth and linen and cotton twine are much easier on the hands than synthetic, and pushing the big sewing machines to the sides of the sail loft for a period of time changed the whole environment of working there. It was quiet.

For hardware at the clews and earrings of square sails and fore-and-aft sails, Nat had spectacle irons, iron rings, and other hardware custom made by blacksmith Matt Harkins of Newcastle, Maine. Sails are made from 24-inch No. 4, No. 6, and No. 8 cotton duck supplied by C. R. Daniels, Inc., of Ellicott City, Maryland; boltropes are hemp from Holland, and twine for stitching (both linen and cotton) came from the New Bedford Thread Company.

At the end of the summer last year, Nat and his crew dedicated the sail loft to the work on the *Charles W. Morgan*'s sails exclusively. It took nineteen weeks to build nineteen sails. With the exception of the three hand-seamed staysails, the job of building the *Morgan*'s sails was no different from the regular work

PHOTO BY ANDY PRICE, COURTESY MYSTIC SEAPORT

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PHOTO BY MAYNARD BRAY, OFFCENTERHARBOR.COM

The Charles W. Morgan*'s new suit of sails is hand-sewn cotton duck with hemp boltropes and custom-made galvanized ironwork, including these spectacle irons for clews—a typical design from the Age of Sail. (2nd photo from top) sailmakers Sam Upton, left, and Adam Yanchunis.*

they do there. Sailmaker's benches, sail palms, three-sided sail needles for handwork, brass ring grommets, tarred wax, and fids are all standard tools and materials used in most of the sails they build at his sail loft. Machine-seamed sails still have to be hand-finished. Hand-worked grommets are not only more traditional, they are much stronger and more durable than modern pressed rings. For sewing on the bolt rope, no machine has ever been invented that can properly rope a sail. Roping is a critical step: a mediocre sail can be made into a well-performing sail with good roping. Likewise, a poor roping job can ruin even the best-made sails. At Nat's loft, all the sailmakers are trained to do every job, under the watchful eye of the master sailmaker, of course. From a careful study of the historic photos, Nat also determined that *Morgan*'s sails had canvas covers sewn over boltropes to protect from chafe, and he had his crew sew sailcloth covers on every sail edge except the luffs on fore-and-aft sails and on the heads of the square sails. Most of their usual work uses synthetic cloth called Oceanus, made by North Sails with design input by Nat. *Morgan*'s use of cotton will require a little bit more maintenance than synthetic sails, as cotton sails will mildew if stored damp.

At this stage, the sails have left the loft and are now being bent on the *Morgan*. While the crew at Mystic is busy working on readying their ship for sea, the crew at the sail loft is back at work, making sails for square-riggers and schooners, classic yachts and workboats. For Nat, his relationship with the *Charles W. Morgan* and Mystic Seaport has come full circle. He worked there for a while in the 1970s when he was first discharged from the United States Coast Guard. His job with the Coast Guard? You guessed it—sailmaker aboard the barque *Eagle.*

PHOTO BY MAYNARD BRAY, OFFCENTERHARBOR.COM

Nathaniel S. Wilson has made sails for such historic and replica ships as USS *Constitution,* USCGC *Eagle, Sultana,* sloop *Clearwater,* the schooners *Spirit of Massachusetts, Pride of Baltimore II, American Eagle*, and *Lettie G. Howard,* plus the *Kalmar Nyckel, Mayflower II, Godspeed* and *Discovery, Niagara,* and many others, including four Murray Peterson-designed coasters, and now the 1841 whaler *Charles W. Morgan.* ⚓

Deirdre O'Regan is the editor of Sea History.

PHOTO BY RYAN LEIGHTON, COURTESY BOOTHBAY REGISTER

(left to right) Sam Upton, Adam Yanchunis, and Nat Wilson back on the job in the sail loft working on new sails for another historic ship.

Off Center Harbor

To view the sailmakers at their work in East Boothbay, check out the excellent video reports made by Maynard Bray and his crew at Off Center Harbor at www.offcenterharbor.com.

Mystic Seaport

To follow the 38th voyage and learn where *Charles W. Morgan* will travel this summer, visit the Mystic Seaport website at www.mysticseaport.org.