NOTICIAS del PUERTO de MONTEREY

A Quarterly Bulletin of Historic Monterey Issued by The Monterey History and Art Association Contents copyright 1994 by Monterey History and Art Association Member, National Trust for Historic Preservation California Historical Society • Conference of California Historical Societies American Association of Museums

Vol. XLVI No. 3

September 1994



Sectional Elevation of Watchroom and Lantern showing position of Lens Apparatus - Office of Light House Board, March 1888 First Order Fresnel Lens at Point Sur - Now installed in the Maritime Museum of Monterey.

INSIDE: A LIGHT FOR ALL TO SEE - A HISTORY OF THE POINT SUR FIRST ORDER FRESNEL LENS

A LIGHT FOR ALL TO SEE By Ruta S. Casabianca and Richard McFarland

"As Reliable as the North Star ... Lighthouses are the last thing sailors see of their home port and the first thing they spot when they're home."¹

A History of the Fresnel Lens by Ruta Casabianca

Introduction

Throughout history, mariners have sought a means to identify their location in relation to nearby land. One of history's favorites was a large lighthouse built on the island of Pharos outside Alexandria, Egypt around the 3rd century B.C. This lighthouse became known as one of the Seven Wonders of the World and also gave its name to Pharology, the study of optics and lighthouses.

Romans constructed towers along the shores of their Empire. These towers consisted of an open lantern room where keepers tended coal or wood fires. But it was not until the end of the 17th century that the English constructed a lighthouse in Eddystone which employed a closed lantern with glass storm panes.²

The Swedes first installed parabolic (bowl-shaped) reflectors into their lighthouses during the 1730's and in 1782, the Swiss scientist Aime Argand invented a relatively smokeless oil lamp and circular glass chimney which drove air currents into the flame and produced more intense light as well as cutting down on the smoke.³

By the end of the 18th century a means to rotate large banks of parabolic reflectors was devised to create flashing characteristics or signatures.⁴ These signatures allow mariners to distinguish one beacon from another by checking its pattern on a chart called a light list. In this way the mariner can identify his/her location.

The Fresnel Lens - An Innovation of Revolutionary Proportion

The most revolutionary innovation to the science of Pharology was the lenticular lens, a lens which is convex on both surfaces (a convex surface is one which curves outward like the surface of a sphere). This type of lens was discovered and developed by Augustin-Jean Fresnel (pronounced "frey-*nel*") during the early 1800's.

Fresnel was born in France in 1788. As were many great scientist throughout history, Fresnel was considered slow-witted by his early teachers. Despite this early assessment, Fresnel discovered, corrected and refined every fact we know about the nature of light. Too weak for the military, Fresnel became an engineer and was assigned to repair highways. He pursued scientific experiments as a personal passion on his own time.

Sir Isaac Newton's (1642-1727) theory of light was the guiding principal at the time. Newton believed that light consisted of a swarm of "corpuscles" moving

through "ether" (Aristotle's term for the substance filling space). Some light "corpuscles" were refracted, some reflected and some did as they pleased.⁵

Fresnel's papers focused on the beginnings of the wave theory of light and, because they contradicted Newton, were viewed as sacrilegious. Fresnel was labelled "an illusionistic renegade" to dispute guiding principles in use by the scientific community for over 150 years.⁶ His discoveries were even more impressive when viewed in light of his crude equipment: Fresnel's early lens was a drop of honey placed over a small hole in a piece of cardboard.⁷

By recognizing the true properties of light, Fresnel was able to devise a system which magnified, reflected and refracted light rays to travel on a single horizontal path. This lens is used today in our car's headlights, in theatrical spotlights and in street lights.

Fortunately, key scientists of his day appreciated that Fresnel was doing revolutionary scientific work and had him appointed Secretary to the Commission for Lighthouses.

By 1822, a First Order Fresnel Lens was placed in the famous lighthouse at Cordouan at the mouth of the Gironde River in France. Mariners spread the word of the excellence of the French coast lighthouses and soon all European lighthouses employed the Fresnel lens. Considered too expensive, they were purchased only for experimentation by the US Lighthouse Service until 1852.⁸

Fresnel died in 1827, when only 39 years old. He once said, "All compliments that I have ever received never gave me so much pleasure as the discovery of a theoretic truth, or the confirmation of a calculation by experiment."⁹

The Fresnel System: A Summary

Before Fresnel:

Numerous parabolic reflectors were hung in tiers around a frame in the lantern room. Some lighthouses had up to 36 reflectors, each with its own lamp to tend and wick to trim.¹⁰

Fresnel's System:

One lamp is place at the focal plane (the center) of the lens. Prisms are mathematically arranged to capture 65 to 70% of the light rays. The prisms bend the light rays into one horizontal sheet of light which, in the case of a first order lens, can be seen up to 22 miles at sea whereas the light from the reflector system was visible a maximum of 8-10 miles. The lens is either fixed or revolving. The revolving lens has panels which produce periodic flashes timed to be constant and therefore the lens has a specific characteristic or signature. As described above, the characteristic is unique and its pattern is listed on a chart called a light list.

The Order or Sizes of the Lenses:

The first order is the largest. It is a metal and glass structure six feet in diameter and standing over 18 feet high. In 1885, the firm of Messrs.

Barbier and Fenestre of Paris constructed a hyper-radial lens which is 8 1/2 feet in diameter, stands over 22 feet high and weighs 10 tons. The smallest lens is a 6th order lens which is 18 inches high and one foot in diameter. The largest orders were installed in major landfall lighthouses, the mid-range were designed for lighthouses at coastal and harbor entrances, and the smallest served in bays and estuaries.

Types of Rotating Mechanisms:

- a) a series of small brass wheels (known as chariot wheels)
- b) ball bearings

c) mercury floats (used in the giant hyper-radial lenses)

Rotating lenses were powered by clockwork mechanisms which had to be wound at least once each night (the one at Point Sur had to be wound every four hours).

The Point Sur Lighthouse and Station

The "phantasmagoirc situation" of Point Sur, to use the term coined by Robinson Jeffers, was a significant challenge for the ships that circumvented it.¹² Point Sur was a witness to many shipwrecks over the years and marks a navigational turning point for ships travelling north and south along the Big Sur coast. The rock on the point was also a major challenge for those constructing the station, and not an easy place to live and raise a family for the lighthouse keepers.

Moro Rock is a steep, island-like point 369 feet high. Its top is only ten to twelve feet wide. Around much of the wedge-shaped point the rock faces are almost vertical. A stretch of soft sand connects the point to the main coastal headlands. Until the 1930's, when Route 1 was completed, there was barely a one-horse-and-wagon trail connecting this remote land to Monterey and civilization.¹³

Point Sur was part of an 8,800 acre land grant made to Juan Bautista Alvarado in 1834. Alvarado traded Rancho El Sur to his uncle John Cooper who owned it until his death in 1872. In 1853, the United States Coast Survey identified Moro Rock as a "good mark for vessels," and sketched its general outline and appearance. But no action was taken until 1866, when, by executive order, the federal government reserved "Moro Rock, Point Sur California, for lighthouse purposes" (1882 General Land Office Map). This reservation was made the same year that the patent was issued confirming Cooper's land grant.¹⁴

The first of a series of topographic inspections was made in 1866 which noted that locating structures "atop the steeply sloped and isolated site would be difficult and expensive." Congress did not appropriate the funds to begin its construction until 1886. (Fifty thousand dollars was appropriated in 1886, and again in 1889.)¹⁵

Construction was a monumental task. Materials were brought to Point Sur by lighthouse tender ships, transferred to a boat, then hauled to the top of the rock by a steam "donkey" engine railway. The first permanent structure to be built was a 53,000 gallon stone and cement water cistern. It was not until the summer of 1889, that the lighthouse and the light-keeper's dwelling were completed. The First Order Fresnel Lens was purchased by the US Lighthouse Service from the firm of Messrs. Barbier & Fenestre in 1887. It travelled from Paris around Cape Horn in a clipper ship arriving at Point Sur in 1889. The light became operational in August, 1889.

The characteristic of the light was originally a flashing red and white alternating signal which was then changed to an alternating white light.

The station was manned by members of the US Lighthouse Service from 1889 to 1939, when the US Coast Guard assumed the responsibility for all lighthouses in the United States.

The First Order Fresnel Lens was the light source at Point Sur until 1972. It was on November 22, 1972, that the Commanding Officer of the US Coast Guard Group in Monterey wired the Commandant of the Coast Guard in Washington that, pursuant to an order from Washington: "Point Sur LTSTA Automated and Resident Person No Longer in Attendance on 21 November 1972." A computer-controlled aero-beacon was installed and an era of history ended.

Rescuing a Treasure: Moving the Point Sur First Order Fresnel Lens to the Maritime Museum in Monterey by Richard McFarland

The desire to preserve the treasured, nearly 100 year old First Order Fresnel Lens at Point Sur brought together top-ranking representatives from the Navy and Coast Guard in 1978. Rear Admiral Earl E. Stone, USN, Ret, Director of the Maritime Museum requested his friend, Rear Admiral Edward J. O'Donnell, USN Ret, to write a personal appeal to Vice Admiral Austin C. Wagner, US Coast Guard, that "The Maritime Museum would be greatly interested in acquiring the old lens so that it can be preserved and displayed in the Museum for all to see." Approval for the removal and transfer of the light came from Admiral James S. Gracey, Commandant of the 12th Coast Guard District. Officially the entire mechanism was loaned in perpetuity to the Maritime Museum by the US Coast Guard in 1978.

With this beginning Admiral Stone directed me to work closely with the local Coast Guard Group personnel to disassemble, transport and reassemble the entire mechanism in the museum in Monterey. The result of my work and that of the officers and enlisted personnel of the Coast Guard is displayed in the Maritime Museum of Monterey in downtown Monterey adjacent to the historic Custom House, the Pacific House and Fisherman's Wharf.

I feel I must furnish the reader with some background information about the circumstances that precipitated the action of turning off the light and removing the works from the tower.

After a computer-controlled Aero Beacon Assembly was attached on the roof of the oil house at Point Sur and the tower itself was boarded up, the Fresnel Lens was left intact in its original position.

Some vandalism of the mechanism began to occur. This prompted the

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decision to remove the entire mechanism from the tower for safe keeping, public display and preservation.

Preliminary work started in 1978, with a series of inspections and written and photographic recording of the tower at Point Sur. Lieutenant Commander David Lyon, Group Commander in Monterey designated Lieutenant Sue Kinner, the Deputy Group Commander and Chief Warrant Officer Curt Lundine, the Engineer Officer of the group to work with me on the task.

The lens, comprised of over 50 individual frames was held together by brass bolts which had never been removed. It was decided that no power tools would be used in the disassembly work. We used only screw drivers and ball pin hammers to loosen the bolts in their sockets. CWO Curt Lundine, MT3 Glenn Miller and I worked on this project. As each section was unbolted and removed from the lens assembly it was lowered to the ground from the balcony of the tower, wrapped in a quilt, placed in a wheel barrow and hauled across the access road to the main road. It took three days to remove the lens. The rotating mechanism and supporting metal stand were left in the tower for later removal. After the lens had been taken apart we were proud to say that not one single thread had been damaged nor was there any damage to the glass prisms.

The disassembled lens was carried to Monterey by personnel from Wermuth Van and Storage Company, owned by Mr. Vince Torres, at no charge to the Museum.

Pieces which had been stolen were replaced by new pieces fabricated to exact specifications by civilian companies in Monterey and Salinas. Commander J.S. Glackett, US Coast Guard in San Francisco and Mr. Wayne Wheeler, a former Coast Guardsman provided invaluable expertise and advice for this project.

Each piece was cleaned, polished and finally reassembled on October 12, 1978.

The rotating mechanism and supporting stand was removed from the tower by Coast Guard personnel in August 1981, and placed in storage until the beginning of 1990, when restoration began on each individual piece in preparation for complete assembly in the new Maritime Museum at Custom House Plaza. A crew of volunteers headed by CWO Craig Bitler, the Operations Officer of the US Coast Guard Group in Monterey, Mr. Paul Beemer, a retired engineer and I refurbished and painted all the iron parts of the stand. Then the parts of the clockwork mechanism were polished and a preservative applied.

Volunteers who assisted in this deserve recognition and thanks: John Burd, Nils Christensen, Douglas Despard, Glenn Engholm, Hedley Jones, Mrs. Sydney Kalmbach, David Lueck, RADM William McClendon, CAPT James Neill, Mr. and Mrs. Ralph Mitchell, Ian Perry, CAPT William Provost, Dick Rotter, Gerald Smith, Ed Shirey, William Stanley, and CAPT George Whisler. Coast Guard personnel helpers were GM Mark Hayes, GM Ron Pearson and GM Cornel Sandoz. To all of them we owe a deep debt of gratitude.

Today our "beacon of light" is seen and admired by the many visitors to the Maritime Museum of Monterey. The three Admirals who were instrumental in allowing this treasure to be preserved would be well pleased to see their wishes have been accomplished. May the "beacon" continue to shine for many more years.¹⁶

FOOTNOTES

- Handy, Bruce; as quoted in "Point Pinos light as reliable as North Star": Salinas Californian, 1991.
- Wheeler, Wayne; "Augustin Fresnel and his Magic Lantern": The Keeper's Log, The United States Lighthouse Society, San Francisco, California, Winter, 1985, pps. 8 - 13.
- Rajan, Seshu; "The light on the rock: Building the Point Sur Lighthouse was a monumental task": Alta Vista Magazine, Monterey, California, July 12, 1992, p. 7.
- Nelson, Sharleen & Ted; California Lighthouses: Epicenter Press, Seattle, Washington, April, 1993, p. 55.
- Roland, Carol; *Historic Structure Report: Point Sur State Historic Park*: California Department of Parks and Recreation, October 1, 1991, p. 13.
- Roland, Carol; Historic Structure Report: Point Sur State Historic Park: California Department of Parks and Recreation, October 1, 1991, p. 14.
- 16. McFarland, Richard; Background files and memos, 1972.

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Noticias del Puerto de Monterey is a quarterly publication issued by the Monterey History and Art Association every March, June, September and December. ISSN No. 0886-7151 Change of address should be directed to the Association Office: 5 Custom House Plaza, Monterey, CA 93940 Non-Profit Organization Bulk Rate U. S. Postage PAID Permit No. 88 Monterey, California

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