

Coast Surveyors on the Pioneer Coast

By Captain Albert E. Theberge, Jr. NOAA Corps (ret.)



S. Westerly view from Harrow.



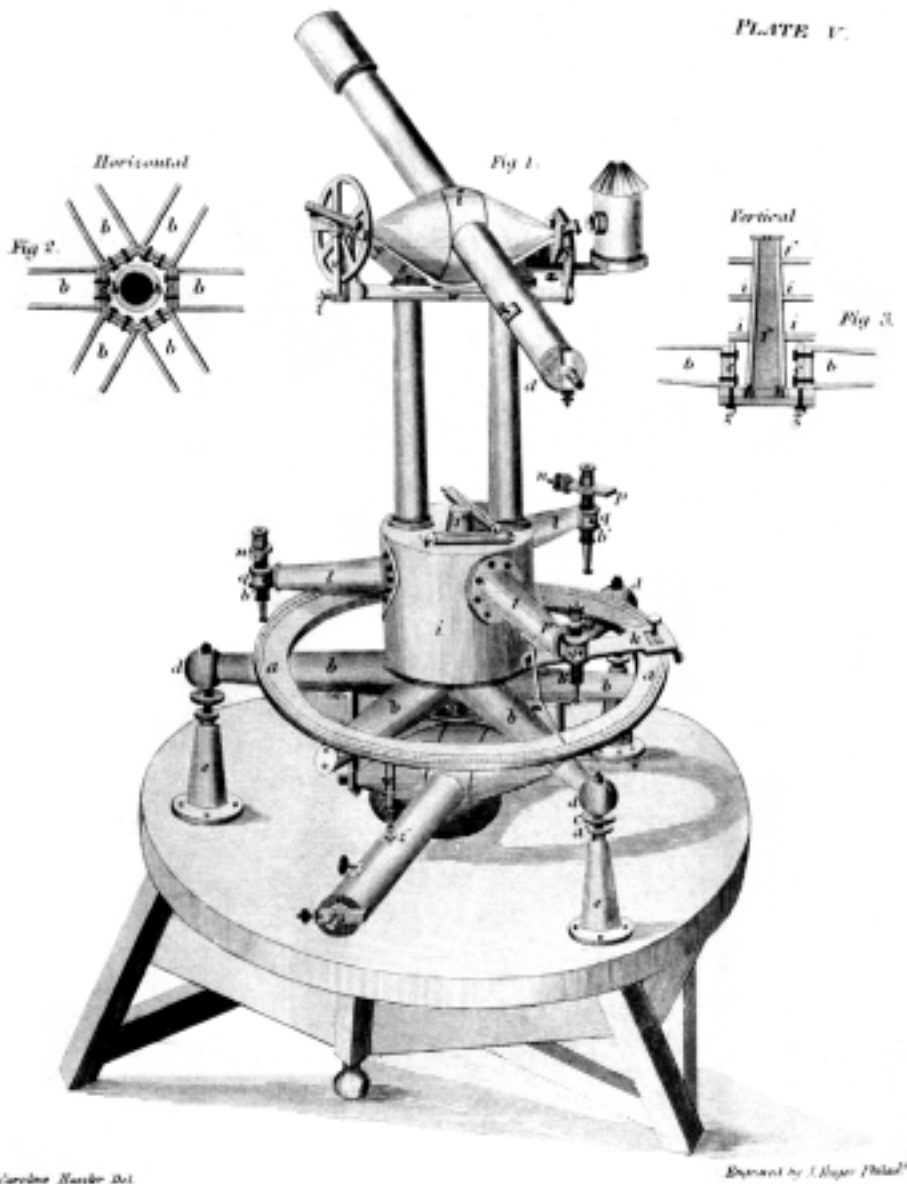
From Prince's Bay Light

OBSERVING PARTY OF UNITED STATES COAST SURVEY ONE HUNDRED YEARS AGO
TWO SKETCHES BY JOHN FARLEY MADE BETWEEN 1817-1841 SHOWING HASSLER'S FAMOUS CARRIAGE IN THE FIELD. THE LARGE THEODOLITE IS IN THE CARRIAGE.
STATION HARROW WAS ON NORTH SHORE OF LONG ISLAND AT HEAD OF HEMPSTEAD HARBOR. PRINCE'S BAY WAS APPARENTLY WHAT IS NOW KNOWN AS PRINCESS BAY, STATEN ISLAND.

Two sketches by John Farley between 1817-1841, show Ferdinand Hassler's carriage transporting the large theodolite used in surveying. "Harrow" was on the north shore of Long Island, at the head of Hempstead Harbor. "Prince's Bay" was apparently what is now known as Princess Bay, Staten Island. These sketches illustrate early surveying attempts along the eastern seaboard

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In general the American people have been presented with an American West of wagon trains, trackless deserts, fierce Indian warriors riding painted steeds, mesas and mountains, and vast herds of buffalo rumbling across an endless prairie. This view has glorified the sodbusters, the cattle ranchers, the U.S. Cavalry, the noble savage, the railroaders, the miners, the peace keepers, and the gunslingers. But there was another frontier—a frontier of uncharted waterways, bold and precipitous mountains doing perpetual battle with the on-rushing swells of the North Pacific, wild and tumultuous storms that could drive the unwary sailor upon an iron-bound shore, relentless fogs blocking the path of all but the bold or foolish, desert shores to the south and rainforest to the north, majestic redwood and



Caroline Hassler Del.

Engraved by J. Hager Philad^a

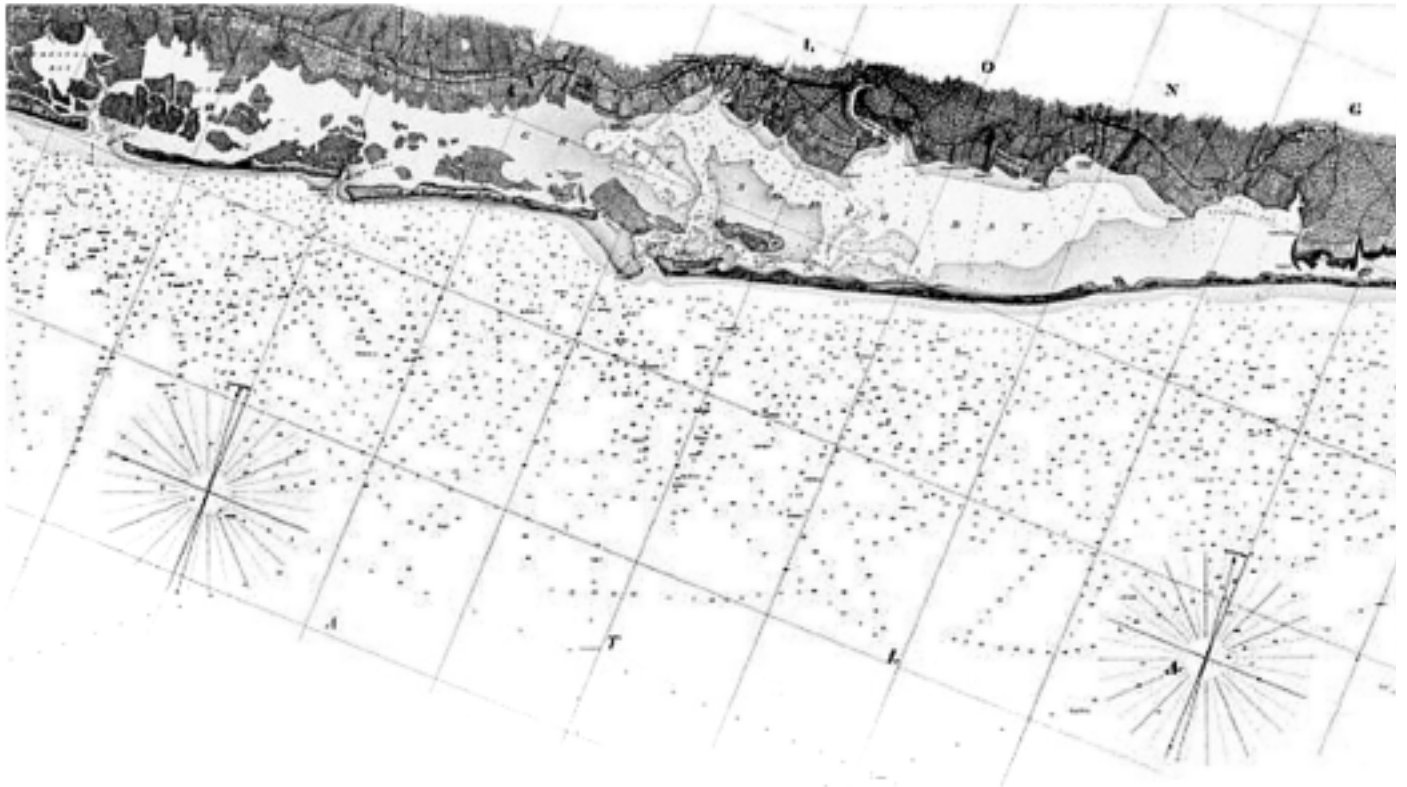
The Troughton 24-inch theodolite drawn by Caroline Hassler, from the: "Papers on various subjects connected with the survey of the coast of the United States," by Ferdinand Hassler, 3 March 1820. Treasures of the NOAA Library Collection, Call Number QB281.2 .H28 1825. (NOAA Citation)

fir forests growing to the very edge of the sea, and sea-going Native Americans who were as fierce and brave as their storied counterparts of the plains and deserts. This was the Pacific frontier, the western-most frontier that faced the first Coast Surveyors who made the arduous trip from the East Coast of the United States to the western margin of North America. More than any other organization, it was the United States Coast Survey that helped tame this frontier coast. A small group of dedicated surveyors helped make this coast as safe for commerce and travel as any in the world in the short space of a few years beginning in 1849.

The Coast Survey was the first physical science agency in the United States Federal Government and served as the model for all subsequent

Captain Albert E. Theberge is retired from NOAA Corps, the commissioned service of the National Oceanic and Atmospheric Administration. NOAA Corps is a descendant of the United States Coast Survey, known also as the United States Coast and Geodetic Survey. Captain Theberge was raised on the California coast on the north shore of Monterey Bay, and subsequently had tours of duty in both Monterey at the Naval Postgraduate School, and at Scripps Institution of Oceanography, San Diego. He served on four NOAA ships during his career and served also on mobile geodetic and hydrographic survey crews. Theberge directed the NOAA multi-beam surveys of the central California coast including surveys of Monterey Canyon and Davidson Seamount (named for George Davidson of the Coast Survey). He retired from NOAA Corps in 1995, after 27 years of service and has since been affiliated with the NOAA Central Library as historian of the Coast Survey and as a technical information specialist.

Theberge is the primary content provider for the NOAA History website at: <http://www.history.noaa.gov/> and the NOAA Photo Library at: <http://www.photolib.noaa.gov/>.



The chart of Great South Bay, Long Island 1834, is one of the earliest mapping efforts by the U.S. Coast Survey involving a hydrographic corps composed of naval officers.

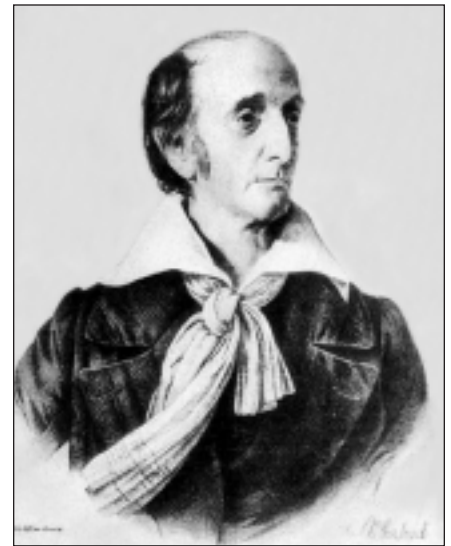
science agencies. It was authorized in 1807, during the administration of President Thomas Jefferson. Ferdinand Hassler, a Swiss immigrant who was an accomplished mathematician, surveyor, and scientist, was selected to head this embryonic science agency. Hassler's vision for the Survey of the Coast involved developing an interlocking geodetic survey network that would tie all surveys together and serve as the basis for a national mapping effort. An interlocking geodetic survey accomplished by the method of triangulation, which precisely determined the latitude and longitude of points on the surface of the Earth, was to be followed by topographic surveys which used the points determined geodetically as reference points from which to delineate the shoreline and near shore features. The geodetic and topographic surveys were accomplished prior to offshore hydrographic surveys which would measure depths positioned relative to the geodetic framework and the established shoreline. Other parameters such as tides and current, geomagnetism, and a variety of other ancillary observations necessary for construction of a nautical chart rounded out the suite of observations made by the Coast Survey. Thus, it became the first Federal agency to acquire massive amounts of geographic information including not only the core sciences of geodesy, topography, and hydrography, but also such areas as geophysics, marine geology, and physical oceanography. In short, it became a geographic information factory.

For its first 25 years the Coast Survey accomplished little because of animosity in the military services engendered by a civilian-headed science agency, a perception that little was accomplished for money spent, and the general lack of scientific knowledge of Congressional leaders who had little or no conception of either the nature of the work, or what it took to accomplish an undertaking as far-reaching as the survey of the coast of a large maritime nation. In fact, Hassler was removed as head of the Survey in

1818, when a law was passed removing all civilians from the Survey. By 1828, this situation led to the then Secretary of the Navy declaring charts produced in the intervening years as “useless and pernicious” and made “by incompetent men, with incompetent means”. Such comments, and a rising ground swell of opinion, led to the reinstatement of Hassler as head of the Survey of the Coast in 1832, a position he held until his death in 1843. By the mid-1830s, the name **Survey of the Coast** had been supplanted by **United States Coast Survey**, a name which survived until 1878, when the organization was renamed the **United States Coast and Geodetic Survey**.

Under Hassler, the Coast Survey began to develop into the premier science agency in the United States. Because of the lack of technical education in the United States at that time and the paucity of technically competent individuals, Hassler engaged in a program to use and train civilians and Army and Navy officers for the work. He also imported skilled Europeans for various facets of the work including topographic surveying, engraving, computing of results, etc. In general, Navy officers worked on hydrographic survey ships, while Army officers were assigned to triangulation and topographic crews, as well as a number of administrative positions in the Coast Survey offices. The first work by Navy officers was a hydrographic survey of Great South Bay, Long Island, conducted in 1834. Over the next nine years, Hassler built an organization of geodesists, topographers, hydrographers, technical draftsmen, engravers, mathematicians and instrument-makers. Although not all was smooth politically, during this period Hassler succeeded in building a strong foundation for the future. Triangulation had worked outward from New York to Massachusetts in the northeast and down to the head of the Chesapeake to the south. A few small harbor charts had been published and engraved, more importantly the first Coast Survey chart of New York Harbor and approaches was nearing completion. This chart would set the tone for the distinctive style which characterized Coast Survey charts for many years to come.

Ferdinand Hassler died on 20 November 1843. Hassler left a thriving organization imbued with principles of accuracy, scientific standards, and integrity as his gift to the American people. Even before his death, Alexander Dallas Bache and his good friend Joseph Henry were lobbying for Bache to be appointed the next Superintendent. Bache was a great-grandson of Benjamin Franklin and inherited both Franklin’s scientific abilities and political acumen. He was appointed Superintendent in December of 1843, and acted immediately to consolidate his position by expanding the operating area of the Survey throughout the Southeast and as far north as Maine. By doing so, he increased both the rate at which work was being accomplished and built political support for increased appropriations. By the 1850s, the budget of the Coast Survey was five times what it had been during Hassler’s tenure and it was operating in every United States maritime state and territory. The amount of information acquired was commensurate with the increased budget as well as the number of personnel. Thus, Hassler laid the foundation, but it was Bache who built the house.



Ferdinand Rudolph Hassler was the 1st Superintendent of the Coast Survey, 1770-1843.

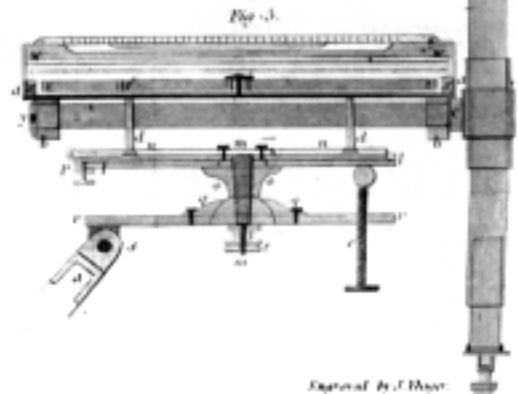
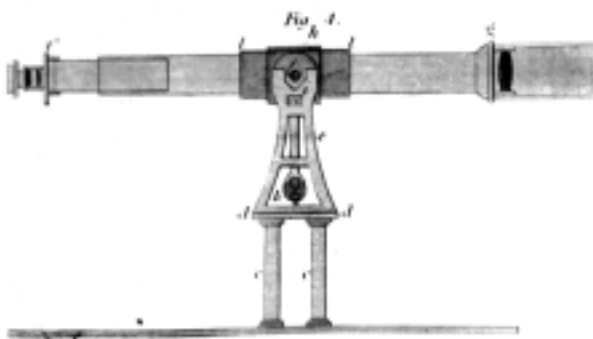
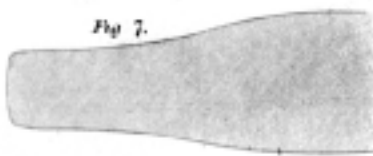
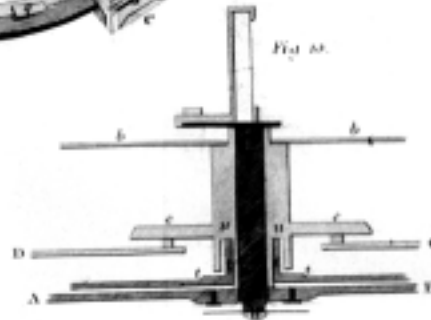
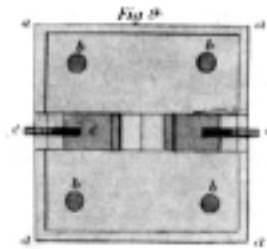
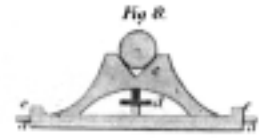
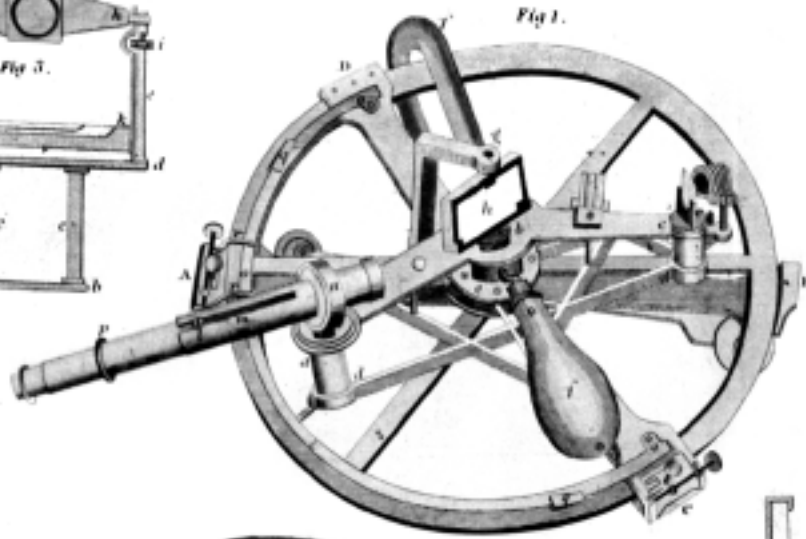
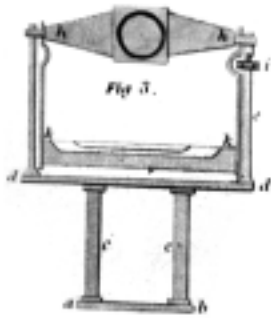
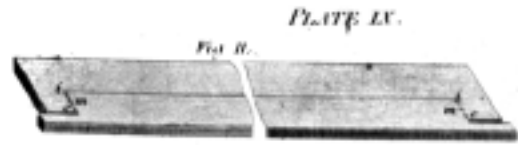
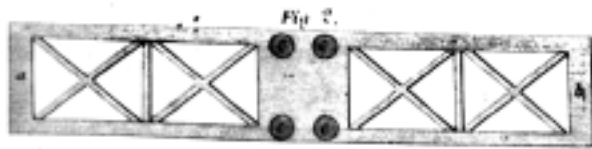
WANTED:

Young men with record to make willing for one year to do any duty, however hard or manual, incident to the survey on the western coast.

Such was the call in 1850, of the Superintendent of the Coast Survey in response to the need to survey the new territory and rugged western coast of the United States. George Davidson answered the call and stayed for over six decades. His name became synonymous with science on the Western rim of North America as he surveyed the coast, wrote the great Coast Pilots of our Western states and Alaska, and carried the geodetic network of the Coast and Geodetic Survey into the interior of California observing some of the most accurate classical triangulation work ever accomplished with classical instruments. George Davidson also served the science community and citizens of California as President of the California Academy of Sciences for 17 years, a Regent of the University of California, one of three commissioners of Irrigation of the state of California, and first President of the Pacific Seismological Society, forerunner of the Seismological Society of America. Davidson also led the first American science expedition to Alaska in 1867, and wrote the report that was influential in swaying Congress to authorize funding for what has become one of the best real estate deals of all time—the purchase of Alaska. George Davidson is commemorated by the naming of a mountain range in Alaska, a mountain in Nevada, a seamount

Pictured is George Davidson (1825-1911), pioneer Coast surveyor, in his later years onboard the steamer *Spokane* in 1907.





Designed by Gardner Whipple

Designed by J. B. Burt

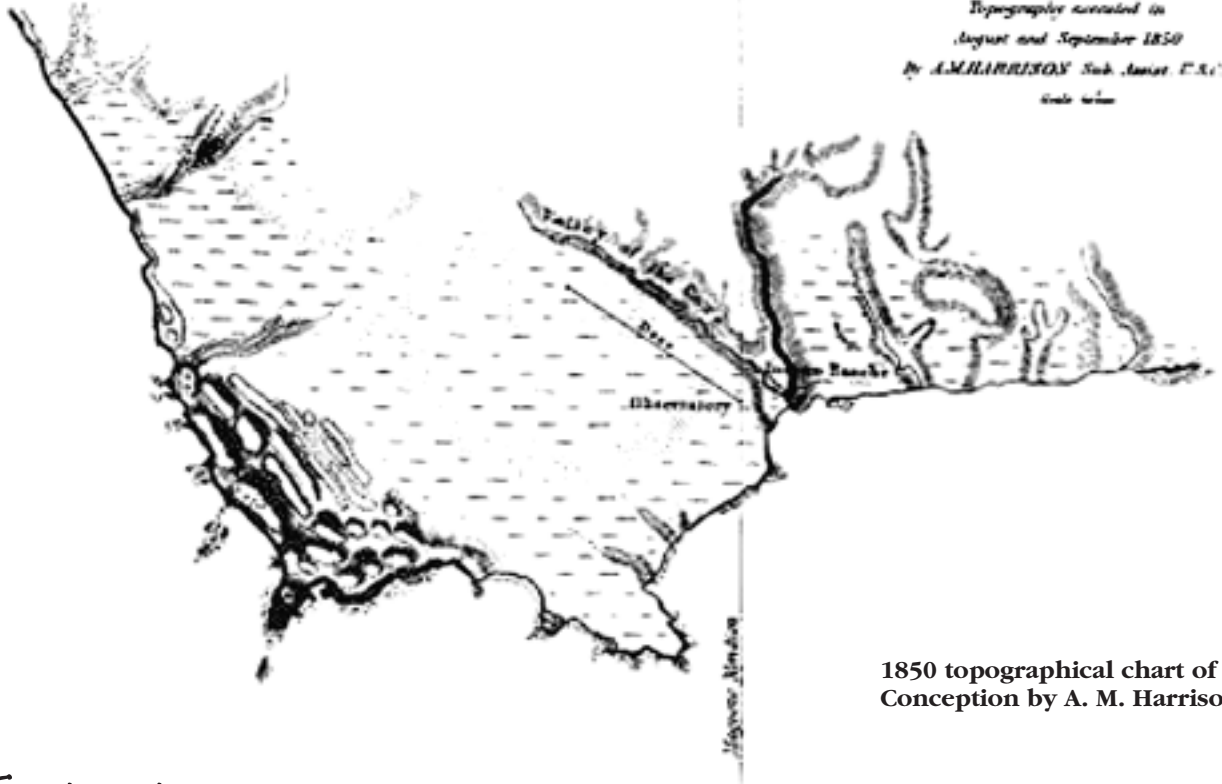
off California, the highest point in San Francisco, and a major offshore fishing bank south of the Alaska Peninsula. The decommissioned NOAA Ship *Davidson*, which had an illustrious career on the West Coast and Alaska, was also named for George Davidson.

Because of immigration to the Oregon country, the Coast Survey had been making plans to survey the coast of Oregon Territory as early as 1846. In 1848, Congress authorized this work and the Coast Survey sent its first crews to the West Coast in 1849. Unfortunately, the gold rush was on: labor, transportation, and costs of supplies skyrocketed with an accompanying stoppage of field operations. One crew, under Assistant

Displayed are various surveying and measuring instruments from the: "Papers on various subjects connected with the survey of the coast of the United States," by Ferdinand Hassler, 3 March 1820. Treasures of the NOAA Library Collection, Library Call Number QB281.2 .H28 1825. (NOAA Citation)

Sketch J No. 3
POINT CONCEPTION
Coast of California

*Topography ascended in
August and September 1850
By A.M. HARRISON Sub. Ass't. U.S.'S
Scale 1:100,000*



1850 topographical chart of Point Conception by A. M. Harrison.

*Coast surveyors
George Davidson,
A. M. Harrison,
John Rockwell and
James Lawson set sail
in 1850 onboard the
steamer Philadelphia
with a "reputation
to make and a
desire to overcome
all hardships..."*

James Williams was sent for the land operations and another crew, under Lieutenant William P. McArthur, USN, was sent for the offshore hydrographic surveying operations. The Coast Survey Schooner *Ewing* arrived in San Francisco on 1 August 1849, after a seven-month trip fighting its way around Cape Horn. The *Ewing* was a topsail schooner 91 feet in length. For a variety of reasons including desertions and a mutiny, the *Ewing* was stymied in 1849, and retired with the land crew to the Hawaiian Islands for the winter of 1849-50, to obtain new crewmembers and to resupply at cheaper rates.

Because of the above frustrations, Alexander Dallas Bache, Superintendent of the Coast Survey, decided that a crew of young energetic men with "reputation to make" and a desire to overcome all hardships should be sent to the West Coast in 1850. This group of four men was led by George Davidson, who would become the leader of the West Coast scientific community over the next half century. James Lawson, A. M. Harrison and John Rockwell comprised the remainder. Davidson, Lawson, and Rockwell sailed from the East Coast on 5 May 1850, on the steamer *Philadelphia* for Panama. They landed at Chagres, hired native Indians for traveling by canoe to the head of the Chagres River, and then joined a mule train to go the rest of the way to the city of Panama. On 30 May, they embarked on the Pacific Mail Steamship *Tennessee* and arrived in San Francisco on 20 June. After a few weeks spent establishing a base of operations, they proceeded to Point Conception, landing at El Coxo in mid-July.

In Lawson's words: "Pt. Conception is one of the most notable points on the

California coast, and its accurate position was particularly desirable, as it marked, in fact is the key to, the Northern entrance to the Santa Barbara Channel.” Harrison, the chief topographer of this group, joined them during the Point Conception work. By the end of September 1850, an accurate latitude and longitude of Point Conception had been obtained by precise astronomic means, its magnetic declination determined, a site for a lighthouse selected, and a topographic survey of the area about the selected location conducted. The labor involved with this was quite difficult involving the carrying of large heavy instruments from El Coxo to Point Conception and a 300-pound instrument stand.

Relative to the wages of the times, each of the young Coast Surveyors was paid \$30.00 per month. A cook they hired in San Francisco was paid \$125.00 per month, making more than this whole group of skilled engineers. Lawson suggested the weather was better than the storied “Italian skies” for this sojourn at Point Conception, but noted the continual offshore fog hid the Channel Islands from view for the first six weeks of their stay. The work was finally finished in early October and the crew hired a pack train and headed into Santa Barbara to await transportation to San Francisco. They “did the town” while there and met the famous otter hunters George Nidever and Isaac Sparks. They had earlier made friends with Don Luis Carillo, son of Don Anastasio Carillo, the owner of the Point Conception area. They stayed at Don Anastasio’s home while awaiting transportation and had many conversations with Don Luis. He felt they were near to transgressing the truth when they described the multi-story buildings of the East Coast and the railways, but “morally certain they lied” when they described the wonders of the telegraph.

Little was accomplished in Southern California the following year as the Coast Survey concentrated its efforts to the north of San Francisco. Although a source of supplies, Southern California was still considered a relative backwater at this time. However, an astronomic position, magnetic declination, and site for a lighthouse were determined at San Diego and a triangulation scheme and topography were carried southward to the Mexican border from San Diego. The *Ewing* proceeded north in a first reconnaissance survey from San Francisco to the Columbia River entrance and conducted a few surveys at the river entrance as well.

In 1852, the Coast Survey Steamer *Active*, under the command of Navy

A view of Point Loma (San Diego) from the entrance of False Bay (Mission Bay) with the Point Loma Lighthouse seen to the right, from: “Pacific Coast, Coast Pilot of California, Oregon and Washington Territory,” by George Davidson, 1869. P. 22. NOAA Central Library, Library Call Number VK947.D4 1869.





This is the only known photograph of the U.S. Steamer *Active*. Formerly named the *Goldhunter*, she was 172.5 feet in length. *Active* was purchased in 1852 for the West Coast survey and conducted the first reconnaissance from San Francisco to San Diego in 1852. Lieutenant James Alden was the commanding officer for most of its period with the Coast Survey. *Active* was also used as troop transport and as a dispatch boat during the various Indian wars and during the San Juan Islands Pig War. In the early stages of the Civil War, *Active* rushed Union troops to Los Angeles to be deployed. She was sold in 1862.

Lieutenant James Alden (one of approximately 800 Navy officers who served with the Coast Survey in the Nineteenth Century), made a first reconnaissance hydrographic survey from San Francisco to San Diego. On this trip George Davidson was put ashore with his equipment and acquired astronomic positions at San Luis Obispo, Santa Barbara, Prisoner's Harbor on Santa Cruz Island, San Pedro, Santa Catalina Island, San Clemente Island, San Nicolas Island, and Cuyler's Harbor on San Miguel Island. This marked the first time that these islands had been adequately located. By the end of 1852, most of the major headlands and points of interest for mariners between the California-Mexico border and Cape Flattery, Oregon Territory, had been accurately determined by George Davidson and his assistant John Rockwell. Rudimentary charts of many of the observed harbors and islands of Southern California were produced by the end of 1852.

During these first three years of Coast Survey operations on the western coast, a relatively accurate general outline of the coast was sketched in and many dangerous errors corrected, the geographic positions of the major headlands and landmarks determined, magnetic declinations at strategic points observed, and locations for lighthouses recommended. The detail work of connecting the various independent astronomically determined locations by triangulation (much more rigid positioning than attainable through astronomic means), and conducting topographic mapping of the shoreline and offshore hydrographic surveying that would be controlled by the triangulation network, was ready to begin.

A fourth major component of Coast Survey operations was the observation of tides, initially only done to establish a local datum during hydrographic survey operations such that water depths could be reduced to a plane of reference. To obtain readings, either a sailor attached to the survey party or a local citizen was hired to read the water level on a temporary tide staff either every hour or some fraction of an hour never less than every 15 minutes. This situation changed radically in 1854 with the introduction of self-registering tide gauges that were able to continually trace a near-sinusoidal tidal record on a drum-mounted sheet of paper. Tidal height was read from these tracings and correlated with time, which ultimately led to the development of tide prediction tables.

Within six-months of the establishment of self-recording gauges at San Francisco and San Diego, a great earthquake and tsunami occurred on the coast of Japan. Remnants of the tsunami were recorded as super-imposed waves on the tide records. From these squiggles, Superintendent Bache was able to compute an average depth of the Pacific Ocean which was within 10% of modern values. This remarkable feat was done when only a handful of deep sea soundings had been obtained in the Pacific Ocean and even those were of dubious accuracy. The tidal observations begun at San Francisco in 1854 have continued through storm, earthquake, fire, changes of technology, and myriad opportunities for human error. Today they constitute the longest unbroken series of tidal observations in the Western Hemisphere and have served to record subsequent tsunamis including those from the eruption of Krakatoa, record the inexorable rise in sea level which has been noted over the past century, and served as a major factor in the ability to predict West Coast tides.

Such was the nature of the work of the Coast Survey on the West Coast in the early 1850s. On 20 July 1854, a young Navy Passed Midshipman, Philip C. Johnson, reported for duty on the Coast Survey Steamer *Active* under the command of Lieutenant Commanding James Alden, Jr. and remained associated with Alden's party until detached in 1859. During this period, Johnson wrote of his survey activities, personal observations of fellow naval officers and Coast Surveyors, and a description of naval activities during Indian uprisings in Seattle, in late 1855 through March 1856, in one of his diaries featured in this issue of *Mains'l Haul*.

Perhaps in anticipation of the coming Civil War, there had been a gradual drawdown of naval officers assigned to the Survey starting in 1858, and Johnson was part of that process. Following the Civil War,

Johnson became one of the first naval officers to be reassigned to the Coast Survey and served from 1871-1875 on the Survey as commanding officer of the Coast Survey Steamer *Hassler*, which came to the West Coast via the Straits of Magellan in 1872. Altogether, Johnson served over eight years on the Coast Survey most of it was in our western waters. He ultimately retired as a Commodore from the Navy and became a Rear Admiral in 1887.

The Coast Survey has continued to serve the people of the West Coast of the United States and Alaska. Although it has gone through name changes from **Survey of the Coast** to **Coast Survey**, then to **Coast and Geodetic Survey** (1878), and finally reorganized into a number of sister offices in the **National Oceanic and Atmospheric Administration (NOAA)** of today, much of the basic mission remains the same. Real-time tides, currents, and meteorological conditions are observed and passed to marine pilots and ship operators through the PORTS system of NOAA's Center for Operational Oceanographic Products and Services in many of our major harbors; modern electronic charts produced by NOAA's Office of Coast Survey guide mariners while transiting United States marine waterways; and NOAA's National Geodetic Survey helps support the Coast Guard's Differential Global Positioning System network, which provides pinpoint navigation information to mariners in our ports and coastal waters.

Editor's Note: All images and charts Courtesy of the NOAA Central Library.



Although the frontier coast is gone, the spirit of the old Coast Survey lives on in the NOAA of today, providing accurate charts, forecasts, and other services that help save the lives of mariners and protect cargoes entering and leaving our ports.

