

The first high-tech war

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Ironclad warships. A steam-powered warship defending New York's harbor. Submarines. Rifled cannon firing elongated explosive shells. The first use of steam power for logistical support of a battle. Industrial automation. Obviously, I'm talking about the U.S. Civil War, right?

Nope.

We are currently celebrating, with regrettably little fanfare, the bicentennial of the War of 1812. This little sideshow of the Napoleonic Wars receives little enough attention among history buffs. It receives even less from engineers. We all know it was fought with primitive cannon and wooden ships and moved by horses and canvas sails. But once I was persuaded to dive into the history of the era, I found a surprising amount of emerging technology.

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[Robert Fulton](#) [1], partnered with [Chancellor Robert Livingston](#) [2], first operated the North River, the steamboat most people call the Clermont, in 1807. Livingston developed a strong interest in river steamboats when he negotiated the Louisiana Purchase ... today we would call that insider information. Less known is another steamer put in service about the same time as Fulton's by Livingston's former partner, [John Stevens](#) [3]. Stevens' Phoenix became the first steamboat to navigate open ocean when he relocated it to Philadelphia to avoid the Livingston-Fulton monopoly in New York. By 1811, Fulton launched a steamboat named the New Orleans from Pittsburgh, which made it down the Ohio and Mississippi to New Orleans, and established a monopoly there. Alas, this underpowered deep-draft boat could make it no further upstream than Natchez. The New Orleans was piloted by [Nicholas Roosevelt](#) [4], who had also built the engines, based on Watt's low-pressure designs. All these boats were commercially successful prior to the War of 1812.

Both Fulton and Stevens used the title of "Colonel" during the War of 1812. Stevens was not much good at building engines but was quite accomplished at civil engineering, particularly roads and defenses. Stevens designed much of the defenses of New York's harbor, while Fulton worked on a steam-powered, oak-armored floating battery called the Demologos. This self-propelled fortress featured an oak hull five-feet thick and sixteen 32-pound cannons. Fulton had also worked on submarines and underwater "torpedoes" (mines) for both the French and British, and some of his ideas were likely incorporated in New York's defenses. Fulton had given up on subs, although Silas Halsey tried one in 1814, to predictably bad effect. The Demologos never saw combat ... the British preferred the less well-defended Chesapeake Bay.



Colonel Stevens tested

sloped-wrought iron armor over wooden structures, firing cannon against it. The armor worked well, and he had a couple of steam-powered turreted ironclads on the drawing board at the end of the war, five decades ahead of the [Monitor](#) [5]. While the Phoenix was a paddlewheeler, Stevens had built smaller steam-powered boats using counter-rotating screw propellers and was known to prefer them, again beating the Monitor. Propellers were not new ... Bushnell's Turtle had used a prop during the Revolutionary War, and Fulton had used one on his sub, the Nautilus.

Exploding mortar shells (those "bombs bursting in air") existed well before the war, but cannon still fired mostly solid shot. Stevens developed an elongated explosive shell for rifled cannon and demonstrated it against a simulated ship's hull near the end of 1814. The flat-fired shells were remarkably accurate, hitting targets at up to a mile by skipping off water. The shells would bury into the wood and exploded with a timed fuse, with devastating effect.

[Oliver Evans](#) [6] was America's answer to Britain's Richard Trevithick, the man usually credited with building the first rail locomotive. Both rejected the condensation-driven "atmospheric" engines of Newcomen and Watt, preferring to risk high-pressure boilers and use the pressure of steam itself to drive a piston. This advance was essential to making compact engines practical for transportation. Evans had little formal education but acquired a mastery of the most advanced

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metalworking methods then available, which are probably better than you think. Evans mostly built fixed-installation engines but foresaw and advocated railroads and steamboats. His ideas were picked up by Daniel French, who built a steamboat with a high-pressure engine, which set out from Pittsburgh in December 1814 bound for New Orleans with much-needed supplies for General Andrew Jackson.

The Enterprise made the trip far faster than the Fulton boat, arriving the day after the Battle of New Orleans. Jackson was delighted with it and kept it busy for months. When Jackson was satisfied and Fulton's monopoly-crazed lawyers were told to stand down, Captain Shreve pointed the bow north and the Enterprise made it all the way back to Pittsburgh, a first that had the papers abuzz all up and down the river. On the way, he devised a few refinements for his own boat. Shreve's design for the [Washington](#) [7], launched in 1816, is considered the prototype Mississippi River steamboat, a design that changed little over the next hundred years.

Both Stevens and Evans pushed for railroads even before the war. There was bad blood between them, which is a real shame, because by the spring of 1815, Stevens had a charter for the first railroad in North America but no clue as to how to build a locomotive. Evans had no clue how to charter a railroad, but he had built a large number of high-pressure steam engines by this point and around 1805 had even built a working model of a steam-powered agricultural traction engine which probably would have sufficed as a first-generation locomotive. Evans scholars may raise an eyebrow at this early tractor, so I direct the curious to [page 182 of this wonderful little publication](#) [8]. If these two had come to an agreement, we could have had our first railroad by about 1816. Don't fret about the wooden rail problem. Evans had his own iron works, and we were cranking out plenty of iron by this date.

Near the start of the War of 1812, [Francis Cabot Lowell](#) [9] managed to get a tour of some British fabric mills and committed the designs to memory. This was export-restricted stuff, something all of us plagued with ITAR and EAR restrictions will recognize all too well. Lowell manage to slip the embargos and make it back to Massachusetts, where he convinced investors to build the first American water-powered mill to both spin cotton thread and weave it on automatic looms under one roof. The American textile industry took a giant leap forward during the War of 1812, in large part because the embargos left us choking on cotton but starving for cloth.

Mind you, Oliver Evans was able to go into the steam engine business because he'd made his fortune designing automated flour mills that were arguably the most advanced materials-handling plants in the world at the end of the 18th century.

So why don't we date the American Industrial Revolution to the War of 1812? In large part because I've just named most of the Americans who had any idea how to build this stuff, and they had their hands full trying to invent what they needed in a world of coopers and blacksmiths. There was technology out there, including at least rudimentary machining, but precious few people knew how to do it. Tradesmen's arts were not taught at colleges and universities. Self-taught men like Evans, French, and Shreve followed the self-improvement example of Ben Franklin

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and availed themselves of his legacy: the Library Company of Philadelphia and the American Philosophical Society. They invented Engineering on their own, and if they wanted bright young assistants, they needed to train them from scratch.

These men were considered visionaries in their time. Alas, as you'll find on about page 37 of that little gem I linked above, being called a "visionary" was, in their time, a vile insult, synonymous with being called delusional. The spark had been struck, and the fuse was burning, but it took a decade or two before the explosion went off.

Why should we care today? Have you scoffed at any delusional inventors lately? How many true visionaries do we dismiss today that we'll recognize in a decade or two? I'm thinking back to the day I saw [Amazing Grace Hopper](#) [10] speak at Virginia Tech, handing out a fistful of "nanoseconds" and telling us that within a few years we'd no longer be begging for time on mainframes but would have our very own computers on our desks, for a few thousand dollars, and that this would change forever the way we use computers. I really wanted to believe her, but it seemed beyond our wildest dreams.

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Links:

- [1] http://en.wikipedia.org/wiki/Robert_Fulton
- [2] [http://en.wikipedia.org/wiki/Robert_Livingston_\(1746%E2%80%931813\)](http://en.wikipedia.org/wiki/Robert_Livingston_(1746%E2%80%931813))
- [3] http://books.google.com/books/about/Scannell_s_New_Jersey_s_First_Citizens.html?id=D5JPAAAAYAAJ
- [4] [http://en.wikipedia.org/wiki/Nicholas_Roosevelt_\(inventor\)](http://en.wikipedia.org/wiki/Nicholas_Roosevelt_(inventor))
- [5] http://en.wikipedia.org/wiki/USS_Monitor
- [6] http://en.wikipedia.org/wiki/Oliver_Evans
- [7] http://steamboattimes.com/steamboats_1811~61_p1.html
- [8] <http://si-pddr.si.edu/jspui/handle/10088/10090>
- [9] [http://en.wikipedia.org/wiki/Francis_Cabot_Lowell_\(businessman\)](http://en.wikipedia.org/wiki/Francis_Cabot_Lowell_(businessman))
- [10] http://en.wikipedia.org/wiki/Grace_Hopper