

LIGHT TOUCH

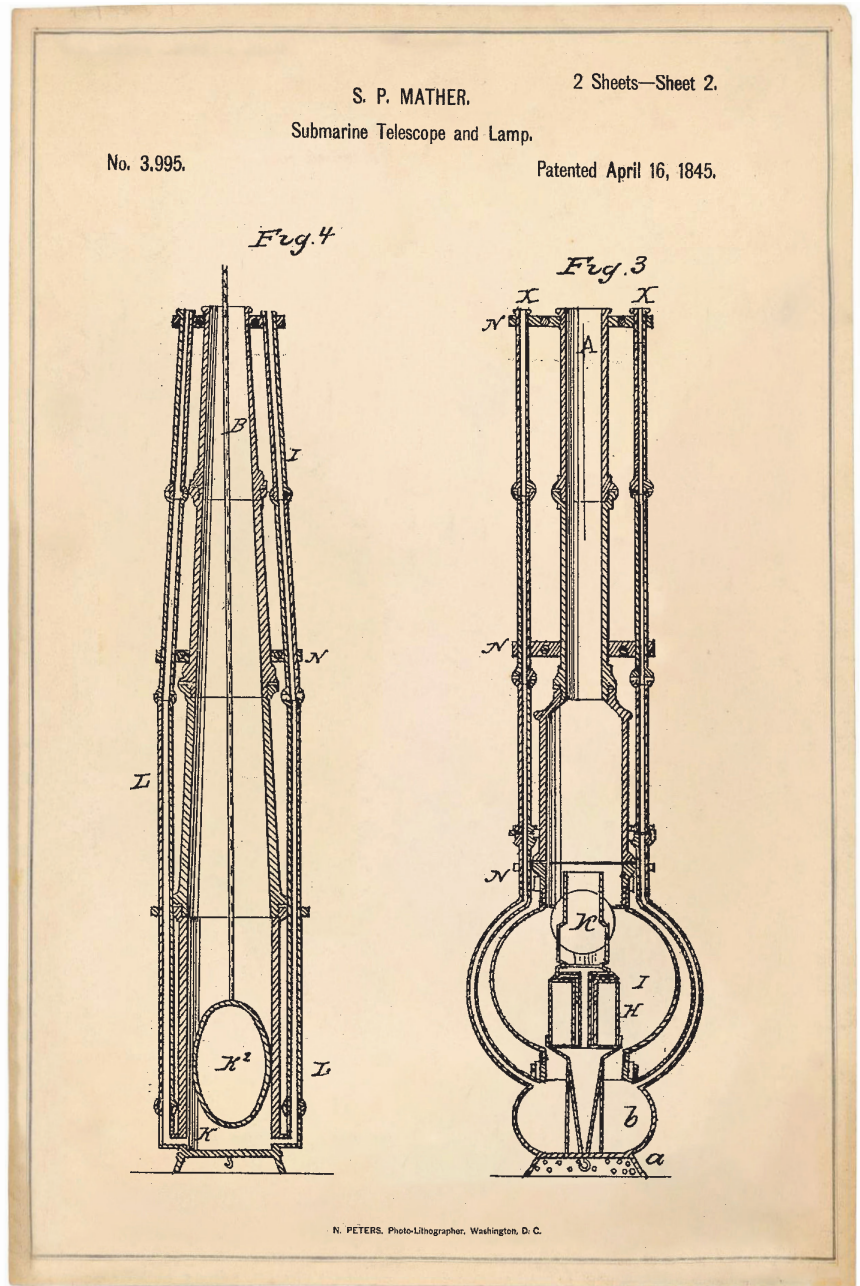
Out of the Depths: The Submarine Telescope

In the 1840s, Sarah P. Mather invented an impressive and unusual optical device that could be used to see underwater.

Stephen R. Wilk

In early November 1842, something new was added to Phineas Taylor Barnum’s American Museum in New York City. The museum had opened on New Year’s Day with an array of novel stuffed animals, dioramas, performers and scientific instruments. The new addition fit into this last category. It was a tank of water four and a half feet deep, with a peculiar brass construction inside.

The device consisted of three tubes that went down almost the entire depth of the tank. One of these housed a burning camphine lamp, which used a mixture of purified turpentine and ethanol to produce a very bright light, and supplied the air that the swiftly burning lamp required. A second tube drew away the exhaust fumes, while the third contained a telescope imaging an object seen through the waterproof window at the bottom, which was illuminated by the lamp through another waterproof window.



Sarah P. Mather’s 1845 patent for a submarine telescope and lamp. US Patent No. 3,995, dated 16 April 1845

“A pin at the bottom could be as distinctly seen as though there had been no water in the vessel,” read the newspaper account. The inventor said that it had been used to view objects 22 feet beneath the water’s surface in the harbor and could be pushed to even greater depths. Because it used a telescope

for viewing and the tubes could be extended by the “telescope” principle of sliding concentric tubes, the device was called a submarine telescope.

The newspaper continued, “The apparatus it is thought will be very useful in the discovery of sunken wrecks, in the construction of

fortifications, and all works extending to the water. ... [B]y attaching a mirror to the telescope, the bottom and keel of a ship may be examined under full sail."

Even more amazing to many of the reporters was that this device was the invention of a woman, Sarah P. Mather. Who was Sarah P. Mather? And how did she come to invent this amazing and unusual piece of aquatic optics? "We know almost nothing about her," say several of the websites reporting on the invention. And there most of them leave it.

Searching for Sarah P. Mather

Sarah Porter Stiman was born sometime in 1796. In 1819 she married Harlow Mather in Huron, OH, USA. How they met and how they were employed we don't know. But by 1842 they were living in Brooklyn, NY, and Sarah Mather, in addition to raising five daughters, had invented her marvelous device.

At the time, there was definitely a market for something that enabled a clearer look underwater. Although crude diving suits and diving bells had been invented before the 17th century, it wasn't until the 1830s and 1840s that practical helmeted diving suits were first made and used for underwater salvage and work on the submerged portions of ships. Nevertheless, this method was clumsy, expensive and not without risk. The time was ripe for a simpler, safer and cheaper alternative.

Mather's invention—coming into the world full-blown, from someone with no obvious background—is a remarkable performance. The basic idea of combining an aquascope (essentially a bucket with a glass bottom to enable one to see underwater) with a submerged lamp and a telescope to bring distant objects near



Barnum's American Museum in New York City. W. Jeffrey / Wikimedia Commons

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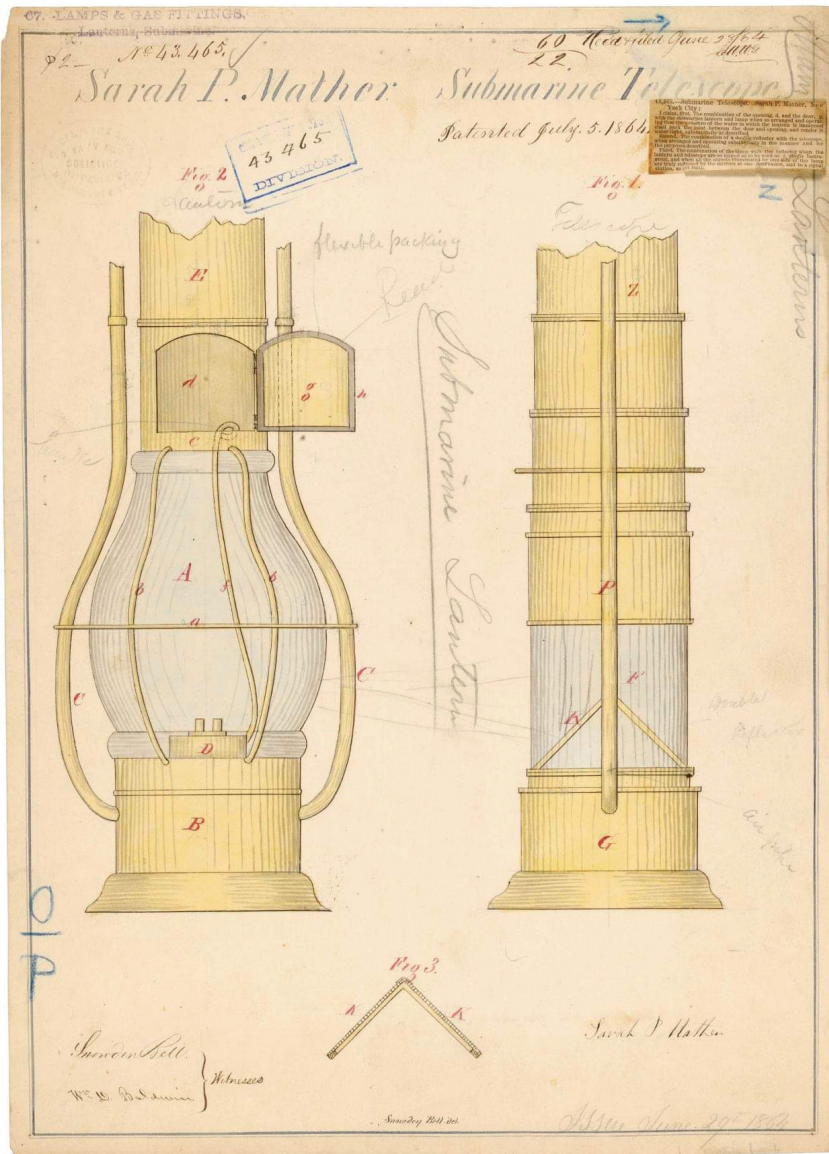
is a simple enough synthesis. But the execution requires knowledge and experience with construction techniques, soldering and watertight seals. There were a thousand technical challenges to be met.

And this was no mere paper idea—Mather constructed the device and operated it. On top of that, there was the coup of publicity. Having the device demonstrated in Barnum's already-popular American Museum brought it to the attention of a great many people, and its success generated further exposure.

Engineers inspected the device and pronounced on it. Commodore Matthew Perry, who led the expedition that "opened" Japan to trade with the United States, approved of it. The *Brooklyn Daily Eagle* wrote a long article praising the device and Mather herself: "And surely it must be a theme of no small gratification to Americans that the world is indebted for all this, not only to an *American* but to an *American Lady!*"

Patents and kudos

Mather was granted her patent, US 3995, on 16 April 1845. Connecticut Congressman Thomas P. Seymour had written a report for the US House of Representatives that was published in May 1844, in which the "utility of the telescope invented by Mrs. Sarah P. Mather [was] acknowledged" and an appropriation for testing (which amounted to US\$2,000) was approved. In October 1845, Mather won a silver medal for



An image from Sarah P. Mather's second patent application in 1864, for improvements to her submarine telescope. US National Archives

her working model of the telescope at the American Institute Fair on Long Island, NY, USA. In 1846, the New York State legislature passed an act establishing the Submarine Telescope Company. In 1847 the *Brooklyn Evening Star* published notices for subscription to the company, and in February 1848 the company established its office.

Mather filed for and was granted a second patent on improvements

for the submarine telescope, receiving patent number 43,465 in 1864. She died on 21 June 1868. Mather's daughter Olive Devoe also applied for a patent for undersea lighting but apparently did not receive one. Her sketches and application dated 13 January 1868 survive. The device appears to be a large parabolic reflector intended to send a searchlight-like beam through especially turbid water for viewing through

her mother's submarine telescope. Military searchlights appear to have first been used in the Franco-Prussian War in 1870, but Devoe's is the first such device I've come across for underwater use.

Was Sarah Mather's submarine telescope actually used? I can't find explicit cases of its being employed, but the fact that others re-invented the submarine telescope with minor improvements many times over the next few decades suggests that such a tool was much in demand. Mather had essentially invented the borescope—an illuminated optical device for inspection of hard-to-reach areas—long before the modern version of that instrument was officially invented in the 1960s. Certainly, the examination of boat hulls in the water is still strongly recommended, although today this is typically done by underwater drones with mounted cameras and remote controls.

The success of Mather's invention, at least in penetrating the public consciousness, might be best demonstrated in the way that it showed up in a revivalist sermon given by the Reverend Daniel Baker in 1854. In remarking upon the many wonderful new inventions of mankind, he brought up one by womankind: "And have we not the submarine telescope, by which a seaman standing upon the deck of a vessel in the midst of the ocean can look down into the blue water and see distinctly the bottom of that vessel, even the head of every nail and every crack." **OPN**

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