“The Matthew”
A Plank-On-Bulkhead Model Ship Project

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The Matthew Project

When asked if I was interested in developing a modeling project for the ship Matthew the first thing I had to do was to find out exactly what the Matthew was. It didn’t take long to find out the Matthew was the ship John Cabot used to explore North America in 1497.

Two ship types dominated the seas during this period the carrack and the caravel. So, my next thing to decide was which type of ship was most likely used by John Cabot.

The carrack and the caravel were very similar in appearance, the only real difference was in size.

The carrack was the super ship of the day, often having two or three decks at 625 ton and 140 foot stem to sternpost. Their primary use was huge cargo ships and ships of war. The one and only example of this type of ship I know if is the Mary Rose.

Crewing a carrack was a major consideration in using such a vessel as an exploration ship. Maritime laws at the time required one seaman per five ton burthen of ship. You would need a crew from 45 to 80 mariners to sail a carrack. This crew would be much too large for an expedition crew.

So I ruled out the carrack as used by John Cabot, which leaves us with the caravel.

The caravel was used by the Portuguese and Spanish on sea routes to the East Indies and the conquest of New World. The caravel was also used for coastal trade, fishing, and the choice for exploration.

Considering the wide use and importance of the caravel very little is actually known about its construction and form. No remains of a 15th or early 16th century caravel have been found.

The earliest specifications or crude drawings date back to 1571-1616 and most current knowledge of the caravel is based on artistic renderings and fragments of information from accounts of early explorers, dockyard supply lists and a few 15th century contracts, building and refitting accounts.

From existing records we find the average size caravel from the Mediterranean region was about 50 tons and 60 feet long where they were the workhorses of the area employed in fishing, local trade or served as escorts and patrol ships, these early caravels were open boats of one mast. Portuguese trade with England and Ireland brought the caravel to Europe and gave rise to the northern Caravel a three-masted fully rigged ship.

Throughout the middle ages in Europe shipbuilding was a craft learned through apprenticeship, handed down from one generation to the next orally and by example in the shipyard. The master shipwright may or may not have been literate, but any plans or treatises on ship construction did not exist.

Shipwrights in the Mediterranean basin built their hulls by joining each plank to the next with mortise and tenon joints. As the hull grew, frames were added to reinforce the structure, the lines of the hull were created by eye as the ship was built. When ships began to grow in size, through a slow evolution, the practice of first erecting frames on the keel, then nailing on planks, arose in the Mediterranean.

A strongly-braced hull was one of the characteristic features of the caravel, enabling it to withstand hard and continued use on the open ocean which caught the interest of the northern shipwrights. The most im-
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important revelation from the study of the caravels coming into northern ports were their construction. Up to this point in time European shipwrights built ships by the shell method. It was the caravel that introduced the skeletal construction to northern shipwrights.

Our building project contains three sources of information. First, the scarce historical information, next, a replica built in Bristol England (the location from which the original Matthew sailed) and a replica built in Bonavista, Newfoundland (the location believed to be the landing place of John Cabot in 1497).

The major source of our information will come from the latter. Here we can look at the plans, compare pictures of the replica to view actual construction details.
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The Mock-Up

The initial concept of this project is to create a model based on the reconstruction built at Bonavista Newfoundland using a set of plans supplied by Parks Canada and the actual reconstructed caravel at Bonavista. This gives us a set of plans and an "as built" ship.

Having two versions of a caravel and adding to that some basic historical findings, this gives us wide latitude to work in.

The northern caravel is actually a hybrid of the cog, carrack and the Mediterranean caravel. There are two methods we can go about in creating a model this project. Either a historically correct plank-on-frame kit or a plank-on-bulkhead kit.

To create a historically correct framing on the model would require setting in floor timbers and overlapping the first futtocks between the heads of the floors. This old style of framing requires skills of a more advanced model builder, thus it would limit the ability of the average modeler to build a model. The plank-on-bulkhead model was chosen for its simplicity allowing anyone from a beginning modeler to an intermediate builder to take part in the build. The ships drawings are included in the appendix for the advanced modeler who wishes to take on a plank-on-frame model.

Designing our model began with converting the original plans into modeling plans for a bulkhead hull.

To build our model using our converted modeling plans, the first step required was to build a mock up of the skeleton using foam board to confirm our drawings. With the mock up of the ship using foam board, any alterations that may be required can easily be made to the general form. It also helps you to anticipate any problems that you may run into before you actually cut into any wood.

For example, the yellow arrows in the picture above are pointing to errors in the hull
lines. Which would cause a kink in the hull shape. Either bulkheads 3, 4 and 5 are too full or bulkheads from 6 to 9 are incorrect. Either way adjustments were needed.

When looking at the hull from the stern we can see on the right side of the hull, all the bulkheads from midship to the stern have a nice even flow. At this stage of development corrections to the bulkheads from midship to the bow were made.

Looking at the mock-up (Fig. 4, 6, 7) and the Matthew replica (Fig. 5), it becomes quite apparent that the top timbers inside the bulwarks as well as those that support the forecastle and stern castle decks are all exposed.

If the bulkheads are made completely of plywood the edge of the plywood will show on the top timbers and stanchions thus giving us an undesirable visual affect.

It is also not practical or cost effective to cut the bulkheads from solid wood in this instance. For one thing the six inch wide bulkheads will tend to warp when using solid wood. Because the top timbers are curved and have a distinctive tumble home they actually form the shape of the upper hull thus it is important that they are strong.

To overcome this problem we will create custom solid wood timbers that will not only provide us with the strength we need but will also give us the desired visual effect of real timber.
The last thing we will look at before continuing on to build our basic hull structure is the stern of the ship.

The red line indicates the actual stern frame. If built as per the plan, the builder would have to set the stern frames to the exact angle and the entire structure would be quite delicate.

The only point at which the stern frame connects to the hull is shown with the green arrow.

To solve this problem the last bulkhead was made solid because it is hidden below deck and cannot be seen.

Solid stern frames are then set against the last bulkhead shown with the blue arrow. This insures the correct angle of the stern and creating a strong structure to plank.
Before we begin getting into the actual construction of our model I would just like add a few words on the plans as they relate to our build. It is my goal, as you read this book to hopefully understand the process and logic that we went through in developing this model.

The plans that you will find in the appendix were developed using some reverse engineering techniques. Although we started with conceptual plans, we have also taken into consideration historical information as well as implementing various aspects of the two ships as built.

The Matthew and ships of the period were not built from plans. The shipwrights of the day built their ships from knowledge and experience gained through their apprenticeship. They built using a time tested system and each step of construction was based on the steps before it.

As model designers we follow a similar process, using our modeling experience, some basic information about the ship and forming it into a model. Our plans were actually drawn throughout the process of our build, with the final results presented to you with our drawings in the appendix.

Most of the information you will see here is based on the Matthew Kit that we have developed. It is not necessary to purchase this kit in order to build this model. All the information and drawings you need are fully included in this book. Our goal is to explain the process in a detailed manner.

Once satisfied that our hull lines were corrected using our mock-up, our drawing files were modified to make the appropriate corrections to the frames in question and we created a cutting file in our CAD program that was used for our kits laser cutouts for the bulkheads along with some other components.
The problem of the exposed top timbers was solved by cutting the lower half of the bulkhead from plywood, with a keyed notch for the solid wood top timbers as shown above.

By keying in the top timber the problem of the timber slanting inward or outward is solved. You can see in the photo (Fig. 12) the key on the top timbers which fit into the keyway on the plywood bulkheads.

In our cutting file we also have the plywood profile piece, top timbers, keels parts and deck beams for the forecastle and quarter deck (Fig. 10 & 11).

At this stage we have the profile piece and the bulkheads. This provides us the size and general shape of the hull and we can now add all the ships features based on the relative scale of the structure.

Like the shipwrights of old no two ships were built exactly the same. This idea also applies here. YOU are the master shipwright of this model.

It does not matter if the final shape of your hull matches anyone else's or if your main hatch is 1/8 of an inch farther forward. Even though a set of plans is supplied you have to remember you are building from conceptual drawings.

Remember there are no original plans in existence for the real Matthew. And if there were, you can bet that the actual ship was not built to exacting standards by the shipwright. They were limited by their experience and the materials available to them. It is more the norm than the exception that the real ships were not built as per the plans. Plans were used as guidelines and in this time period seldom even seen.

For anyone deciding to build this model from the kit it is our goal that you learn the basic structure of a ship and how to build it. Learning how to mill wood and the use of machines is not part of this build. Its about building a nice scale model without the need for anyone having to run out and buy a miniature table saw, scroll saw, thickness sander and a host of other power tools.

All you will need is a few hand tools and a power Dremel tool at the most, everything else has been done.
To construct your model you will require some very basic modeling tools such as a hobby knife, sand paper, ruler etc.

One other tool that I have found very helpful, not only in building the Matthew but most other models as well is a dremel rotary tool. Though I haven’t seen them available commercially one very helpful attachment I use is a sanding disk. If you cannot acquire one locally, do not worry, here are some examples of some materials you probably have laying around that you can make them from.

Almost anything can be used to do any job at hand. Above are examples of material from green foam; the type mouse pads are made from. Felt and a fiber backing to an old leather belt to a hard plastic disk. Notice the sandpaper is cut larger than the disk. This is done so the edge of the disk can be used.

Some examples of how I have made use of some of these home made disks on other projects I have worked on are, are shown in the next few pictures.

For the Matthew project all we will be needing is a hard plastic disk and following these pictures is the simple process to use in making them.
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The first step in making your hard sanding disk is to find a suitable bottle cap to make a disk from. Look for the little indentation in the center of the cap. This will allow you to drill a hole dead center for the mounting screw. Caps come in all sizes and a variety of thickness and stiffness. Some caps have a larger indentations like the second sample.

Some bottle caps I will cut at the edge where the top curves over shown by the blue arrow. Leaving the curved edge allows the sandpaper to roll over the edge and it can than be used as a cutting surface. The process is very easy and all you need to do is either cut off the sides or sand them off, then drill the center hole for the mounting screw.

So, if you have a Dremel rotary tool or any rotary tool for that matter, this is a handy attachment you can make in a few minutes.
Getting Started

If you already have your kit you can skip over this paragraph and get right into the build. If you don’t and you plan on building this from your own materials you’ll need to print out and cut your profile piece before you continue. You’ll find it in the appendix.

Before you do any work on your profile piece I suggest that you read through this section and make sure that you have a full understanding of what you are about to do.

Starting with the center profile piece there is a little sanding that will need to be done.

On an actual ship’s hull the sanding we are doing is called the rabbet. This rabbet is a “V” shaped groove cut along both sides of the keel and stem for the planking ends to fit into. Typically this would be cut out with a chisel, but in our case we are going to create the main groove of the rabbet on the plywood profile piece. The bottom section of the rabbet will be formed by the top of the keel where it joins the profile piece. By using the two outer layers of the plywood as shown by the blue arrows in the picture below we are going to create a beveled edge.

Above you can see the full thickness of the plywood. In the next picture you can see it after it has been sanded down. The idea here again is to create a bevel along the edge of the plywood profile piece about 1/8 wide. Once again the blue arrows show the edges of the bevel.

All along the stem and keel the bevel is kept at a constant 1/8 as the bevel reaches the stern deadwood area the bevel fans out as shown by the green arrows. On an actual ship this area would be made up of timbers and knees a few inches thinner than the width of the keel. The stern ½
The Matthew frames were attached to the sides of the deadwood.

The rabbit is created when the keel is glued to the profile piece so the planking can come to rest on the inner edge of the stem, stern post and keel as shown below.

Fig. 25
Building The Bulkheads

If you don’t have the kit, you will now need to cut out all your bulkhead parts. Cut out all the main bulkheads and the top timbers. Then simply follow along. The drawings are in the Appendix.

In this section we will construct and install our bulkheads. Each bulkhead consists of three parts. The main body of the bulkhead which is made from plywood and two top timbers.

Taking out the components of your bulkheads you will note that they are charred along the edge. This charring is caused by the laser cutter. All the components in your bulkhead kit were created slightly larger than necessary to allow for this charring effect.

Using a sanding disk on my Dremel tool I hit the inner edges of the plywood bulkhead and the solid wood top timbers. As
you can see I didn’t sand the edges clean, just enough to remove the loose char. The fit between the top timbers and the bulkheads are not a tight fit, there is a little wiggle room between the parts. Each top timber has extra material added to it so any slight wiggle will not matter because the final shape and size will be sanded to when to hull is shaped.

As you will note when looking at the pieces, all your components are labeled with numbers. (If you have cut out the parts yourself, be sure to number them all so you don’t mix and match timber heads.)

Once you have given them all a quick sanding it’s merely a matter of gluing the parts together ensuring all along that your part numbers match.

**Attaching the Bulkheads to the Profile piece.**

With all the bulkheads assembled its now time to build the hull. Begin with bulkhead number 11 this is the midship frame. All the other bulkheads will be built off the midship section so be sure bulkhead 11 is square to the profile piece. I have 1 x 2 x 3 inch steel square blocks I use which come in handy for a number of uses one being to square up the bulkheads.

Depending on the humidity the bulkheads may or may not fit tight in the grove. Just incase a little sanding is needed a sanding paddle can be made from a scrap piece of wood about 3/32 thick, some two sided tape and 60 grit sandpaper. It takes just a few swipes down the edges of the groves to get a nice fit.

Glue is not applied to the inner edges of the slots, the fit is so snug most of the glue will be squeezed out. A fillet is used on both sides of the joint between the bulkhead and the profile piece. A little black was added to the glue to show the fillet. A fillet is a very strong joint and it will hold the bulkhead in place quite nicely.

Begin with bulkheads 10,11,12,13. These form the midship section of the hull. The idea here is to construct a solid, square section in which we can continue adding bulkheads in both directions, clamping them to the midsection as we go along.
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Clamps will be needed to hold the blocks in place while the glue set. After setting 3 bulkheads stop and make sure you are still square to the profile piece. Besides clamps rubber bands work just as well.

You may encounter a few stubborn bulkheads or a slight warp in the profile piece, this can be taken care of with stronger clamps or rubber bands.

**Filler Blocks**

The blocks are an important element in the structure, not only do they make the hull rigid but also provide a landing for the decking. In actual ship construction lodging knees were added where the deck meets the hull and at every hatch. If we were to add knees the shape would be like the photo below. In this project structural elements are not eliminated but rather simplified when they are covered and out of view.

In order for the bulkheads to remain square to the profile piece the blocks have to be cut fairly accurate. A measurement is taken at the center of the bulkhead where it meets the profile piece. When the blocks are cut they are placed at the center to check fit. The blocks should just hold in place without the glue, requiring only a gentle tap to knock them out.

Keep in mind that the bulkheads are getting smaller as you work your way to the bow and stern, and the deck has a sheer. The blocks will be stepping up and inward. Make sure you place the blocks so they can

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be shaped to the deck sheer as well as the hull form.

At the bow and stern, the hull changes drastically from bulkhead to bulkhead so blocks large enough to form the final shape are used. Rather than using smaller blocks at the bow, the entire space was filled in.

There is a steep sheer to the deck at the bow. Each block was lined up with the bulkhead in front of it. When the deck is finally sanded, these blocks will be shaped to form a nice smooth sheer.

The finished hull with all its blocks in place form a strong structure which is necessary in order for it to withstand the grinding and sanding required to shape the hull.

Many of the plank-on-bulkhead kits will have less than half the amount of bulkheads used in the Matthew hull. Because the bulkheads are spaced so far apart double planking is necessary to form the shape of the hull. In the Matthew hull, where the hull planking takes the most twisting and bending aft of midship the bulkheads are closer together as apposed the midship where the planks will lay almost flat. Notice the stern has not been added to the hull at this stage of construction. The stern will be added once the hull has been shaped.

Looking at the hull from the top you can see how the blocks are stepped and how the blocks will form a ledge for the ends of the deck planking.
Shaping The Hull of The Matthew

Shaping the hull can be done by hand with a block and sandpaper, however the job is much easier if a sanding disk is used on a Dremel tool. A 60 grit disk will take down the hull quite fast. Shaping the hull begins along the sheer line where the filler blocks are sanded down to the bulkheads. This will create a smooth belt along the hull from bow to stern. The one major concern is the top timbers at the deck line. You do not want to sand the top timbers at this location to thin. Sand a belt about ¾ to 1 inch wide along the blocks making sure you leave enough material on the top timbers.

Once you have a smooth belt running along the hull at the deck level, the next area is
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along the bottom of the hull. Here you will be sanding in a rabbit. As you can see in the photo the bulkheads extend to the bottom of the center profile piece. Using a sanding disk with the sandpaper extending beyond the edge creates a tool that acts like a saw and enables you to get right against the side of the profile piece. Sand down the bulkheads until they are about 1/16 below the edge of the profile piece. At the bow the bulkheads are sanded down to match the curve of the stem.

Overall shaping of the hull is done with a 60 grit sanding disk. The key here is to use a disk that will span 2 bulkheads. The actual sanding is done between the bulkheads so you touch 2 bulkheads, the back of the forward bulkhead guides the forward edge of the bulkhead next to it. Using the laser char as a guild you can sand an even forward edge along each bulkhead as you work your way to midship. Looking at the laser char notice I am staying below the deck line and about the bottom of the blocks and not sanding the top timbers, this comes later in the final hull shaping.

Fig. 43

Fig. 44

Fig. 45

Fig. 46

Fig. 47

Fig. 48
A second tool is a home made sanding sled (fig.48) made from a scrap piece of wood. The ends are rounded so the sled glides over the edges of the bulkheads rather than crashing into them. By using a 80 grit sandpaper fastened to the sled with two sided masking tape you can begin to give the hull its final shape.

Shaping the hull will be a dusty job and not something you can do on the couch while watching TV. As a matter of fact an extension cord with a Dremel tool outside is your best bet. As you sand and shape the hull what you are looking for is an even line between the bulkheads as you view the hull from the bow and stern. In many cases where the hull is built from only a few bulkheads spaced far apart you can not get a true feel for the shape of the hull. A nice planking job depends on the structure it will be fastened to. Whether you are building a plank-on-frame or a plank-on-bulkhead hull, planking with no bulges or dips depend on the beveling to form a smooth transition from one frame or bulkhead to the next.

Looking at the stern view you can see the bulkhead with the yellow arrow. First of all the space is far too wide when compared to the space between the four bulkheads in front of it. Secondly the bulkhead has a bulge shown by the blue arrow. This bulge blocks out the bulkheads behind it. So it is necessary to grind down this area until it blends into the hull shape. Looking to the right side of the hull the shape is becoming a little more refined. The red arrows show areas where the hull has to be sanded. What you are looking for is a nice even transition from bulkhead to bulkhead.

In this next photo, sanding and shaping has not been started and the unevenness of the hull is quite clear. On the left side the rabbit has been sanded in and the first shaping has been done. The yellow arrow points to an area where bulkheads 3,4,5 are too full, you should be able to see bulkheads 6 and 7 all the way to the center profile piece. More sanding is needed before we can call this done.

The next few pictures show the finished shape of the hull; each bulkhead has a smooth transition from one to the next. A well shaped hull is necessary for the planking to have enough surface to be attached to and also the planks will have to lay flat to the hull. Looking down the side of the hull you can see how the stern will take on the characteristic rounded stern.
It is important while shaping the hull to stop sanding every once in a while and view the hull from all angles. The mid ship remains pretty constant and it’s a matter of blending in the bow and stern. Once you have a smooth shape you can continue to shape the hull by making the hull a little sharper or fuller. Even in the time these ship were built the hull shape varied from one shipyard and ship builder to the next.
With the bottom of the hull shaped we will now use a sanding disk on a long shaft to sand the filler blocks and bevel the tops of the bulwarks. With a 2 inch disk you can get right up to the top timbers. Getting between the top timbers is difficult even with a very small sanding disk so removing the extra material is done with a knife. The wood used is soft and its easy to cut away the excess between the top timbers.

The deck has a pronounced sheer and also a curve from side to side. Use the tops of the bulkheads as a guide and sand the blocks level with the bulkheads. With the blocks sanded down level, then lightly sand off the laser char across the rest of the bulkhead. Be careful to maintain the curve of the deck and don’t sand the bulkhead tops flat.

On the drawing for the hull lines the sheer is shown in red on the profile and on the half breath plan.

Finally the bottom part of the hull is shaped to your satisfaction and the deck is finished sanded, notice the top timbers still have not been sanded. Shaping of the hull
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stopped at the deck level and finishing the top timbers will come after the deck and inside have been sanded. The red arrow is pointing to the sheer line. This is the curve the outside planking will follow.

Fig. 59

Fig. 60
Before we begin with the waterways let us take a look at the Matthew and see how it was built.

In the photos the black and blue arrows point to two seams.

The black arrow is the seam between the wale on the outside and the bottom of the scupper which is between the inside waterway.

The blue arrows point to a seam between the scupper bottom and the waterway.

The waterway is made up of two pieces. One is a block between the top timbers, the second part is a filler below the outside plank or the bottom of the scupper.

It was common practice in ship building to make the waterways from a large plank. These planks were scarfed together at their ends. The average size would have been about 5 inches thick and 12 inches wide, in lengths of 25 feet (quite a large piece of lumber).

The piece between the black and blue arrows might be a filler. When the scupper is cut out of the plank it will leave an open hole in the hull that goes all the way down between the frames. If the plank goes behind the wale then what we are looking at is not a filler block but the bottom of the scupper cut into the plank.
The following photos shows a waterway on a schooner built in the 1840s. This shows a one piece timber notched to fit around the stanchion timbers. A molding on the outside of the hull completes the waterway. Large heavy waterways acted as structural timbers which helped to straighten the ship.

**Fig. 63**

A little pre planning is necessary at this time.

The Mathew has five wale timbers which run along the hull. These wales were nailed to the face of the frames and did not sit on top of the hull planking.

If you go with a one piece waterway the top wale timber will fit against the outside edge of the waterway as shown in the photo.

Hull planking will then butt the top and bottom sides of the wale timber. The top plank will have the scuppers cut out of the bottom of the plank. There is no need for a filler or to run the top plank under the wale. The top surface of the waterway is the bottom of the scupper.

**Fig. 64**

Cutting and fitting this type of waterway is a very fussy job and can become quite aggravating. On the Mathew you have to cut 22 notches, if one is cut wrong you either have to cut out that section of the waterway and replace it, start over or use filler to patch up the job. Ultimately, it is up to you the builder to decide which way you want to go with the waterways.

Take another look at the Matthew waterway notice the deck planking runs up to the waterway filler blocks and butts against the inside edge of the top timbers. Now compare that with the photo of another waterway and notice the waterway runs along the inside of the stanchion timbers. The decking butts the waterway all along the deck. You’re the master shipwright so can make your waterway out of filler blocks between the stanchions or cut a notched timber. Using filler blocks is a simple method and needs no step by step instruction. In this section I will go through a step by step process of installing a notched timber waterway.

Keep this in mind if you decide to cut your waterways out of one piece of timber. It took me 12 hours and two tries to fit the waterways as I have done and I have done this several times before. So, if using this method, be prepared for some tedious work. Take your time, don’t try to do it all at once and you should have no problems. Remember the old adage, measure twice cut once? This is a good example of where this saying came from. Luckily, if we make a mistake its only a small piece of timber!
Before we begin with the waterways, the inside of the top timbers have to be cleaned of the laser char. You can clean the inside edge before you begin to assemble the bulkheads which might be a good idea, however I prefer to do this in place. Looking at the hull it comes to mind how do you fit the Dremel in the hull to sand the timbers? It's just to big so you need to sand at a 90 degree angle. It is no problem, turn the sanding paper on the inside of the disk. Then you sand the inside from the outside. Why did I wait until the hull was assembled before I sanded off the char? Because holding the top timber pieces while sanding proved to be a problem. Once they are secure in the hull it takes such a small light sanding to remove the char, just a quick zip of the disk and you're done.

Begin the waterways by making a cardboard pattern to fit the inside of the top timber. There are several way to make the waterways. One is to notch the cardboard pattern to fit the timbers making a pattern you can trace or glue to a piece of wood. Another method is to cut roughed out blanks, then trace the shape of the waterway on the wood blank. Sand the outer edge of the blank so it fits the inside of the top timbers.
Once the waterway blank fits in the hull, clamp it in place. Use a knife and mark along the sides of each timber with a cut. With only a small cut mark it is very easy to cut the sides of the notch at the wrong angle or cutting them so the sides are not exactly parallel giving you a notch wider or narrower at the bottom that at the edge.

My favorite method for doing things like the waterways or for joinery work is to use electrical tape.

With this method I prepared my wood blank and clamped it in place in the hull. Rather than mark both sides of the timbers I marked only one side. With a scrap piece of wood from the top timber laser sheet as a guide I lined one side up with the cut mark and then cut a pattern in the tape. This gives me a clean, sharp pattern to follow.

The waterways were made with nothing more than an Exacto knife. You can cut the notches with a small scroll saw but hand cutting them proved fast and easy.

One thing that makes the waterways easy to cut is the choice of wood used. If this were a very hard and dense wood the only way would be to use a scroll saw or hand razor saw.

The wood I selected for the waterway is Black Willow, also called Bat Willow or Swamp Willow. Its name, Salix Nigra in Celtic is Sal Lis or near water. The wood is named Black Willow not because the wood is black or even dark in color its because the bark of a mature tree is dark brown to almost black in color. Willow is very light weight and easy to cut. The wood is prized in wood carving because it cuts with a clean sharp edge. Don’t let the light weight
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fool you in thinking it’s a soft and breakable wood. Willow is used to make cricket bats, artificial limbs, paving blocks, boat building, flooring and aircraft construction. Desirable properties of willow is its resistance to splitting and its stable in use. When all the notches have been cut test fit the waterway to the hull to make sure all the notches are in the right place and the sides of the notches are not running out of true.

Use an Exacto knife starting in the middle of the notch and cut to the bottom of the cuts made along the sides. Finally slice out the center. Notice I didn’t cut the notch its full depth. This was done so I could check the fit of the waterway to the hull and make any adjustments to the width of the notch or the angle of the sides.

Fitting the waterways is a fussy job that requires small cuts to adjust the notches then refitting it to the hull. This process is done over and over until all the top timbers fit snug in their notches.

Looking at the series of photos you can see the pencil markings where adjustments are needed. As you get closer and closer to all
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glue into the hull.

Before you glue the waterway into the hull however, it is a good idea to do a dry run

the notches fitting the top timbers take note that the waterway has to move outward until its outer edge is even or slightly beyond the hull. In the last photo you can see the waterway needs to move a little farther out.

After several test fitting and making adjustments it becomes a little tedious and you will want to make bigger cuts to finally get the waterway to fit. In the long run you will end up cutting a notch too deep then all the notches will have to be adjusted. So, take your time, it’s better to make small cuts and a lot of test fits.

From an oversized blank the final shape of the waterway is completed and ready to

and make sure your clamping will hold the waterway exactly where it should be.

In my test run only clamps were used to pull the waterway tight to the top timbers. The final gluing clamps were used to pull the waterway outward and also downward to the filler blocks.

As you can see in the photos a lot of clamps are needed to insure everything fits right and the waterway has the correct sheer.

Now that you have one waterway done its time to start all over and make one for the
other side. Don’t start off making both waterways exactly the same. The one you just finished may or may not fit the other side exactly. Begin with a cardboard pattern cut to fit the inside of the top timbers then proceed to mark and cut your notches.

**Deck Clamps**

Next step is to install the deck clamps. Use two of the deck beams and clamp them level with the top of the timbers, one deck beam on the first timber in the front and one on the last timber at the stern. Set the deck clamp tight under the deck beams and clamp it to the inside of the timber. You do not want to bend the clamp to the timbers but rather pull the timbers in a straight line. Pulling the timbers in a straight line is done by using a stiff timber, something like a 3/8 x ¼ piece on the outside of the hull. Installing the clamps at this time will stiffen up the top timbers and prevent them from breaking when the bottom planking is installed.

**The Keel**

The final pieces to install in this section is the keel assembly. Begin on a flat surface, (I work on a piece of plate glass), and glue the keel to the stem pieces. With the use
of rubber bands glue the keel to the hull. I left off the sternpost because some adjustments might have to be made so the keel notch lines up with the after edge of the deadwood.

Install the sternpost into the keel notch and against the edge of the deadwood. If you don’t get a nice tight clean fit between the keel and sternpost there is enough material on the laser sheet to make another sternpost.

A trick in getting tight fitting joinery is to cut a very slight hollow at the end of the sternpost. I used a round file and with a few passes created a concave surface. It is sometimes difficult to get a perfectly flat surface on both pieces. By creating a slight concave surface insures the edges will mate with the adjoining surface.

The center profile piece should have been sanded down far enough to create a deadwood and rabbit for the hull planking. Before final gluing of the keel and sternpost double check to be sure you have a nice deep rabbit. If the deadwood is to shallow the plank ends will become very thin at the ends when you sand the hull.

This concludes this section in the building of the Matthew. Note that the top timbers still have not been sanded on the outer hull nor has the stern been built.

Planking the hull is a rough job and the hull requires a lot of handling. Because the planking of the hull is done while the model is upside down, the top timbers will get subjected to being banged on the end of the work table or your knee or anywhere else. It is easy to snap off a top timber so at this stage they are kept thick to help prevent any breakage.

In the next section we will have a look at the stern where some more work is required before we move on.
In classic model building where the model is built timber for timber like an actual ship, the stern would be made up of several timbers.

The photos are showing the transom timbers, which make up the lower section of the stern.

The bulkhead construction of the Matthew hull leaves a void at the stern where the transom pieces would normally go.

If you were to plank this stern the planks would crease at the last two bulkheads and lay flat from the last bulkhead to the rabbet.

In order to avoid this we will need to build a structure underneath the planking to form a nice smooth bend in the planking.

Before we begin any building on the stern we will need to do a bit of pre-planning. To
begin let us take a look at the stern of the Matthew.

One unique feature is the end of the transom sticking out beyond the side of the ship. If you were to follow the wale pointed to by the blue arrow notice it is level with the deck. Now we know how high to place the transom.

![Fig. 99](image)

Taking a close look at the planking we can see the planks of the lower section of the stern run about half way over the outer face of the transom. The hull planking runs up the inside edge of the stern post and over the outer face of the transom timber were it butts the bottom edge of the planks of the lower section of the stern. There is a small, wedged shape piece that fills the gap between the hull planking and the stern planking.

![Fig. 100](image)

The final plank of the hull runs along the top of the second wale and under the end of the transom piece and finally twists and lays flat on the outer face of the transom. The blue arrows show this plank in the photo.

The height of the opening of the tiller arm is the width of 2 ½ planks above the upper face of the transom. Looking from the inside out you can see the stern timbers pointed to by the yellow arrows and the blue arrow points to the top of the transom timber.

![Fig. 101](image)

In the next picture (fig. 104), starting with the black arrow, it is pointing to the face of
the transom timber. The dark green arrow is pointing to the stern planking, which is over the face of the transom timber. Lastly the light green arrows are showing the hull planking fitted into the sternpost rabbet.

If you fit the transom timber against the inside face of the stern post you will end up with planking that looks like the photo below.

There is a jog between the planking in the rabbit and the plank on the transom timber. In order to get the stern planking to look like the photo of the Matthew stern, there has to be a gap the thickness of the planking between the transom timber and the inner side of the stern post. In actual ship building it would seem if the transom timber didn’t notch into the stern post it would be floating with no support. The transom timber in actual ship building would sit on top of the inner stern post and its ends were notched into the last frame timber.

With all the pre-planning examination done it appears some alterations will need to be done to the model. For some unknown reason (could be that creeping error), there wasn’t enough room for the planking between the stern post and the transom timber.

A little shaving off the stern post will correct that problem. It looks much worse than what it really is.

Simply mark the amount you need to remove then clamp a straight edge to the stern post. Use a new blade sharpness is
The Matthew

the key to getting a clean cut. Don’t use a lot of pressure on the first couple cuts, just score the wood. Once you have a path for the blade to follow then shave off the excess wood. If on your model there is room for the planking then you don’t have to correct the stern post. This may have just happened on the model I am building.

The exact height of the transom timber could be seen in the photo of the actual ship. Line up the top of the transom timber with the top of the waterway as indicated by the two red arrows. When the transom timber was being fitted is when I noticed there wasn’t enough room between it and the stern post. In the photo the transom fits tight against the stern post. Another possible correction is to make the transom timber smaller. The structural timbers used in the actual ship were either 5 x 5 or 6 x 6 timbers in the upper works. It was a guess on my part to use a ¼ square piece for the transom, which is a 12 x 12. In the photos of the actual ship the planking is eight inches wide, the transom timber looks larger than eight inches so I settled on the 12 x 12 because it is a main timber supporting the stern structure.

To simulate the lower transom timbers you see in the photos of the Oliver Cromwell at the beginning of this section, I decided to remove the lower section of the last bulkhead. Another correction that looks harder than what it is. A razor saw and a sanding disk on the Dremel make short work of it.

Now there is a big hole where the lower transom pieces will fit. I saw no need to fit individual pieces because the area will be
The Matthew

covered with planking. Blocks will serve the purpose well and give the planking a solid backing.

At this stage the blocks do look ugly and you wonder if you will ever get them shaped. When I cut the blocks I measured from the last bulkhead to the sternpost then subtracted the thickness of the planking to form a rabbit between the block and sternpost. The wood used is Basswood, which is soft and easy to cut. The only mistake I made was not to brush off the chips from my lap, thus leaving a trail through the family room and into the kitchen. This required breaking out the broom and covering my tracks through the house, luckily my floors are all hardwood and easy to clean. Needless to say the rest of the job was done outside on the deck.

When you’re satisfied the planking will lay smooth and your blocks have a nice shape a final sanding is done by hand to smooth out any bumps or high areas as well as feather out the bottom into the deadwood area.

The final shape of the blocks simulate the transom timbers and fill the area for the planking to rest against.
It is very common for kits to provide planking material unsuitable for the purpose, thus causing a number of problems for the model builder.

Every commercial wood has its properties. Some are suitable for bending while others are not.

Some common problems are, providing wood not suitable for bending, dry wood and providing planking material far too thin. Thinly milled wood will reach a certain point when it looses its strength and it breaks before it bends.

Taking a look at the photo above you can see the plank is bent and twisted from horizontal to vertical within a length of 6 inches. There were no heated plank bending tools used, nor was the wood soaked in water. The bend was done dry and cold.

The bending and twisting was accomplished because, first the correct type of wood is used and second, notice the thickness, its much thicker material than usually provided in double planked kits. Actually the thickness is to the correct scale of a 3 inch thick bottom plank.

The last point is dry wood. You will find furniture and cabinet makers all require wood dry to a low 6% moisture. Some woodworkers will tell you that is too dry, while other say no.

As wood dries it becomes brittle, so a kit sitting in a warehouse for a year will dry out the thin planking to a point it becomes so brittle it snaps when you try to bend it.

An example of this is to take a dry twig and break it, it will not bend but it will snap in half. Now take a green twig and do the same, you will find the green twig will bend, even be difficult to break.

Even if you soak the dry twig in water it still will not have the same bending properties as a green twig.

Somewhere between the dry and green twigs the perfect moisture content is used in planking a model.

For this project I used the same wood used for the waterways to plank the hull. The Willow I used was been slowly sea-soned in a solar kiln and not flash dried in heated commercial kiln. The wood is seasoned to a moisture content of from 12 to 15% keeping the wood flexible and pre-venting it from becoming brittle.

There is a concern expressed by some model builders that planking with a moisture content above 6% will cause the wood planking to shrink and you will have gaps between your planks. Black Willow was selected because while seasoning it has a large shrinkage but once seasoned and it looses it high moisture content it becomes very stable. The wood also does not split or check very easy. Lastly willow has an ex-
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cellent ability to take glue and finishes to a smooth surface. The wood will move ever so slightly due to humidity in the air but not enough to notice, and it will not leave ugly gaps between your planking.

Before we actually get into the job of planking there are a couple issues to cover concerning caulking and fasteners. These you should decide on before you start the job.

The Matthew is painted and any planking spikes may have been counter sunk and filled over. The black arrows are pointing to the barely visible heads of spikes. What can be seen are the caulk lines between the planks.

Model builders will go the extra steps and show caulking on the decks but not on the hull, it's up to you, the builder, if you want to show caulking or not on the hull.

On this model the edges of the planks were darkened to simulate caulking, making every plank stand out.

There are a few ways to create the caulking. One method is to darken the edges with a marking pen, which you would have to test to be sure the pen does not bleed into the wood and give you a fuzzy line.

Another method is to use a soft lead pencil and darken the edges. With the use of a pencil the caulk lines will not be perfectly even and will tend to fade in and out. This does give a realistic appearance.

By standing the planks on edge and gluing them to a sheet of black paper then cutting them apart will give you a perfectly even caulk seam. To produce a subtle appearance simply space the planks ever so slightly apart and allow the glue to ooze up between the planks.

In the first photo below (fig.120) the planks are set apart allowing for several methods of showing the caulking. One is to leave the gap and allow it to be filled in with whatever finish you intend on using. Wipe the seams with a mixture of colored glue, or fill the seams with graphite paste mixture. Using this method it is a little difficult to maintain an even gap between the planking because as the planks are glued to the hull they require clamping, which may cause the planks to shift.

In the second photo (fig.121) the planking is set tight against each other.

As you decide how to handle the caulking remember that you are working at ¼ scale and at that scale the caulking is so small it would be a very faint line.

Caulking comes down to art vs. realism, you can exaggerate the caulking slightly so
the viewer can see the individual planking and show off the craftsmanship of placing every plank. Also to demonstrate how the hull is built using planking and caulking to make the hull watertight. Or push the planking tight and leave only a hint of caulking.

Finally the length of the planks used is something to consider. By planking the hull in one long strip makes bending and twisting of the plank easier. A quick and simple example of this is to hold a piece of planking with you hands about 3 inches apart, then twist and bend. Now hold a plank in your hands 12 inches apart and twist and bend. Its much easier to bend a long plank because the stress is spread over the length of the plank. Seventy foot planks were a little difficult to obtain in real life and even if the were handling them would be a big problem. The longest planks used were thirty foot with an average of 18 to 22 feet and down to just a few feet. One way to show the butt ends of planking is to cut a shallow seam into the plank. You can't go to deep or the plank will snap at the cut. In the last photo is a fake butt cut into the plank and to the right is an actual butt joint. To the average viewer the difference may not be noticed. To anyone who has built a model ship and planked a hull they can easily tell the difference between the two. The cut butts have to be done after the hull is given its final sanding or you will sand away the line.

Now we come to a debated issue that has been with ship modeling for many years, the treenail or wooden pegs used in ship building.

On one side of the issue are those who feel using oversized and or contrasting treenails detracts from the model giving it the appearance of chicken pox. While on the other side there are those who like the look and feel it lend an element of authenticity to the construction of the model.

In most cases like the Matthew the hulls were painted and the fasteners didn't show. Where hulls were not painted the fasteners were counter sunk and covered with either a wooden plug or a putty. On the realism side of the issue the fasteners were small and when reduced to ¼ scale they would disappear or be nothing more than a pin prick.

This is another issue where art vs. realism and it comes down to the model builders...
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and what they want to show or demonstrate in their portrayal of a model of a wooden ship.

Leaving the final decision up to the builder, all that can be done is to present the facts and the real thing and how to show the fasteners on a model, allowing the builder to choose.

The only example we have for the time period of the Mathew for fastening planking to the hull is the Mary Rose. This ship used wooden trunnels which ran all the way through the outer planking through the frame and ceiling planking. The outer ends were counter sunk and plugged with a resin or tar.

The butt ends of the hull planking of the Mary Rose used iron spikes. Over time iron spikes replaced the wood treenails altogether.

In the photo above is a close up of a shipwreck of about 1840. Here we see the use of iron spikes, the green arrows show the same methods employed back when the Mary rose was built. The iron spikes were counter sunk and the red arrow shows the remains of a putty used to cover the spike.

In the photo it looks as if the spikes are above the surface of the planking. Actually the wood plank is worn down as you can see by the area around the spike shown by the blue arrow.

This shipwreck has sistered frames and the spike pattern shows two spikes in each half of the frame producing a pattern of four spikes per frame.

The Matthew was not sister framed so the pattern most likely would be two fasteners per frame. To add treenails or not is the question each model shipwright will have to decide for themselves.

Lets examine the choices. A planking spike measured 5/8 diameter and a wood treenail measured one inch. At ¼ scale a planking spike would be about .012 and a wood treenail .020.

The ¼ scale plastic figure is showing different sizes of fasteners. The top large fasteners are the size of the little brass nails available from hobby supply dealers. These measure .025 to .030 if you drive the nail into the plank and snip off the heads. A true to scale iron spike would look like the examples in the center while the bottom examples are showing a wooden treenail at about 1 ¼ diameter.

The traditional method for adding treenails is the use bamboo or hardwood pulled through a draw plate. Alternatives would be to use the bristles from paint brushes, whisk brooms, push brooms, wall paper brushes or anything with bristles. Other materials used are copper, brass or silver wire or plastic rods available in many sizes.
If you were in a shipyard and the foreman yells to you get a crew and line off the hull, the photos above and below show what you would be doing.

On the bulkheads, using 1/8 wide electrical tape the hull is divided into belts or sections for planking. By lining off the hull it insures a smooth run of the planking.

Start by measuring the hull in midship into the number of planks it will take to cover the hull. It takes seven planks from the sheer to the cap rail then a belt of three planks and three belts of four planks and finally the bottom planks.

First line off the sheer and the bottom plank belts. Next start the center belts at midship and allow them to run as natural as possible. The tape strips will want to run up the sternpost and stem so at the ends divide the remaining space evenly between the three center belts. When the hull is lined off take a knife and notch along the tape to mark their locations.

Each strip of tape on the model represents a wale on the hull.

Looking at the plans and at the actual Matthew there is a difference in the location of the wales. The plans show five wales colored brown and a molding under the cap rail. The way the Matthew was built it has five wales with the top wale running two planks under the cap rail and no molding. The four lower wales are called the main wales and the upper most wale above the
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down line is called a channel wale. The purpose of the wales are to act as a longitudinal support for the hull as well clamping the frame components where they lap each other.

Looking at an illustration of framing of a hull you can see the placement of the wales and how they correspond to the lapping of the frame components. The third wale up from the keel stiffens the frames.

The construction of a plank first hull begins with setting in the floors. When the floors are in place the hull is planked inside and out and the first frame section is wedged between the floor heads. Where the floor and frame timbers overlap they create a solid band of timber. A stringer is run on the inside and a wale is run on the outside of this solid band of timber.
The garboard plank is the first plank to install on the hull. It is a special shaped plank with the ends called hoods. Looking at the photo you can see the plank is narrow in the center and tapers outward to the ends, which is exactly opposite of the side planking, which are wider in the middle and taper to about half their width at the ends.

In the photos below are the hood ends of the garboard. The yellow arrow is the garboard and the orange and red arrows point to the ends of the bottom planks. Notice the planks at the top of the photo are much narrower than the three bottom planks.

Making a pattern of the garboard starts with a 3/8 wide strip of cardboard.

When it is clamped at the sternpost (fig.142) and it takes its natural bend, the cardboard will tend to move away from the keel as shown in fig.143.

If you were to clamp the end at the sternpost and stem then force the pattern along the keel, a kink in the plank will accrue as in fig.144.
And, if you were to pace the strip against the keel, the ends of the pattern will sweep upward leaving a large gap between the plank and the keel.

The objective is to get the garboard to naturally lay flat against the bulkheads and along the keel to the stem and sternpost. The only way I have found that this can be done is to cut the garboard to shape. The easiest way is trial and error, or the so called trim till it fits method.

IN order to shape the garboard plank, cut out a small tapered sliver of wood from the center of the plank to about an inch from the stem and also back to about an inch from the stern post.

Your cutting more off from the center of the plank than at the ends. It will take a little touch up at the ends to get a nice fit in the rabbit. Slowly trim away small amounts of material until you have a good fit. The final shape of the garboard will be a little off (see fig.139).

When the garboard is cut to the correct shape it will lay flat without any kinks or forcing the plank. You can see in the photos the kink is now gone and the garboard plank lays smooth and flat.
Once you have a garboard plank that fits use it as a pattern for the other side of the hull (fig.139).

You may have to go back and trim the bottoms of the bulkheads a little if the garboard does not slip into the rabbit with a nice tight fit. It’s important that your garboard planks are the same so that your planking is symmetrical.

The garboard is easy to glue in place because the rabbit will hold it. The only clamping you should really need will be at the ends.

In ship building there is a term called “spiling”. What it means is cutting a plank to shape. Hull planking is not just a matter of tapering the ends of a plank. Each and every plank has its own unique shape. Some planks will flare at the ends then narrow and widen then narrow again.

Spiling is a methods of taking measurements from a batten which is first laid on the hull so it forms a smooth run. When the batten is set, measurements are then taken along its length. These measurements are transferred to a plank and a line is drawn from one measurement to the next forming the bottom of the plank.

On the model the spiling is done in reverse. Rather than cutting the next plank to fit the one below it, the plank on the hull is shaped to fit the run of the next plank.

Planks set end to end on the hull from stem to stern is called a strake and the flow of a strake is the run. You want a smooth flowing run of planking.

A nice natural run is the first concern and the planks are cut and shaped to accommodate the run, if a plank has to be forced in place it is not shaped correctly.

By using a strip of any flexible material lay the strip on the plank. This strip is laid even with the edge of the plank between the two clamps in the center of the hull, then allow the strip to follow its natural curve to the stern and bow. Always use a sharp blade and lightly cut along the strip. A number of light passes are much better than trying to cut through the plank in one
or two passes. By starting in the center it is necessary to shape the plank at the bow as well as the stern.

There are two methods to cut a plank to shape. One method is to cut along the edge of a guide making a shallow score in the wood. Then with light passes continue to cut until you have cut through the wood. A problem with this is the cut running off the original score. The second method is to cover the plank with electrical tape and make your cut along the guide strip then remove the sliver of tape.

This method may take a little practice but works very well once you get the hang of it. What is being done here is taking off slivers of wood until you reach the black tape. A key to success is the direction you cut. In one direction you get short cuts because you are cutting against the grain, in the opposite direction you cutting with the grain and you can slice off long slivers of wood, but you must be careful or you will remove too much material depending on the grain of your wood. Either way you choose to shape your plank the final step is to run a sanding block along the edge to smooth it out. Use a small sled with the sandpaper double taped to the side, it will take just a couple passes to even out the edge.

When your finished with shaping the plank a final check is done to see if the next plank will lay flat to the bulkheads and tight to the plank on the hull.

As each plank is cut to fit watch where they end up in relation to the marks you placed on the bulkheads when you lined off the hull. The second bottom plank will end up very close to the mark. If you are too far off further up the hull you will need to take
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drastic measures to insure all the planks will fit.

It takes a lot of clamps to secure the plank to the hull. Some builders will use a 5 minute Epoxy or a fast setting supper glue.

I have had planks spring loose when the Epoxy lets go, so I found the use of Titebond wood glue to work the best. However, it does require clamping the planks until the glue sets.

In the following series of photos different methods of clamping are shown.

The orange tip clamp is clamped to the bulkhead and presses the plank down and inward.

By using C clamps and a small scrap of wood the planks are clamped to each other.

The black tipped clamp at the bow pinches the tip of the plank into the rabbit.

The large spring clamps pull the plank toward the keel and tight against the garboard plank.

It is not all the crucial to set every plank perfectly even with the previous plank. If there is a little bump in the planking it can be sanded out. The blue arrows are point to areas where the planking is slightly raised. Planking used on this hull is thick
enough to enable sanding to smooth everything out.

After the first bottom plank is set in place the shaping process is repeated same as was done with the garboard and the second bottom plank is glued in place. From a view of the bow and stern the height of planking should match at the stem and sternpost.

After the bottom planking is in place the first wale is installed. The wales are higher than the planking so it is easier to finish the planking before the wale is installed. Finishing can be done by hand or with a sanding disk on the Dremel. Once again a sanding disk is made to suite the job at hand. A soft felt disk is cut out and a 180 grit sandpaper is stuck to the felt with double sided masking tape. Because there are convex and concave areas on the bottom planking a soft disk is used to prevent the edges of the disk from digging into the planking. The disk will conform nicely to the shape of the hull.

A before and after photo shows the difference between the planking as installed and after a sanding with a 180 grit sanding disk. All the bumps and glue are sanded away leaving a smooth surface. At this point you can continue with finer sandpaper or stop at the 180 grit sandpaper depending on how fine you want the finish.
A question often asked by the beginner is where do you start planking the hull, from the keel up or from the rail down? Without a doubt the hull planking begins at the keel because of the difficulty of shaping and installing the garboard and bottom planks. Once you planked up to the sheer line then you plank from the rail down to the sheer to meet the hull planking. The garboard used a 3/8 wide plank and the two bottom planks were ¼ wide. The width is needed for these three planks because of the excessive amount of shaping needed. Once the bottom planking is installed it is easier to sand the planks to their final finish. This is done because the wale sticks up above the planking and it will be difficult to sand the hull once the wales are in place.

Plank by plank instructions would be a bit long winded so in this part of the build only the general information will be covered. Once you get the idea of shaping and installing a plank you will find the rest of the planks are pretty much the same.

The Matthew has five wales the first is located along the bottom planking. These wales are 1/8 square stock and are a little tricky to install. Problem one is clamping the wales, second is they tend to want to roll so it is necessary to twist them in order for them to lay flat and finally they take a sharp bend at the bow and stern. In midship problems with clamping and the wale sitting flat is minimal, its at the bow and stern where one will encounter problems. It takes a lot of clamping pressure to hold
the wales in place at the bow and stern. Pressure of the clamps will dent the wood, so an alternative method is needed. Ends of the wale were first glued in place at the bow and stern to the second bulkhead. This required no clamps or force to hold them in place. Once the glue sets carefully bend the wales until they sit flat. No wetting or heating was used to bend the wales, they were bent dry. If you have problems with bending the wales all that is needed is to run the ends under hot water for a minute. Then bend and clamp the wales until they dry.

Creative clamping is needed to install the wales as well as the rest of the planking.

At the stem a bur was used to deepen the rabbit so the end of wale will be able to seat itself. The end of the wale is notched so the bottom part will sit into the rabbit and the upper section will sit against the stem.

The final fit of the wale into the stem rabbit produce a clean tight fit. Caution here, the notch will tend to split, to avoid the splitting either wet the end of the wale and bend it at the bow, you will need to bend the wale and hold it in place until it dries or glue the ends of the wale at the bow.

The C clamps with a little scrap of wood will hold the wale tight and flat to the bulkheads. While the larger spring clamps pull the wale tight against the bottom planking.
With half of the wale from the stern secure to the hull bend the second half from the bow to the end of the first wale section. Mark and cut the wale sections to butt.

With the bottom planking finished and the first wales on the hull recheck the location of the next wale and mark it. The first lining off of the hull was a general location for each wale. As each belt of planking is installed there will be variances so slight adjustments might have to be made as you work your way up the hull. You can see the dark markings on the center bulkhead for the location of each wale.

The next section of planking will require five strakes of planks. Planking this section differs in method from the bottom planks. Because the bottom planks required such extensive shaping, the spiling was done by cutting the planks after they were on the hull. In this section of planking the planks are tapered first then glued on the hull.

Measuring off the belt of planking will give you a better idea of how the planks will taper. At midship five full width planks are used and at the bow the distance is half that at midship, at the stern the planks taper then right at the sternpost the planks will take a slight flare.

At the bow the tapers begin at about bulkhead number 6. The first plank up from the bottom will have the longest taper and progressively get shorter as the planking works its way up the hull. The yellow lines show the lengths of each taper. Each belt of planking is done the same way. After the next wale is put on to the hull a check is made as to how close you are working to the projected location of the next wale up. The first belt of planking used five strakes of planking the next two belts use 4 strakes each and the final belt used three strakes.

Cutting the taper in a plank is done by using a piece of plate glass and clamping the plank under a piece of steel banding strap. The straps used for banding have a spring to it so when it's clamped it will bow slightly and hold the plank quite securely. Use a new, sharp knife blade and run it down the edge of the strap. After you have made the taper cut run a block of sandpaper where the taper runs off the plank. This is to
blend the taper into the full width of the plank.

At the turn of the bilge the hull is taking a tight curve and the planks will not want to sit against one another very close. By using a sharp blade a fine shaving is done to the edge of the plank to bevel it. Before a plank is glued to the hull you can run a razor blade along the edge giving it a slight bevel.

Another problem is the planking will not want to sit flat against the curving edge of the bulkhead. This creates stepping of the planks from one to the next. There will be some stepping of the planks unless you hollow out the back of the plank to form a concave surface.

This is one way to solve the problem but a bit extreme.

The thickness of the planking is a little oversize to compensate for any irregularities such as stepping.

Once the planking is glued to the hull a sanding will eliminate the stepping problem. You do however want to minimize the stepping as much as possible or you will be sanding the planking paper thin.

A creative way to solve the stepping is to use C clamps and clamp on to the plank. By using rubber bands pull the C clamp down and towards the hull until the plank sits flat on the edge of the bulkhead.
Aside from using spring clamps and C clamps to hold the hull planking while the glue sets there is nothing more useful than a good old block and rubber band. By adjusting the pressure point of the rubber band on the block you can use the block to push the planks against each other or apply pressure straight down so the plank fits tight to the edge of the bulkhead. Placing a block up on end you can pin point pressure to a location on the plank or use longer blocks to hold long sections of a plank in place.

Before laying planking for the third belt, line off the hull for the location of the next wale.

Belt three of planking presents a unique problem as the belt takes a drastic taper at the bow and almost no taper at the stern. The main focus of the planking job here is to maintain a smooth run of the planks from bow to stern. Planks at the stem will want to naturally run upwards, however there is a limit to how far up the stem the planks can go, the hull planking has to stop at the deck line. The planking has to be cut to fit as apposed to allowing it to creep upward at the stem.

At midship, four strakes of planking will fill the third belt. If all four planks were run to the bow each plank would taper to almost a point. Planks which are too narrow at the end of the taper are a problem to fasten to the hull. One way to solve the planking for the third belt is to use wider planks. Divide the distance you need to cover at midship by three and cut your planks to that dimension. Each wider plank will have more of a taper but the ends of three planks will fit at the stem as apposed to four. There is a limit to the width of a plank that can be used. In the photo it shows wide planks will not conform to the shape of the hull as apposed to a narrower plank. Wide planks also cause stepping from plank to plank.

A common method used by shipwrights is to replace the two narrow planks with a stealer. Run the first two strakes of planking above the wale forward to a point where the taper begins. These two strakes...
of planking will both stop at the same bulkhead. Now, take the space at the bow and divide it in thirds. The width of the stealer will not want to sit flat to the bulkheads so a little coaxing with C clamps and rubber bands may be necessary. The use of stealers are always kept as low as possible on the hull, preferably below or as close to the waterline as you can get. By the time planking reaches the sides of the hull each strake of planking should have a smooth run from bow to stern.

Looking at the stern the main concern is the location and bending of the third wale. On the Matthew the third wale ended below the top of the sternpost. On the model the wales ended about the same location. On the drawings the third wale is shown ending at the intersection of the sternpost and the stern transom timber. The two different locations for the end of the third wale gives the model builder a little latitude as to where the wale ends up.

A problem is the bending of the wale, the third wale takes a sharp bend, then a twist and finally a sweep upward. So far all the planking was done cold and dry, however to bend this wale we need to resort to steam bending.

Note in the photo the stern block inserted earlier in the build acts as a backing for the planks and wale. Without the stern block it would have been very difficult to maintain a nice curve of the planks and wale. Some minor reshaping was done to the stern block and last couple bulkheads as the planking was done to allow a better bending of the planks.

By using a heated plank bender the end of the wale was soaked in water and the hot plank bender was then used to bend the wale. Sounds simple enough. The Willow up to this point took bending quite well without the use of steam so by just adding a little heat and water bending should be a breeze.

Not so, five out of five tries and the wale broke. I tried taking the process slow and easy soaking the wale, then only a slight pressure of bending soaking again and again only a little bending at a time. The
results were the same, breakage. The longer you leave the end of the wale soaking in water the easier it is to bend, but the longer the wood soaks the softer it be-

comes which will result in a tendency to crush. I tried several more times until the lights up stairs went on and I realizes all the heat and steam was being applied to the inside of the bend between the heated plank bender and the wale. The outer edge of the wale was sitting in a puddle of water on a cold block of steel. I took the steel block and heated it up on the kitchen stove and soaked the end of the wale again.

Eureka ! success at last. Sandwiching the damp wale between the heated bender and warm block I got steam on both sides of the wale and it took the extreme bend without breakage. The final step for the third belt of planking is adding the wale. Another way to secure a plank or in this case the wale to the hull while the glue sets is to use push pins. Plywood is to hard to push the pins in so a little tapping with a small hammer works the best. Then you need pliers to pull them back out.
The Fourth Belt of Planking

The blue arrow is showing the fourth belt of planking at the stern where the planks are taking a drastic taper where they meet the stern post.

With the third belt of planking completed up to the wale we now start planning the fourth belt beginning at the stern.

When the hull was lined off, four planks were figured at the center. If the planking so far has ended to far up the stem, now is the time to correct the sheer.

A wider plank is used above the wale, this is done to take up more space midship and flatten out the sheer just a little. Lining off the planks at the stern plank number 3 ends at the top of the sternpost so planks one and two fill in the shaded blue area.

Here you can see the lining of the four planks and the W is the location of the wale. The short arrow is where the first plank of the next belt will end.

Looking at the next picture, it now becomes apparent why the stern was not built when the bulkheads were being set up. They would have been in the way, making clamping of the planking very difficult. All the planks in belt four had to be steam bent and clamped in place to set. Even though the Willow worked very well for bending the extreme bending at the
The Matthew

Stern required the planks to be soaked in water for about 30 minutes and then bent with a hot plank bending tool on a hot surface. Don’t give up if they seem to keep breaking. It took me several tries because the plank insisted on breaking, but finally it did bend.

Bending must have been difficult in the building of the Matthew. It is apparent by a close inspection of the wale that it was laminated.

Planks were extended beyond the transom timber because the soaking makes the wood soft and the clamps will indent the ends of the plank. So make sure you have enough length on the planks to trim off the indented section.

These planks take an uneven taper so it is better to glue the plank in place and trim the taper on the hull. Start by drawing the taper and using a sharp blade to slice the plank.

Looking at the hull upside down you can see the stepping in the planking. Bending around the stern then a sudden sweeping upward cause a drastic step from plank to plank. Sanding will take care of the steps but it is best to try and keep them at a minimum.

Once again when all the planking is done it is sanded to a final finish and the next wale is set in place. None of the planks or wales were laminated. Steam bending worked quite well.

All the attention was focused at the stern in the fourth belt of planking. Planks at the bow were simply tapered as was done in the second belt of planking so there is no need to repeat the process.
The final belt of planking is called the shutter planks. In some hulls this may be the last one or two strakes of planks between the lower hull planking and the upper planking. The upper planking of the hull will follow the sheer line and the bottom planks are tapered or cut to fit the shape of the hull. Looking at the run of planking it produces a nice flowing curve from bow to stern. In the case of this particular hull the lining off of the planking could have been a little flatter by the time it reached the shutter planking. Then again it’s up to you as the shipwright as to how you want the run of planking to look. Personally I like the flowing sweep of the plank run.

Begin the last belt of planking by measuring off the space to be filled at the midsection. Start by placing a piece of wale at the top of the fourth belt and at the deck line. Next divide the distance between the two wales by the number of planks you intend on using, in this case three will be used to fill the last belt.

The width and number of planks will vary according to each hull and the final run of the planks done by the shipwright.

These planks are given a special name of “shutter planks” maybe because they have to be carefully shaped and fitted and the planker(s) doing the job just shutter at the thought of have to do the job, or maybe it’s a slurred slang for “ok guys shut her up” meaning close up the hull with the final strakes of plank. Whatever the reason these planks got the name of shutter there is no doubt they are the most difficult to do. The first two planks above the wale are the most difficult to shape and bend. These two planks take a sharp bend and rest on the face of the transom timber.

The first one will need a long taper, which runs almost a third of the planks length. Once the plank is in place its upper edge will have to be trimmed slightly, starting at the stern skip the last bulkhead and trim the next four to give the plank a smooth run. The second plank fits snug under the transom timber and bends up to the tran-
som timbers face. This plank will require a very sharp bend right at its end.

Looking at the photo you can see the sharp of the first two planks. These two planks will not bend around the square bottom edge of the transom timber so a slight rounding off of the bottom of the timber was done.

Finally the third plank to go on, butts against the forward face of the transom timber. And the top edge is about one half the distance up the timbers face leaving enough room for the wale.

This completes the hull planking and we now move on to the upper works and building of the stern.

On a final note, the planking may differ slightly from one hull to the next. The shape and amount of planks used depends on how each person lines off the hull. This part of the build provided enough information to plank this hull as well as a basic instruction on planking hulls in general. One unique feature of the Matthews hull is the wales. When the hull is first planked each plank may or may not sit perfectly even with the plank next to it. The final look of the planking job rests on the sanding and finish. Looking at the photo below, the red arrow is pointing to a section of a wale where the planking is sticking out too far making the wale look narrow.

Taking another look at the wale from a different angle the blue arrow is showing the correct height of the wale from the planking and the yellow arrow is showing where the planking is too high.
An easy correction to make the wales all appear to be evenly raised above the planking is to shave down the plank. This can not be done with an Exacto blade the knife in the photo is a surgical scalpel. These blades are flexible and you are able to bend them to the contour of the hull planking and they are also very sharp. Just lay the blade flat on to the planking and cut off paper thin shavings until you get an even edge along the wale. For a finish a coat of Tung oil is used, let it dry and apply a coat of finishing wax by Minwax buff out the hull to a desired sheen. Willow will take an excellent satin smooth finish and the tan color gives the hull a rich look.
As the model shipwright building the Matthew you have the option to design the upper works of the hull from some different concepts and ideas.

First we have the Matthew replica built in Bristol England with eight inlayed, arched panels (fig.221 & fig.223).

Next we have the Mathew built in Bonavista, Newfoundland with four windows.

Then we have the drawings from which the Bonavista Matthew was based on with only planking.

And yet one more option is to paint geo-
metric designs on the upper part of the hull, as seen on many ships and models.

![Fig. 226](image)

Planking the upper works from the sheer line to the cap rail the planking is the same as the rest of the hull.

On the Matthew, as built, the upper section of the hull over lapping planking was used called lap-strake.

The original drawing does not show lap-strake planking. On the original drawings there is a deck clamp colored white behind the hanging knee colored gray. Lower is the channel wale colored white, between the bottom of the deck clamp and the wale there isn’t enough room for windows.

If you are going to plank up the hull as designed then the deck clamp is no problem, as it will be covered. The same applies if you wanted to panel the hull.

If you want to put windows in the hull then some adjustments will have to be made.

The deck clamp is a structural timber the deck sits on so you cannot eliminate it. You can’t raise the quarterdeck nor move the wale down because it runs along the top of the bulwark which produces a nice sheer from bow to stern.

The solution to adding windows is to lower the bulwarks.

From photos of both reconstructions of the Matthew with people standing on deck the bulwarks look to be four feet up from the deck.

On the original drawings the bulwarks are five feet up from the deck, this gives a foot of play.

What I can find on cogs, galleons and caravels there doesn’t seem to be windows, which makes sense because you didn’t want rain and ocean splashing into the closed area under the quarterdeck.

On our prototype model a combination of both Matthews were used.

The plan is to use one window at the stern and arched inlaid panels along the rest of the area.

This will cover the framing in of a window and also how the inlaid panels were made.

If you choose to add more windows just follow the steps for making one and repeat it for as many windows as you want.

The lap-strake planking is not used at all so if you want to use it you on your own.

If the rail clamp were run along the tops of the bulwark timbers it would not leave enough room between the rail clamp and

![Fig. 227](image)

![Fig. 228](image)
The Matthew

dock clamp. In order to add any windows the rail clamp is moved down to a four foot bulwark thus leaving enough room for windows.

Once you decide on where you want the rail clamp it is glued in place to strengthen the top timbers.

The rail clamp runs from the stem at the bow along the bulwarks and to the stern. If you plan on putting any windows in measure one inch up from the entire length of the waterway to locate the rail clamp. Notice on the drawing a wale runs along the rail clamp on the outside of the hull so it is important you maintained the correct sheer of the deck.

Once the rail clamps are glued in place and the top timbers braced, it is finally time to finish sanding the top Timbers. The top timbers were left heavy because of all the clamping, rubber banding, and handling of the hull while planking, would have broken

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The Matthew

a timber or two. The top of the timbers should be sanded to a measurement of 3/32. Looking at the photo you can see the bevel the timbers are sanded to and the amount of material that has to be removed.

When you have the top timbers all sanded down to the correct shape and thickness clamp a stiff piece of wood along the side of the hull. Allowing it to extend beyond the last bulkhead. Glue and clamp the end stern timber to the end of the piece of wood as shown in the photo. It is important you maintain the same taper along the side of the hull. The end timbers are slanting inward as they reach the stern.

Windows

On this model one window will be cut in close to the stern. The reasoning for not

If you decide on windows now is the time to add sills. These sills are added to the outside face of the rail clamp between each timber. For the sills I used a piece of the wale stock cut to fit between each timber. Once the sills are in place the timbers are sanded until they are even with the sills. There isn’t any reason to add a sill between every timber, I did it for the support of the structure.
The Matthew

Adding four windows is to keep this section of the ship as dry as possible. Less windows would prevent the wind and rain and the sea from splashing in and provide some shelter from the weather. If you choose to add more windows simply repeat the following steps.

To begin cut the timbers about half way to create a shelf for the window header to sit on.

Next I used a piece of the wood from the keel sheet, it was the perfect thickness. A block was cut to fit snug between the timbers. This block’s thickness sticks out beyond the face of the timbers about the distance equal to two thickness of planking.

Remove the block and use a drum sander in a dremel and arch the deck clamp.

Then arch the header block to match the arch in the deck clamp. Now glue in the header block. To complete the window frame a wale runs along the face of the sills at the bottom of the window and two molding are glued at the sides from the bottom of the header block to the top of the wale.
The shutter planks were cut to fit the last belt of planking to insure they line up with the edge of the waterway. Looking at the darker colored plank in the center you can see how it is shaped to fill the space between the lower planking and the waterway, the bottom of the plank has more of a curve than the top edge.

When the last wale is installed it should line up with the top of the waterway at midship as shown in the photo looking out between the bulwark stanchions.

At the stern the wale pointed to with the blue arrow ends at the top of the transom timber pointed to with the yellow arrow.

With the last wale in place the next job is to plank up the stern. Begin by installing two blocks at the top and bottom of the tiller opening. Next you will have to cut the ends of the hull planking even along the transom timber.

You should have a space between the inside face of the stern post and the face of
The Matthew

the transom timber as shown in the photo.

Planking the stern is quite a simple job of running planks up from the transom timber to the top, leaving the ends overhang the sides slightly. The first plank on the transom timber slips between the stern post and transom timber.

Using a felt disk and 180 grit sandpaper give the stern a final sanding and trim the ends by sanding them flush with the sides.

One last item added to the stern is the molding piece. You can set the molding so it is even with the stern planking or off set it a little to frame in the stern.

Windows are up to you either adding them at the stern or not.
Planking the bulwarks begins with the scuppers shown on the photo of the Matthew. The Matthew built in England simply left off the first plank above the wales at midship. We will begin by marking out at plank at every stanchion and dividing the width of the plank in half. Using a drum sander each scupper is sanded out leaving nice rounded corners. Once all the scuppers are sanded into the plank it is positioned on the hull at mid ship and the bulwarks are planked to the cap rail.
With the planking complete to the cap rail we will stop at this point and move on to laying out the main deck. There are various molding pieces which fit at the quarter and forecastle where the deck meets the side of the hull. In order to install these decks the main deck has to be laid down first.
Looking at the deck layout we can see that we will need to install a few items before we can start laying deck planking.

Starting at the bow the first pieces will be the platform the capstan sits on. The deck is not level, it has a sheer from the bow to the stern, if the capstan platform were laid on the deck it would have a slant as shown in the first drawing.

In the second drawing the capstan platform is wedged shaped allowing the capstan to sit vertical. On the model a wedged shaped platform is used. Exactly how the platform is made will be up to you as the builder.

In the photo it appears the platform is higher in the middle then tapers to the front and back. This platform would have been made of two or three heavy timbers rather than one piece.
The Matthew

It’s a simple job to make the platform. Cut a piece from the ¼ thick sheet material to the size indicated on the plans. Cut a groove along the two sides to the correct depth then clamp the piece in a vice. Proceed to sand down the surface until its even with the groves on either side.

Building the rest of the capstan began with turning the spindle to the measurements on the plans. Two circles were cut from sheet stock and black paper was glued around the edges to simulate the banding. Cutting the circles for the spindle and the head pieces is a simple job of finding an exact size washer and using it as a guide. Using double sided tape stick the washer to a piece of wood. With a single edge razor blade continue to nip away the wood until you have a nice circle.

The three head piece you just cut now have to be split for the bars. Using a piece of two sided tape stick the end of a bar to the center of the circle piece. With a sharp razor blade cut on both sides of the bar.
producing two semi circle pieces. Do this with all three circle pieces. Mark out the center of the spindle circle and place the bar in the center of the circle. Glue the two semi circles on both sides of the bar. Before the glue sets remove the bar so it does not end up getting glued to the circles. Do the same thing with all three circles being sure you rotate the location of each bar. The final piece is the drum cap. With everything glued in place sand the drum smooth.

You can glue the capstan together but at this time do not glue it to its base. If you glue the capstan to its base it will be in the way of planking the deck.

Looking at the capstan on the Matthew there are thin boards called whelps attached around the spindle. You can either scribe lines in the spindle and cut a small notch at the base or add the thin boards around the spindle.

The next item is a hatch, which will take a bit more work to create than the simple platform. Before building the hatch coaming, lets first examine a real hatch and see how they are built.

In this next photo the view is from inside of the hold looking up through a hatch. A common error model builders will do is place the hatch coamings on top of the deck planking. In actual construction the
coamings rest on the deck beams and carlings with the ends of the deck planking butting against the sides of the coamings. The next photo is standing on deck looking at the hatch. The white arrow points to the coaming, the yellow arrow is the deck beam and the blue arrow is the carling.

At the corners coamings have a lap joint which is fastened with a long spike which goes down through both coamings and into the beam below. The white arrow points to the head of this spike. The height of the coamings will vary from ship to ship and from builder to builder. An average is 8 to 14 inches.

Hatches on the Matthew appear to be about 18 to 24 inches, which seems to be a little high for a coaming, on the model the coamings are 12 inches. There is no right or wrong way, so if you want to make your coamings 12 inches or 20 inches the choice is up to you. If you do decide to go with a higher coaming you will not be able to overlap the corners. Corners on the higher coamings will either have to fit at a 45-degree angle or butt together.

The following steps are using a piece of ¼ x 1/8 inch material. Each corner is cut with an overlapping joint and then two sides are glued using a square block corner. After you have a set of two sides glued up, glue the two pieces together to form a complete coaming. Once all the sides are glued together place a 1/16
The Matthew

square frame around the top to form a ledged for the hatch cover boards.

Fig. 287

Carlings are then added in between the bulkheads for the hatch coamings to sit on. This also adds a surface along the hatch for which the planking will sit on.

Fig. 288

Fig. 289

Fig. 290

The next in line to construct are the mast partners.

First, the center profile piece is cut away so the mast can drop below the deck. A piece of dowel is positioned and two side sup-

ports are glued in place. Making the mast partner is a simple job of cutting a square to the size indicated on the plans and cutting a hole in its center for the mast. Position the partner so the mast hole is tight to
The Matthew

the forward bulkhead and not centered between the bulkheads.

Three pin rails are needed of slightly different sizes so we begin by cutting to length six pieces of square stock and clamping them together.

Draw a line for the center of the curved section. The series of photos show how the rail is assembled and glued to the face of the bulkhead.
The Matthew

At the break of the quarter deck the Matthew leaves the middle section open with a cabin on either side. It was a common practice to completely close off the break of the quarter deck with a bulkhead. As a model shipwright you can choose either way and either would be correct. My thought was to close off the end of the quarter deck with a bulkhead to make a dry cabin area.

This was an exploration ship and was intended to sail on the open ocean. A dry cabin would be quite welcome by the crew. Bulkheads sat on what was called a sill.

This sill had the same purpose as coamings around hatches. They sealed the hatch or in this case the bulkhead from water seeping in. In the B&W photo you can see the sill being pointed to by the blue arrows. If you intend on building a bulkhead start with adding a landing for the main deck planking.

This was done by gluing two pieces of wood to the outer face of the bulkhead shown by the white arrow. A sill sits directly on the deck beam and the deck planking butts against the side of the sill and caulked between the decking and sill. Looking at the photo you can see how the use of a sill would prevent water from getting into the cabin area, as opposed to the bulkhead sitting directly on the deck.

There are a few other items to add to the deck but they will be added after the planking is finished.
Before we begin laying the deck on the model of the Matthew lets first take a look at some real decks.

Some model builders will use Holly for decking, however, this wood is stark white with no figure or variation in color and produces a somewhat unrealistic looking deck.

The original Matthew most likely was planked with White Oak, which turns a dark gray when exposed to the weather. When given a finish White Oak has a light tan color.

For the Matthew model Sugar Maple was selected because of its honey color and hardness.

Another style of decking in model ship building is to use strips of black paper between the planks to represent caulking giving the deck a very contrasting striped appearance.

Some model builders will also pepper the deck with over sized tree nails. Looking at the photos of the deck you will notice the caulking is very subtle and you cannot see any treenails or spikes.

Getting closer to the deck (fig.306) you still cannot see treenails or caulk lines. Finally getting right up close to a section of the deck (fig.307) you can see counter sunk spikes with wooden plugs used over the spikes. Measuring the wooden plug the size is one half an inch. At one quarter scale that is .010. So small you wouldn’t see them.

It is ultimately up to you the model builder as to what you want to show on your model.

Fig. 305
The Matthew

Fig. 306

Fig. 307
The previous examples are that of a shipwreck where the decks have not been attended to and are weather beaten.

Let's take a look at the Matthews deck which is fresh and new as compared to the above examples.

The Matthews deck appears to be planked with Pine thus the yellow appearance. The caulk lines are very clear and if you look you can see the wooden plugs. The plugs don’t exactly jump up at you like the black dots you see on some models.

If this deck were reduced to quarter scale the caulking would be as fine as a hair and the wooden plugs would disappear. Someplace between the reality of a deck and a modeler's interpretation and how the modeler want to portray the deck is left up to the model builder.

Caulking can be simulated by a number of different methods. One is to use black construction paper between planks, another, to use a black marker or paint and paint the edges of the planks.

A problem with using markers and paint is that they might bleed into the wood leaving a fuzzy edge.

The sample in the photo looks ugly because it is a very close macro shot of caulking being applied to the edge of a plank. After trying many different methods the best one I have found to use is a simple black crayon. The wax crayon does not stain the wood or bleed into it.

When the decking is laid down the wax crayon looks bad because of the flakes of crayon all over the surface and the crayon lapping over the edge of the plank when its applied gives an appearance of wide caulking. The decking material is Hard Maple also known as Sugar Maple, which is a hard wood and the crayon does not sink into the wood grain. The deck planking supplied in the kit has a sanded finish close enough so that further sanding is not required. Once the deck has been laid it is then scraped and not sanded to a finish.
The Matthew

The decking process begins down the center of the hull and working out on both sides to the waterways.

A deck such as the Matthew has a pronounced sheer and the deck planks will need to be clamped down. The best method I have found for this process is to lay about 4 to 6 planks at a time and use the block and rubber band method.

The hardest part of laying the deck is having to work around the hatch, mast partners, capstan base and pin rail. If you end up short of an object such as the mast partner, do not use a sliver plank to fill in the gap. Use a wider plank as shown above the partner. There will also be some notching required. Hard Maple is not as easy to work with as the Willow so cutting and notching the planks will take a little more time and effort.

Once you have reached the waterway the last plank has to be cut and shaped to fit.

Before laying all the planking to this final plank it is best to make a pattern of the plank.

Take a piece of cardboard, cut and fit it into the space shown in the photo. You may need a piece of two sided tape to hold it down.

Continue to fit the next few planks right on top of the cardboard until you have reached the final plank that will run along the waterway. Using a sharp knife cut along the edge of the last plank creating an
The Matthew

exact pattern for the final plank. Now remove the planks that were placed on top of the cardboard and the cardboard pattern. Now continue to glue the planks down. Use the cardboard pattern and cut out the final plank. It should drop in place with minimal adjustments.

The deck in the cabin area was planked even though there will be a bulkhead at the break of the quarter deck and the quarter deck itself will be decked over.

With this arrangement the cabin deck will be totally closed in and not seen. If you go this route you can skip over planking the cabin area, if it’s not going to be seen there is no need to add it to the model. If you intend on not adding a bulkhead then you will have to eliminate the bulkhead sill and continue the deck planking uninterrupted all the way to the stern like the Matthew is built.

Another arrangement is to add the separate cabins, hatch and the tiller with its rigging. To show off the work under the quarter deck you can leave off the quarter deck planking or just add a few planks down the middle and along the sides. Whatever you choose for your model now is the time to add anything you would like to under the quarter deck.
In the classical form of model ship building it is common to leave off sections of deck planking to allow a viewer to look inside the hull or down to the next deck below. On the Alfred model built by Harold Hahn, sections of the deck planking was left off to show the parquet flooring in the cabin below as well as the lower gun deck. In the photo of the Rattlesnake half the decking was left off to expose the deck construction.

At this point in the construction of the Matthew, as the model shipwright it is up to you if you want to show any detail below the deck.

If you decide to show cabin details below deck you can lay decking down the middle of the deck or strips of decking on either side of center. In actual shipbuilding lodging knees would have been used between deck beams along the sides. In the photo you can see the lodging knees being in-
stalled in a model. If you add knees to the end of the deck beams you can leave off the deck planking along the sides to show off the detail work. On the prototype model the deck will be planked over so blocks were used instead of knees. Blocks or “chocks” as they are called, are an important part of the deck structure because they provide a landing for the ends of the deck planks.

Once all the decisions have been made we can begin to construct the bulkhead and deck. On the prototype the bulkhead was framed and closed in leaving a door in the center. A close up of the bulkhead framing shows a footer set on top of the sill and studs are placed on top of the footer and extend to the underside of the deck beam.

Once the bulkhead is framed horizontal planking finishes the job. The deck beams provided are longer than required and will be cut to fit the model. The first two deck beams to be installed are at the location of the mizzen mast, once these are in place the rest of the beams are spaced out evenly along the deck.

Carlings for the knight and mast partner are added with square holes for the bitt posts. Blocks are added at the end of the deck beams and the beams are trimmed to size. When the stern was built the exact height and angle was left unfinished until the deck was installed. The black arrow is
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Mark the height of the deck on the stern timbers and trim it even with the deck. A margin plank is placed all around the deck. The margin plank placed over the bulkhead extends beyond the bulkhead leaving a ledge along the inside for the ends of deck planks to fall onto.

It would be a bit redundant to go through the process again on laying deck planking. The quarter deck was done the same as the main deck using hard Maple with a black crayon used as caulking. If you look careful at the bitt posts in the photo you can see two slightly wider planks running the length of the deck. These were the two starter planks on the deck and the rest of the planking was worked from these planks to the margin planks along the sides.
Before we proceed to the forecastle deck we will go through the steps of making the knights. Three knights are needed in the following locations. The first location is on the quarter deck we just finished and two are needed on the main deck in the locations marked in blue.

Knights were not added when the main deck was constructed because only the part of the knight above the deck will be made and glued to the deck. In real life the knights would be timbers which went down to the keel and secured by knees under the deck and at the keel.

The knight at the quarter and forecastle deck was below those decks and on the main deck, a hole was made in the deck to run the rigging to the knight.

On the quarter deck if decked over would make rigging the knight impossible plus the idea of having a hole in the deck would defeat the purpose of weather tight cabins. On the quarterdeck the knight was run up to the deck, the break of the forecastle deck is open so the knight is accessible for rigging and it was placed on the main deck.

The blue print shows the complete knight from the keel to the deck with knees.

Making the knight begins with the proper size timber and drawing the profile on its side. Then mark off the front for eight holes and the slots where the sheaves would fit. You could if you wanted to, cut the slots all the way through and put in four sheaves. You can buy sheaves or make them yourself. On this build we are going with a dummy with only holes to pass a rigging line through.
The blue lines are showing where you make a cut with a knife, you are cutting from the edge of each hole to the edge of the one below it. Next make and angle cut from the center between the two lines and cut to the line, do this to both sides creating a small wedge shaped of wood down the center of each slot. Using a round file, clean out the slot.

This process is done on both sides of the knight. Above the slots make a V cut at the center location of the concave curve. The V cut gives a good start for a round file to file in the final shape. If you’re round file has a taper to it file in one direction then reverse and file in the opposite direction. If you don’t do this the curve will also have a taper.

On the quarter deck, the knight is mounted between two carlings. The empty space between the carlings is taken up with a knee. This knee is a simple block rounded at the top and wedged between the carlings and the knight.
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Fig. 343

Fig. 344
In this section we will build the sides and deck of the forecastle. The only difference between the prototype model and the replica is the location of the last channel wale. On the prototype model the channel wale is right under the cap rail and runs between the hull planking and the forecastle side planking. Notice in the photos the last channel wale is not on the model.

This was done because it makes the lower set of blocks easier to install. Begin by adding blocks between the timberheads along the outside of the deck clamp. Add another set of blocks between the timbers at the location of the rail clamp. The purpose of the blocks are to add a backing for the ends of the vertical planks. When all the
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blocks are glued in place sand them even with the top timbers.

Make a copy of the planking layout from the plans. Use the layout and check it against the side of the model. The model should match pretty close to the planking pattern.

Because the planking is vertical you can not just lay the pattern on to a piece of sheet stock. The pattern has to be rotated so the grain runs length wise to the planks. Begin by sticking two sheets of wood together with double sided tape. By using two patterns rubber cement the patterns to the wood sheets one set with every even numbered plank and one set with every odd numbered plank. Continue to cut all the planks apart and give them a sanding to the lines. Line up the planks and you will notice the creeping line. With each plank having two lines and 23 planks the thickness of the lines add up to being an overall of 3 to 4 planks to long.

Placing the planks on to the pattern we can see the first 5 planks have already taken up the space for the first 6 planks. To solve this problem use a drum sander on the Dremel tool and give each plank a quick pass against the sanding drum. These planks are small and difficult to hold, you might end up sanding the tips of your fingers. A solution is to hold the plank with a
clamp, this gives better control and holds the plank secure.

Go through each and every plank until the planks match up with the pattern.

Planking begins with plank 1 placed right at the first timber and each plank butts against the one another. Plank number 23 is then cut to fit the final space at the stem. The planks are all left a little long at this stage of construction. Later they will be sanded even along the top.

To begin the forecastle deck, a cutout from the plan was used to check overall fit and the location of the key beams. Next a test bow sprit was set in place to check the angle which was also taken from the plans. If you look careful at the bow sprit and the far right beam it was moved a little so the bow sprit can rest on it.

Note the bow sprit runs alongside the stem and not centered over it. In order to maintain the correct angle of the bow sprit it has to run past the fore mast. Once all the deck beams have been glued in place blocks are added between the deck beams. At the very front I opted to use
one solid piece of wood rather than individual beams and filler blocks.

With all the beams and blocks in place, flip the model over and set up a guide to trim the deck to size. The forecastle deck does extend beyond the sides of the hull. Using a circular saw on the Dremel tool just zip off the extra close to your guild and then with a sanding disk on the Dremel sand the edge clean and even with the guide.

Before gluing on the front of the forecastle deck add the timber to the top of the head knee. Make sure the top of the beam is level with the bottom of the deck beams.
The forecastle deck was held in place with the use of hanging knees. Each deck beam would have had a knee fastened to the side of the beam and into the side of the hull. On the prototype model only the knees at the last beam were added. Before the deck planking is started on the forecastle deck, a margin plank is run around the edges. The green arrows are pointing to the caulk seam between the deck planks and the margin plank.
Each plank will have to be cut on an angle, an easy way to cut the planks all at once is to layout enough planks to cover the entire deck. Use masking tape and tape the planks together. By using a pattern of the forecastle deck trace the pattern on to the planking and cut out the deck.

What you have done is to create a mat which you can fold over and with a black crayon darken the edges for caulking. As you lay the decking peel off the planks one by one, trim them to length and glue them in place.

Once all the deck planking is finished then go back and install all the post knees.
The first piece we will install is a cover board along the edge of the forecastle deck. Looking at the photo you will see the blue arrows point to the ends of each deck beam and the yellow arrows point to the filler blocks. Installing the cover board makes a neat and finished job to the edge of the deck it also covers the end grain of the deck beams. This cover board runs flush with the deck planking and down to the bottom of the deck beams.
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STEP 1 Cut a shallow notch at each corner of the square stock.

Fig. 385

STEP 2 Cut off the corner edge.

Fig. 386

STEP 3 I used a scrap piece of hard wood and drilled a hole slightly smaller than the square stock being used for the stanchions.

STEP 4 Twist the end of the stanchion into the hole. This will shave and compress the end of the Stanchion.

Fig. 388

This is how you fit a square peg in a round hole and make the job look neat and tidy.

Fig. 389

Go all around the forecastle deck and install all the needed stanchions. Note at this point the stanchions are a little longer than the finished size. They will be trimmed when the cap rail is put on.

Fig. 390
The next step is to make the sides of the railings. The railing sides were done by using masking tape and taping four planks together on one side and two sided tape was used to stick a pattern of the windows on the face of the planks. Each window was then cut out by drilling starter holes and cutting away at the windows with a knife. An easy method for cutting the arched top began with a notch cut to the center of the arch and cuts were then made along the side to the point of the notch.

When all the windows are cut out remove the masking tape from the back of the planks leaving the front pattern taped to the front. You can now bend the planks and apply a little glue to the edge of the planks. The final step is to glue the one piece rail sides to the stanchions.
With the sides of the forecastle finished the next piece of work is to install the cap rails.

Begin by cutting and fitting the joint at the bow then slip an oversize length piece under the two corners. By using a piece of tape mark the angle from corner to corner. The use of tape gives a clear clean edge to cut and sand to. Once you have the first angle use it as a pattern and mark the second rail.

and twist these ends from a flat piece of cap rail proved to be very difficult. Rather than soaking and heat bending a piece of cap rail the ends were carved from a block of wood. First shape the block to fit against the forecastle sides.

The cap rail at the forecastle and the quarterdeck sweep upward and end under the decks. These ends also conform to the slanting inward of the hull. Trying to bend

A slightly oversize thickness of the cap rail is drawn on the side of the block and cut out.
At the quarter deck the block is first cut to fit the corner between the quarter deck and the top of the bulwark. Once again the thickness of the cap rail is drawn on the side of the block. At the quarter deck the curved rail is not cut out like the forecastle. Looking at the Matthew you will see a filler piece behind the curved cap rail being pointed to by the black arrow. Rather than cut the filler block and the cap rail in separate pieces. The back of the block was cut so the filler piece matched the width of the bulwark.

At the quarter deck the curved section of the cap rail was fit as one piece.

The cap rail itself begins with a cardboard template traced from the bulwark.
Use the shape from the template and trace the shape on a piece of cardboard making the width of the cap rail wider than the finished size. Some fitting is necessary between the ends of the cap rail and the two curved sections so you want a little extra material to make adjustments. When the cap rail fits nice to the curved end pieces then go ahead and sand down the edges to a nice even overlap along the hull.

The curved end at the forecastle was given a flare to match up with the edge of the forecastle.
Futtock Riders

The frame riders or futtock riders are a simple piece to fit. Start out by making a cardboard template to fit the side of the hull. Trace the template shape to a piece of wood and cut out the shape. Do not cut out the entire shape until you have a nice clean fit between the rider and the hull. When you are satisfied with the fit then go ahead and cut out the final shape. The reason you are fitting the rider to the hull as a large piece is to give yourself enough material to keep fitting the rider without jeopardizing the final shape.

Once all the riders are glued in place you can give them a final shaping.
This now concludes the building of the Matthew hull. The main objective of this project was to recreate a hull for a carrack of 1490.

I was a little apprehensive about using the Willow for the hull. Willow is a soft, light weight wood and I figured I would have problems with denting the wood as well not being able to get a sharp and clean edge. After working with the wood I found it to be very nice to work with, it cuts easy and it will take a smooth finish. Color of the wood is a tan when finished with a coat of tung oil.

This would make a good looking model with masts and rigging.

The Matthew project can be taken a step farther and be developed into a framed hull for those who want to add more detail.

We hope you have enjoyed following the project as you followed along in the MSB Journal and we look forward to presenting another one.

And we further hope that you have taken the next step when you downloaded this ebook and built your own version of the Matthew. If you have, we’d love to see some pictures. (email: thematthew@modelshipbuilder.com)