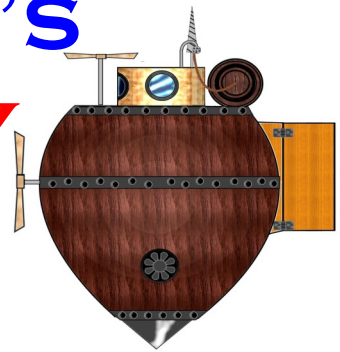


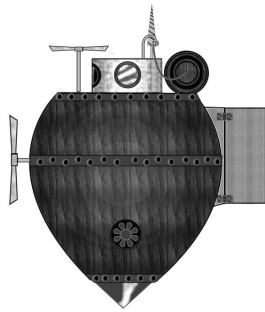
BUILD YOUR OWN AMERICAN TURTLE



DAVID BUSHNELL'S REVOLUTIONARY SUBMARINE



MATTHEW SPARKS



Build Your Own American Turtle
David Bushnell's Revolutionary
Submarine

Matthew Sparks



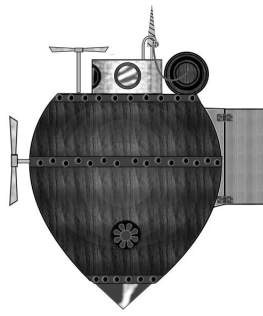
The American Turtle

Build Your Own American Turtle, David Bushnell's Revolutionary Submarine

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The Story of David Bushnell and the American Turtle

David Bushnell was
born in 1752 in Saybrook, Con-
necticut. He was an inventor.
While attending Yale College
(now Yale University,) he in-
vented the Depth Charge. He
called it an infernal. This is re-



markable for two reasons; first
because first he had to prove gunpowder would explode under water and then he had
to invent a way to explode the gunpowder remotely and secondly, the submarine hadn't
been invented yet, so the depth charge was not very practical, there was nothing to at-
tack with one. Bushnell successfully proved that gunpowder would explode under wa-
ter at a pond near Yale College. This left him the problem of what to do with his infer-
nals...

In the year 1775, Bushnell Graduated from Yale College. He returned home to
his farm in Saybrook, Connecticut, This farmhouse where he lived still exists. The very
next year the winds of war fanned into flames and the American Revolution broke out.

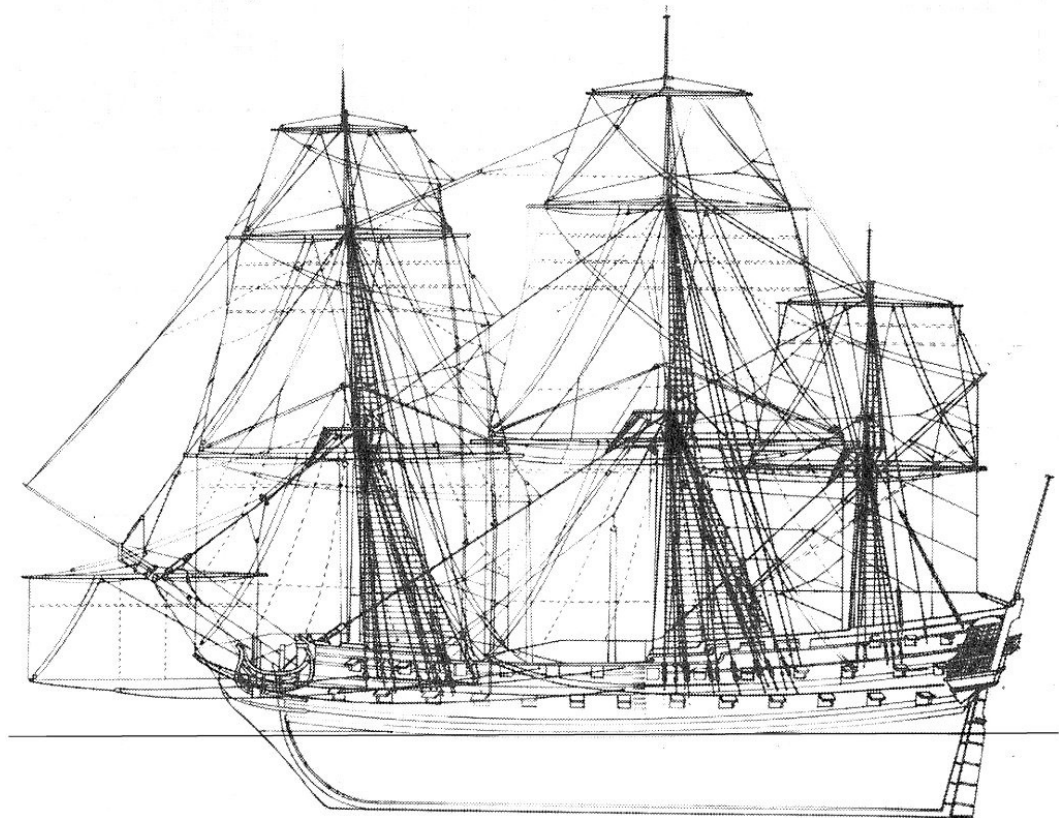
David Bushnell was a patriot, so there was no question what side he was on.
Most patriots joined the local militias and went to war supporting America. Bushnell
stayed home. He was tinkering with a project he hoped to use to help in the fight
against the British. With the help of his brother, Ezra Bushnell, David invented a way
to deliver his infernals to the British.

David Bushnell invented the submarine. His idea was simple, build a craft that
could move underwater. Sneak up to a British ship, attach an infernal to the bottom of
the ship and then leave it. After the clockwork mechanism in the infernal wound down,
the infernal would blow up and sink the ship. Now, people had thought about subma-

rines before and some people had even tried to make them. Several people had made craft that could take a man and submerge, and some of them actually came back up. But no one had made a practical craft capable of submerging and navigating and most importantly re-surfacing.

In a top secret workshop behind his farmhouse David and his brother identified all the problems facing a submarine and came up with solutions to each one. They ranged from “What watertight material to use for the hull?” to “How do you make it move?” To even more difficult problems like “How do you read your depth gauge in the Dark?” Well, first you have to invent the depth gauge; it is easy to see the problems the two broth-

ers were facing. They were persistent and ultimately successful. David called his invention “The American Turtle.”



The Voyages of the American Turtle

On the night of September 7th 1776, Sergeant Ezra Lee of the Continental Army climbed into Bushnell's submarine at a dock along the Whitehall section of Manhattan, That is near where the United Nations Building is currently located in New York. Several men in rowboats attached lines to the submarine and quietly began rowing toward the British fleet. The fleet comprised of about 300 ships and was located off Bedloe's Island. Bedloe's Island is now known as Liberty Island and is the location of the Statue of Liberty.

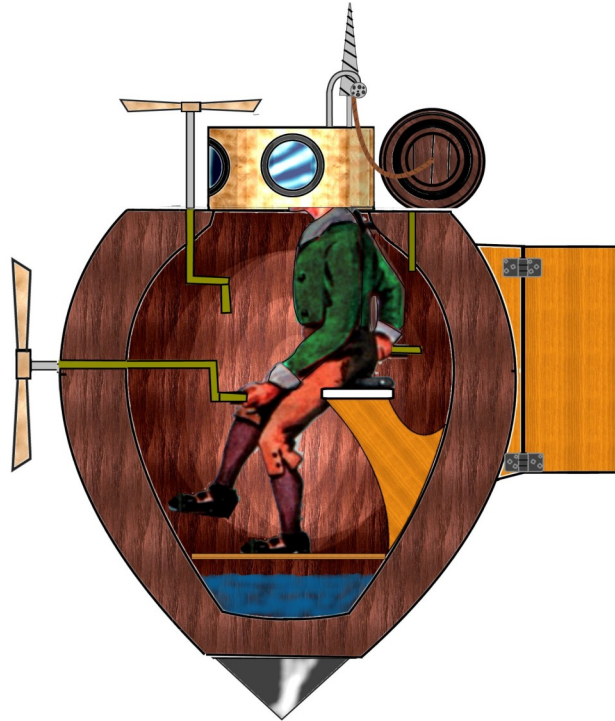
The rowboats got close enough to the fleet to be noticed by the lookouts on the flagship HMS Eagle, At that point the rowboats headed back toward the Whitehall slip, With Sgt Lee at the Helm, the Turtle slowly moved underwater toward the Eagle. Ezra Lee was not the first choice to operate the Turtle. Bushnell's brother, Ezra Bushnell had been practicing for a long time to operate the craft, but he had recently become ill, Ezra Lee was his last minute replacement.

Due to Ezra Lee's unfamiliarity with the submarine, he was not able to operate it as expertly as required. He was able to reach the Eagle, but unable to attach the bomb. Its possible the change in the tide swept him away from his target and he was unable to get back to it. We really don't know the exact circumstances, but Lee gave up the attack and headed back past Governor's Island toward his starting point. Along the way the British stationed on the island noticed the craft in the water and came to investigate, Lee released the bomb and when it exploded it scared off the British sailors who were rowing toward the Turtle. Lee made it back to port.

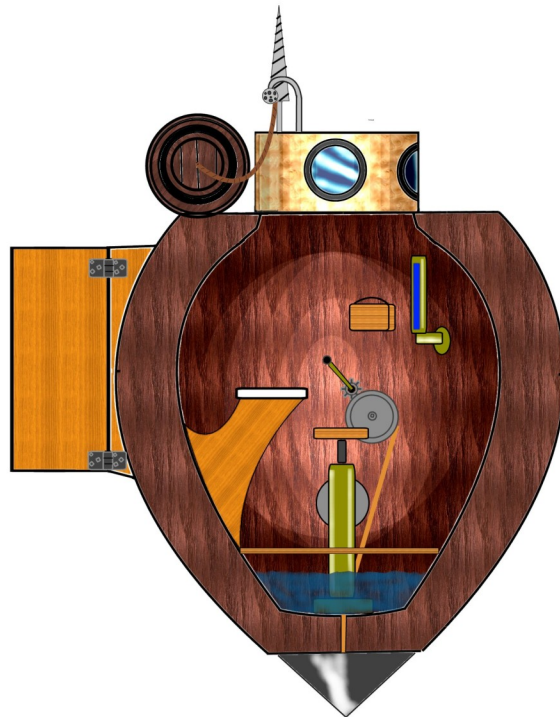
In early October Lee made a second attempt at the British. This time the Turtle was launched from Fort Lee, New Jersey and made its way down the Hudson River. This time the Turtle was noticed before the attack and Lee had to retreat. A third and final attempt was made by an different pilot, but his inexperience with the craft and the currents made it almost impossible for him to direct the submarine, He barely made it back to Fort Lee.

On October 9th 1776 three British warships ran the blockade of the Hudson River and made it up as far as Fort Lee. There they shelled the boats docked at the fort, they sunk two sloops, and one carried wine and supplies. The cargo of the second sloop was the Turtle. The Turtle never went into battle again. David Bushnell later wrote he salvaged the submarine and later destroyed it, but it is possible that the Turtle still rests in the waters of the Hudson River under the George Washington Bridge, which connects Fort Lee, New Jersey with Manhattan.

American Turtle - Interior Views

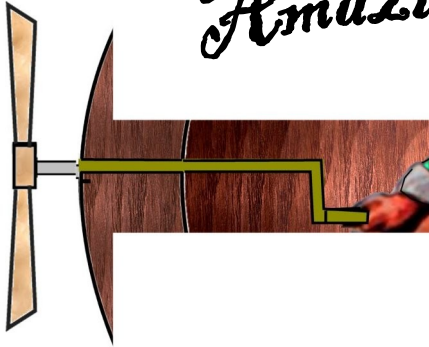


Starboard Side
Sgt Ezra Lee at
the controls



Port Side showing
Depth Gauge
Compass
Ballast Pump
Droppable Anchor

Amazing Inventions



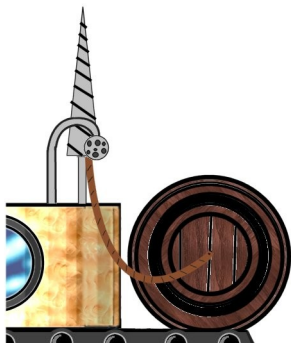
David Bushnell invented the propeller up until this time Oars or sails were the only way to move a boat. A eyewitness described it as “shaped like the arms of a windmill”, “formed on the principal of the screw.” The next real use of propellers on ships happened during the civil war.



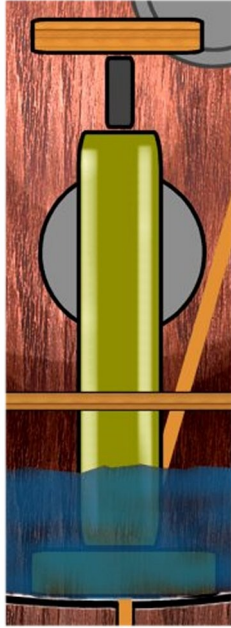
Bushnell borrowed the design of the depth gauge from a previous inventor, but until this point no one had actually built one. Inside the glass tube was a cork that would go up as the sub went down. The problem really was how do you read it in the dark?



Bushnell had the same problem with the compass he used for navigation, How do you read it in the dark? The answer came from Benjamin Franklin who suggested Bushnell use Foxfire, a fungus that glowed in the dark. This fungus was common in the woods around Connecticut. Next time you see a clock or watch with hands that glow in the dark you can thank Benjamin Franklin & David Bushnell.



For fresh air Bushnell invented the snorkel. A wooden ball closed the valve when the sub submerged so the sub would not fill with water and on the surface the pilot could get fresh air even though the hatch was closed. Next to the snorkel is the auger used to attach the bomb to the British ships.

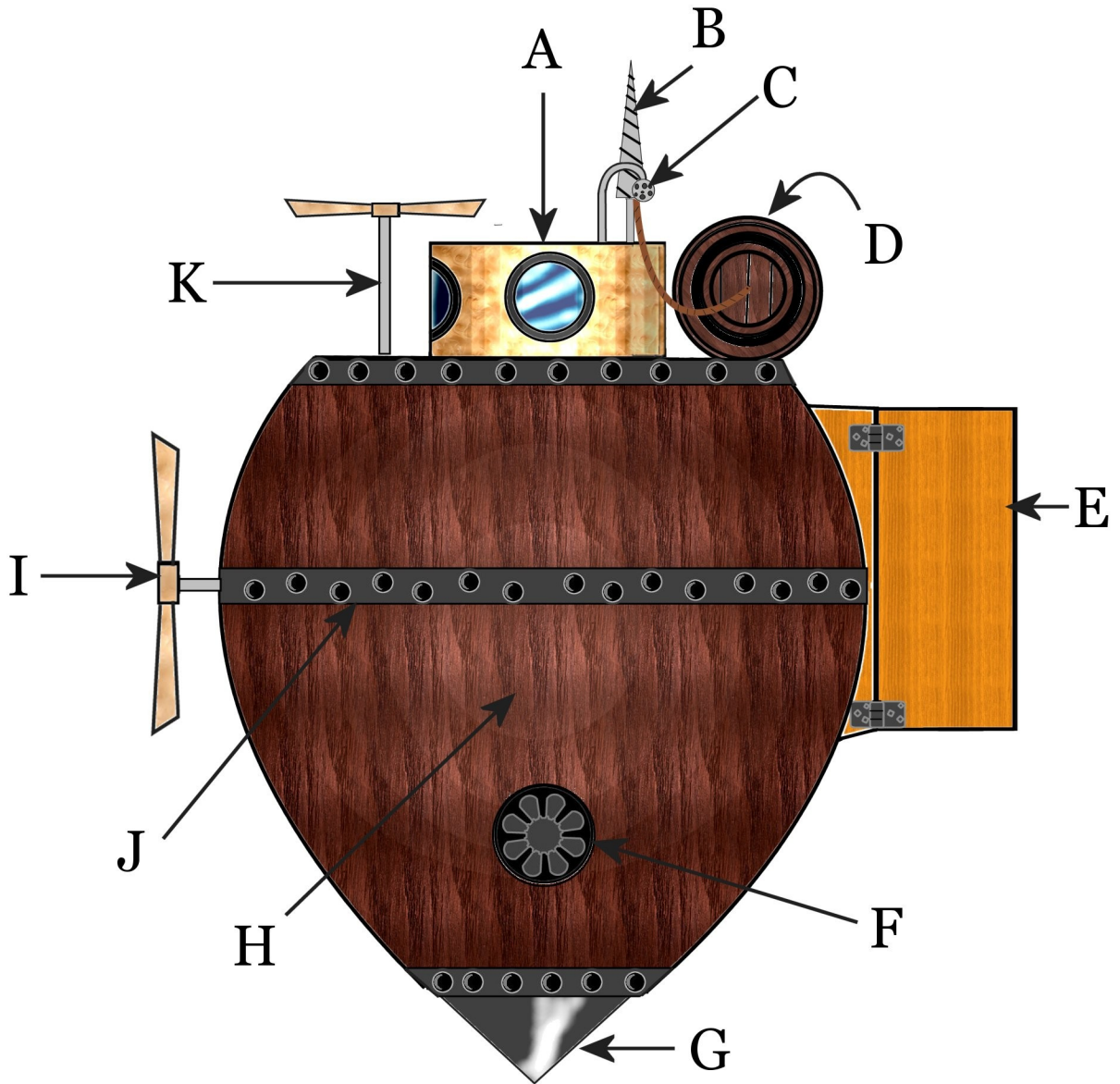


To make the Turtle sink and surface, Bushnell invented a Ballast Pump. By stepping on a valve the pilot could let water flow into the sub. The air in the sub would just compress. This made the sub get heavier and heavier. It probably also made the pilot get wet feet. Ezra Lee complained later about Rheumatism in his legs. He said he had contracted it while operating the Turtle. The water must have been horribly cold and probably came up to Ezra's knees.

When the sub was to surface, the pilot would move a hand operated pump that would force the water back out of the sub. The sub would become more buoyant and rise.



Bushnell's submarine also had an interesting safety feature. If the Pilot could not pump the water overboard or he could not use the vertical propeller to go upwards. He had the option of dropping a large weight attached to the bottom of the sub by a rope and winch. If the pilot just cut the rope the sub would become immediately buoyant and pop to the surface. The pilot also had the option of winching out the weight and using it for an anchor. Modern mini subs still use droppable ballast like this today.



David Bushnell's American Turtle

1776

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- | | |
|-------------------------------|--------------------------|
| A - Brass Hatch | H - Wooden Hull |
| B - Auger | I - Horizontal Propellor |
| C - Snorkel | J - Iron Bands |
| D - Clockwork Infernal (bomb) | K - Vertical Propellor |
| E - Rudder | |
| F - Ballast Vent | |
| G - Dropable Weight/Anchor | |

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Author/Designer/Artist's Note

I started designing this model in 1999 using Microsoft Paint©, but It didn't turn out the way I pictured. Over time I got better software and got better at using it. Finally in 2008, I got out my old model files and decided to try again. This time it looks just like I imagined. I hope you like it. It was created on my Mac using Jasc PaintShop Pro© ver. 7.

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