CBHS NEWS of NOTE ~ JULY 2025

CAPE BLANCO LIGHTHOUSE ~ 1870

A MONTHLY PUBLICATION
of the
CAPE BLANCO
HERITAGE SOCIETY

CBHS BOARD MEETINGS: Currently held at Point.B Studio at 10:00 AM on the 2nd Tuesday of every month.
PLEASE NOTE: Our meetings are open to everyone who would like to attend. We invite and encourage anyone interested in CBHS to participate!

Lighthouse Technology ~ The Mother of Invention

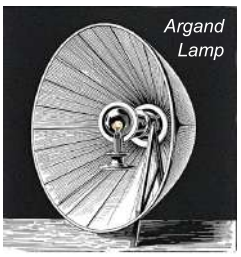
By Brian Zimmerman with CBHS ~
When early humans first ventured out to sea *(and the fishing was good)* they often did not get back until after dark. Needing to find their way home, bonfires were lit by people on land to guide them back to shore. The only real change to this early technology was putting fires higher on towers or cliffs so they could be seen further out to sea.

Fast forward to the Lighthouse of Alexandria, constructed during the reign of Ptolemy II Philadelphus *(c. 280–247 BCE)*. As for its height, estimates vary, but historical sources suggest it was between 103 to 118 meters *(338 to 387 feet)* tall, making it one of the tallest man-made structures of the ancient world. But for all of its height and fame it used bonfires of wood to provide light. The lighthouse was so influential that its Greek name, *Pharos,* became the root word for "lighthouse" in several languages. It remains a symbol of ancient ingenuity and maritime safety.

During the Middle Ages, beeswax candles gained popularity in Europe. Unlike tallow candles, which produced smoke and an unpleasant odor, beeswax candles burned cleanly but were expensive, making them a luxury item. Early lighthouse keepers hung candelabras in lighthouses to guide ships in.

In 1780, a major advance in illumination was made by Swiss chemist and physicist Aimé Argand. The Argand lamp featured a cylindrical wick and a glass chimney, which significantly increased the brightness and efficiency of the flame. This invention revolutionized indoor lighting and became widely adopted in homes and public spaces. The lamp was so good Thomas Jefferson brought one back from Europe and said it was the equivalent of six beeswax candles. Unfortunately, there was an unwanted consequence: this new invention was fueled by whale oil which provided a brighter, cleaner and steady flame *(superior to olive and other vegetable oils)*. It also burned longer which was perfectly suited for lighthouses. By the mid-19th century, whale oil fell out of favor due to scarcity of whales and rising costs, leading lighthouse authorities to seek more efficient lighting technologies and alternative fuels.

There is a problem with light, either from an open flame or an Argand lamp, it spreads everywhere. Early lighthouse engineers faced the same problem and attempted to solve it with parabolic reflectors. These curved mirrors were sometimes made of polished brass or tin. The issue was lack of perfect reflective shape or surface. Once a reflector was in place it often became dull without daily polishing. The best efficiency was about 30%. Even with the best Argand lamp and the best polished parabolic mirrors not enough light was sent to sea. Optical science was able to craft lenses that focused light, but they were thick, heavy, and inefficient.



Augustin Fresnel, a French physicist, invented a lens in 1819 that would revolutionize lighthouse illumination worldwide. The first lens installed at Cordouan Lighthouse in 1823 consisted of eight annular lenses placed around the lamp at a focal distance of 920 mm *(3 ft)*. To collect the light that would otherwise escape above the lenses, Fresnel placed a series of plane silvered mirrors on

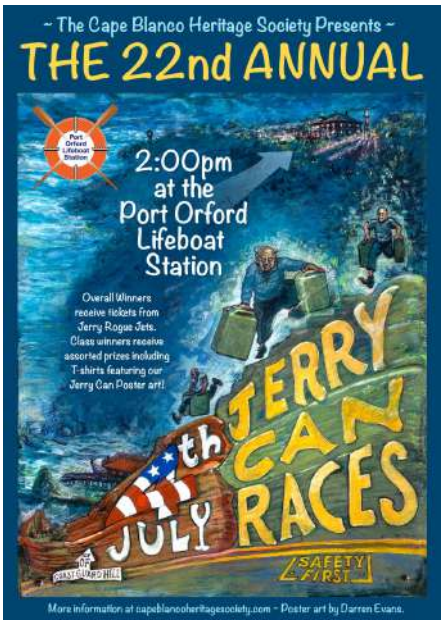
First order fresnel lens at St. George Reef (CA)

which the light was thrown by another system of lenses. Fresnel did a wonderful job creating the lens, but to make each lighthouse flash, the lens had to rotate. Fresnel was a genius at optics, but he did not know clockwork so he partnered with the clockmaker for the French Empire.

Henry-Lepaute was a French company specializing in clockworks and lighthouse optics. The company was founded by Augustin Henry *(later Henry-Lepaute)*, who initially worked with Augustin Fresnel in 1825 to design the clockworks that powered revolving lighthouse lenses. In 1838, Henry established his own factory, focusing on both precision timekeeping and lighthouse lens manufacturing. Before electricity, these massive lenses were rotated by a clockwork mechanism like the concept of a grandfather clock. A weight would drop down the center shaft of the lighthouse attached to a cable, which was wound around a drum. The drum was linked to a series of gears. The ratio of the gears was designed to allow the weight to drop at a certain speed. A pinion gear from the clockwork would interface with a large ring gear attached to the pedestal and rotate the lens.

The original lens installed in 1870 at Cape Blanco was a first order fixed lens. In 1911, Cape Blanco's signal changed to provide flashes of light with the introduction of an occulting light system powered by clockworks. It was later replaced with a second order rotating lens in 1936 when the lighthouse was electrified. That same lens is in the tower today. Fresnel's design used concentric rings of specially cut glass to reduce weight while maximizing light output. This allowed ships to see lighthouse signals from much greater distances, significantly reducing shipwrecks. Cape Blanco's light could be seen 23 miles out to sea.

The idea of dividing a lens into concentric rings was first proposed by Georges-Louis Leclerc de Buffon in 1748, but it wasn't until Fresnel refined the concept that it became practical for lighthouse illumination. His lens could be fixed or revolving, producing unique flashing patterns that helped sailors identify specific lighthouses. Because of its impact, the Fresnel lens has been called "the invention that saved a million ships". Today, the technology is still used in lighthouses, spotlights, projectors, and traffic signals.



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OUR MISSION: To provide interpretative and educational services for the Cape Blanco Light Station, Historic Hughes House and Ranch and the Port Orford Lifeboat Station. We are a 501(c)(3) non-profit organization and your donation is tax-deductible.

Mail this portion of the form with your check made out to:
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