CRL Report 12: A chest from the *Brother Jonathan* shipwreck

California State Lands Commission / Institute for Western Maritime Archaeology

The Brother Jonathan crate was shipped to the Conservation Research Laboratory on October 17, 2000, but the conservation work did not begin until January of 2001. The conservation plan is simple. The goals of the project are to: 1) determine the contents of the crate; 2) determine the way the crate was packed; 3) identify each of the artifacts; 4) evaluate the condition of each artifact; and, 5) devise a conservation treatment for each of the artifacts.

As is the case with all encrusted metal and organic material from underwater sites, it is necessary to keep the material wet at all times. When not being worked on, the crate is stored in a solution of 5% sodium sesquicarbonate mixed with tap water. When the conservator is working on the crate, it is kept wet using a stream of water pumped from the vat. To facilitate the documentation and the conservation work, a large stainless steel vat was placed in a corner of the conservation labortory. A web cam was installed over the vat to document the work, a white vinyl curtain was installed behind the vat and daylight balance fluorescent lights for daylight are installed over the vat. The crate was placed on a fiberglass grate and an electric chain hoist was installed over the vat. This enables the worker to raise and lower the crate unassisted and with ease. Since the webcam is continuously broadcasting and saving images of the ongoing work, the work surfaces of the crate are labeled in plan view from the perspective of the web camera -- top, north, south, east, west. The south side is exposed to the camera, and in typical plan view, north is up.



The stainless steel vat, the crate on the fiberglass grate, and the electric chain hoist installed over the vat.

As of June 1, 2001, approximately one third of the chest had been successfully excavated. At present, we are only prepared to state that the crate appears to be a shipment of miscellaneous hardware bound for a British Columbia store for resale because all the material appears in multiple quantities. We found that the crate was constructed of thin boards, which are largely

gone through the action of teredo worms and other marine organisms. It appears that the planks were approximately 10 mm. The exterior dimensions of the crate were 85 cm x 70 cm x 30 cm. It was thought that the crate had originally been bound with rope as there was an alignment of ropes going across the top, but this was found to be rope around two bundles of scythes.

The interior of the box was lined with tin sheeting which was soldered with lead at the junctures. The tin sheeting has for the most part deteriorated; however, the soldered seams are in good condition. The box was carefully and tightly packed with an array of material. Most of the objects were grouped into like items and carefully packaged and wrapped in paper, some of which still have the faint remains of a label.



View of the "top" of the crate as it was received for conservation

An interesting array of artifacts have been identified. These include: hafted axes and hatchets, cast iron meat grinders and detached handles with wood hand grips, iron scythes, brass keys, brass plumb bobs, cast iron pulleys, iron hooks, cast iron window sash guides, and some yet to be identified artifacts.

The primary tool to excavate out the heavily encrusted objects is a Chicago Pneumatic Air Scribe, assisted with an array of thin metal strips and other assorted tools. During the excavation, water is run over the artifacts to keep them wet. As each artifacts is removed it is placed in separate vats of 5% sodium sesquicarbonate aqueous solution to prevent any corrosion.



"Top" designates the top of the working area, the area that is uppermost on the crate. "South" and "North" designate parallel sides that are the longer length of the crate. "East" and "West" designate the sides that are the shorter sides of the crate. In the photograph above and the plan drawing to the right, the south side is at the lower right, while the north side is at the upper left. The east side is to the right and the west is to the left. .

To facilitate the following description the work surfaces of the crate have been designated as described above and as indicated in the plan to the left.

In the photograph above, the hafted axes are located at the top of the crate and down the south side.

The wood found associated with or part of the artifacts in the crate is in very good condition, but the iron (both cast and wrought) such as the axe and hatchet heads are gone as a result of extensive corrosion. For most of the iron artifacts, the only way to recover them is by casting the voids left by the corroding iron with epoxy. In contrast the non-ferrous artifacts, such as the brass plumb bobs are in excellent condition. The corroding iron has obviously provided the nonferrous metal with galvanic protection. The paper that is wrapped around the packages and the string wrapped around the paper are in varying states of preservation, ranging from very good, to totally disintegrated. In some instances the remains of labels can be seen on the packages. Twelve hafted axes were stacked along the south side of the crate. The top wood handle can be seen in the photograph above. The iron axe heads was wrapped in paper and alternately stacked with the blade on one axe laying along the poll of the adjacent axe. The axe heads were completely deteriorated and a natural mold of some of the axe heads is preserved within the wrapping paper. In some instances it is hoped that these voids can be filled with epoxy to form a mold of the axe head.





Three packages of cast iron pulleys (possibly sash window weight pulleys) were placed just north of the the axe heads. Two of the packages are shown to the left. Each package contains four pulleys, one of which is shown above the two packages. It is exciting to find the wrapping paper so well preserved. It is hoped that as the conservation of the paper is completed the stains can be removed and any identifying labels will be legible. Each paper package containing the pulleys is tied securely with string. Three additional packages of pulleys (for a total of 24 pulleys) were found in the opposite (north-west) corner of the crate. The conservation of the paper and the pulleys has not begun; however the paper will be folded back so the pulleys can be extracted. they will then be conserved individually by different processes.

In the center of the top surface there were two rope wrapped bundles that, based on the x-rays, we believe to be iron scythes, They are wrapped in rope to protect the blades. The white epoxy at the lower left of the photograph is a cast of the corroded handle on one of the scythes. The x-rays indicate that there are six scythes in each rope-wrapped bundle. At the center of both bundles the faint outline of a rectangular paper label can be seen. These may be a manufacturers' label that identifies the contents. Hopefully, during the conservation, some of the paper will be preserved and the writing will be legible. If so, then additional information can be gained about these tools.



The hafted axes can be seen along the south side of the crate. In the upper left (NW corner) and continuing down the west side is a small hafted hatchet (this was under the second group of pulley packages). The impression of the corroded scythe hafting tang on one of the scythes has been cast with white epoxy.

Along the south side, overlapping the axe handles are two cast iron handles for the meat grinders. Each has a wood hand grip, easily seen in the photograph below. The cast iron is very graphitized with little remaining iron. When the handles were removed, the fragile iron broke into several pieces, but they can be easily reassembled. Four meat grinders were found in the crate -- two small ones and two large ones. On the right, below, are examples of the two different sizes of meat grinders. Cast into the top of both sizes were the markings, "PATENTED / MARCH 1(?) / 1859". By searching in the U.S. Patent Office archives we found a patent issued to Albert W. Hale on March 15, 1859. The plans for the patented meat grinders are slightly different from those recovered here, but it is obvious that they are the same patented design. To date, only two handles have been found, so another two must be in the crate somewhere.



Below is a picture of the inside of one of the large meat grinders. The cast iron is badly graphitized and little iron remains. They have a very weak magnetic attraction. Still the overall preservation is good. In fact, the ease with which they came apart is amazing!



To the right is an X-ray of a small, paper-wrapped package containing six brass plumb bobs.

Other brass artifacts identified to date include brass rivets in the pulleys, two keys, and what appears to some sort of locking mechanism -perhaps a door lock or a clock.



A number of unidentified artifacts have been removed and more remain partially exposed in the crate. What was originally thought to be a leather boot turned in the first report was found to be part of one of the paper-wrapped packages.

The conservation of the crate, analysis of its contents, and pertinent background research is the subject of a Master's thesis by Carrie Sowden, a student in Nautical Archaeology at Texas A&M University. Who knows what awaits Carrie as she continues to reveal the two thirds of the crated that remains. The conservation of the artifacts recovered to date has started and will continue over the summer.

Excavation and Conservation of Artifacts

Following a three-month hiatus due to summer fieldwork, excavation and conservation of the crate from the *Brother Jonathan* shipwreck resumed in August 2001. Conservation began on artifacts removed in spring 2001, and new artifacts were uncovered as the excavation of the

crate continued. Prior to removal from the crate, each artifact was fully documented, including photographs and scale drawings on a site plan. After extraction from the concretion and prior to conservation, each artifact underwent further documentation and analysis.



The first set of axe handles (BJ-17-5) after cleaning.

Axe Handles

The six axe handles removed in spring 2001 (BJ-17-5) were stored in water over the summer. Encrustation and graphite from the axe heads were cleaned from the handles. Desalination required two baths of rainwater and three baths of deionized water. Dehydration of the first set of handles will be completed by the end of summer 2002 and conservation will begin in fall 2002. Due to the excellent state of preservation, the acetone-rosin method will be used to conserve wooden artifacts removed from the crate. The wood cells are impregnated with pine rosin, imparting a golden color to the wood and yielding a strong, stable artifact.

The second set of axe handles (BJ-17-6) was successfully removed as a complete package during spring 2002. As with the earlier set, the heads were wrapped in paper. It is hoped that some identification data, perhaps in the form of imprinted maker's marks will be discernible on the preserved paper.

Hatchets

Two packages, each containing six hatchets, were found stacked on top of each other. Due its inherent fragility, the paper used to wrap the heads has disintegrated. Within the wrapping paper, partial molds of each hatchet head were present; these were cast using RTV-112, a silicone rubber molding compound, before the handles were removed.

By chance, the stamped impression of a maker's mark was preserved in one of the natural molds of the hatchet heads. The inscription appears to read "No. 2/ USSELL & ERW / MANF'G Co. / WARRANTEED".



Wooden hatchet handle with silicone rubber cast of iron head.



Stamped inscription preserved on iron hatchet blade. The mark reads "No. 2/ USSELL & ERW / MANF'G Co. / WARRANTEED".

Through an educated guess, this mark was identified as the stamp of the Russell and Erwin Manufacturing Company, which manufactured goods in Connecticut and had a warehouse in San Francisco. A reprint of the company's 1865 catalogue was obtained from the Texas A&M University library. All of the artifacts discovered to date in the crate are listed in this catalogue. As a result of this discovery, the Brother Jonathan crate is currently believed to represent a shipment from the warehouse in San Francisco to a general store in Portland or Victoria.



Front cover of the Russell & Erwin Manufacturing Company's 1865 catalogue.



A pair of cast iron hooks recovered from the crate.

Hooks

To date, eight packages of single cast-iron wall hooks have been removed from the crate. The packages are wrapped in paper and tied with string, and it appears that each has a small rectangle of paper, possibly a product label, at one end. One badly damaged intact package of hooks (BJ-17-42) was X-rayed and carefully unpacked. It contained 72 hooks. Due to the similar sizes of the other packages, it is assumed that they contain the same number of hooks. The Russell and Erwin catalogue lists these hooks for sale by the gross (18 pieces),

thus each of the excavated packages holds four



Illustration of a hook from the Russell & Erwin catalogue

Meat Grinders

Four cast-iron meat grinders were excavated in spring 2001. During fall 2001, surface debris and concretion were removed and all components were disassembled, permitting examination of the interior of the grinders. Most of the metallic iron in the grinders has corroded, leaving only a graphite skeleton of the artifact. Unfortunately, during cleaning, a small piece of the grinder disinteg1rated. Research shows that the missing piece was a blade that ran down the center of the mincer between the rollers.

Through an online auction, Dr. Hamilton purchased a working example of a small grinder similar to those recovered from the crate. This antique will be used for comparative purposes. This grinder has one essential feature that was lost on the *Brother Jonathan* grinders: it contains the blade in the center of the mincer. By molding this blade, a replica cast will be made for the *Brother Jonathan* grinders.

All four grinders recovered from the crate exhibit the same cast markings: "PATENTED / MARCH, 15 / 1859." Research indicates that Albert Hale filed a patent on this date for the Hale Meat Mincer (United States Patent #23,246).

smaller parcels containing one gross. .

The hooks were put into a sodium sulfite solution, sealed, and placed in a warming oven at 60°C. Hamilton (1996: 80) describes the effects of this treatment as follows: "When a marine iron object is immersed in this hot reducing solution, the iron corrosion compounds are converted to magnetite, and the chlorides are transferred to the solution and discarded with each bath change." Following two treatments of sodium sulfite, the hooks were thoroughly rinsed, then boiled in deionized water until all chlorides were removed. The next step was to coat the hooks with three layers of tannic acid and coat them in microcrystalline wax.



Interior and exterior of meat grinder from the Brother Jonathan crate.



Meat grinder purchased through online auction for comparative research.

The exterior casings of the meat grinders have little remaining iron, while the interior cylinders are better preserved. It should be possible to conserve the rollers using sodium sulfite. As long as the mostly graphitized casing retains some level of magnetism, indicating the presence of metallic iron, the same treatment can be used on these components.

Conservation of two grinders, one large and one small (BJ-17-25 and BJ-17-27), began in February 2002. After three months in three warm baths of sodium sulfite, the pieces were rinsed and placed in deionized water. Upon completion in May, the results were found to be excellent. The treatment removed remaining concretion and only the casing stuffer of the small grinder exhibits a slight degree of degradation. After several boiling baths to remove remaining chlorides, the pieces were painted with three coats of tannic acid. The final step of this process was to coat the pieces in microcrystalline wax. Conservation of the two remaining grinders will begin in fall 2002.

Plumb Bobs

Conservation of a package of brass plumb bobs (BJ-17-24) found in spring 2001 required a technique to preserve the paper wrapping while extracting the contents for separate treatment. A new technique developed at Texas A&M University using silicone oil polymers was selected to address these unique problems. The silicone oil will have no ill effect on the brass; and will allow the plumb bobs to be treated using electrolytic reduction.

The intact package was put through a standard series of dehydrations baths used at the Conservation Research Laboratory. The treatment solution consists of silicone oil (SFD1) with 35% methyl trimethoxysilane (MTMS) by volume added as a crosslinker. The package was immersed in the silicone oil solution and placed under a vacuum.



Unwrapping and cleaning a paper-wrapped package of plumb bobs.

After 24 hours, the package was removed from the solution and the excess silicone oil was allowed to drain over a period of several days.



Examples of brass plumb bobs from the crate.

After cleaning and documentation of the entire package, it was slowly and carefully unwrapped. After unwrapping, the brass plumb bobs were removed. The silicone was polymerized in the paper with the addition of a catalyst. The reconstruction of the package is ongoing. Torn pieces will be glued together using butcher paper as a backing instrument. During this process, the shape of the package has been maintained by carved foam replicas of the plumb bobs.

The plumb bobs are brass with steel tips. Due to galvanic action in the saltwater environment, the tips of the plumb bobs were lost. Reproductions of the steel tips will be cast in epoxy resin. The brass component of the plumb bobs are currently undergoing electrolytic reduction. Careful monitoring during summer 2002 will insure that treatment can be completed during fall 2002.

Door Rails

In fall 2001, we removed an array of artifacts from the north side of the crate. The cast iron rails were originally identified as possible guides for sash windows. The 1865 Russell and Erwin manufacturing catalogue indicates that these are sliding door rails of the type used with pocket doors. Large pulleys were used in conjunction with the rails.

The total artifact count for this lot is 50, comprising 25 pairs of rails. Each pair was wrapped at an angle with a single sheet of lightweight paper. The placement of the rails in the crate provides further evidence that the crate is being excavated upside down. During removal, the uppermost pair was always wedged under the next pair. If the crate were to be turned "right side up", the top pair would be free and not wedged under another.



Arrangement of door rails within the crate.



Scythes

Two fiber-wrapped packages, each containing six scythes, were stored in a 5% sodium sesquicarbonate solution following excavation in spring 2001. Desalination and dehydration of the packages occurred during the spring of 2002. One of the packages was immersed in a solution of silicone oil with 35% MTMS by volume for approximately one month. Excess silicone oil will be allowed to drain from the package over the summer. The silicone oil will be catalyzed with the addition of DBTDA and the final mechanical cleaning process will begin in fall 2002.

Large Pulleys

In spring 2001, six packages of cast-iron pulleys with brass pins were excavated. Using X-rays, it was determined that each package contained four pulleys. In October 2002, two of the more degraded packages were unwrapped. Two types of paper were wrapped around the individual pulleys: the exterior of the package consisted of a thick, heavyweight paper, while the inner layer consisted of a lightweight paper. This appears to be true for most paper-wrapped packages in the crate.

Currently one intact pulley package and three individual pulleys are undergoing solvent dehydration. Conservation will follow a method similar to that described for the plumb bobs. Trials to evaluate the effectiveness of the polymer passivation process on badly degraded cast iron objects have begun. If this treatment is not satisfactory, those pulleys with minimal ferrous material remaining will be treated with sodium sulfite. Neither treatment is expected to have any ill effect on the brass pins in the pulleys.



Long Spring Traps

The second layer of the east half of the crate contained many voids left by corroded iron artifacts. Epoxy was used to cast all voids. Lot BJ-17-18 consisted of two obvious shapes: a horizontal, hollow, flat, rectangular piece with holes and a thin V-shaped piece containing some intact metal. Following casting, cleaning, and research, it is believed that these pieces belong to a set of long spring traps. The V-shaped portion (D) of the trap is the spring; each trap has two.



Parts of a long spring trap.



While no intact metal remained in the bases, some metallic iron was preserved in the springs. Because the springs needed to be flexible, they were forged using higher-quality iron than was used for the base pieces. Curved cavities with a central ridge were uncovered along the east edge; these have also been cast in epoxy. These are the jaws of the trap (C). There are no teeth on the jaws, suggesting that the traps were intended for hunting small animals.

Two other artifacts observed in the crate may also be associated with the traps. Iron rings were found in three separate places and small lengths of chain were also found in two separate areas of the crate. Traps of this kind were often strung together in a series using chains and hooked in the center by a ring. Casts of the rings were made using silicone rubber.

Leather Sheaths

Several leather sheaths were uncovered near the bottom of the crate. At the end of the each strap was an iron buckle and a small leather loop for securing the excess strap. It appears that the cross bar of the buckle may have been covered with a copper tube to protect the contact point with the tongue. The loose ends of the straps are wound together, while the other end is threaded through the upper portion of each sheath. The sheaths will be among the last artifacts removed, as they are intertwined and several are located underneath other artifacts.



Augers

One wooden tool handle (BJ-17-43) shaped like a small rolling pin was discovered in late spring 2001. Removal of the cast iron rails (BJ-17-41) exposed other similar pieces. The metal portion of the tool was cast in epoxy. Instead of the expected spiral auger shape, the tool cavity had a square cross-section with a 30° twist 2 cm below the handle. Four other auger handles were removed, and four more remain in the crate. At least three different sizes of handles can be distinguished. Some of the tools may be bunghole borers, used by coopers in manufacturing casks and barrels.



Wooden tool handle (BJ-17-43), possibly for an auger.

Small Pulleys

Two packages of small pulleys (BJ-17-65 and 73) were excavated. X-rays reveal that these pulleys have iron axles, in contrast to the brass pins used in the larger sheaves described above. At least one more package (BJ-17-40) will remain in the crate until fall 2002.





Mortise Latches

Two packages of small sash window or shutter locks were excavated in spring 2002. X-rays indicate that the locks are iron, while the faceplates are brass.

Brass Keys

One package of brass keys was excavated in spring 2002. The total quantity of keys is currently unknown. However, the catalogue lists keys by the dozen, so a multiple of 12 is expected. The keys will be removed and placed in electrolytic reduction, while the wrapping paper, due to its substantial weight, is suitable for silicone oil conservation. The removal of the keys will begin in fall 2002.







Door Locks

During spring 2001, a package was discovered containing two brass keys and a small brass strip. The interior of the package contained an unidentified mechanical anomaly, tentatively identified as the inner workings of a clock. Following excavation and radiography of the package in spring 2002, six locks have been identified. These are termed "Patent Cylinder Rim Night Latches" in the Russell and Erwin catalogue. The lock works are manufactured primarily of brass, with an iron casing. It will probably be necessary to disassemble the locks in order to treat the brass and iron components separately.

Door Knobs

Two packages of doorknobs were excavated from the lowest level of the crate. These appear to be mineral knobs with brass and iron hardware. While all of the iron components have disintegrated, some molds were made of remaining impressions of the screws. Hopefully, the missing iron pieces can be reconstructed. Conservation of the knobs will begin in fall 2002.



The Crate

The worm-eaten, fragmentary, and heavily encrusted wood forming the crate has been removed from all of the sides except the bottom. Many samples have been collected, including two knots that provide an accurate thickness for the boards. A graduate student in the Nautical Archaeology program at Texas A&M University is analyzing the boards, wood shavings, and the grass packing material. The wood from the box has been identified as *Juniperus virginiana*, commonly known as Juniper, or Eastern Red Cedar. Over the summer, work will continue on the identification of the grasses. The wood shavings could not be identified because they were cleaved along the grain and no cross sections were preserved.

Citation Information:

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2001 The *Brother Jonathan* Crate: Opening the Crate, Conservation Research Laboratory Research Report 12-1, World Wide Web, URL, http://nautarch.tamu.edu/CRL/Report12/part1.htm, Nautical Archaeology Program, Texas A&M University.

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