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PRESENTS

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THE HUNLEY NEWSLETTER

by George W. Penington - Editor

APRIL, 2005 ISSUE #57

Contents:

- 1) [WELCOME TO THE NEW HUNLEY NEWSLETTER >](#)
- 2) [THE HUNLEY'S DEPTH GAUGE >](#)
- 3) [AN EYE-WITNESS TELLS HIS STORY OF THE HUNLEY BEING RAISED IN 1872](#)
- 4) [THE PETERSBURG DAILY INDEX JUNE 1871](#)
- 5) [REPORT ON THE WRECK OF THE HOUSATONIC](#)
- 6) [REPORT ON THE LOSS OF THE HUNLEY](#)
- 7) [A LETTER FROM EVILMIKE2 aka Mike \(the Torpedo man\) Kochan](#)
- 8) [DISCUSSIONS ABOUT THE COLLISION, PROP AND SINKING THEORIES](#)
- 9) [COMMENT ON SOUTHERN TECHNOLOGY](#)
- 10) [THE HUNLEY IS A FORENSIC INVESTIGATION - THE COLDEST OF COLD CASES](#)
- 11) [EMAIL AND GUESTBOOK SELECTIONS:](#)
- 12) [WHAT WERE PEOPLE SEARCHING FOR THIS MONTH:](#)

1) WELCOME TO THE NEW HUNLEY NEWSLETTER

A SPECIAL WELCOME TO ALL THE NEW SUBSCRIBERS. THIS NEWSLETTER IS PUBLISHED ONCE A MONTH WITH A LINK TO THE ONLINE ADDITION AVAILABLE TO SUBSCRIBERS ONLY.

ALL ISSUES ARE DEDICATED NOT ONLY TO THE **BRAVE AND HONORABLE MEN OF THE HUNLEY**, BUT TO THE SUBSCRIBERS AND CONTRIBUTORS TO EACH ISSUE, PARTICULARLY TO THE **CSS H L HUNLEY CLUB**. THIS IS MY TENTH YEAR OF RUNNING THE HUNLEY.COM WEBSITE AS A FREE SERVICE TO ALL THOSE THAT PLAYED A PART IN MAKING THIS HAPPEN.
GEORGE W. PENINGTON

[The Hunley store](#) is now offering, a free one year subscription to thehunley.com newsletter with any purchase of \$25 or more, a savings of \$10.

New at the Hunley store

Lt Dixon : Special Price: **\$60.00** plus S&H (Product # LtGED)



The Hunley store is taking preorders for the new pewter sculpture of Lt. George E. Dixon, by Andrew Chernak, edition limit to 900 sculpture. The sculpture is set to be released on April 2005. We will only be able to order 50 sculptures. **Your sculpture will not ship until after April.** Item Name: Lt. Dixon
Item Number: LTGED Price: \$60.00

If you would like to send in a check or money order [click here](#)

2)THE HUNLEY'S DEPTH GAUGE

Mon, 18 Apr 2005

On the night of February 17, 1864 between 8:45 and 9:00 P.M. the Confederate States Submarine H L Hunley rammed a 135 lb. Package of black powder into the hull of an enemy ship, The U.S.S. Housatonic. The impact threw the eight man crew forward, disrupting all uniformity of the hand cranking cadence at the moment of the sudden slamming stop. Crew members aboard the Housatonic stated " About one minute after she (Hunley) was close alongside the explosion took place, the ship sinking stern first and heeling to port as she sank. " "The torpedo struck the ship forward of the mizzenmast, on the starboard side, in a line with the magazine." The combined



THE HUNLEY'S DEPTH GAUGE IS TO THE (LEFT) PORT SIDE OF THE COMPASS SHOWN HERE

explosion of the Housatonic's powder magazine and the Hunley's torpedo practically blew the backend of

the Housatonic off. The 207 ' Steam sloop was totally sunk in five to seven minutes. The impact to the partially submerged submarine caused damages that have not totally been assessed.

One of the more recent clues of what happened to the Hunley that night is the depth gauge. Researchers believe that the thin glass of the specially built depth gauge shattered sometime during the concussion of the blast or from Commander Dixon falling against it. During the removal of material from the interior of the sub, Scientist discovered the heavy mercury. Maria Jacobsen, senior archaeologist on the Hunley project stated, "When we found George Dixon, literally at his feet was a pool of mercury."

"The H. L. Hunley archaeological and conservation teams successfully completed the excavation of the central compartment of the submarine. Two pieces of thin (5.6 mm in diameter) glass tubes were found concreted to the submarine's hull near Lt. Dixon's post. These were the remains of the submarine's depth gauge."

The depth gauge found (December 7, 2001) in the forward section of the crew compartment connected to the hull on the upper port side near a seacock when opened allowed water to enter through a pipe that pushed against the heavy metal Mercury. As the Hunley dove beneath the surface the increased water pressure moved the mercury in the glass tube allowing the Captain to read the scale and determine his depth. Officials have stated that "the depth gauge, which was nearly 3 feet tall with piping running down the portside hull and halfway back up, was mounted to a board with markings indicating the sub's depth." Hunley senior conservator Paul Mardikian said according to Brian Hicks of the Post and Courier, "the technology could have been inspired by or copied from any number of pressure gauges in use with boilers or the like in the mid-19th century." He goes on to say, "The depth gauge idea was at least a century-old by the time the Hunley sailed. Contemporary reports of David Bushnell's Turtle say the Revolutionary War-era submersible carried some sort of depth gauge."

Hicks states in his article that..” Jacobsen said the way the gauge fits into the sub makes it appear that it was built specially for the Hunley. Originally, the Hunley was designed to tow a contact mine behind it, dive under ships and pull the mine into the enemy ship's hull. The depth gauge would have been an important tool for that sort of navigation.”

Because the CSS H L Hunley had sunk on at least two previous occasions, the second time from pilot errors by H L Hunley himself while diving, General Beauregard had ordered that the Hunley only be used as a “David”. There was to be no more diving and all operations were to be conducted “semi-submersed”. For this reason, it is believed that the Hunley no longer needed her depth gauge unless Commander George E. Dixon had plans of his own.

The Hunley scientists have stated that according to Hicks "... the Hunley's depth gauge is in worse condition than most artifacts they've found in the submarine. Besides the broken glass and spilled mercury, the iron piping is heavily corroded. That could have been caused by scouring of sediment pouring into the sub, or could be some reaction to holding the caustic liquid metal." "Getting it out of the submarine was a scary ordeal; it is very fragile," Mardikian said.

Friends of the Hunley, Inc. have still not allowed a public viewing of the depth gauge

**A section of a depth gauge was also discovered, which still had mercury in it. July 31, 2004 Newsletter 51

http://www.thehunley.com/News/Newsletter/Newsletter_32-The%20Subs/Newsletter_32_The%20Subs.htm

A **Depth Gauge** is a device used to measure pressure and display the equivalent depth in water. It is a piece of diving equipment often used by SCUBA divers.

Most modern diving depth gauges have an electronic mechanism and digital display. Older types used a mechanical mechanism and analogue display.

As the gauge only measures pressure, there is an inherent inaccuracy in the depth displayed by most gauges that are used in both fresh water and sea water due to the difference in the densities of fresh water and sea water.

A diver uses a depth gauge with decompression tables and a watch to avoid decompression sickness. A common alternative to the depth gauge, watch and decompression tables is a dive computer.

http://en.wikipedia.org/wiki/Depth_gauge

MERCURIAL SYPHON GAUGE

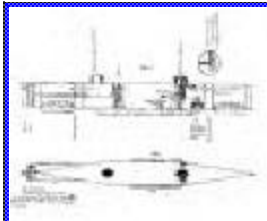
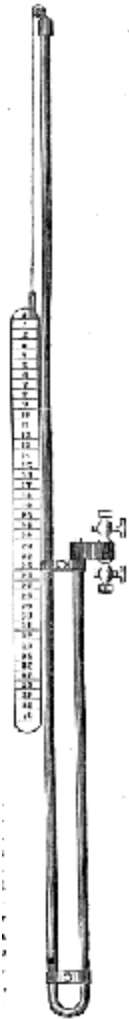


Figure One of the 1872 drawings of McClintock's submarine design, from the Record Office., this one showing the internal plan view of the boat and a transverse cross-section at the aft face of the forward bulkhead. "The pilot is represented through a bull's eye, his right hand on the vertical steering control, and his left lever for working an ordinary stern rudder... The depth being constantly indicated by an **ordinary mercurial syphon gauge** fixed immediately opposite the pilot—one which is open to the outside water—each 1/2 inch of mercury represents about 1 foot immersion." (PRO Adm. Ser. 1/6236, File 39455)

Section shows blowup of depth gauge from the "American Diver" It has the same trombone shape described by Brian Hicks.

Notes from the Hartford Steam-Boiler Inspection and Insurance Company - July 1871 Page 231 of THE MANUFACTURER AND BUILDER

This gauge (**Mercurial Syphon Gauge**) consists of a mortised iron siphoned shape tube the curve down, containing a column of mercury, one leg of the syphon being shorter than the other. Upon the mercury in the long leg floats a piece of iron, to which is attached a cord, which extends through the tube over a pulley at the top, and has fastened to its end a marker, which points to divisions on the adjacent graduated scale. Steam being admitted at the end of the short leg, the pressure pushes the mercury down and raises it in the long leg, and is, in rising, carries the float up with it and causes the marker to descend. It will readily be seen that the greater the pressure, the more the mercury will rise in the longer tube, and the lower will fall the marker, thus indicating the exact pressure of the steam.

The advantages of this gauge are, its extreme simplicity and consequent reliability. It is not a new invention, but one that has stood the test of time and experience. Those desiring, may obtain further information of the Railway Machinist and Engineer's Supply House of H. A. Rogers & Co., 50 and 52 John Street, New York City. [Cornell.edu](http://cdl.library.cornell.edu/)

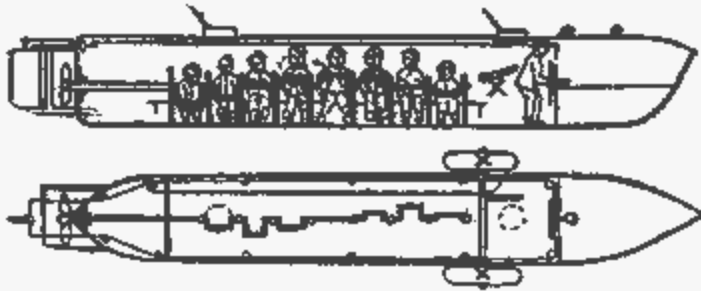
<http://cdl.library.cornell.edu/>

3)AN EYE-WITNESS TELLS HIS STORY OF THE HUNLEY BEING RAISED IN 1872

“ I am one of the few persons, if not the only one now living, who saw that epoch-making craft.”

This article was taken from the *New York World Telegram & Sun Newspaper* and published in the Washington Post August 29, 1915. Part of the article was printed originally in the *Houston Telegraph*.

First Submarine To Sink Ship



PLAN OF FIRST UNDERSEA BOAT TO DESTROY WARSHIP.
A HAND-PROPELLED "DAVID" HYDROPLANES SHOWN AT X.

IT WAS LOST IN ACT OF TORPEDOING THE U. S. S. HOUSATONIC
ON BLOCKADE DUTY OFF CHARLESTON.

PLAN OF FIRST UNDERSEA BOAT TO DESTROY WARSHIP A HAND-PROPELLED "DAVID" HYDROPLANES SHOWN AT X

IT WAS LOST IN ACT OF TORPEDOING THE U.S.S. HOUSATONIC ON BLOCKADE DUTY OFF CHARLESTON

On the night of February 17, 1864, the United States steamship – of – war Housatonic, on blockade duty off Charleston S.C. was sunk by the first submarine successfully used in offensive effort. I am one of the few persons, if not the only one now living, who saw that epoch-making craft.

The submarine boat was designed by Horace L. Hundley and built under his supervision at Mobile, in 1863, by a man named McClintock. While much has been written about it in a general way, the most detailed and apparently accurate description, printed originally in the Houston (Texas) Telegraph, was recently discovered in an old scrapbook.

"She was built of boiler iron and impervious to water or air," says the writer. "Her extreme length was about 30 feet, with a five or six foot beam, and about six feet depth of hold. In general contour she resembled a cigar, sharp at both ends. She was propelled by a screw, the shaft of which ran horizontal along her hold, almost from stem to stern, and was turned by the manual force of eight men seated along it on either side.

"The only hatchway was circular, about two feet in diameter, with a low combing around it, which was placed well forward, and when desired could be closed by an iron cap working on hinges and made airtight. In the forward part of the cap was inserted a clear glass bull's eye, through which the pilot could see. She was provided with watertight compartments, by filling or emptying which she could sink or rise, and to enable her to rise instantly her ballasting of railroad bars was placed on her bottom,, outside of the hull, and , by means of keys accessible to her crew, could be detached in a moment so that she could rise quickly to the surface. Besides her rudder, which was of the usual form, she was equipped with side paddles, or fins, which , like those of a fish, served to guide her up or down with reference to the surface of the water.

“To prepare for action, a floating torpedo was secured to her stern by a line more than 100 feet long, and, her crew having embarked, the water tanks were filled till the boat was in equilibrium and almost submerged. The hatchway was closed, the men revolved the shaft; the Captain or the pilot, standing under the hatch, steered the boat, regulation at the same time, by the action of the fins, the depth at which she would move.

“She could remain submerged for half an hour or an hour without any great inconvenience to the crew, and on one occasion had been known to remain under water two hours without actual injury to them, although no means were provided for procuring fresh air, and from the moment the hatch was closed the men, thus fastened in their living tomb, inhaled and exhaled continually the atmosphere enclosed with them.

“The plan of attack proposed by the inventor was to dive beneath an enemy’s ship, hauling the torpedo after her. Its triggers would thus press against the ships bottom, explode the torpedo and inevitably sink the ship. “Not anticipating an early opportunity of using the dangerous vessel against the fleet of Farragut, General Maury sent her by rail to General Beauregard at Charleston, believing the waters of that harbor better suited to her peculiar construction. Beauregard changed the position of the torpedo by fastening it to the bow. Its front was terminated by a sharp and barbed lance, so that when the boat was driven against a ship’s side the lance would be thrust deep into the hull below the water line and thus fasten the torpedo firmly. Then the boat could back off and explode it from a distance.

“General Beauregard’s call for volunteers to man this dangerous craft was promptly answered by Lieutenant Payne, a Virginian, and eight sailors. The evening set for the expedition the torpedo boat was lying alongside the steamer, from which the crew had embarked. She was submerged till the combing of her hatch alone was visible above the water. Her commander, Payne, was standing in the hatchway in the act of ordering her to be cast off, when the swell of a passing steamer rolled her over and sunk her instantly,, with her eight men in several fathoms of water. Lieutenant Payne sprang out of the hatchway as the boat sank from under him, and he alone was left alive.

“In the course of a few days she was raised and again made ready for action. Again Payne volunteered, and eight men with him.

“The embarkation for their second attempt was made from Ft. Sumter, and, as before, all having been made ready, Payne, standing at his post in the hatchway, ordered the hawser to be cast off, when the boat careened and sank instantly. Payne sprang out, two of the men following him; the other six went down in the boat and perished.

“Again the boat was raised and made ready for action, and her owner, Captain Hundley, took her for an experimental trip into Stono River, where, after going through her usual evolutions, she dived in deep water. For days the return of Hundley and her crew was watched for in vain. After a week’s search she was found inclining at an angle of 60 degrees, her nozzle driven deep into the soft mud of the bottom.. Hundley was standing, dead, at his post, a candle in one hand, the other stiff, in a vain effort to unclamp the hatch. Lieutenant George E. Dixon, of the Twenty-first Alabama Volunteers, finally essayed, with eight men, to take her against the Housatonic.”

The fate of the warship was plain, but the fate of the submarine remained a mystery until the wreck of the former was raised, more than eight years later, in the summer of 1872. Then she was found hanging to the rudder chains of the hulk. It was made plain, therefore that she had not carried the torpedo in front, as Beauregard suggested, but had towed it astern, as Hundley originally devised.. She had actually passed under the Housatonic and was making her way aft to safety when her upper works caught in the rudder chains of the victim.

By invitation of the contractor , a man named Maillefort, who had done government work in **Hell Gate**, I

was present at the raising of the Housatonic wreck and saw the submarine in the position above described. The torpedo exploded under the main mast of the ship and blew a great hole in her hull.

NOTE: I had never heard of Hell Gate so did some research :

[HELL GATE—THE LARGEST ARCH BRIDGE IN THE WORLD](#)

THIS LETTER IS INTERESTING IN THAT IT HUNLEY WAS APPARENTLY SPELLED HUNDLEY AT ONE TIME

Sent: Saturday, April 05, 2003 12:06 PM

Hello:

My Brother forwarded your email letter to me as I have been researching our family tree.

I have found that John Hunley married Louisa H. Lawson on 2/20/1822 and had two children, Horace (12/29/1823) and Volumina 1825. Horace was the son of John Hunley (my 6th Great Uncle). John was the son of Henry Joseph Hundley(1747) and Mary Johnson. They had ten children, Nehemiah (1778 was my direct line), Archabald (1785), William (1780), Arabella, John, Nancy (1779), Polly & Patty (1787 twins), Robert and Amos.

Volumina Hunley married Robert Ruffin Barrow in 1850 and they had two children, Volumina Roberta (1/8/1854) and Robert Ruffin Jr. (1/25/1857)

Nehemiah Hundley (1727) fought in the Revolutionary War under General McIntosh in the 13th Virginia Regiment. Peter Meredith Hundley(1825) fought in the Civil War, Peter was the Great Grandson of Nehemiah.

This is some of the information I have gathered with the help of relatives and I have documentation to prove all of this.

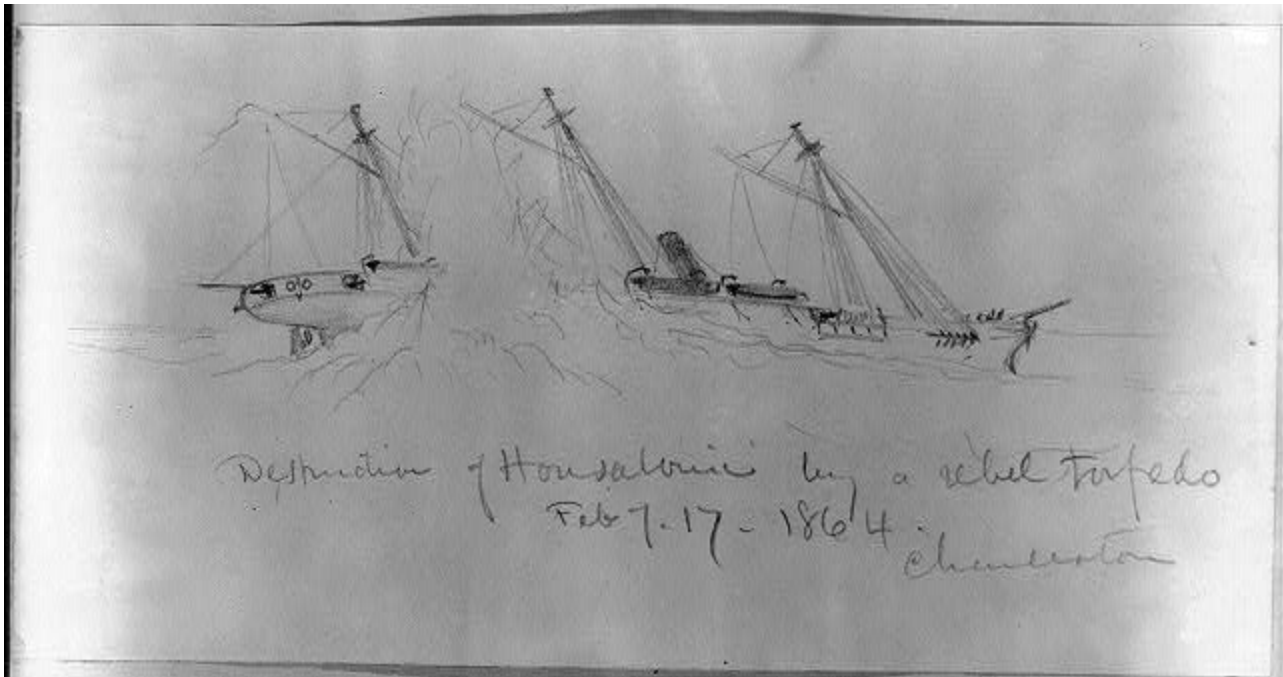
Just thought you might be interested. I would like to receive your news letters, thank you.

Sincerely,

Barbara Jean Hunley Freitag

Destruction of Housatonic by a rebel torpedo, Feb. 17, 1864, Charleston. Pencil drawing, 1864.

Reproduction number: LC-USZ62-783



4) THE PETERSBURG DAILY INDEX

Volume IX Petersburg, Virginia Tuesday morning June 27, 1871

THE DAILY INDEX WILL BE DELIVERED TO ANY PART OF THE CITY FOR FIFTEEN CENTS PER WEEK

UNDER THE WATER

Sunken Iron-clads Curious Things Seen By Divers

The Charleston News in giving an account of the work of wreckers in Charleston, says the iron-clad Housatonic lies in thirty-six feet water, just over the bar, sixteen miles from the city. She rests on a hard shell bottom and lies northwest and southeast, upright on her keel. The water out here is beautifully blue and clear and the divers prosecute their work with much less difficulty than at the Weehawken. Her decks, mast and rigging have all been eaten away by the worms and little else is now left of her, but the huge black hull. Her propeller shaft, chains and anchors, and a large portion of her machinery have been hoisted from her by the machine and two of the smaller guns composing her armament. The rest of them were taken up by the government several years ago. The government has a buoy planted about three hundred yards east southeast of the wreck, which enables the wreckers to guess pretty closely as to her whereabouts. To render the matter a certainty, however, Captain Soames when he leaves her to come up to the city, marks her position with a buoy fastened to the centre of her hull. About twenty feet south of the wreck of the doomed ship lies the hull of her destroyer, the Confederate torpedo boat.

She has been visited by the captain who reports her to be lying bottom upwards, and seemingly in good preservation. There are no holes in her hull and the wings of her diminutive propeller, now uppermost seem to be in good running order. She did her work effectually. In the hull on the port quarter of the huge ship is a jagged hole large enough to drive a carriage and pair through. The heavy oaken ribs and thick planks are blown in with tremendous power, and the Housatonic must have gone down with but little preparation. Her diminutive but dangerous foe met with a similar fate, and the two now rest in silence, side by side, at the

bottom of the sea.

5)REPORT ON THE WRECK OF THE *HOUSATONIC*

**Report of Lieutenant W. L. Churchill, U.S. Navy, on examining
the wrecks of sunken blockade runners and the *Housatonic*.**

U. S. SCHOONER G. W. BLUNT
Port Royal Harbor, S. C., November 27, 1864.

SIR: After a careful examination of the wrecks of the sunken blockade runners and *Housatonic*, I have the honor to make the following report:

I find that the wrecks of the blockade runners are so badly broken up as to be worthless. The *Housatonic* is very much worm-eaten, as I find from pieces which have been brought up. She is in an upright position; has settled in the sand about 5 feet, forming a bank of mud and sand around her bed; the mud has collected in her in small quantities. The cabin is completely demolished, as are also all the bulkheads abaft the mainmast; the coal is scattered about her lower decks in heaps, as well as muskets, small arms, and quantities of rubbish.

I tried to find the magazine, but the weather has been so unfavorable and the swell so great that it was not safe to keep a diver in the wreck. I took advantage of all the good weather that I had, and examined as much as was possible.

The propeller is in an upright position; the shaft appears to be broken. The rudderpost and rudder have been partially blown off; the upper parts of both are in their proper places, while the lower parts have been forced aft. The stern frame rests on the rudderpost and propeller; any part of it can be easily slung with chain slings, and a powerful steamer can detach each part.

I have also caused the bottom to be dragged for an area of 500 yards around the wreck, finding nothing of the torpedo boat. On the 24th the drag ropes caught something heavy (as I reported). On sending a diver down to examine it, proved to be a quantity of rubbish. The examination being completed, I could accomplish nothing further unless it is the intention to raise the wreck or propeller, in which case it will be necessary to have more machinery.

Very respectfully, your obedient servant,

W. L. CHURCHILL,
Acting Volunteer Lieutenant, Commanding.

Rear-Admiral J. A. DAHLGREN,
Commanding South Atlantic Blockading Squadron.

Source: *Official Records of the Union and Confederate Navies in the War of the Rebellion*. Series II, vol. 1 (Washington, Government Printing Office, 1921): 334.

NOTE: D. D. Porter's history of the war states explicitly that HUNLEY was sucked into the hole blown in the Union ship, and dragged down with it. He states clearly that she was found that way, with all her crew drowned. "After the war it was discovered, on examination of the wreck of the Housatonic by divers, that the torpedo-boat which destroyed her had run partly into the opening made by the explosion, so that all on board the David found a watery grave." [Torpedo Warfare](#). [The North American review. / Volume 127, Issue 264, September - October 1878] Admiral D. D. Porter, U.S. Navy

6) REPORT ON THE LOSS OF THE HUNLEY

Letter from Captain Gray, C.S. Army, to Major-General Maury, C.S. Army, regarding the loss of the *H.L. Hunley* and her crew.

OFFICE SUBMARINE DEFENSES,
Charleston, S. C., April 29, 1864.

GENERAL: In answer to a communication of yours, received through headquarters, relative to Lieutenant Dixon and crew, I beg leave to state that I was not informed as to the service in which Lieutenant Dixon was engaged or under what orders he was acting. I am informed that he requested Commodore Tucker to furnish him some men, which he did. Their names are as follows, viz: Arnold Becker, C. Simkins, James A. Wicks, F. Collins, and Ridgeway, all of the Navy, and Corporal C. F. Carlsen, of Captain Wagener's company of artillery.

The United States sloop of war was attacked and destroyed on the night of the 17th of February. Since that time no information has been received of either the boat or crew. I am of the opinion that the torpedoes being placed at the bow of the boat, **she went into the hole made in the *Housatonic* by explosion of torpedoes and did not have sufficient power to back out, consequently sunk with her.**

I have the honor to be, general, very respectfully, your obedient servant,

M. M. GRAY,
Captain in Charge of Torpedoes.

Major-General DABNEY H. MAURY,
Mobile, Ala.

Source: *Official Records of the Union and Confederate Navies in the War of the Rebellion*. Series II, vol. 1 (Washington, Government Printing Office, 1921): 337-338.

TELEGRAM

BALTIMORE, March 2, 1864.

The torpedo boat "David," that sunk the *Housatonic*, undoubtedly sank at the time of the concussion, with all hands. How the *Housatonic* was sunk was not known at Charleston until the

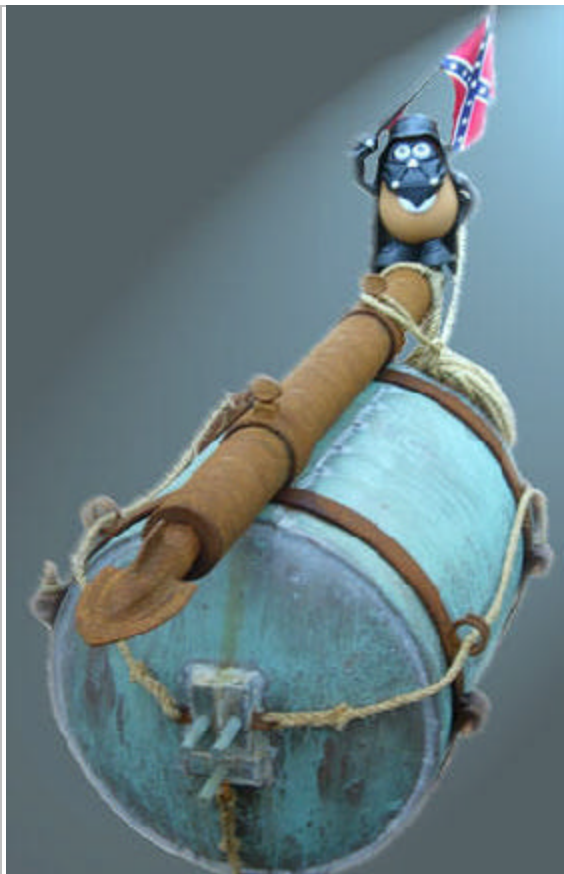
27th, when the prisoners, captured in a picket boat, divulged them the facts.

C. C. FULTON.

Hon. G. V. FOX,
Navy Department.

7) A LETTER FROM EVILMIKE2 aka Mike (the Torpedo man) Kochan

From: "evilmike2" Date: Tue, 26 Apr 2005
Subject: [CSS H L HUNLEY] spar



STAR WARS III

I followed up my fax sketch to the Lasch Center earlier this month, with a phone call today to the archaeologist that was to help me with the spar dimensions. I want to thank them for the time spent with me today.

First I was shocked to learn yesterday that FOTH Volunteer H. Frank Aaron passed away in October at the age of 71. I tried to get him a while ago but this time his wife answered. He was a perfect gentleman from the old school (the kind of guy that would get up when a lady got up from or came back to a table or in or out of a room and helped he any way he could on my visits to the Lab as well as phone calls and e-mails. I really miss him. Perhaps a dose of reality here..... I'll get what I'm after shortly and I added a few things. Now reality, answers to questions asked..

Positions of ballast tank valves? It looks like the handles come off

so they might not be in the way at that position. At this time

they are not sure which position the valves are because of the covering. Time will tell.

Front hatch locking device is different the rear hatch. The device itself is not attached to the hatch but appears to be in pieces

inside the sub. At this time they are not sure what it looked like so they don't know if it was in the way ...Time will tell.

Snorkel position? ...same as tank valves too much covering it to tell...Time will tell.

No, I didn't ask the one George wanted me to ask.... Can they crank it with their feet? (Just one of the ones)



Mike and Aaron at the Lasch Lab

Mike Kochan

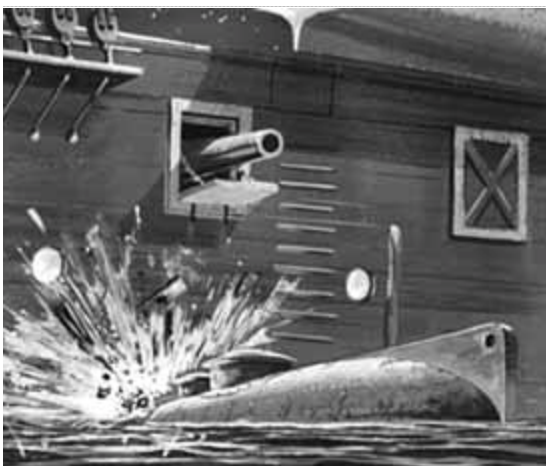
I asked if I could relay the info and he had no problem. I had to fax back a disclosure form signed by me a while ago for some x-rays.

So from today's call it looks like the sub has to be clean to really get a true picture of the way things are... Time will tell.

P.S. History Channel show on May 22 8:30 et/pt...
"The most Daring Mission of the Civil War". See the Union sinking a Confederate Iron clad with a spar torpedo. I'll be on there with the cut away torpedo I made.

8) Discussions about the Collision, prop and sinking theories that go with these occurrences by members of the CSS H L HUNLEY CLUB.

Before this discussion started Barry talked about braking. How did the Hunley stop?



Picture courtesy of [U.S. NAVY](#)

I suspect there was quite a thud when the Hunley collided with the Housatonic. Since the spar was not bent, it is reasonable to assume that the forward momentum was converted into a moment that rotated the submarine. The bow would be plunged downwards and the stern up. The kinetic energy at 4 knots is sufficient to raise the entire Hunley up about 9" but it was only rotated about its center of gravity. Maybe the stern rose a couple of feet. Does this seem reasonable? "Paul" <phoward333@yahoo.com>

'The crew was almost certainly braking, i.e., cranking in reverse at the moment of impact in order to reduce their momentum to avoid bending the spar or pushing it right through the wooden hull of the Housatonic. I think it can be safely assumed that they had practiced the technique of gently planting the harpoon point and

backing off at least a few times before going out after the Housatonic.

“The impact was a little harder than they intended considering the mass of the Hunley and the inertia that had to be overcome in order to reverse direction at exactly the right moment. Not an easy thing to do in the heat of battle.

The Hunley’s drive train was not designed for reversing direction. The original intent was to tow a torpedo under the target ship, which involved only a straight-ahead movement. It’s quite possible that the stresses involved in reversing direction finally broke the drive train altogether.”

This wheel may have been part of a braking assembly. There does not appear to be any significant gearing or other mechanism to support the classification of this as a flywheel.



Reversing the prop would require overcoming the momentum of the flywheel, something fairly easy for a trained crew operating in concert, but definitely introducing a delay. I believe Maria has twice mentioned some sort of brake on the flywheel. The photos we have show a jumble of mechanics at the aft end, including the pump and the aft tank fill valve, both of which have handles that extend back into the cabin so the man in the last seat could easily reach them. I don’t see a brake there, but I may be wrong. Michael (JVNautilus)

“Clearly, the drive train worked well enough in reverse to support the changeover from the towed torpedo to the spar, but it could have failed at any moment in either direction due to stresses built up over time. For example, metal fatigue could have caused the some part of the drive train to twist and bind up. Those of us who believe in Murphy’s Law know that it would have chosen the worst possible moment to do that.”

“The point is that it (drive train) was not designed to reverse direction. Keep in mind that the builders did NOT have welding technology at that point, only brazing. So if the drive train (including crank, gears, prop shaft, prop, etc.) was constructed using screw threads or fasteners it may very well have been optimized for forward rotation. We may find out someday if the science team takes it apart.”“Speculation is based on the theory that something had to be damaged in order for the Hunley to have been still in the area of the Housatonic roughly 45 minutes after the attack.” Barry

We know that there was a line or tether that ran from the forward hatch attached to a spool and from there to a triggering device on the Torpedo. The 135 lb Singer Torpedo was strapped to a barbed pipe and sleeved onto the end of a 17' +- spar. There was 150 ' of line around the spool that would be fed out as the Hunley reversed after sinking the torpedo into the hull of the Housatonic. Some of our discussions are around what would of happened to the over 100' of line left over after the explosion.

■ In [csshlhunley@yahoogroups.com](mailto:csshunley@yahoogroups.com), Tim Smalley wrote:

"Try dragging a 100 foot line from the bow of any boat with a propeller. You get fouled every time."

■ > evilmike2 : The fouled prop theory although possible and I wouldn't count it out, reminded me more of Charlie Brown Flying his kite into the only tree for miles around.

■ "hunley_bar" <hunley@bfkinsey.com> The fouled line is a good theory, but I would think that IF they moved the Hunley forward after backing away without winding up the broken cord; and IF they fouled the prop, and IF the line were heavy enough not to break on its own (our own boat had line-cutters in case we ran over the heavy lines of Maine lobster traps, but anything less wouldn't need to be cut as the shaft rotation alone would have enough oomph to snap it), I'd think that as soon as they realized what had happened, they'd have a crewmember in the water with a knife to remove the problem. I'm inclined to agree with Mike's point of view.

Bruce

■ "Barry Rogoff" brogoff@rogoff-darrow.net If the torpedo lanyard fouled the prop, they may not have realized it right away. Sure, if the crank completely froze, they would have sent someone outside to assess the situation. But if the crank continued to turn with some amount of extra resistance, it's interesting to speculate how much extra force they would have applied to it before stopping. Knowing what I do about human nature, I think they might have applied enough force to do some real damage to the prop, rudder, and/or drive train."

NOTE: McClintock, one of the designers of the Hunley agrees with Barry's assessment:

"...One difficulty which Mr. McClintock very frankly pointed out was the uncertain action of the compass in such a vessel...He also pointed out another requirement which he had not succeeded in applying rather from want of means than from want of skill, or from any great difficulty in the requirement [illegible]. He states that when under weigh beneath the surface, it is quite impossible to ascertain whether the vessel is progressing as there are no passing objects by which to recognize the fact of motion; on several occasions when experimenting with his boat they continued working the crank while all the time the boat was hard and fast in the mud ("Report on a submarine boat invented by Mr. McClintock of Mobile, U.S. of America," PRO, Adm. Series 1/6236, File 39455).

Newsletter 57

■ “Keep in mind that Dixon and the crew may have been suffering from all sorts of things and thus not at their best decision-making state of mind. Assume that Dixon himself was the bosom, i.e., the person directly commanding the crew to crank or stop. He had one or two other things on his mind at the time. And when operating as a team, the crew may not had the presence of mind to realize that even a slight increase in resistance could be critically important.”

”Also keep in mind that it was dangerous to the open the hatches at sea, where even a light chop could have allowed water to slosh into the boat. It was something they did only when necessary. To reach the point of sending someone over the side, significant damage had to have already occurred. “ Barry

■ One of the questions ask to the group was: <<Is it possible that the Hunley was hit by the Housatonic before she blew up. The Hunley was very close to the Housatonic when she set off the torpedo.>>

■ “Impossible. The Housatonic was at anchor when the Hunley started her attack run. Yes, the captain of the Housatonic was under orders to keep a head of steam up. And yes, at some point the order was given to raise anchor and get underway.”

”But even had she started to move, a steam sloop of war the size of the Housatonic could not possibly have maneuvered herself into contact with the Hunley, which was roughly perpendicular to her at the time.” Barry

■ Paul Howard <phoward333@y...>wrote: “With seven men turning the crank (drive shaft) each individual is unaware of the total torque. If a rope tightened around the shaft, each man may have thought, “The guy next to me is slacking off and I have to try a little harder”. Their collective effort could not be known. In addition, I would guess that they were almost out of oxygen, which could have farther exasperated the situation. If they could survive 2 hours at rest, their cranking duration would be at best half as long. I know that my breathing and heart rates doubles when on a treadmill.”

■ “ Suppose: They buttoned up the hatches 1 mile from the Housatonic; cranked for 15 minutes, planted the charge, backed up 100-200’, felt the detonation, cheered, then realized that if 90# of powder did that what if the Housatonic’s magazine goes off? cranked backwards another couple of minutes, waited for the coast to clear, signal with the blue light. At this point they are almost out of oxygen and their thinking would be impaired. “ Paul

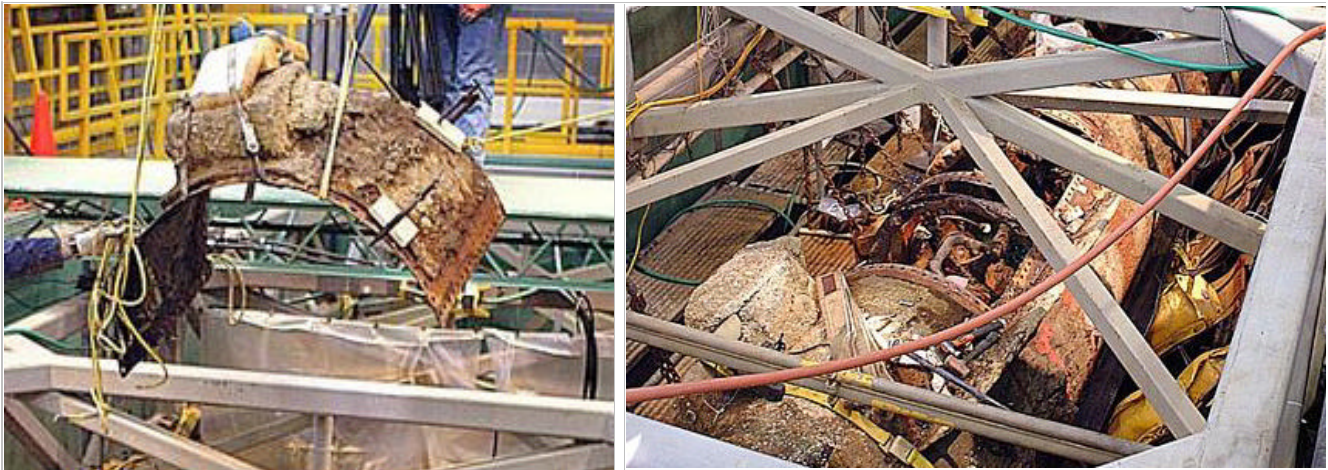
(We concur that the 90# torpedo was used when towing...but increased to 135# for the final mission)

■ “Barry Rogoff” Paul, good point about how an individual turning the crank would not be aware of the overall torque. I think it’s simply instinctual behavior to work harder when the going gets more difficult. It would have required training and practice for the crew to be able to properly respond to a fouled prop and I doubt that Dixon had time to train the crew that well.

Your point about **oxygen deprivation** raises another important question: **did the ventilation system work?** The currently accepted theory is that it didn’t work, or at least not very well. That theory is based, in part, on various statements in the historical records. I think one of the Confederate sailors captured before the attack said as much. Alexander himself might have said something about it. (Too busy to look it all up - sorry.)

My theory is that the ventilation system did work - on the surface. It’s based partly on fact and partly on logic.

1. When the Hunley was recovered, air box/snorkel assembly was in place and the bellows (air pump) and rubber ventilation hoses were found on board. Had the ventilation system never been used, some or all of it would have been removed and the openings sealed off. Why leave a bulky and potentially leaky system in place if it’s not needed?



Pictures courtesy of the CSS H L Hunley Club and the FOTH

2. Ventilating the boat on the surface was not a particularly difficult engineering problem. Compared to all of the other problems that had to be solved in order to build a working attack submarine, getting fresh air inside the boat would have been a piece of cake. It did not require any technological innovation.

I think the truth of the matter is that the ventilation system didn't work very well underwater. The length of the snorkels might lead one to believe that they were intended to work with the hatches submerged. I don't think so. I think their height was intended to keep them above the waves in rough water, allowing the boat to be operable even in bad weather at sea. Barry



- "Barry Rogoff" wrote: I believe that the ventilation system worked on the surface and thus anoxia wasn't a factor. Other than the historical record, there's not a single bit of evidence that it didn't work.

Having done the endurance dive, Dixon and the crew were well aware of what the effects of oxygen deprivation felt like and someone would have raised an alarm.

- "Tim Smalley" <tmsmalley@yahoo.com>Actually, the historical record should be given weight. I expect that statements that it didn't work were probably exaggerations. Perhaps the real question is how well it worked. It's likely the endurance dive was done under special controlled conditions, not after hours of cranking out to the Housatonic, the adrenaline rush of an attack and aftermath and with the exertion of cranking back. I think it's safe to say these guys were exhausted, jubilant, and hurting and it's very possible they didn't recognize the symptoms.
- "BR" Secondly, there's no reason to believe that the dive planes were a factor. Yes, in normal operation, Dixon maintained more-or-less neutral buoyancy and depended on the planes to control the depth. But in this case, the mission was over and there was no longer any reason to submerge the boat. For safety, he would have pumped both ballast tanks dry and ridden as high in the water as possible with the planes neutral or angled upward.
- "TS" Well, we do have Owlsey's statement that two crewman were close enough together at each end of the cabin so that their remains were co-mingled. It may be a leap to interpret this as two men on each pump, but I think it's reasonable. If they were pumping like that water must have been coming in. It's also certainly possible that Becker was operating the air pump and the next guy working the water pump.
- "BR" Sure, it's possible that the boat could have lost some buoyancy due to water leaking into the tanks, but I don't think it could have lost enough to submerge without anyone noticing. It was Dixon's responsibility to know the depth of the boat at all times and he was too good an officer to get complacent enough to kill himself and the crew.
- "TS" Dixon would not have expended as much energy as the crew but he would have shared in their excitement and he was very likely tired. Even good officers make mistakes. We may not know if Horace Hunley was a good officer but we know he made a fatal mistake. Michael

"The Hunley's spar has a slight bend of a few degrees to the right, probably due to the impact against the hull of the USS Housatonic when the submarine was planting its explosive. Paul Mardikian, conservator for the sunken Civil War sub, said X-rays of the area where the pole was bolted to the Hunley also shows damage, probably because of the strong impact. "We've got the memory of the battle in the spar," Mardikian said."
June 30, 2000 Post and Courier



CLOSE UP OF SPAR - FOTH

- "Andy Hall" <tigone@wtez.net> Given there's no clear physical evidence of the cause of the boat's loss,

the fouled-screw theory makes some sense. A fouled screw would have deprive the boat of dynamic lift, and if the boat was trimmed slightly negative—or got that way because of small leaks caused by the concussion of the torpedo -- then down she goes. Unfortunately it will likely never be proved, since the main piece of evidence—the trigger line itself - disappeared long ago.

For me the fouled screw theory makes a lot more sense than intentionally bottoming the boat so close to the sinking. While Dixon undoubtedly would want to wait for the tide or current to take him back to shore, I cannot imagine he would have intentionally put the boat down there—the area immediately around HOUATONIC would almost certainly get very busy, very quickly after her sinking. Trying to wait out the commotion so close to the sinking would be like a bank robber “hiding out” at a table in the sidewalk cafe across the street—ballsy, but with long odds of success.

As for the boat backing up directly away from the sinking, I suspect it did—that would put them as far as possible from the blast, and expose the smallest profile of the boat to the concussion.-----> AH

▪ **9) COMMENT ON SOUTHERN TECHNOLOGY**

Considering that the "Hunley" was built in Mobile, AL, along with its predecessor, the "American Diver" and both vessels were larger than the "Pioneer" built in New Orleans, LA, I would not sell Southern technology short as many history books tend to depict.

First, both vessels were designed by the McClintock-Watson team, who were innovative engineers. McClintock even experimented with electric engines to power the "American Diver." This team chose Mobile as opposed to other locations to set up shop after the fall of New Orleans.

Second, both vessels were built at the Parks & Lyons Machine Shop in Mobile, AL. This was likely a fair-size business, and apparently had enough capacity to perform other workloads concurrently with the submarines.

Third, Mobile was a major port on the Gulf Coast. Other major ports were Pensacola, FL, New Orleans, LA, and Galveston, TX. There were two major fortifications guarding the entrance to the bay. Selma,



Courtesy of the Friends of the Hunley and the National Geographic Society

which had major industrial facilities, was upriver. There was plenty of demand (Government, Military and Commercial) to attract industrialists before and during the War.

I conclude that the Singer Submarine Corps (which was the main backer of the "Hunley"), had the technical capability and industrial capacity to produce war machines on par with the Union, but not necessarily in the quantities that the Union could.

maclilus

10) THE HUNLEY IS A FORENSIC INVESTIGATION - THE COLDEST OF COLD CASES

Paul Mardikian, senior conservator at the Warren Lasch Conservation Center in North Charleston, S.C., examines paint on the crew bench recently removed from the H.L. Hunley. The 40-foot, hand-cranked Hunley rammed a spar with a black powder charge into the Union blockade ship Housatonic, Feb. 17, 1864. It was the first sub to sink an enemy warship.

Associated Press



Confederate sub's sinking like a cold-case file

Hunley holds clues to what sank sub

CHARLESTON, S.C. - On the anniversary of its sinking, a scientist said it's still not known what sent the Confederate submarine H.L. Hunley to the bottom, but the vessel will eventually give up its secrets.

"There is no such thing as a smoking gun when you are conducting a forensic investigation," Maria Jacobsen, the senior archaeologist on the Hunley project, said Thursday.

"Archaeology is the perfect forensic discipline. But in our case we



The crew bench contains clues about the crew of the Hunley, including samples of human hair that scientists can examine.

Associated Press

have a very cold case. It's not 10 years old. It's over 140 years old," she said. "I'm very confident we will know what happened but it's a matter of time."

Thursday was the 141st anniversary of the sinking of the first sub in history to sink an enemy warship. The 40-foot, hand-cranked Hunley rammed a spar with a black powder charge into the Union blockade ship Housatonic on Feb. 17, 1864.

But the Hunley also went down and was finally located off Sullivans Island in 1970 and re-located again in 1995. It was raised five years later and brought to a conservation lab at the old Charleston Naval Base where it sits in a tank of chilled water.

Thursday evening, Confederate re-enactors planned to march from Fort Moultrie on Sullivans Island to Breach Inlet, where the sub began its ill-fated mission. They planned to throw wreaths onto the water in memory of the sub's eight-man crew.

Earlier, journalists got a chance to see the wooden crew bench removed from the submarine. The 18-foot bench, fashioned of three sections of wood, is in remarkably good shape after the sub sat on the ocean floor for decades.

Jacobsen noted there are few signs that worms ate away at the wood.

That would indicate the submarine filled with sediment after the sinking. Water rushing through would have brought in more sea life, she suggested.

Paul Mardikian, the Hunley's senior conservator, focused a magnifying glass on the bench to reveal a human hair from one of the crewmen.

Scientists later found the faint imprint of fabric on the bench, which had been painted with an oil-based paint. Since the paint probably took a long time to dry, the imprint could have been from the clothes of a crewman or perhaps someone working on the sub before its voyage, said Kellen Correia, a spokeswoman for the Hunley project.

More clues about what happened after the sinking will be provided by examining the sediment excavated earlier, Jacobsen said.

Using Lead 210 dating, scientists can narrow down to decades when something happened in the sub.

Beyond that, she said, scientists can get an even closer estimate by looking for pollen inside the sediment.

"We are looking at the pollen inside the layers. You can look at the pollen and that will give you an idea of how things changed in a year," she added.

Mardikian said about 1,000 artifacts have been removed from the Hunley so far, including the shoes of the crew which were freeze-dried as part of the conservation process.

He said scientists are working three days a week on the sub itself and two days on conserving artifacts.

Scientists think they may find more artifacts in the heavy encrustations on the sub found beneath the crew bench.

The remains of the Hunley's eight-man crew were buried last year in a ceremony that attracted thousands and has been called the last Confederate funeral.

Scientists are still determining the best way to conserve the Hunley itself. The sub eventually will go on display in a museum in North Charleston.

On the Net: Friends of the Hunley: www.hunley.org

citation: http://aikenonline.com/stories/021805/new_N8832.shtml

11) EMAIL AND GUESTBOOK SELECTIONS:

Newsletter 57

Ann Larabee <larabee@msu.edu> wrote:

To: <csslhunley@yahoogroups.com>
From: "Ann Larabee" <larabee@msu.edu>
Date: Wed, 6 Apr 2005 16:15:58 -0400
Subject: RE: [CSS H L HUNLEY] Book on Civil War era Torpedoes - published 1869

This book is available in electronic form at <http://www.hti.umich.edu/m/moa/>
(Making of America Collection, University of Michigan) as are many other
19th century books of scientific and technical interest.

realname: Calvin
username: cashwell@
city: Lynchburg
state: Va.
country: USA
Date: Friday April 29, 2005
comments

Do you have plans of the CSS Hunley (Interior with the names of the equipment)?

Try this site..it is one of the best. George
<http://home.att.net/~JVNautilus/Hunley.html>

Thanks that is what I was looking for.
Calvin

realname: Weston Hunley
username: allballs9
city: salyersville
state: KY
country: USA
Date: Wednesday April 27, 2005
comments

why did they name it the Hunley i was interested because my last name is Hunley

--- Original Message ---
From: "tia hunley" <tiahunley@yahoo.com>
To: <mistergwp@thehunley.com>
Sent: Wednesday, April 20, 2005 9:13 PM
Subject: i know george's middle name...

> To whom it may concern: you were requesting George E.

Newsletter 57

- > Dillon's middle name? I saw it on the Hunley
- > newsletter at the bottom of the homepage...
- > George Evert Dillon

>Very interesting...send me the link for the page that you saw this on.
 George W. Penington Webmaster and Editor of The Hunley.com website and newsletter.

-

12) WHAT WERE PEOPLE SEARCHING FOR THIS MONTH:

Mon Apr 25 12:15:03 2005 discovery	Mon Apr 18 11:35:41 2005 Who was the Hunley named after?	Mon Apr 11 12:11:12 2005 H.L. Hunley
Mon Apr 25 11:56:43 2005 initial finding	Mon Apr 18 11:34:35 2005 what war was the Hunley fighting in?	Mon Apr 11 11:39:38 2005 Map
Mon Apr 25 07:35:54 2005 hunley submarine	Mon Apr 18 11:34:00 2005 when did the hunley sink?	Mon Apr 11 06:30:24 2005 blueprints on the hunley
Sun Apr 24 15:25:17 2005 HUNLEY TICKETS	Mon Apr 18 11:26:44 2005 Hunley	Mon Apr 11 06:28:07 2005 info on the hunley
Sun Apr 24 15:10:52 2005 WHERE IS THE HUNLEY DOCKED	Mon Apr 18 11:24:08 2005 Who was the H.L. Hunley named after?	Mon Apr 11 06:24:10 2005 ship sunk
Sun Apr 24 14:19:01 2005 facts about the hunley	Mon Apr 18 11:16:05 2005 Hunley	Sun Apr 10 18:41:30 2005 artifacts of the hunley
Sun Apr 24 14:04:35 2005 size of the hunley	Mon Apr 18 08:16:08 2005 the recovery	Sun Apr 10 17:55:58 2005 Pioneer
Sun Apr 24 14:02:16 2005 facts about the hunley	Mon Apr 18 08:03:44 2005 the first mission	Sun Apr 10 16:20:24 2005 Raising Blue
Sun Apr 24 12:06:33 2005 reinterment	Mon Apr 18 08:03:31 2005 the recovery	Sun Apr 10 16:07:39 2005 diagrams of the hunley
Sat Apr 23 20:59:43 2005 How did the Hunley work?	Mon Apr 18 08:02:13 2005 The recovery	Sun Apr 10 16:07:09 2005 inside of the hunley
Sat Apr 23 17:13:08 2005 crew mebers names	Mon Apr 18 07:43:18 2005 gold coin	Sun Apr 10 15:43:41 2005 pictures
Sat Apr 23 15:09:36 2005 How the hunley works	Mon Apr 18 06:45:09 2005 stalactites	Sun Apr 10 15:20:44 2005 pictures
Sat Apr 23 11:10:53 2005 directions	Sun Apr 17 19:06:47 2005 julius kroehl	Sun Apr 10 15:14:14 2005 picture gallery
Fri Apr 22 12:02:41 2005 mississippi	Sun Apr 17 18:18:57 2005 about hunley	Sun Apr 10 12:05:33 2005 other artifacts
Fri Apr 22 09:29:13 2005 dixon's gold watch	Sun Apr 17 18:16:08 2005 cook photo	Sun Apr 10 12:03:46 2005 other artifacts
Thu Apr 21 21:03:25 2005 Burials	Sun Apr 17 18:08:21 2005 mobile	Sun Apr 10 09:53:38 2005 width
Thu Apr 21 16:18:41 2005 plans	Sun Apr 17 18:02:59 2005 the pioneer	Sun Apr 10 09:53:34 2005 dimensions
Thu Apr 21 14:11:19 2005 css hunley	Sun Apr 17 18:01:51 2005 info on the hunley	Sun Apr 10 09:53:18 2005 configuration
Thu Apr 21 10:30:18 2005 tours	Sun Apr 17 18:01:46 2005 the pioneer	Sun Apr 10 09:53:13 2005 length
Thu Apr 21 07:08:26 2005 biography of the cilvil war hunley submerine	Sun Apr 17 18:00:23 2005 william alexander	Sun Apr 10 09:51:34 2005 width
Thu Apr 21 01:57:17 2005 dimensions	Sun Apr 17 16:41:28 2005 Artifacts	Sat Apr 09 20:52:52 2005 distance traveled after sinking the U.S.S
Wed Apr 20 19:12:56 2005 Horus Lawson Hunley	Sun Apr 17 13:12:13 2005 The Hunley	Sat Apr 09 14:58:18 2005 Hunley museum
Wed Apr 20 17:29:22 2005 history	Sun Apr 17 11:53:22 2005 Gold coin	Fri Apr 08 18:42:27 2005 Pioneer
Wed Apr 20 17:24:12 2005 the coin	Sun Apr 17 10:58:28 2005 Captain Dixon	Fri Apr 08 18:34:26 2005 Alligator
Wed Apr 20 11:54:21 2005 Ridgeway	Sun Apr 17 10:46:48 2005 Captain Dixon's Gold coin	Fri Apr 08 16:32:42 2005 who was the members of the Hunley
Tue Apr 19 19:43:58 2005 plan	Sun Apr 17 10:45:49 2005 Captain Dixon's Gold Coin	Fri Apr 08 13:42:32 2005 deminsions of vessel
Tue Apr 19 14:46:22 2005 pictures	Sun Apr 17 06:06:48 2005 submarine	Fri Apr 08 12:03:45 2005 directions
Tue Apr 19 14:30:27 2005 hunley pictures	Sun Apr 17 05:44:58 2005 artifacts	Fri Apr 08 09:03:47 2005 Why did the Hunley sink?
Tue Apr 19 11:06:13 2005 crew	Sat Apr 16 19:02:13 2005 Alexander	Fri Apr 08 06:39:25 2005 book about hunley
Tue Apr 19 09:01:17 2005 discription	Sat Apr 16 17:25:26 2005 gold coin	Fri Apr 08 05:44:27 2005 location
	Sat Apr 16 16:28:03 2005 hunley story	Fri Apr 08 04:47:03 2005 h l hunley location
	Sat Apr 16 09:19:09 2005 gold coin	Fri Apr 08 04:35:56 2005 (h l hunley location) AND (h l hunley location)
	Sat Apr 16 08:13:31 2005 clip art	Thu Apr 07 21:51:50 2005 lawson
	Fri Apr 15 16:19:31 2005 gold coin	Thu Apr 07 21:51:32 2005 h. l. hunley
	Fri Apr 15 12:31:05 2005 Where is the	Thu Apr 07 21:43:30 2005 hunley
		Thu Apr 07 21:22:16 2005 history

Newsletter 57

Hunly on exhibit at? Fri Apr 15 11:54:59 2005 pictures of the hunley Fri Apr 15 11:54:31 2005 the first submarine, the hunley Fri Apr 15 07:10:43 2005 Hunley's Second Crew	Thu Apr 07 19:05:39 2005 Tours Thu Apr 07 13:27:46 2005 Remains of the hunley crew Thu Apr 07 11:37:55 2005 artifacts Thu Apr 07 11:29:07 2005 map of the hunley went on Thu Apr 07 08:31:22 2005 WRENCH
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or if you would like to send a check you can send it to the address below (
Make checks out to The Hunley.com). Total \$10.00**

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Savannah, GA 31401**

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