

THE FIRST SUBMARINE

BY STEWART H. HOLBROOK

To appreciate the difficulties faced by Sergeant Ezra Lee, commander of the first submarine ever on the water, it is necessary to know something of the vessel in which this stout-hearted and forgotten Yankee set out, one night in 1776, to destroy the British fleet in New York harbor. The *American Turtle*, as this primordial U-boat was called, was made of oak frame timber in the shape of a round clam. It was bound with iron bands, the seams calked, and the whole smeared over with tar. The top, or head, was of metallic construction, hinged, with eight small windows of thick glass. "On a clear day and in clear sea water," said Sergeant Lee, "I could see to read at a depth of three fathoms." But Lee could have done but little reading, once he had been clamped into the *Turtle*, for he had too much else to attend to.

The *Turtle* was six feet high. A foot spring opened a cock which let water into a compartment, for submerging; two hand pumps were used — by nobody but Lee, the only man aboard — to empty the compartment, for rising. When on the surface, two small

tubes let air into the vessel, but when submerged the operator had to get along with such oxygen as was present. The *Turtle's* inventor said that the vessel contained "sufficient air to support the operator for thirty minutes." Candles were tried for lighting, but they burned up the oxygen very quickly, and resort was had to "two pieces of shining wood, or foxfire" — phosphorescent wood — to light the compass and depth gauge. In the depth gauge was a cork that rose with the descent of the vessel, and fell with the ascent. "A one-inch rise of the cork," said Sergeant Lee, "denoted a depth of one fathom."

For ballast, the *Turtle* carried 900 pounds of lead on her bottom, a part of which could be cut loose and lowered on a cable to act as an anchor. For motive power, there were two sets of paddles — "like the arms of a windmill," says Lee — furnished with a crank for each set. The smaller set was at the *Turtle's* head, or top, and aided the vessel to ascend. The larger paddles, which were twelve inches long, were the motive power. "By vigorous turning of the crank," Ser-

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geant Lee reported, "I could make about three miles an hour." There was also a rudder, a sort of fin on the vessel's rear.

Such was the *Turtle* proper. In addition to the apparatus already cited, the vessel carried a complicated boring machine; and a sort of torpedo, called a magazine, which was the *Turtle's* offensive weapon. What with holes all over the vessel to permit entry of the shafts of the two propellers, of the rudder, the pumps, and the boring apparatus, it seems a wonder that Sergeant Lee did not operate in water up to his waist, but he never complained of bilge in the scuppers; and Dr. Benjamin Gale, who had a hand in the *Turtle's* construction, in a long letter to Silas Deane about the submarine, vowed that "all of these shafts are so curiously fix'd as not to admit any water to incommode the machine."

The *American Turtle* was conceived in the mind of David Bushnell, a farmer boy of Saybrook, Connecticut, who was graduated from Yale in 1775. During his college years he had become interested in methods to explode charges of powder under water, and promptly on his graduation set out to devise an underwater craft to be used against British ships which were then cluttering up American waters and closing American ports. With considerable help from the aforementioned Dr. Gale, who was also a Yale man (A.B. 1733), young Bushnell went furiously to work and late in 1775 the *American Turtle* was

ready for its trial run in the Connecticut river at Saybrook. Whether or not Bushnell operated the vessel on this run is not known. He is described by contemporaries as "too frail" for such rugged work as the *Turtle* called for. In any case, the trials must have been encouraging, for presently General Samuel H. Parsons of the Continental Army was calling for "two or three volunteers" to learn how to operate what newspapers of the time, if they knew of it at all, neglected to call America's Secret Weapon.

Sergeant Ezra Lee, late of Lyme, Connecticut, was among the volunteers. He with inventor Bushnell and others made "several experimental voyages" around Saybrook. Troubles developed. In late November the forcing pumps were not performing well. In early December Dr. Gale was writing Silas Deane to say that the shining wood or foxfire failed in frosty weather, and asked Deane to inquire "of Doctor Franklin if he knows of any kind of phosphorous that will give light in the dark but not consume the air." In February 1776, Gale wrote that experiments with lighting were still being made. He had by then met Sergeant Lee, who, he says, "is no enthusiast, but a perfect philosopher, and by no means doubtful of succeeding." Any man who was going to operate the *Turtle* simply had to be a perfect philosopher.

The experimental voyages apparently continued throughout the spring and early summer of '76, mostly in Long Island Sound. Meanwhile, the

British had taken possession of Long Island, Staten Island, and Governor's Island. The Sound was getting too warm for any vessel that was "to produce astonishment to those against whom it is designed;" so Lee and his helpers hauled the *Turtle* out of the Sound at New Rochelle, took it overland to the Hudson, and launched it in the river. The time had come for the first U-boat attack in history.

II

It was now August 1776. A sizable British fleet lay in New York harbor just north of Staten Island. With it was a large number of transports. Presently came a favorable night, and at eleven Sergeant Lee and party set out. They were in two whaleboats towing the *Turtle*. At a point described as Whitehall Stairs — near the Battery — the expedition halted. Lee crawled into his one-man sub, the head was clamped tight, and away he went down the dark waters, alone.

Here was an epic voyage, a trip for a man of cold courage, a hero by the standards of all times and places. Even in the quiet waters of Long Island Sound, in broad daylight, and with no lurking enemy, a ride in the *Turtle* was something akin to suicide. There were so many things to go wrong with the bungling and complicated mechanisms. Should the lead weight on its bottom drop away, the operator might find himself standing on his head. Too, the vessel was really a sieve with its countless openings

plugged, and "smear'd over with tar;" should a leak start, the operator could do little but drown where he was, for he was clamped in from the outside. A floating log might break the windows. A good jolt could set off the devilish infernal machine on the *Turtle's* back. It is questionable that any other ship ever put to sea was so open to fatal accident. But there is nothing in the records to indicate that the daring young Nutmegger from Lyme gave it a passing thought.

Now it was night, and down below him somewhere in the dark, as Lee knew, was the fleet, and in the fleet the *Eagle*, sixty-four guns, the mighty flagship of Lord Howe. Sergeant Lee had understandingly set his heart on the *Eagle*.

Turning his crank "vigorously," Lee went on. The tide was in ebb, "very strong," says Lee, and before he was aware of the speed he was making, he had passed the men of war and was heading out to sea. This was bad, for dawn was soon coming and the *Turtle* was no ship to approach the British navy in daylight. What was worse was the tide. Lee had to work like a Trojan to get the awkward craft turned about, and then by hard labor at the crank "for the space of five glasses by the ships' bells, or two and a half hours," he arrived under the stern of what he felt certain was the *Eagle*, looming up big and tall in the twilight that precedes early dawn.

Lee's task now was to attach the torpedo or magazine to the bottom of the man o' war. This magazine was an

oak container shaped like an egg. It was attached to the *Turtle* by a large screw, a little above the rudder. In the oaken egg were 130 pounds of gunpowder, a clock, and a gun-lock provided "with a good flint that would not miss fire."

The method of attaching the bomb to the ship's hull was this: a long sharp screw, worked by hand from inside the submarine, would penetrate the hull — theoretically — then be disengaged, and left sticking out from the hull. Attached to this spike was a line for holding the torpedo firmly against the ship until the magazine should explode. So, all that Sergeant Lee had to do, now that he was under the *Eagle's* hull, was to hold the *Turtle* steady, bore into the ship, disengage the screw, plug the hole in his own craft, loose the powder magazine from the *Turtle*, attach it to the screw in the *Eagle's* hull, then get out of there as quickly as possible. Incidentally, the clock was set for running twenty minutes from the time the magazine was unscrewed from the submarine — which automatically set the infernal machine in motion — until the lock struck and fired the powder. Lee figured that twenty minutes would give him time to get clear.

Well, here Lee was at last, under the gently rocking flagship of the British fleet. One can wonder what his thoughts were, this "perfect philosopher," this first submarine commander. But he had little time for reflection, and he was a man of action anyway. He opened the seacock and

let more water into the submerging compartment. The *Turtle* slowly yet perceptibly sank. Lee felt it rubbing the underside of the big ship. All was dark as pitch, except for the foxfire on his compass and gauge. He started the boring machine, and although it turned perfectly, it wasn't boring anything. What Lee had run into was thick copper sheathing on the *Eagle*. He paddled along a few feet, then tried again. Same result. After several more futile attempts, Lee put the *Turtle* into a real dive, going under the ship and coming up on the other side. He was a determined man. But it was still copper and he could do nothing against it with his wood-boring bit.

Dawn was coming, all right. Lee noted that he could now see the machinery and his own hands. He could hear orders being given on the decks above him, but he didn't think they applied to his attempt, for he was certain he was undiscovered. Still, he was in a tight place. It was getting lighter by the moment. He knew he had before him a voyage of four miles before he could consider himself anything like safe.

Sergeant Lee came to the surface, and now took his bearings. He had to do this because the foxfire, or phosphorous or whatever it was, had failed and he could not read the points of his compass. He submerged again and started north for the Battery, turning his crank. The tide, praise be, had turned and was now with him again. Governor's Island, which he would have to pass, was his great danger. He

had to rise to the surface every little while to make sure of his course, and presently he came abreast of the Island and could see hundreds of British troops down near the shore. They saw him, too, and were obviously trying to make out what the strange craft was. Lee saw a big barge push off from shore and start toward him. He paddled for dear life, but the barge was coming much faster.

Sergeant Lee was no man to take a torpedo to sea and bring it back. Just as the barge filled with British marines got within good shouting distance, Lee pulled the pin of his torpedo and cut it loose, expecting that his pursuers would seize it, as well as himself, and that they would all be blown to atoms. "Providence, however, directed otherwise," as Lee related the incident, "for the enemy, after approaching within fifty or sixty yards of the machine, and seeing the magazine detached, began to suspect a *Yankee trick*, took alarm, and returned to the Island." It was well for them that they did.

As for Lee, he knew what was in that lethal egg-shaped thing, and he paddled with all his might to get as far away as possible. He made his escape. The magazine had barely drifted past Governor's Island when it went up in one great blast, tossing large columns of water and hunks of wood and iron high into the air. The force of the explosion—"a report like thunder"—was noted at the Battery, on Manhattan's tip. It was the Black Tom Explosion of 1776.

General Israel Putnam, General Parsons and other American officers saw the explosion, and were on hand to welcome the intrepid Lee when he crawled out of the *Turtle* and came ashore at Whitehall Stairs.

III

A few days after Sergeant Lee's exploit, the Americans evacuated New York, and the *Turtle* was taken far up North River and moored. In it Lee made one more attempt in the Hudson, this time "upon a frigate that lay off Bloomingdale." But the deck watch saw the *Turtle* approaching, gave the alarm, and Lee escaped.

For almost a year, nothing more was heard of the *Turtle*. Then, on an August night, in 1777, as the British frigate *Cerberus* lay in Black Point Bay, west of New London, holding a schooner it had taken as prize, one of the crew hauled at a long line which seemed to have fouled on the schooner. At the end of the line was "a machine upward of one hundred weight" which the curious sailors hauled aboard. No sooner was it on deck than it exploded, killing three men and blowing the schooner to bits. Captain J. Symons, commander of the *Cerberus* was pretty angry at such warfare. He wrote British Admiral Parker about "the mode these villains must have taken . . . as the ingenuity of these people is singular in their secret modes of mischief."

One account has it that the *Turtle* was next taken to Philadelphia where

it helped to plant the Delaware river with floating kegs of powder and to send them bumping, and sometimes exploding, among the British fleet there. This event was celebrated in doggerel verse as "The Battle of the Kegs," by Francis Hopkinson. It made sport of the terror of the British sailors at this new kind of atrocity.

As for Sergeant Lee, his cold-blooded courage had taken the eye of General Washington. The Commander-in-Chief congratulated him in person, and later employed him in some sort of secret service, probably as a spy. Lee also served bravely at the battles of Trenton, Brandywine, and Monmouth. He died at Lyme, his home town, in 1821, aged seventy-two, full of honors as an outstanding hero of the Revolution. Had a Longfellow fastened on him, he would be as well-known today as Paul Revere, and it is a pity that he isn't.

The inventor of the *Turtle*, Bushnell, was the butt of much popular ridicule after the *Turtle's* failure to blow up Howe's flagship. But two years later, when Washington organized companies of miners and sappers, Bushnell was put in command of one

company, and later was promoted to captain. In 1781 he was sent to West Point in command of the Corps of Engineers, and was mustered out of service at the end of the war. During the next decade he seems to have disappeared, and it was thought he went to France. There is considerable mystery regarding him at this period and later. In 1795 he turned up in Columbia County, Georgia, as a school teacher and under the alias of "Doctor Bush." The only person here who ever knew his real identity was a former fellow soldier, Abraham Baldwin. Bushnell died in Warrenton, Georgia, in 1824, where he had practiced medicine for a number of years, still under the style of Dr. Bush.

In the United States, at least, Bushnell is considered the legitimate father of the submarine. Sergeant Lee did not fail him, either. Only the sturdy copper on Lord Howe's ship prevented Bushnell from joining the ranks of Eli Whitney, Samuel Colt, and Thomas A. Edison. Long after the war, in a letter to Thomas Jefferson, President Washington wrote of the *Turtle*: "I then thought and still think it was an effort of genius."



WITH reasonable men, I will reason; with humane men I will plead; but to tyrants I will give no quarter, nor waste arguments where they will certainly be lost.

— WILLIAM LLOYD GARRISON

THE ARTS AND SCIENCES

Epidemiology

BUBONIC PLAGUE IN AMERICA

BY TOM S. HYLAND

UNKNOWN to most Americans, bubonic plague, the dread Black Death of the Middle Ages, is today entrenched in the United States. The disease has a firm foothold in the Western states and is now spreading eastward into the Mississippi Valley. It appeared most recently in North Dakota and may spread to the Atlantic Coast in another generation.

Though the plague is primarily an animal disease which claims human beings only incidentally as its victims, and fatal human cases of the plague in the United States have averaged only one or two a year for the last two decades, these facts by no means lessen the worries of public health authorities. The great plague epidemics of medieval Europe and modern Asia were caused by similar epidemics among rats whose fleas readily stray to bite human beings.

In the United States, however, the plague has taken a new and potentially even more dangerous form, for it is spread by wild rodents such as squir-

rels, rabbits, chipmunks, prairie dogs, etc. It has also been discovered in burrowing owls (which share the holes of prairie dogs) and hawks. The great danger is that at any time the diseased animals of the sparsely settled regions, driven, perhaps, from their habitat by drought or famine, will give their fleas to city rats and thus start great urban epidemics, a peril which increases as the disease insinuates itself eastward into the more densely populated part of the nation.

There is still another cause for worry. Rat plague, and its corresponding outbreak among mankind, appears in cycles, rising to its highest incidence and then dying out in the course of a century or less, a phenomenon not yet explained by science. Wild rodent plague follows no such cycle; it is everlasting and permanent. "Americans will have to learn to live with the plague," warns the nation's foremost plague expert, Dr. Karl F. Meyer of the University of California. And, he adds, the fact that the United States has so far escaped a catastrophic plague epidemic does not indicate that one may not occur sometime.

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