

Charles Momsen and the USS *Squalus*: Challenging the Frontier of Deep Sea Rescue

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I enjoy reading and learning about history, especially maritime and naval history. As a resident of southwestern Maine, the story of the *Squalus* is a local one, but one of national and worldwide importance. It is a sensational story, as intriguing and captivating today as it was for the men and women who lived when it occurred. A lost submarine, a daring and brave rescue using the latest technology, a hero inventor, and the celebration and stories of the survivors.

The first I heard of Charles Momsen had to do with the Momsen Lung. My great-grandfather served in the Navy during WWII, and attempted to sign up in the Submarine force. He was able to meet every requirement needed to join, except for the Momsen Lung. Due to a dental issue, he could not work the Lung, and was told to join the surface navy instead. He later shook his head at how foolish and invincible he thought he was in his youth, and how, ultimately, the Momsen Lung may have been his savior.

During my research, I corresponded with the director of the Portsmouth Naval Shipyard, Mr. Joseph Gluckert. He helped get me access to the shipyard and the on base museum, where I was able to view artifacts from the *Squalus* and learn more about her sinking, the rescue, and the laborious task of getting the salvage to shore. I also met with the museum volunteers, mostly retired navy men, who also shared their own experiences and provided insight on those they knew who were directly related to the rescue operation. The visit to the museum and the yard was invaluable to my research experience.

As this paper will show, Charles Momsen was clearly a front runner of ideas and innovations in deep sea safety. His frontier was 40 fathoms below the surface of the ocean, rescuing the pioneers of submarine warfare who ran aground.

*The Ships destroy us above
And ensnare us beneath,
We arise, we lie down, and we move
In the belly of death.
- Submarines, by Rudyard Kipling¹*

They call it a watery grave, because once lost to the sea, lost forever. Ever since people first ventured across the water, leaving the safety and security of land, the dark depths have been swallowing and gorging on the “forever lost”. Still, people continue to embark, to voyage across the briny deep, and then home again. For a sailor on a submarine, the risks are even more apparent, for they have already surrendered to the inky blackness, and can only rely on the science and technology of their craft to be reclaimed again to the light and air. That is, until that equipment fails, and the only hope is a rescue.

On May 23, 1939, the submarine USS *Squalus* found herself immobilized on the ocean floor, 240 feet below sea level.² It was a depth beyond which anyone had ever been rescued, which was only a few feet under water at that time.³ The crew sat in complete darkness and silence, paralyzed. They could not even breathe with ease, for the oxygen they needed was now of a finite quantity. Monitoring each breath and movement, in blackness, they could only hope that their rescue would come swiftly.

Then Charles Momsen arrived, stepping into a precarious situation, with an all too short and important deadline (See Appendix A). Ultimately, his invention of the McCann Rescue Chamber and the Momsen Lung would help create a new frontier, helping those on board the *Squalus*, and revolutionizing deep sea rescue technology.

¹ “Submarines” Rudyard Kipling

² Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/. Accessed 6 Jan. 2023.

³ Patterson, Ross. "Raise the Squalus: The Loss, Rescue, and Resurrection of a Submarine." *The Portsmouth Naval Shipyard Museum*, 9 Apr. 2020, portsmouthnavalshipyardmuseum.com/online-learning-archive/raise-the-squalus/. Accessed 21 Nov. 2022.

Charles “The Swede” Momsen was born on June 21, 1896 in Long Island, New York.⁴ He joined the Naval Academy in Annapolis Maryland in 1916.⁵ By 1922, his true love was submarines, and he eventually graduated from the Submarine School in Groton, Connecticut.⁶ During his naval career he was the commander of multiple submarines.⁷

It was the sinking of the *USS S-51* that would most deeply affect him, and forever determine his legacy. The *S-51*, based out of New London, Connecticut had been on a night drill on June 24, 1922, when it was accidentally rammed by a merchant steamer off the coast of Long Island.⁸ Momsen, and those under his command, were sent to look for her.⁹

They arrived at the scene, the location identified by the oil slick left by the *S-51*.¹⁰ Despite multiple attempts, they were unable to make contact with the sub, located 130 feet below the surface.¹¹ For the crew members entombed inside the sub, there was no way to communicate with their potential rescuers on the surface, and no way to escape the sub.

The loss of the *S-51* and her crew would haunt Momsen. He knew many of the sailors on board, and he would be forced to stand idly by while knowing that his friends would eventually die a slow and painful death by asphyxiation.¹² He vowed that he would find a way to stop the needless loss of life, and make deep water rescue possible.

⁴ "Charles Bowers Momsen." *Naval History and Heritage Command*, 3 Mar. 2016, www.history.navy.mil/content/history/nhhc/research/library/research-guides/modern-biographical-files-ndl/modern-bios-m/momsen-charles-b.html. Accessed 9 Jan. 2023.

⁵ Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/. Accessed 6 Jan. 2023.

⁶ academickids.com/encyclopedia/index.php/Charles_B._Momsen. Accessed 19 Jan. 2023.

⁷ Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/. Accessed 6 Jan. 2023.

⁸ Winslow, Richard. *Portsmouth-Built Submarines of the Portsmouth Naval Shipyard*. Portsmouth Marine Society, 2000.

⁹ Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/. Accessed 6 Jan. 2023.

¹⁰ academickids.com/encyclopedia/index.php/Charles_B._Momsen. Accessed 19 Jan. 2023.

¹¹ Winslow, Richard. *Portsmouth-Built Submarines of the Portsmouth Naval Shipyard*. Portsmouth Marine Society, 2000.

¹² Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 63

His plan was to create a diving bell, or a submarine rescue chamber. While the idea of a submerged bell had been around for thousands of years, around 332 B.C.E., Momsen wanted to update the design and provide new upgrades. His 10 foot tall “bell” would be dropped from surface ships which had cables attached to the wreck, which it went down to.¹³ It would then attach to an escape hatch, to allow crew members inside the sub to board the chamber.¹⁴ The rescuers and the rescued submarine sailors would then float to the surface in the bell.¹⁵

The bell was to be split into two sections, the upper half was for the operators controlling the bell.¹⁶ The lower section would hold the ballast needed to float or sink it in the water, as well as a secure seal, to allow the bell, when in contact with the submarine, to maintain equal pressure inside and outside of the submarine, and to prevent further flooding.¹⁷ (See Appendix B)

Momsen sent the plans to the Navy’s Bureau of Construction and Repair. For over a year, Momsen would not hear anything about his design. He would eventually follow up, only to find that it had been disregarded as impractical, and forgotten.¹⁸

¹³ "New Rescue Chamber Laughs at Sea." *Popular Mechanics*, Sept. 1931, pp. 1-144, books.google.com/books?id=veQDAAAAMBAJ&pg=PA366&dq=Popular+Mechanics+1931+curtiss&hl=en&ei=4Gv7TLLNJ8XBnge1nLXGCg&sa=X&oi=book_result&ct=result&resnum=7&ved=0CD4Q6AEwBg#v=onepage&q=Popular%20Mechanics%201931%20curtiss&f=true. Accessed 9 Jan. 2023.

¹⁴ "New Rescue Chamber Laughs at Sea." *Popular Mechanics*, Sept. 1931, pp. 1-144, books.google.com/books?id=veQDAAAAMBAJ&pg=PA366&dq=Popular+Mechanics+1931+curtiss&hl=en&ei=4Gv7TLLNJ8XBnge1nLXGCg&sa=X&oi=book_result&ct=result&resnum=7&ved=0CD4Q6AEwBg#v=onepage&q=Popular%20Mechanics%201931%20curtiss&f=true. Accessed 9 Jan. 2023.

¹⁵ "New Rescue Chamber Laughs at Sea." *Popular Mechanics*, Sept. 1931, pp. 1-144, books.google.com/books?id=veQDAAAAMBAJ&pg=PA366&dq=Popular+Mechanics+1931+curtiss&hl=en&ei=4Gv7TLLNJ8XBnge1nLXGCg&sa=X&oi=book_result&ct=result&resnum=7&ved=0CD4Q6AEwBg#v=onepage&q=Popular%20Mechanics%201931%20curtiss&f=true. Accessed 9 Jan. 2023.

¹⁶ Momsen, Charles. "USS Squalus (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

¹⁷ Momsen, Charles. "USS Squalus (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

¹⁸ Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/. Accessed 6 Jan. 2023.

Then, another submarine disaster occurred. The *USS S-4* sank off of the coast of Cape Cod with every single member of the crew still alive on the bottom of the ocean, slowly running out of air, and dying. Once again, there was nothing to be done.¹⁹

Fueled by renewed determination to improve submarine safety and rescue, Momsen planned for a new design, which would later be called the Momsen Lung (See Appendix C). As explained by Momsen:

Two tubes leading from the top of the bag are fastened together at the mouthpiece. In a chamber on the outside are two mica disk valves, which guide the air through the left-hand tube when you exhale and the right-hand tube when you inhale. A valve near the rubber mouthpiece itself can close off the air and retain it in the bag for use as a life preserver after the user reaches the surface of the water. The rubber mouthpiece fits securely between the lips and is gripped by the teeth. A strap passes over the head of the user, another around the waist, and two lower clips attach to the clothing about the legs. A nose clip attachment aids the wearer to breathe only through his mouth. At the bottom of the bag is a flutter valve which permits exclusive air to escape and prevents water from flowing in.²⁰

The Lung would allow the rebreather to swim up to the surface from a sunken submarine. The Navy found the Lung a huge hit, and incorporated it in all of its submarines.

Momsen would return to his original idea of the rescue chamber. With the help of Allan McCann, a fellow worker at the Bureau of Construction and Repair who would incorporate the final elements of the design, they created what was to be known as the McCann Rescue Chamber.

The *USS Squalus*, a Sargo class submarine, was laid down on October 18, 1937, and launched at the Portsmouth Navy Yard (See Appendix D).²¹ The name “Squalus” is the Latin

¹⁹ Charles Momsen." *FAMPeople*, 18 May 2019, fampeople.com/cat-charles-momsen. Accessed 6 Jan. 2023.

²⁰ "Popular Science." *Popular Science*, Sept. 1929, pp. 1-161, books.google.com/books?id=FigDAAAAMBAJ&pg=PA30&dq=popular+science+1930&hl=en&ei=bEWmTqWYJ aLt0gH8k4WYDg&sa=X&oi=book_result&ct=result&resnum=9&ved=0CFAQ6AEwCDgU#v=onepage&q&f=true . Accessed 5 Jan. 2023.

²¹ Patterson, Ross. "Raise the Squalus: The Loss, Rescue, and Resurrection of a Submarine." *The Portsmouth Naval Shipyard Museum*, 9 Apr. 2020, portsmouthnavalshipyardmuseum.com/online-learning-archive/raise-the-squalus/. Accessed 21 Nov. 2022.

word for shark.²² With a length of 310 feet, and a max surface speed of 20 knots, she would be a force to be reckoned with.²³

On May 23rd, 1939, at 8:40 AM, the *Squalus* was off the Isles of Shoals, a group of islands nine miles east of Portsmouth, New Hampshire, on a test dive.²⁴ This would be her 19th dive.²⁵ On board were 56 crew members and 3 civilians.²⁶

Everything was going smoothly, as the sub quickly went below the surface, crew members were actively monitoring the dive. Suddenly, at 60 feet, the sub began to inexplicably level off.²⁷ There was a shudder. In the engine room of the sub, located in the stern, water from the induction valve began to flood in.²⁸ Cries were heard, and, after a moment of stunned silence, the crew began the attempt to bring the *Squalus* back up.²⁹ Air was put into the ballast tanks, to try to reach the surface, but it would fail.³⁰ The weight caused the *Squalus* to sink, until she came to her final rest at 240 feet.³¹ Watertight doors were shut, and only the bow of the submarine was not filled with water.³²

Not all on board survived the initial events. There were 26 souls, 24 crew members and 2 civilians, who drowned.³³

²² Bester, Cathleen. "Spiny Dogfish." *Florida Museum*, www.floridamuseum.ufl.edu/discover-fish/species-profiles/squalus-acanthias/. Accessed 14 Feb. 2023.

²³ "Sargo Class." *Uboat.Net*, uboard.net/allies/warships/class/150.html. Accessed 13 Feb. 2023.

²⁴ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 23.

²⁵ "This Day in History: A Rush to Raise USS Squalus." *Tara Ross*, 23 May 2020, www.taraross.com/post/tdih-uss-squalus-pt1. Accessed 6 Jan. 2023.

²⁶ "15 Brought up in Diving Bell from Ocean Floor." *Imperial Valley Press* [El Centro, California], 24 May 1939.

²⁷ "The Greatest Submarine Rescue Ever: Saving the Squalus." *New England Historical Society*, www.newenglandhistoricalsociety.com/the-great-submarine-rescue-squalus-2/. Accessed 30 Nov. 2022.

²⁸ "The Greatest Submarine Rescue Ever: Saving the Squalus." *New England Historical Society*, www.newenglandhistoricalsociety.com/the-great-submarine-rescue-squalus-2/. Accessed 30 Nov. 2022.

²⁹ "This Day in History: A Rush to Raise USS Squalus." *Tara Ross*, 23 May 2020, www.taraross.com/post/tdih-uss-squalus-pt1. Accessed 6 Jan. 2023.

³⁰ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 34.

³¹ "Craft on Bottom When Valve Jams; Crew Is Still Alive." *Imperial Valley Press* [El Centro, California], 23 May 1939.

³² Patterson, Ross. "Raise the Squalus: The Loss, Rescue, and Resurrection of a Submarine." *The Portsmouth Naval Shipyard Museum*, 9 Apr. 2020, portsmouthnavalshipyardmuseum.com/online-learning-archive/raise-the-squalus/. Accessed 21 Nov. 2022.

³³ "15 Brought up in Diving Bell from Ocean Floor." *Imperial Valley Press* [El Centro, California], 24 May 1939.

At the shipyard, it was noticed that the *Squalus* did not report back as expected, but it would not be until 11AM that the sister ship of the *Squalus*, the *Sculpin*, was sent out to look for the missing vessel.³⁴ Concerned over the developing situation, the shipyard's commander would make a very important call to Charles Momsen, who immediately took action and was soon onboard an airplane to join the efforts off the New Hampshire coast.³⁵

Onboard the *Sculpin*, they were able to find the presumed location of the *Squalus*. As they were brought in closer, the crew noticed a buoy, which had a telephone connected to the *Squalus*.³⁶ The recorded communication went as follows:

Sculpin: "What is your trouble?"

Squalus: "High induction open, crew's compartment, forward and after engine rooms flooded. Not sure about after torpedo room but could not establish communication with that compartment. Hold the phone and I will put the Captain on."

Sculpin: "How are things?"

Squalus: "Consider the best method to employ is to send diver down as soon as possible to close high induction and then hook on salvage lines to flooded compartments and free them of water in attempt to bring her up; for the present consider that preferable to sending personnel up with Lungs."³⁷

Suddenly, a swell from the sea rose, and the wire connecting to the *Squalus* was cut, ending the conversation, and leaving the *Squalus* to the quiet depths once again.³⁸

³⁴ "The Greatest Submarine Rescue Ever: Saving the Squalus." *New England Historical Society*, www.newenglandhistoricalsociety.com/the-great-submarine-rescue-squalus-2/. Accessed 30 Nov. 2022.

³⁵ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 97.

³⁶ "This Day in History: USS Squalus Is Rescued." *Tara Ross*, 24 May 2020, www.taraross.com/post/tdih-uss-squalus-pt2. Accessed 6 Jan. 2023.

³⁷ "Report of Rescue Operations." *Naval History and Heritage Command*, 24 June 2016, www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescue-of-survivors-and-salvage/rescue_ops_report.html. Accessed 13 Feb. 2023.

³⁸ "Report of Rescue Operations." *Naval History and Heritage Command*, 24 June 2016, www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescue-of-survivors-and-salvage/rescue_ops_report.html. Accessed 13 Feb. 2023.

Time was ticking. For the crew of the *Squalus*, there was only a matter of time before the oxygen would run out, an estimated 48 hours, and then all on board would perish. Other ships began to join the *Sculpin* in the rescue efforts. The USS *Falcon*, a WWI era Minesweeper repurposed as a submarine rescue ship, made its way from New London, Connecticut.³⁹ On board was one of the McCann Rescue Chambers.⁴⁰ Other tugs arrived for assistance.

For the rest of that day, nothing could be done, as the crew onboard the ship waited for Momsen and the navy divers that were to assist him. He would not arrive until late that night. Searchlights were placed, pointed overlooking the water, to see if, in desperation, the *Squalus* crew would attempt to use their Momsen Lungs to reach the surface.⁴¹

For the wives and children of the men aboard the USS *Squalus*, there would be a roller coaster of emotions of grief and hope. As news quickly spread around the country, many of these went to the shipyard, hoping for any news related to their loved ones. However, as the *Squalus* was almost entirely cut off from the rest of the world, nobody could tell who was alive - and who was dead.⁴² One paper reported:

“Like some others, Mrs. Eveyln of San Diego had come back to the navy yard, and yet again, in response to officials’ repeated advice to “return in an hour.” Her lips trembled and she burst into weeping as she inquired the latest word that might shed light on her husband, Carlton Powell, machinist’s mate. Just then news came of the lowering of the great diving bell to be used as a rescue chamber, and from that message she gathered hope that ended her tears.”⁴³

³⁹ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 83.

⁴⁰ "USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*, www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

⁴¹ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 127.

⁴² "Wives, Sweethearts, and Children of Trapped Men Keep Vigil." *The Evening Star* [Washington D.C.], 24 May 1939.

⁴³ "Wives, Sweethearts, and Children of Trapped Men Keep Vigil." *The Evening Star* [Washington D.C.], 24 May 1939.

Unfortunately, Powell would not be one of the lucky ones.⁴⁴

The next morning, over 24 hours after the *Squalus* sank, rescue operations finally began.⁴⁵ The *Falcon*, which was now anchored above the sub, sent the first of many divers down to the *Squalus*.⁴⁶ Divers were put into a 200 pound diving suit, and sent off.⁴⁷ Because of how deep it was, divers could only stay at the bottom for a couple of minutes, but eventually, a cable was connected to the *Squalus* from the *Falcon*.⁴⁸ The McCann Rescue Chamber, which had never been used in an actual submarine rescue, was put in the water.⁴⁹ Two of *Falcon*'s crew members went in, along with food and blankets, and the chamber made its descent to the bottom.⁵⁰

After minutes of tense hours waiting, the sailors inside the chamber reported a seal made with the *Squalus*.⁵¹ They opened up the chamber and, looking up at them, were seven men, including the one civilian, Harold Preble, who had survived the disaster.⁵² Food was passed out, and, while there were a few jokes made, such as, "Where are the napkins?"⁵³ there was no cheering, and all went down to business.⁵⁴

⁴⁴ "On Eternal Patrol-USS Squalus (SS-192)." *On Eternal Patrol*, www.oneternalpatrol.com/uss-squalus-192.htm. Accessed 5 Jan. 2023.

⁴⁵ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 152.

⁴⁶ Momsen, Charles. "USS Squalus (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

⁴⁷ Momsen, Charles. "USS Squalus (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

⁴⁸ "USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*, www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

⁴⁹ "Submarine Rescue Chamber." *United States Naval Undersea Museum*, Sept. 2016, navalunderseamuseum.org/src/. Accessed 21 Nov. 2022.

⁵⁰ "USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*, www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

⁵¹ "Report of Rescue Operations." *Naval History and Heritage Command*, 24 June 2016, www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescure-of-survivors-and-salvage/rescue_ops_report.html. Accessed 13 Feb. 2023.

⁵² Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 162.

⁵³ "USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*, www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

⁵⁴ Momsen, Charles. "USS Squalus (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

Seven men would be sent up.⁵⁵ After hours of being under the surface, the first survivors returned to the outside world as the chamber reached the surface (See Appendix E). Three more trips would be made, and every single crewmember who had not died in the initial flooding would escape.⁵⁶

It was decided that the *Squalus* would be salvageable, and so, over the course of that summer, sailors and divers of the *Falcon* would attempt to bring *Squalus* back to Portsmouth.⁵⁷ Despite multiple setbacks, they were finally successful.⁵⁸

Ultimately, the cause for the faulty induction valve was never known.⁵⁹ The *Squalus* would be decommissioned, repaired and recommissioned as the USS *Sailfish* on May 15, 1940.⁶⁰ During World War II, the *Sailfish* would serve in the Pacific, sinking over 45,000 tons of shipping. Following the end of the war, on October 27, 1945, the *Sailfish* would return back to New Hampshire for her decommissioning.⁶¹ While she would eventually be scrapped, her bridge was put in as a memorial at the Shipyard, in honor of what happened that May morning, and in tribute of the perseverance made to save the sub and crew.⁶²

Momsen would also be successful during the war. He was in the Hawaiian Islands to see the attack on Pearl Harbor.⁶³ In February of 1943, he took Command of Submarine Squadron 2, in which he would play a role in changing the Mark 6 torpedo, which often failed to explode on

⁵⁵ "USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*, www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

⁵⁶ Momsen, Charles. "USS Squalus (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

⁵⁷ Patterson, Ross. "Raise the Squalus: The Loss, Rescue, and Resurrection of a Submarine." *The Portsmouth Naval Shipyard Museum*, 9 Apr. 2020, portsmouthnavalshipyardmuseum.com/online-learning-archive/raise-the-squalus/. Accessed 21 Nov. 2022.

⁵⁸ "Charles Momsen." *FAMPeople*, 18 May 2019, fampeople.com/cat-charles-momsen. Accessed 6 Jan. 2023.

⁵⁹ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999, Page 235.

⁶⁰ "Sailfish." *Hazegray*, www.hazegray.org/danfs/submar/ss192.htm. Accessed 5 Jan. 2023.

⁶¹ Winslow, Richard. *Portsmouth-Built Submarines of the Portsmouth Naval Shipyard*. Portsmouth Marine Society, 2000.

⁶² "USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*, www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

⁶³ Maas, Peter. *The Terrible Hours*. HarperCollins, 1999.

impact.⁶⁴ Following the surrender of Japan, he would take command in multiple positions, ranking up to Vice Admiral.⁶⁵ He would retire on September 1, 1955.⁶⁶ Charles Momsen passed away 12 years later, on May 25, 1967 in St. Petersburg, Florida.⁶⁷ He is buried at Arlington National Cemetery.⁶⁸

The USS *Squalus* would not be the only submarine tragedy to occur that used Momsen's inventions. One such case, during the Second World War, the USS *Tang* would sink from its own torpedo in the Pacific Ocean. Nine men would escape using Momsen Lungs.⁶⁹

Momsen's inventions would revolutionize submarine rescue. The Momsen Lung would eventually be replaced by the Steinke hood in 1962. However, many ideas that Momsen created were the basis for the technology. The Navy currently has two upgraded McCann Rescue Chambers, to use in case of an emergency. However, the Navy has also created other escape methods, such as the Submarine Escape Immersion Equipment, which can allow crew members to reach the surface from a depth of 600 feet.⁷⁰ This was all made possible because of Momsen, and his determination to allow submariners to escape the jaws of the ocean.

Momsen's achievements and the successful rescue of the *Squalus* survivors are paramount to naval and submarine history. Before that fateful day in 1939, when a submarine

⁶⁴ Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/. Accessed 6 Jan. 2023

⁶⁵Momsen, Helen. "Vice Admiral Charles Bowers Momsen." *Momsen.us*, 2017, www.momsen.us/index.php. Accessed 15 Feb. 2023.

⁶⁶ "Charles Bowers Momsen." *Naval History and Heritage Command*, 3 Mar. 2016, www.history.navy.mil/content/history/nhhc/research/library/research-guides/modern-biographical-files-ndl/modern-bios-m/momsen-charles-b.html. Accessed 9 Jan. 2023.

⁶⁷ "Charles Bowers Momsen." *Naval History and Heritage Command*, 3 Mar. 2016, www.history.navy.mil/content/history/nhhc/research/library/research-guides/modern-biographical-files-ndl/modern-bios-m/momsen-charles-b.html. Accessed 9 Jan. 2023.

⁶⁸Momsen, Helen. "Vice Admiral Charles Bowers Momsen." *Momsen.us*, 2017, www.momsen.us/index.php. Accessed 15 Feb. 2023.

⁶⁹ "USS Tang (SS-306)." *National Submarine Memorial*, submarinememorial.org/lostboatsfinished/ss306tang.html. Accessed 2 Apr. 2023.

⁷⁰ "Saving Submarines: Rescue and Escape." *United States Naval Undersea Museum*, navalunderseamuseum.org/rescue/. Accessed 8 Apr. 2023.

went down, all were lost forever. Due to his perseverance, he was able to create the tools to save sailor's lives and provide hope to the families waiting onshore.

Appendix A

Photo # NH 47733 LCdr. Charles B. Momsen, 1934



A Younger Lieutenant Charles Momsen in September of 1934

Lieutenant Commander Charles B. Momsen, USN. Ibiblio, 27 Jan. 2005,

www.ibiblio.org/hyperwar/OnlineLibrary/photos/images/h47000/h47733.jpg. Accessed 15 Feb.

2023.

Appendix B

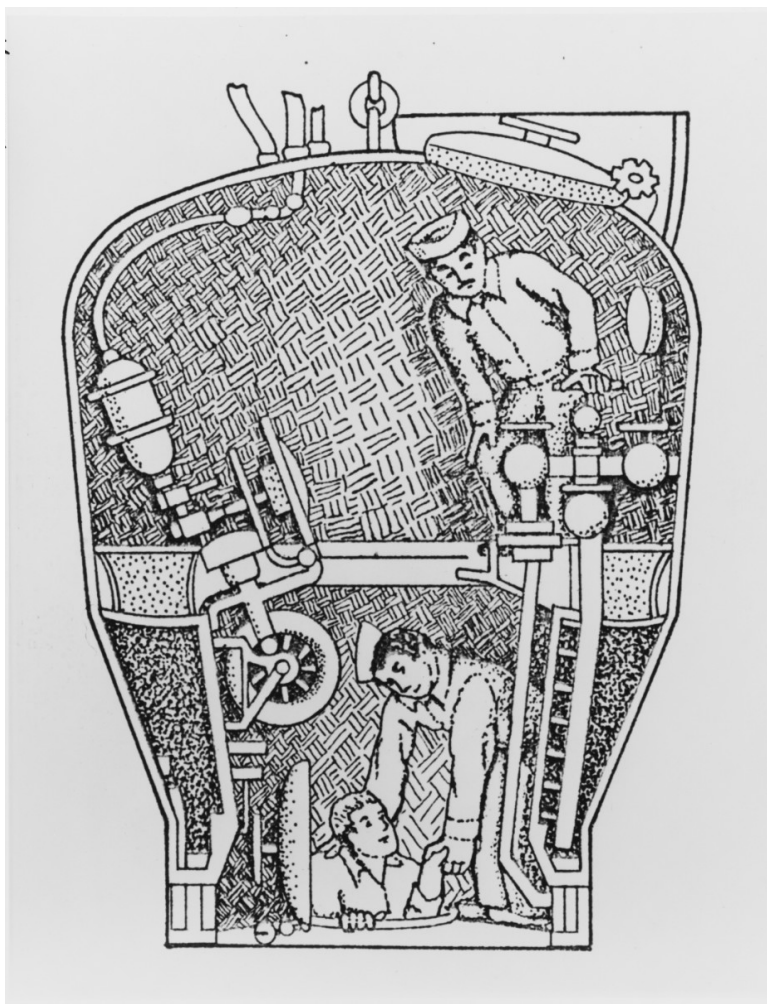


Diagram of the McCann Rescue Chamber

Cutaway Drawing of the McCann Rescue Chamber. Wikiwand, [www.history.navy.mil/content/history/nhhc/our-collections/photography/numerical-list-of-images/nhhc-series/nh-series/NH-97000/NH-97291/_jcr_content/mediaitem/image.img.jpg/](http://www.history.navy.mil/content/history/nhhc/our-collections/photography/numerical-list-of-images/nhhc-series/nh-series/NH-97000/NH-97291/_jcr_content/mediaitem/image.img.jpg/1460086225807.jpg)

1460086225807.jpg. Accessed 8 Apr. 2023.

Appendix C



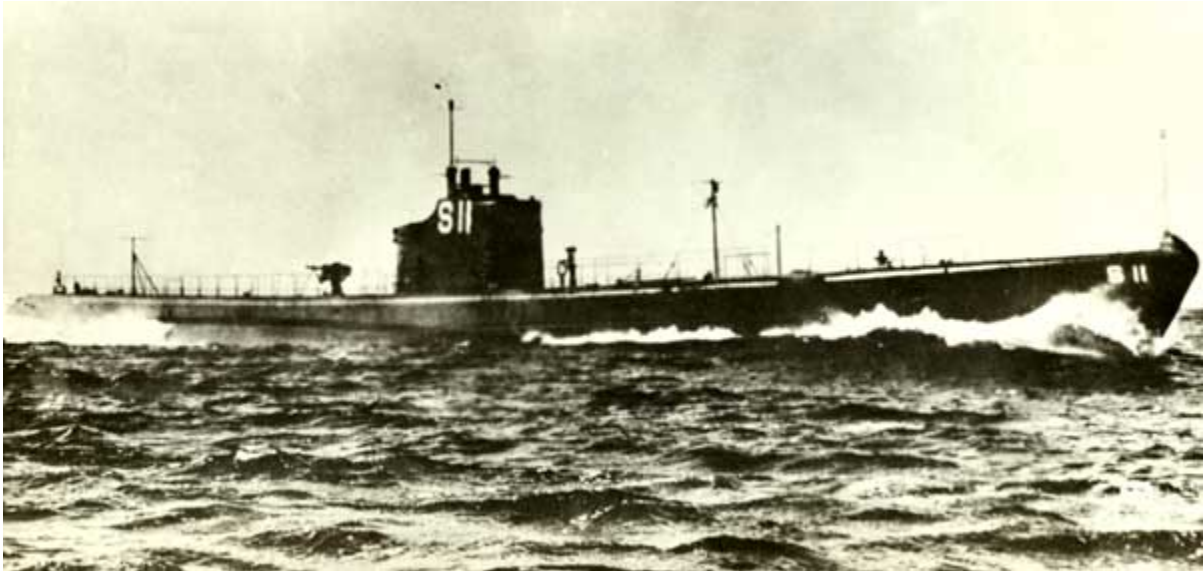
Charles Momsen Holding His Momsen Lung

Charles Momsen with a Momsen Lung. Naval Undersea Museum,

navalunderseamuseum.org/wp-content/uploads/2016/09/inn-momsen-2006039004.jpg. Accessed

15 Feb. 2023.

Appendix D

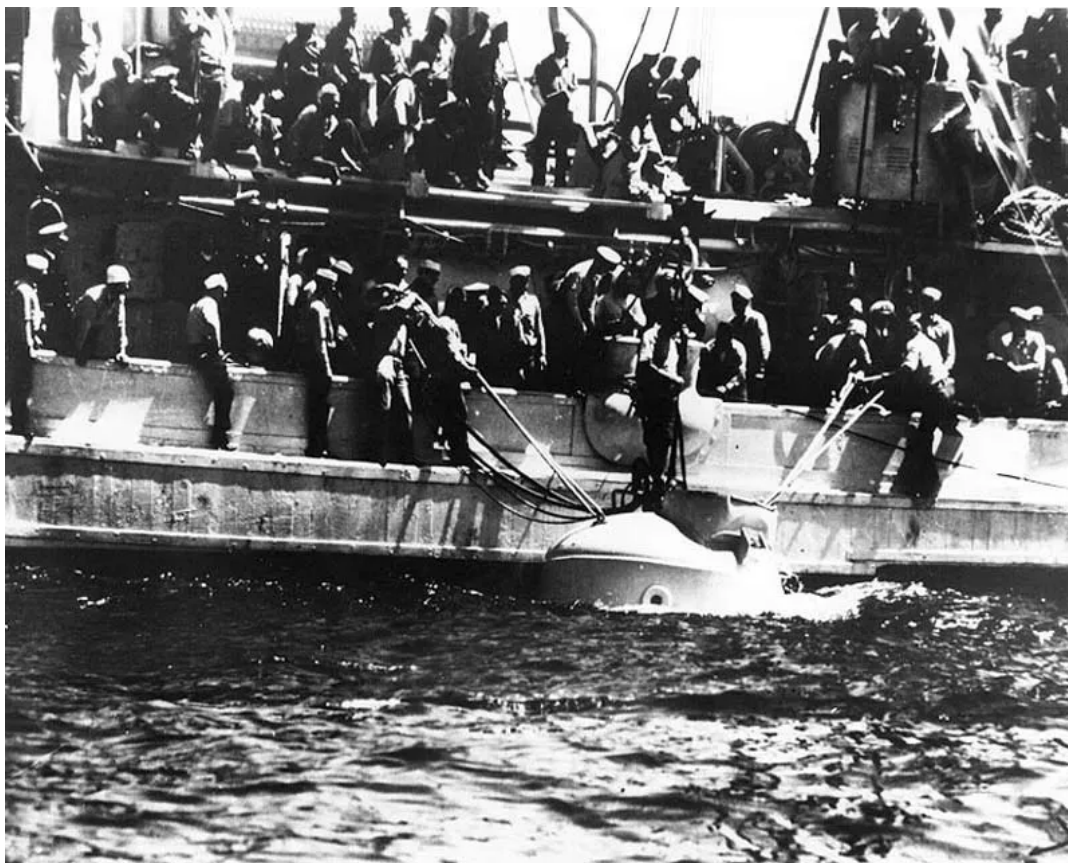


USS *Squalus* Before the Sinking

USS Squalus before Her Sinking on May 23, 1939. *On Eternal Patrol*

www.oneternalpatrol.com/USS-Squalus-192a.jpg. Accessed 15 Feb. 2023.

Appendix E



Survivors Exiting the Rescue Chamber Next to USS *Falcon*

Survivors Exiting the McCann Rescue Chamber against the Falcon. *Defence Media Network*, <https://i0.wp.com/www.defensemianetwork.com/wp-content/uploads/2010/02/Squalus-Disaster.jpg?fit=720%2C575&ssl=1> alt="Squalus Disaster"/>. Accessed 15 Feb.

2023.

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"Craft on Bottom When Valve Jams; Crew Is Still Alive." *Imperial Valley Press* [El Centro, California], 23 May 1939.

This newspaper views the initial sinking of the USS *Squalus*. While it did provide me some information, what I found most interesting about this source is how the media was able to grab as much information as possible, in a very short time.

"Diving Log of Rescue Operations." *Naval History and Heritage Command*, 12 June 2015, www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescue-of-survivors-and-salvage/divinglog.html. Accessed 13 Feb. 2023.

This webpage explains the times of the rescue chamber, as it made its descent into the ocean. While it didn't provide a ton of information, it did tell me the times of when everything happened, which proved to be very useful.

"15 Brought up in Diving Bell from Ocean Floor." *Imperial Valley Press* [El Centro, California], 24 May 1939.

This source explains what has happened in the events leading up to some point on May 24, 1939. At the time of its release, it explains the sinking of the *Squalus*, and the first 15 crew members to escape the submarine.

Momsen, Charles. "USS *Squalus* (SS-192): Lecture Given by Charles Momsen on Rescue and Salvage." Harvard Engineering Society, 6 Oct. 1939. Lecture.

This lecture, given by Charles Momsen himself at Harvard University shortly after the rescue of the USS *Squalus*. He explains his motives for creating the Momsen Lung and Rescue Chamber, and his role in saving the members of the

Submarine earlier that May. This lecture was extraordinarily helpful in writing my paper, especially due to the fact that Momsen is a major part of my paper.

"New Rescue Chamber Laughs at Sea." *Popular Mechanics*, Sept. 1931, pp. 1-144,

books.google.com/books?id=veQDAAAAMBAJ&pg=PA366&dq=Popular+Mechanics+1931+curtiss&hl=en&ei=4Gv7TLLNJ8XBnge1nLXGCg&sa=X&oi=book_result&ct=result&resnum=7&ved=0CD4Q6AEwBg#v=onepage&q=Popular%20Mechanics%201931%20curtiss&f=true. Accessed 9 Jan. 2023.

The article from this magazine from 1931, explains the McCann rescue chamber, and includes many quotes from McCann himself, explaining how it worked, which proved to be very useful.

"Popular Science." *Popular Science*, Sept. 1929, pp. 1-161,

books.google.com/books?id=FigDAAAAMBAJ&pg=PA30&dq=popular+science+1930&hl=en&ei=bEWmTqWYJaLt0gH8k4WYDg&sa=X&oi=book_result&ct=result&resnum=9&ved=0CFAQ6AEwCDgU#v=onepage&q&f=true. Accessed 5 Jan. 2023.

This article, from the Popular Science magazine in 1929, explains what the Momsen Lung is and how it worked, with numerous quotes told by Charles Momsen himself. It was very interesting and very important in writing my paper.

"Report of Rescue Operations." *Naval History and Heritage Command*, 24 June 2016,

www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescue-of-survivors-and-salvage/rescue_ops_report.html. Accessed 13 Feb. 2023.

This primary source from Commander of Rescue Operations of the USS *Squalus* to the Chief of Naval Operations, overviews the sinking and rescue of the USS

Squalus. This would be extremely important in my research, and would be an excellent primary source to use.

"Sailor, Who Chose Life or Death for All on 'Sub' Is Interviewed." *The Tacoma Times* [Tacoma, Washington], 26 May 1939.

This newspaper from 1939, interviews one of the divers, who had, following the rescue, checked to see if there were any survivors in the aft torpedo room.

Unfortunately there wasn't, confirming that there were no more survivors inside the submarine. The paper also interviews a *Squalus* survivor, who was forced to shut the bulkhead door. I found this newspaper very interesting, and fascinating to see it in a primary source.

"Statement of USS *Squalus* Survivor, II by Harold C. Preble, Naval Architect." *Nava History and Heritage Command*, 15 June 2015,
www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescure-of-survivors-and-salvage/squalus_survivor_preble.html. Accessed 13 Feb. 2023.

This source is the sinking and rescue of the USS *Squalus*, told by the only civilian survivor, Harold Preble. This was a very good resource, and would be very helpful when researching and writing.

"Statement of USS *Squalus* Survivor, 1 Lieutenant W.T. Doyle, USN." *Naval History and Heritage Command*, 15 June 2015,
www.history.navy.mil/research/histories/ship-histories/danfs/s/squalus-ss-192/squalus-ss-192-sinking-rescure-of-survivors-and-salvage/squalus_survivor_doyle.html. Accessed 13 Feb. 2023.

This source is the tragedy of the USS *Squalus* told by one of the survivors, Lt. Doyle. This, like the statement of Harold Preble, would be very helpful in learning my topic better.

Submarine Escape. 1953. *WebArchive*, archive.org/details/MN-7418. Accessed 5 Jan. 2023.

This film instructs how submarines should escape from a submarine. Despite being from 1953, and after the specific topic I am talking about was finished, helped me gain a perspective about the perilous escape that crew members on board a sub could face.

"Wives, Sweethearts, and Children of Trapped Men Keep Vigil." *The Evening Star* [Washington D.C.], 24 May 1939.

This newspaper article shows what it was like for the family of the members of the USS *Squalus*, and their fear for their loved ones lives. I found that it gave me a very unique perspective, and helped me give more life to my paper.

Secondary Sources

Barnett, Glenn. "Charles 'Swede' Momsen: Submarine Pioneer." *Warfare History Network*, May 2010, warfarehistorynetwork.com/article/charles-swede-momsen-submarine-pioneer/.

Accessed 6 Jan. 2023.

This paper was on Charles Momsen and his contributions to the Navy. It provided a lot of good information for my paper, and would tell me a lot more about him after the *Squalus* disaster and into the Second World War.

Barrows, Natt. *Blow All Ballast!* Dodd, Mead And Company, 1940.

Blow all Ballast, despite being released in 1940, would be very helpful in helping me understand my topic. It went very in-depth on the sinking of the USS *Squalus*.

It would end up being very helpful in my research and study.

Bester, Cathleen. "Spiny Dogfish." *Florida Museum*,

www.floridamuseum.ufl.edu/discover-fish/species-profiles/squalus-acanthias/. Accessed 14 Feb. 2023.

This source shows off the spiny dogfish, also known as a *Squalus Acanthias*.

While not very useful, it did help me explain where the USS *Squalus* got his name.

"Charles Bowers Momsen." *Naval History and Heritage Command*, 3 Mar. 2016,

www.history.navy.mil/content/history/nhhc/research/library/research-guides/modern-biographical-files-ndl/modern-bios-m/momsen-charles-b.html. Accessed 9 Jan. 2023.

This page held a lot of information about the story of Charles Momsen. It goes very in-depth on what he did, and the vessels he served on. It was most helpful in telling me information on what he did beyond the USS *Squalus*, both before and after.

"Charles Momsen." *Academic Kids*,

academickids.com/encyclopedia/index.php/Charles_B._Momsen. Accessed 19 Jan. 2023.

This page follows Momsen's journey in the Navy, and the inventions that he took part in. It also explains his role during the Second World War. It gave very precise and condensed information, and told me a lot of who Momsen was as an individual, and gave very clear information on what his inventions were.

"Charles Momsen." *FAMPeople*, 18 May 2019, fampeople.com/cat-charles-momsen. Accessed 6 Jan. 2023.

This article provides a simple overview of the life of Charles Momsen and his accomplishments. It provided a lot of information, and it was a good source to look back on while writing the paper, for a quick fact check.

Dunmore, Spencer. *Lost Subs*. Da Capo Press, 2002.

This book would analyze the sinkings of major submarines in history. While it did provide a great deal of information on the *Squalus*, it was also helpful in telling the stories of other submarines, and how they occurred and resolved.

"The Greatest Submarine Rescue Ever: Saving the Squalus." *New England Historical Society*, www.newenglandhistoricalsociety.com/the-great-submarine-rescue-squalus-2/. Accessed 30 Nov. 2022.

This website is about the sinking and the rescue of the USS Squalus leading up to the arrival of Momsen and the USS Falcon. It provided a lot of information, and was especially helpful in getting a more personal side of the story.

Laurent, Suzanne. "'Swede' Momsen Honored at Albacore Park Event." *Seacoastonline*, 20 Sept. 2014, www.seacoastonline.com/story/news/local/portsmouth-herald/2014/09/20/swede-momsen-honored-at/36359462007/. Accessed 19 Jan. 2023.

This article explains how Charles Momsen was honored in Portsmouth, and his role in saving the crew and raising the submarine *Squalus*. While it does provide a good amount of information, it didn't provide a lot that I hadn't already known.

"The Loss of the USS S-51 (SS-162)." *The Submarine Force Museum*, 25 Sept. 2014, ussnautilus.org/the-loss-of-uss-s-51-ss-162/. Accessed 13 Feb. 2023.

The source explains what the USS *S-51* was and the tragedy of its sinking. While overall, this source wasn't very beneficial, it did help me explain the sinking of the submarine, and its impact on Momsen.

Lost Subs: Disaster at Sea. National Geographic, 2002.

This video, from National Geographic in the year 2002, overlooks multiple Submarine disasters, such as the *Squalus*, as well as the *Kursk* disaster from 2 years prior (as of the film's recording) While it didn't tell me a lot of new information about the *Squalus* specifically, it did tell me a lot about the *Kursk*, as well as some other famous Submarine disasters.

Maas, Peter. *The Terrible Hours*. HarperCollins, 1999.

The *Terrible Hours*, by Peter Maas was exceedingly useful in my research, and was one of the reasons why I started learning the topic. The book overviews the *Squalus* disaster, and how Momsen would eventually save those 33 men and the sub. The book would provide a ton of information and would be the starting point of my research, and something that I would look back on multiple times throughout the writing of my paper.

Momsen, Helen. "Vice Admiral Charles Bowers Momsen." *Momsen.us*, 2017, www.momsen.us/index.php. Accessed 15 Feb. 2023.

This source is written from Charles Momsen's granddaughter, Helen Momsen. It briefly overviews the life of Charles Momsen, up until his death. This was a good source to have, and especially interesting that it was written by his granddaughter.

"Momsen Lung." *Wikiwand*, www.wikiwand.com/en/Momsen_lung. Accessed 9 Jan. 2023.

This article explains what the Momsen Lung was, and how it worked, as well as showing examples of when it was used, including the disaster of the USS *Tang*.

This article would be important for my research, because it helped me figure out what it was and how it worked in a quick and simplified way that would make sense.

"Object #43: The Momsen Lung." *United States Naval Academy*,

www.usna.edu/100Objects/Objects/object-43.php. Accessed 21 Nov. 2022.

This video clip shows off the Momsen Lung and how it worked. It helped me see what it looked like and how it would actually work.

"On Eternal Patrol-USS Squalus (SS-192)." *On Eternal Patrol*,

www.oneternalpatrol.com/uss-squalus-192.htm. Accessed 5 Jan. 2023.

This web page gathered photos and information about the ones who survived, and perished aboard the USS *Squalus*. It was reasonably important, as it told me names and information about the crew members, as well as who survived, and who didn't.

Patterson, Ross. "Raise the Squalus: The Loss, Rescue, and Resurrection of a Submarine." *The*

Portsmouth Naval Shipyard Museum, 9 Apr. 2020,

portsmouthnavalshipyardmuseum.com/online-learning-archive/raise-the-squalus/.

Accessed 21 Nov. 2022.

This website gives an overview of the tragedy of the USS *Squalus* and how it was resolved. The website also provides numerous images of *Squalus* before, during,

and after the disaster. This page provides excellent information, and was a great starting up point for my research.

"Paving the Way: Navy Undersea Pioneers." *United States Undersea Museum*, navalunderseamuseum.org/undersea-pioneers2/. Accessed 21 Nov. 2022.

This site goes through the history of numerous designers and inventors in naval undersea technology. While it didn't provide a lot of information about Charles Momsen specifically, it did help me learn more about other people in a similar field, and what they did to contribute to history.

Phelan, Ben. "Saving the Squalus." *PBS*, 16 Feb. 2015, www.pbs.org/wgbh/roadshow/stories/articles/2015/2/16/saving-squalus/. Accessed 19 Jan. 2023.

This site explains what happened to both the USS *Squalus* as well as Charles Momsen, and how both would be resolved. It also puts an acute amount of information about the Navy divers that went down in order to save the crew, and eventually raise the sub. This would be decently important in my research.

"Sailfish." *Hazegray*, www.hazegray.org/danfs/submar/ss192.htm. Accessed 5 Jan. 2023.

This Web Page told the story of the USS *Squalus*, as well as the *Sailfish*. I found this page especially interesting as it goes quite in depth on what happened to the *Sailfish* following its sinking and recommissioning, and its role during the Second World War.

"Sargo Class." *Uboat.Net*, uboaat.net/allies/warships/class/150.html. Accessed 13 Feb. 2023.

The source gives technical information on the Sargo class of submarines, one of which includes the USS *Squalus*. This proved to be helpful in giving information on the different dimensions and speed of the sub.

"Saving Submarines: Rescue and Escape." *United States Naval Undersea Museum*, navalunderseamuseum.org/rescue/. Accessed 8 Apr. 2023.

This site goes through what would happen if a submarine sank, and all of the rescue and escape methods the United States Navy has had in its long history.

This was useful to explain how Momsen would impact the different technologies, and become the first person to start a new frontier.

"SciTech Tuesday: The Momsen Lung." *The National WWII Museum*, 15 Jan. 2013, www.nww2m.com/2013/01/scitech-tuesday-the-momsen-lung/. Accessed 9 Jan. 2023.

This page explains what the Momsen Lung was, and how it worked. While short, it did help me explain what soda lime was, as well as what the "bends" were.

"Submarine Rescue Chamber." *United States Naval Undersea Museum*, Sept. 2016, navalunderseamuseum.org/src/. Accessed 21 Nov. 2022.

This website provides information on the McCann rescue chamber, originally designed by Charles Momsen in the 1930s, specifically how it was created and how it works. Overall, the article provides a to the point explanation to its history.

"This Day in History: A Rush to Raise USS *Squalus*." *Tara Ross*, 23 May 2020, www.taraross.com/post/tdih-uss-squalus-pt1. Accessed 6 Jan. 2023.

This article tells the story of how the *Squalus* was laid to rest on the bottom of the Atlantic Ocean. It provided an appropriate amount of information, and was helpful in gathering information.

"This Day in History: USS Squalus Is Rescued." *Tara Ross*, 24 May 2020,
www.taraross.com/post/tdih-uss-squalus-pt2. Accessed 6 Jan. 2023.

This was the second part of the article This Day in History: A Rush to Rescue USS Squalus. Like the first, it continues to explain how the crew members of the submarine were able to escape.

Tietz, Tabea. "Charles Momsen and the Momsen Lung." *SciHi Blog*, 21 June 2017,
scihi.org/charles-momsen-lung/. Accessed 6 Jan. 2023.

This composition gives a lengthy overview of Charles Momsen. This was a great resource to look back on, and provided a lot of important information.

"USS Squalus Rescue: World Awaits News of Sailors' Fate." *New England Historical Society*,
www.newenglandhistoricalsociety.com/uss-squalus-rescue-world-awaits-news-sailors-fate/. Accessed 30 Nov. 2022.

This is the second part of the article "The Greatest Submarine Rescue Ever: Saving the Squalus" providing information on the rescue of the 33 stuck onboard the Submarine and the aftermath of the rescue.

"USS Tang (SS-306)." *National Submarine Memorial*,
submarinememorial.org/lostboatsfinished/ss306tang.html. Accessed 2 Apr. 2023.

This source goes through the operational history of the USS *Tang* (SS-306). While it didn't provide a whole lot of information relevant to my paper, I do briefly mention it, as they used Momsen Lung's to escape.

Williams, Joseph. "The Device That Saved Many Submariners, Swede Momsen and His Diving Lung." *War History Online*, 23 Apr. 2019,

www.warhistoryonline.com/instant-articles/swede-momsen-and-his-lung.html?chrome=1.
Accessed 9 Jan. 2023.

This article follows the story of Charles Momsen, and the things he created.

While it doesn't have a lot of written information, it has numerous photos which were beneficial for giving me an image in my mind, while I was writing my paper.

Winslow, Richard. *Portsmouth-Built Submarines of the Portsmouth Naval Shipyard*. Portsmouth Marine Society, 2000.

This book explains the building and story of each of the Submarines built at the Portsmouth Naval Shipyard, Portsmouth NH. It had a lengthy section on the USS *Squalus/Sailfish*, and it proved to be quite helpful in my research.

Uncategorized Sources

Charles Bowers Momsen. *Wikipedia*,

upload.wikimedia.org/wikipedia/commons/thumb/3/39/Charles_Momsen.jpg/220px-Charles_Momsen.jpg. Accessed 15 Feb. 2023.

Charles Momsen with a Momsen Lung. *Naval Undersea Museum*,

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Cutaway Drawing of the McCann Rescue Chamber. *Wikipedia*,

images.squarespace-cdn.com/content/v1/5d0b90cbb54fb5000122e78f/1561478540159-DIODSQ70Y4F7YTPBL7IC/Dividing+bell.jpg?format=300w. Accessed 15 Feb. 2023.

Cutaway Drawing of the McCann Rescue Chamber. Wikiwand,

www.history.navy.mil/content/history/nhhc/our-collections/photography/numerical-list-of-images/nhhc-series/nh-series/NH-97000/NH-97291/_jcr_content/mediaitem/image.img.jpg/1460086225807.jpg. Accessed 8 Apr. 2023.

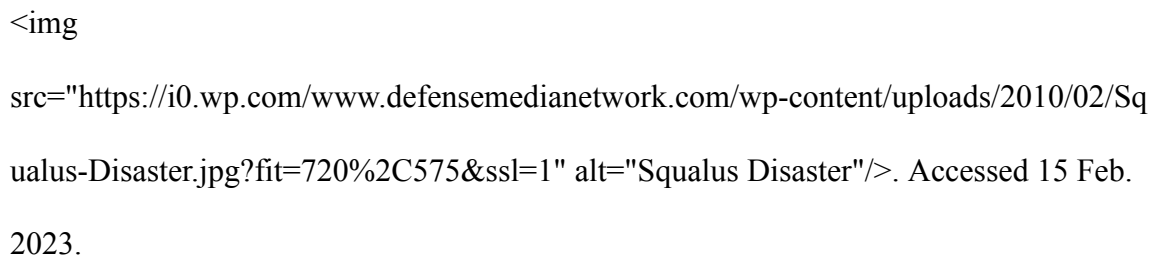
Lieutenant Commander Charles B. Momsen, USN. Ibiblio, 27 Jan. 2005,

www.ibiblio.org/hyperwar/OnlineLibrary/photos/images/h47000/h47733.jpg. Accessed 15 Feb. 2023.

Submarine Escape "Lung." Ibiblio, July 1930,

www.ibiblio.org/hyperwar/OnlineLibrary/photos/images/h45000/h45641t.jpg. Accessed 15 Feb. 2023.

Survivors Exiting the McCann Rescue Chamber against the Falcon. Defence Media Network,

A photograph showing survivors exiting the McCann Rescue Chamber against the Falcon. The image is partially obscured by a broken image tag.
. Accessed 15 Feb. 2023.

USS Squalus before Her Sinking on May 23, 1939. On Eternal Patrol,

www.oneternalpatrol.com/USS-Squalus-192a.jpg. Accessed 15 Feb. 2023.

USS Squalus' bow prematurely breaking the water before sinking again, July 13, 1939. United States Navy Photograph. Portsmouth Naval Shipyard Museum,

portsmouthnavalshipyardmuseum.com/wp-content/uploads/2020/05/08-USS-Squalus%E2%80%99-bow-prematurely-breaking-the-water-before-sinking-again.png. Accessed 15 Feb. 2023.