



2010

Communication No. 300

The Pleasant Places of Florida

A HISTORY OF THE SUBMARINE

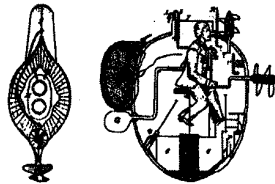
by Wanda Dow

The concept of a boat that would sail under water goes back at least as far as the 16th century. In 1573, an Englishman named William Bourne published a design for a submersible boat that featured a mast that could operate as a snorkel. It does not appear that Bourne ever actually built the vessel, but his ideas influenced others. In 1620, Cornelius van Drebbel, a Dutchman living in England, built several wooden submarines that could sink just under the surface of the water, were propelled by oars and obtained air through tubes to the surface. Details are sketchy, but reports indicate that he made a number of trips up and down the Thames.

In the following century and a half, many people made boats that could sink and, sometimes, come back up again. By 1727 at least 14 patents had been issued for submarine designs in England alone. Although many were just submersible rowboats, several useful features were developed. In 1747, Englishman Nathaniel Symons, developed a vessel that could sink by letting water into leather bags, and then rise again by twisting the water out of the bags. This was the first known use of the concept of a "ballast tank".

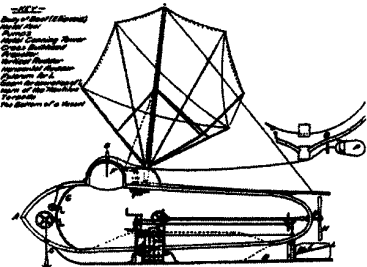
The first attempt to build an actual submarine-like vessel was the *Turtle*, designed during the American Revolution by David Bushnell, a student at Yale involved in resistance against the British. All he left behind, however, was a written description and although illustrations can be found, they were drawn over a century later. The *Turtle* was a one-man craft, shaped like two bowls with tapered lips joined together and a brass "conning tower" on top with portholes to allow the operator to see, and a hatch. It had hand-driven horizontal and vertical propellers, and carried a 68 kilogram (150 pound) black powder charge. The charge was to be attached to a warship with a hand-driven screw, and detonated by a clockwork timing mechanism that released a spring-loaded hammer to strike a percussion cap. It was kept upright by a lead weight in the bottom, which could be jettisoned in an emergency. The craft sank by letting water into a tank, and rose by pumping it out. Air was obtained through valved pipes that closed when the submarine submerged. There was enough air to allow it to stay under for about half an hour. Steered by a rudder, it had a compass and barometer for navigation. Handling the propellers, rudder, and all the other gear kept the operator extremely busy.

Bushnell proposed to use the *Turtle* to attack British vessels that were blockading American ports. Although Bushnell himself wanted to pilot the craft, he fell ill, and substitutes were found. In August 1776, Sergeant Ezra Lee of the American Army took the *Turtle* to sea. The little submarine



was towed towards the British blockaders by two longboats, and then released to move forward on the tide. The tide swept him past his target, the warship *HMS Eagle*, and Lee had to wait for the tide to reverse before he could make his way to his target. The screw used to attach the charge could not penetrate the copper sheathing covering the warship's hull, and Lee was forced to give up the attack. As he was struggling to return to shore, the British noticed the strange little vessel bobbing on the surface and sent out a boat to investigate. Lee released the charge, activating the clockwork timer. The charge exploded and the British decided to give up the chase. Lee escaped, but the *Turtle* never managed to get close to another British warship. It was eventually found by the British and sunk. Sketchy records indicate that the *Turtle* was rebuilt during the War of 1812, and used once more in unsuccessful attacks on British blockaders. Despite its failure, much later another submarine pioneer, John P. Holland, wrote that it was "the most perfect thing of its kind constructed before 1880." Considering the technology available, the little submarine was remarkably clever and well thought out.

A few decades later, an expatriate American living in Napoleonic France, Robert Fulton, tried to build a more advanced submarine. Fulton was anti-military at heart, and did not want the new United States to spend large sums on a big fleet to counter the British. He felt that a submarine would be a cheap equalizer that would undermine the usefulness of big, expensive warships. France was under blockade by Britain at the time, and in late December 1797, Fulton proposed construction of such a craft to the French Minister of Marine. The French turned Fulton down mainly because the rules of war at the time said nothing about submarines, and use of such craft might undermine the existing arrangements, leading to an expanding spiral of brutalities between combatants. When Napoleon was installed as First Consul three years later, Fulton proposed his plan once more, and this time was awarded money to develop an experimental submarine. The *Nautilus* was completed in May, 1801. Shaped somewhat like a fat fish, with a rounded conning tower towards the front fitted with a porthole for visibility, the vessel was made of copper sheathing over iron ribs. It had a folding sail to propel it on the surface, and was powered by a hand-cranked propeller underwater.



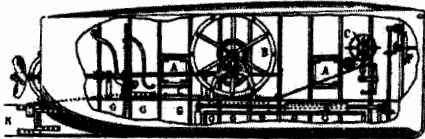
The submarine could dive to 7.6 meters (25 feet) by filling ballast tanks with water. A horizontal "rudder", much like the diving plane of a modern submarine, helped keep the *Nautilus* on an even keel underwater. The vessel con- (cont. on page 2)



(cont. from page 1) tained enough air to keep three men alive underwater for an hour, and was later fitted with compressed air tanks to improve its underwater endurance to five hours. Fulton used the *Nautilus* to sink an old schooner with a gunpowder charge which he called a "torpedo", after a type of ray fish that gave an electric shock. In modern terms, such a weapon would be known as a naval mine, but the term "torpedo" would stick to it for much of the rest of the century. Despite this successful demonstration, the French were returning to their misgivings about the propriety of submarine warfare, and Fulton was increasingly seen as a charlatan. In early 1804, Fulton received a letter from the French government terminating their support. He then went across the Channel to promote his vessel to Prime Minister Pitt. Fulton sank another vessel for the British as a demonstration of his submarine, but the Royal Navy did not want to encourage a mode of warfare that might make their fleet obsolete. Ironically, both of the world's great powers of the day did not want a new weapon because they feared it would be too destructive. Fulton attempted to profit from the Royal Navy's distaste for his submarines by asking for a hundred thousand pounds to cease development work on them for 14 years. The British government had no taste for extortion, turned Fulton down, and he returned to America in 1806, empty-handed. There he would make a name for himself in the design of steamships and in painting. Fulton later managed to obtain support from the US government for the design of a large steam-powered submarine named the *Mute* which had a crew of a hundred. Work on the vessel was abandoned when Fulton died in 1815. The *Mute*, at least 50 years ahead of its time, was left to rot and sink at its moorings. Typical.

Captain Thomas Johnstone, an English smuggler, privateer, and soldier of fortune who had worked with Fulton, built several experimental submarines, one of which he demonstrated in the Thames in 1815. However, he had no more luck than Fulton in interesting potential buyers.

Development stagnated for several decades until February 1851, when Wilhelm Bauer, a Bavarian cavalryman, launched his primitive submarine *Brandtaucher* (Fire Diver) in Kiel harbor.



About 8.1 meters (26 feet 6 inches) long and powered by a two-

man treadmill, it sank with Bauer and his two crewman, although they all managed to escape. Raised in 1887, The *Brandtaucher* is now on display in Dresden.

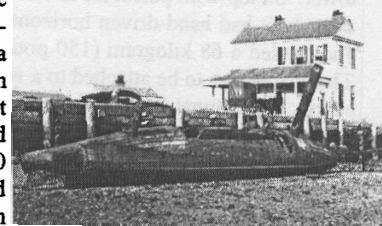
Since the Germans lost interest in Bauer's ideas, he went to England to sell his submarine concepts. He apparently started work on a second submarine but never completed it. Failing in England, he left to build a submarine for the Russians named *Seeteufel/Le Diable Marin* (The Sea Devil) in 1856. The Crimean War was in progress, and the Russians were looking for a weapon to use against Royal Navy blockaders. *Seeteufel* was 16 meters (52 feet) long, powered by crewmen walking on a treadmill, and managed to sink and rise

again over a hundred times, more or less safely. In 1856, the primitive submarine actually carried musicians under water to play the Russian national anthem for the coronation of Tsar Alexander II. The Russians, however, didn't like the blunt and tactless Bauer, and sensibly did not see much potential in his submarine. It finally ran aground and Bauer had to repeat his previous escape. He designed more sophisticated submarines, but never managed to get them built, and died in Bavaria in 1875.

By the middle of the 19th century, the French had become leading innovators in the design of warships, and accordingly began an ambitious effort to build a submarine based on a design by a Captain Bourgois. Built in 1863 by manufacturer Brun, this submarine was a swordfish-like craft named *Le Plongeur* (The Diver), and was a remarkable 43 meters (140 feet) long, with a displacement of 380 tonnes (420 tons). The vessel was armed with a torpedo charge on a pole, or "spar torpedo." Although it was unmanageable underwater and had poor speed and endurance, it was the first submarine to have a more or less real engine and was the biggest built before the 20th century.

During that same timeframe, Spaniard Narciso Monturiol Estarriola also developed submarines, the first being the *Ictineo I*, launched in 1859. Primarily intended to assist in coral harvesting, it was man-powered, and innovative in having a "double hull" design, with an inner pressure hull and an outer hydrodynamic hull, with water ballast and air tanks between the hulls. The double hull scheme provided strength without compromising streamlining, and also improved safety because damage to the outer hull would not hole the inner hull. It was followed by the *Ictineo II* in 1864, which had an innovative "anaerobic engine," which ran off a mix of manganese peroxide, zinc, and potassium chlorate that generated hot steam to drive the engine and also produce oxygen for breathing. Monturiol couldn't get funding and had to give up his work, but full-scale replicas of both his submarines are now on display in Barcelona.

During the American Civil War, the Southern Confederacy developed their own primitive submersible vessels, though details are sketchy and contradictory. The *David*, a cigar-shaped, steam powered craft, about 6.1 meters long and 1.5 meters wide (20 by 5 feet), armed with a 61 kilogram

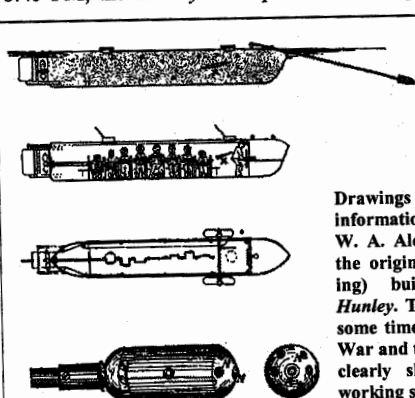


(134 pound) spar torpedo, was designed under the direction of General Pierre Gustave Toutant Beauregard, in command of Confederate forces defending the port of Charleston, South Carolina. It was manned by a crew of four, could not completely submerge and was regarded as a primitive torpedo boat that rode very low in the water. The torpedo was fitted with several percussion detonators so it would explode on contact with the target. During an early attempt to attack Union blockade vessels, the *David* was swamped by a passing steamer and went down with three of her (cont. on page 3)



(cont. from page 2) crew, but it was recovered. On the night of October 5, 1863, the *David* attacked the Union ironclad *New Ironsides*. The crew of the submersible killed an ensign on watch with a shotgun, and then detonated the spar torpedo below the warship's waterline. The water thrown up by the explosion doused the *David's* steam engine, and the crew was forced to abandon ship when they came under rifle and grapeshot fire. The *David's* that were built never did the Union Navy any serious harm, but they managed to keep Federal lookouts edgy and nervous at night, quick to see any floating plank as a possible threat.

The second Confederate submersible was an actual submarine, the *H.L. Hunley*. A man-powered submarine, designed in 1862 by Horace L. Hunley, a prosperous engineer and Confederate States Army captain from Mobile, Alabama, it was little more than a modified steel locomotive boiler, about 12 meters (40 feet) long with two hatches on top, fore and aft. It was hand-cranked by a crew of eight, and directed by an officer who peered through a porthole to see where they were going. Pulling a charge after it on a line, it went under a ship, then came back up on the other side, dragging the 'torpedo' into the ship. Tests in Mobile Bay demonstrated potential usefulness. On her first trial, the *Hunley* foundered when a squall came up and sank it. Only two of her crew got out. Raised, the submarine was later moored to a steamer that got underway unexpectedly, turning the vessel over and sending her to the bottom. Only three of her crew escaped. It was written off as a freak accident and raised again. The submarine was again cruising under the waves of Charleston harbor when on October 15, 1863, it went for a dive. Bubbles came to the surface, but the *Hunley* did not. All hands, including Horace Hunley himself, were lost. The *Hunley* was still put back into service, though ordered never to submerge again, and fitted with a spar torpedo for operation as a torpedo boat. Despite these precautions, the *Hunley* sank again after it fouled a cable from a ship, and seven men were lost. Unbelievably, The Confederates raised it once more and on the night of February 17, 1864, the vessel crept out into Charleston harbor in the darkness and made for the Union sloop *Housatonic*. At 8:45 PM, the *Hunley* was spotted as she approached, but



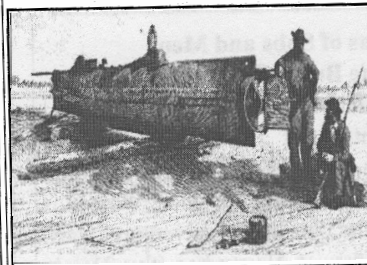
Drawings made from information provided by W. A. Alexander, one of the original (and surviving) builders of the *Hunley*. They were made some time after the Civil War and the cross-section clearly shows the tight working space inside.

the ship didn't have time to escape. The *Hunley* struck the *Housatonic*

squarely, setting off a magazine, and sent the ship to the bottom. Five Union sailors died, but the water was shallow and the rest managed to hang on to the rigging, which remained upright long enough to allow them to be rescued. The good news is the *HUNLEY* was the first submersible to actually sink a surface ship; the bad news is the submarine and all her crew went to the bottom with the *Housatonic*. A total of about 38 men had died in the *HUNLEY*, and it can only be regarded as a blessing that the Confederates did not raise her again.

In 1869, the US Navy obtained a man-powered submarine named *The Intelligent Whale*, but it sank during tests in 1872 and that was the end of that exercise.

In 1879, a Liverpool minister by the name of George Garrett built and launched a spindle-shaped sub-



CSS H. L. HUNLEY, recovered after a fatal accident and awaiting a "go, no-go" decision by Charleston-area commanding General P. G. T. Beauregard, CSA.

marine named the *Resurgam*. The idea was that the vessel would build up steam pressure while on the surface of the water, seal off the furnace and submerge, and then cruise under water for about 16 kilometers (10 miles) at 5.5 KPH (3 knots). It sank off the Welsh coast, taking her three crewmen with her. This might have been just another dead-end suicide ship, except for communications between Garrett and the Swedish munitions manufacturer Thorsten Nordenfelt. Nordenfelt made significant advances in building the first submarines to be armed with torpedoes in the modern sense of the word, and he had also done much to excite interest in the technology. However, he hadn't solved the difficult problems of propulsion, rapid submergence, and maintaining balance or "trim" underwater.

The problem of propulsion, or at least half of the problem, was being addressed by that time. The only practical means of propelling a submarine underwater was with an electric motor running off batteries. Inconclusive experiments with electric-powered submarines had been conducted as far back as the 1850s, but the necessary electrical technology wasn't really available until the late 1880s. Which brings us to advances made and collected to become the Bruce-Partington Plans in 1895. Since there is no evidence of inventors by either name, one can only conclude that a couple of clerks at the patent office gathered together all the useful patents and merged them into a singular document. Perhaps Mycroft himself, with his omniscient brain, was the central exchange, giving credit to Mr. Bruce and Mr. Partington in much the same manner as his brother gave credit to the Yard. We will never know, and that is as it should be.



**The Best Laid Plans of Subs and Men:
Simon Lake and the Bruce-Partington Plans
by David McCallister**

The Adventure of the Bruce-Partington Plans (BRUC) was published in the *Strand and Colliers* in December of 1906. For once, Watson is very specific as to the date of the adventure: starting the third Thursday of November (the 21st in 1895). In the adventure, Mycroft Holmes explains that the eponymous plans are those of a submarine so advanced and powerful that, "...naval warfare becomes impossible within the radius of [its] operation." The question is: What sort of submarine was this? Who really developed the plans? Surely after a century, the secrets of a Bruce-Partington (B-P) vessel are not a priority to the government, especially now that Mycroft no longer is the government.

If the B-P had been an essentially British boat devised by the Royal Navy itself, surely there would have been no need for the *gathering of thirty separate patents, each essential to the working of the whole*, apparently done in an attempt to acquire a *monopoly of the invention*. The implication is that the B-P was not a single complete item derived from a single source, but the integration of a number of the various innovations being proposed by various inventors and manufacturers. The name Bruce-hyphen-Partington was probably the combined code names of two different people. It is likely that the chronology of the developments would have ideas, designs, and plans which were secrets and in various stages of realization before the actual sales, contracts, or manufacture of the boats. Therefore dates and sequences may be taken as flexible.

In 1902, the *Daily Express* had editorialized for subs, but the First Sea Lord, Walter Ken was very much against them. Rear Admiral A.K. Keaton had remarked in 1900, that the submarine was, "underhand, unfair, and damned Un-English." They were, however, very popular with other nations; and disturbingly successful in maneuvers vs. other ships.

Some of the major names in 19th century sub design were:

- The German, Wilhelm Bauer, who had launched his *Brandtaucher* in 1850. Bauer later became a hero to the Nazis.
- Thorsten Nordenfelt, a Swede who moved to Britain, and who with clergyman George Garrett, had developed subs in 1879 and 1885, and had actually sold subs to both Greece and Turkey. Nordenfelt later joined Maxim in manufacturing machine guns.
- Frenchman Gustave Zede, and Spaniard Issac Peral, who offered their respective governments boats in 1888 and 1889.
- Americans John Philip Holland and Simon Lake. Both these rival Americans were actively engaged in manufacturing subs and trying to secure both US and foreign government contracts. The US Navy let contracts in 1893 and 1899, both won by Holland, with his *Plunger* and eponymous *Holland* designs. Britain had acquired five *Hollands* by 1900. Lake sold his subs to Russia and Austria, but notably had patent problems with Krupp in Germany. Nevertheless, a Bruce-Partington has specifications that tend to favor Lake's *Argonaut* and *Protector* designs.

The B-P must be so versatile and powerful that, "...naval warfare becomes impossible within the radius of [its] operation." The plans are "exceeding intricate, comprising some thirty separate patents, each essential to the working of the whole." The Lake Torpedo Boat Company published a table circa 1900 comparing the characteristics of a Lake versus a Holland. In this table, we learn that the Lake is not only larger (65'x11' vs. 63'x11'), with greater displacement (115 tons vs. 105), but faster on surface and submerged (10/7 vs. 8/7), with 250 vs. 160 horsepower and carrying 1400 gallons of fuel vs. 850. Lake's were provided with officers and crews quarters for fairly long missions. Lake had himself taken an early Argonaut 2000 miles from Newport News to Long Island. It's "radius of operation" is therefore the greater. Although the depth capability of each was about the same, at 150 feet in 1900, a Lake "Seal" later set a depth record in 1914.

As to offensive and defensive armament, Lake's carried three Whitehead (cont. on page 5)

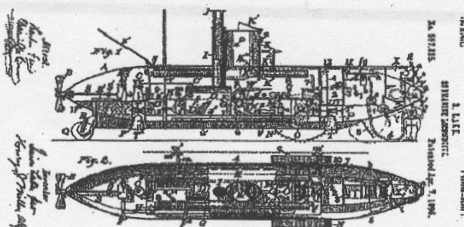


(cont. from page 4) torpedoes to a Holland's one Lake also had the capability of cutting cables, mining and countermining. Lake provided a breech-loading gun in a conning tower, where Holland had none. One of Holland's did offer a fixed *dynamite gun*: a relatively light, pneumatic cannon used in two ships of the US Navy against Cuba in 1898, but which was notoriously difficult to aim and handle, and a Holland would have to surface to fire it.

Lake's subs, in addition to surface and underwater travel, diving on an even-keel, it could travel about a harbor (a particular concern of the Royal Navy), or ocean floor on large wheels. Lake also invented the "omniscopes," an early periscope, and a form of snorkel or breathing tube. Lake therefore would seem to have the edge in the "naval warfare" area, as well as in number of separate, but integrated, useful inventions making up the required 30 patents.

But the clincher might be in found in the "essential" plan found in Cadogan West's set of seven for "double valves with the automatic self-adjusting slots." Surely Lake's unique and characteristic provision for an airlock providing ingress and egress for a hard-hat salvage diver, or possibly a saboteur, would require such a double valve.

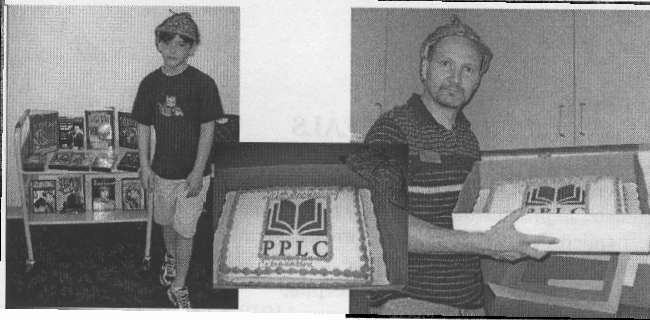
Therefore, based upon a review of the candidates, and the details in BRUC, Simon Lake and his multiplicity of innovative designs are the most likely candidates for the so-called "Bruce-Partington" plans.



Lake's basic patent, granted Apr. 7, 1896



Holland VI, as pictured in the December, 1898 Scientific American.



Sherlock Holmes Spotted in the Library

Another Sherlock Holmes film festival was held at the Clearwater Library main branch on Saturday, April 17, 2010. The main feature was the new film *Sherlock Holmes* starring Robert Downey Jr. and Jude Law.

The crowd had lots of fun watching the movie, enjoying a large cake celebrating the 20th anniversary of the Pinellas Public Library Cooperative, answering Holmes trivia, and winning prizes such as Papa John's Pizzas & Sherlockian books, videos, and DVDs. It was especially gratifying when one prize winner excitedly chose for herself a copy of *The Canon* rather than a large pizza!

It was a very successful program with a total of seventy-one people in attendance - normally unheard of on such a beautiful Saturday afternoon!



A sudden death in the Vatican. An international incident over stolen artifacts. A priest's wrongful imprisonment for murder. In this collection of three as yet untold tales, hinted at in the original Holmes stories, the voices of Dr. John H. Watson and the legendary Pope Leo XIII reveal how the great Sherlock Holmes brought these grim ecclesiastical cases to startling and poignant conclusions.

Go to <http://www.holmeschurchmysteries.com> to find out more, or you can watch a book trailer on Youtube! http://www.youtube.com/watch?v=Y_6Z4DQ86Hk

13-14 October *The Friends of Arthur Conan Doyle Collection Symposium* in Toronto.

14-17 October *Buchercon XLI*, San Francisco, CA. www.bcon2010.com

13? November *The 35th Annual Fall Gathering* The Pleasant Places of Florida. If we can get a definite 16 people at \$15 each, we could have a caboose car for a 90 minute round trip train ride in Parrish, FL (25 miles north of Sarasota, 35 miles south of Tampa off I-75). Please contact Wanda Dow IMMEDIATELY if you would be interested. Lunch included. I have only had two replies for this. If no one is interested, it's a lost cause!!!!!!

The Pleasant Places of Florida

(founded in 1972)

Rev. Leslie Marshall, B.S.I. 1972-1977
Dr. Benton Wood, B.S.I. 1977 - 1988
Bill Ward, B.S.I. 1988 - 1999
Dr. Benton Wood, B. S.I. 1999 -1996
The Last Court of Appeals 1997 - present

For the Record:

THE LAST COURT OF APPEALS

David McCallister, *Master of the House*,
most gatherings, host of the annual Wessex Cup)

(Master of Ceremonies at

Carl Heifetz, *Representative (both with the Servants and with the Tradespeople)*,
(Correspondent)

Wanda & Jeff Dow, *The Papers on the Sundial*,
(Communications and Bookkeeping)

Mike Bryan, *The Unopened Newspaper*,
Wood Fund)

(The Marshall

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