CHAPTER ONE

Only One Hassler for the Coast Survey

The President of the United States being authorized by an act of the last Session to cause the whole of the coast of the said States, together with the adjacent shoals and soundings to be surveyed, it is his intention that the work should be executed with as much correctness as can be obtained within a reasonable time; and he has directed me to apply to you, requesting that you would have the goodness to suggest the outlines of such a plan as may, in your opinion, unite correctness and practicability. Permit me also to ask, whether you know any person whom you might recommend as capable of acting in the different parts of the work.

Albert Gallatin, secretary of the Treasury, Circular Letter on the Survey of the Coast, March 25, 1807

They should have known better, those strangers up there on Bald Hill. It was July, after all, and in July sudden, fierce squalls like the one that pushed through on the afternoon of the twenty-fourth in 1833 were pretty common in western Connecticut’s Norwalk River Valley. They said they were surveyors working for President Andrew Jackson, making a map of the coast. The locals thought they might do a better job of mapping the coast down there on the coast, instead of climbing up a hill five or six miles inland, but that wasn’t their concern. There were seventeen or so in the party led by a balding, fussy old man with a foreign accent. They called him “Professor.”

The Professor and his crew had set up their camp on the twentieth. They sweated and cursed their theodolite to the top of the hill, six hundred feet or more above the river bottom. It was a big instrument, much bigger than any instrument used by the local land surveyors, with a three-foot telescope mounted on a twenty-four-inch circular base that had a scale they used to measure angles. They could, they claimed, see all the way across the Long Island Sound to signals they had set up at West Hills and Mount Pleasant, a distance of more than twenty-seven miles.
At about two o’clock, when the Professor finally paid attention to the ominous black squall line bearing down on the exposed hilltop, he scurried to the tent that protected the theodolite. He emerged moments later, the telescope cradled in his arms like his first-born child. Glancing nervously at the sky, he ran awkwardly, with a Charlie Chaplin silent-movie gait stiffened by age and a fall on the rocks three days previous, hoping to protect the telescope in one of the other more substantial tents. By the time he came out of the tent, the wind tore at the tree branches, and opaque sheets of rain mixed with stinging ice pellets pounded the hilltop. He shuffled back to the observation tent, where some of his crew struggled to hold down the flailing canvas that threatened to carry away the rest of the instrument. He shouted at the men in his accented English as though they could actually hear him over the howl of the wind and the crash of thunder. He slipped between the struggling assistants and into the small tent. Seconds later he and another of the surveyors struggled from the tent, carrying the circular base of the instrument. Hail ricocheted off the bare metal. The two men, battered by the wind, tried to set their burden on the ground. A gust snagged the Professor’s blue cloth cloak, the one he wore regardless of the weather, on one of the projections of the instrument. Another gust shoved at man and instrument, and the theodolite base fell over onto the muddy ground. Behind the prostrate, drenched Professor the storm ripped the ropes and canvas from the hands of his crew. The observation tent disappeared into the storm. All the tents in the camp, except one, were blown away. The theodolite was damaged. Three barometers were so badly broken they had to be shipped back to New York for repair. But the Professor had come through too many troubles over too long a time to let a summer squall stop him. He repaired and realigned the theodolite. His crew rebuilt the camp. By July 27, when he described the incident in a letter to Secretary of the Treasury W. J. Duane, the surveyors were back at work.

The determined man on Bald Hill was Ferdinand Hassler, the first superintendent of the United States Coast Survey (fig. 1.1). He had come to America in 1805 leading a group of Swiss emigrants. Landing in Philadelphia, they discovered that their agent had speculated with their land purchase funds and lost. Hassler decided to stay in America. Trained in geodetic surveying, he responded to a request from his fellow Swiss immigrant Secretary of the Treasury Alfred Gallatin and proposed a plan of operations for the coastal mapping that the United States Congress ordered in 1807. Gallatin accepted the plan. Hassler and a man named Isaac Briggs, an engineer who later became famous for his work on the Erie Canal, were selected to execute the survey.

Congress initiated the survey of the coast in response to compelling pressures. The United States was a maritime nation long before it became a
continental empire. The new democracy’s commerce depended on oceanic and coastal shipping. A thousand ships, mostly sloops and schooners, plied the coastal trade, supplying American cities and collecting goods for export. Oceangoing merchant ships moved grain, tobacco, and a variety of raw materials and manufactured products to Europe. Salt fish was shipped to the West Indies and exchanged for rum, sugar, and molasses. Captains of American whaling and fur-hunting vessels sailed even farther afield, into the frozen reaches of the world’s oceans.

Frequently the most hazardous part of the journey came when the ships left or approached ports on their own coast. Coastal charts were scarce and inaccurate. As late as 1844 Lieutenant Commanding George S. Blake, who conducted surveys in Delaware Bay, reported: “There is no chart extant of the Delaware deserving the name. The situation assigned by the most authentic chart to one of the principal light-houses is nearly seven miles in error. Many dangerous shoals having but few feet water upon them, and upon which numerous wrecks have occurred, are laid down from three to five miles from
the truth, and the bay is in one part represented as fifteen miles in width, when it is actually but seven. Making accurate charts of the American coast was a matter of dollars and cents, and life and death.

An English aristocrat who was, in no particular order of disrepute, a bastard, a bigamist, a mathematician, and a skilled cartographer made the first detailed charts of the coast of North America in 1645. Robert Dudley was born in 1573, the illegitimate son of the Earl of Leicester. In 1594 he commanded two ships on a voyage of discovery to the Caribbean, encountering and destroying two Spanish ships along the way. Two years later he served with the British squadron that attacked the Spanish at Cadiz. The attack resulted in a major English victory. Robert became Sir Robert, knighted by the fleet commander, his uncle, Lord Charles Howard of Effingham. Perhaps encouraged by his knighthood, Sir Robert brought suit to establish his legitimacy. When the case was decided against him, he angrily departed for Italy with his mistress and future wife, Elizabeth Southwell, leaving England and his first wife behind forever. He spent the remainder of his life as a highly regarded military engineer in the service of the Duke of Tuscany.

During his stay in Italy, Dudley produced Dell’Arcano del mare (The Mystery of the Sea). The six-volume work covered navigation, shipbuilding, and astronomy, with 130 maps in two of the volumes. He published the atlas in 1646 and again in 1661. It was the first sea atlas to cover the entire world and the first to use the Mercator projection throughout. Dudley compiled the maps mostly from Dutch sources, with updates based on English maps and on his own experience in the West Indies. The atlas included a map of the eastern seaboard from the Gulf of St. Lawrence to Cape Canaveral, Florida. More detailed charts covered portions of the coast. The Carta particolare della Virginia vecchia e nuova (Detail Map of Old and New Virginia), for example, depicted the coast from Cape May, New Jersey, to Cape Fear, North Carolina, and provided soundings measured in fathoms for Pamlico Sound.

Although Dell’Arcano del mare gave Dudley historical priority relative to detailed maps of the North American coast, he would probably have preferred that it be a commercial success. It was not. It was admired for its innovation and artistic qualities but saw little if any use as a navigation tool.

The direct line of succession for more practical coastal charts runs from the portolan (from the Italian portolano or "pilot book") charts that first appeared in the thirteenth century to the coastal charts that the Dutch developed in the late 1500s. The exact genesis of the portolan charts is a mystery, though it roughly coincides with growing use of the compass. Before the charts were developed sailors made do with portolani, texts that listed ports and the distances and directions between them. The charts, as the name implies, marked
a dramatic change from words to pictures, from text to graphic form. They were hand scribed and often beautifully decorated in the style of an illuminated manuscript, on carefully finished sheep or cow skin. Networks of straight lines emanating from central points like the radii of circles covered the chart and were superimposed on an outline of the coast, showing the names of places of interest to the navigator. These straight lines, or rhumb lines, were constant compass bearings. To find a course from place to place the navigator connected the two places by laying a straightedge on the chart. He could then find a rhumb line parallel to the straight edge that connected the two points and steer that bearing from point of departure to destination.

The portolan charts provided the primitive pattern for the modern coastal chart. Lucas Janszoon Wagenhaer, a Dutch pilot from the town of Enkhuizen, built the detailed prototype. His atlas, *Spieghel der Zeevaert* (Mirror of Navigation), published in 1584, contained forty-four charts covering Europe from the North Sea to Spain. These are true coastal charts. The configuration of the shoreline is shown. The coastline cliffs are drawn to suggest their elevation. The rhumb lines, characteristics of open sea passage, are gone. More important, a new information density is added to the graphic portrayal of the coast and its topography. The charts display soundings in fathoms and a scale in English, Spanish, and Dutch leagues. They show navigational landmarks, shoal water, rocks, and other hazards, anchorages, and tidal details. The basic format of the modern coastal chart—a graphic portrayal of the coastal geography overlaid with information selected for its direct utility to the approaching navigator—was in place.

Pioneering efforts in the visual portrayal of coastal conditions, Wagenhaer’s charts were still unreliable. The location of the essential features of the coast was approximate at best. There were no lines of latitude or longitude. The question of portraying a curved surface on a flat map was not considered. Scales were placed on the charts, but important features such as harbors were clearly enlarged, departing dramatically from the advertised scale. Fundamentally the charts were useful approximations based not on precise surveys but on the accumulated experience of coastal sailors and on hearsay and conjecture.

Whatever their limitations, the Dutch charts were bestsellers. English mapmakers produced their own versions. In 1689 John Thornton and William Fisher published *The English Pilot: The Fourth Book*, the first atlas of coastal charts devoted exclusively to North American waters. English publishers produced thirty-seven editions between 1689 and 1794. Navigators on the American coast used the charts extensively despite the fact that few of the charts were based on actual surveys, and only minor corrections and updates were made over the course of a hundred years. The navigators paid the price.
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“Remote areas such as Sable Island and the Bermuda Isles became virtual graveyards for ships, and vessels reaching these shores sometimes drifted back and forth along the coast for weeks before a local pilot could bring them safely to port.”

Competitive pressure produced the few updates that the publishers of *The English Pilot* issued. Joseph Frederick Wallet Des Barres, a Swiss-born Huguenot who served as a military engineer with the British army in North America, produced most of that pressure. Between 1774 and 1784 Des Barres compiled a series of charts of the North American coast that became known collectively as *The Atlantic Neptune*. The 180 charts in the series were based on Des Barres’s own surveys as well as on the surveys made by British naval vessels and British commercial interests. They became the standard reference for navigators on the North American coast and remained in use well into the nineteenth century.

At the close of the Revolutionary War, American navigators were dependent on these charts produced by their recent enemy, charts that were rapidly going out of date as weather and water constantly altered the configuration of the coast. American commercial sources tried to make up the deficit, relying mostly on the material available in *The Atlantic Neptune*. Edmund March Blunt and his heirs operated the most famous and authoritative of the commercial ventures. Originally a bookseller and newspaper publisher in Newburyport, Massachusetts, Blunt had become aware of and was dismayed by the errors in existing navigation guides. Gradually he gave up his other pursuits to focus on navigation charts and books. In 1796 he published *The American Coast Pilot*, which would be updated until after the Civil War, when the copyright was sold to the United States Department of the Treasury.

Blunt’s early charts owed much to *The Atlantic Neptune* and even to *The English Pilot*. The updates were increasingly based on surveys carried out by the U.S. Navy, the U.S. Army Corps of Topographical Engineers, and Blunt and his sons. Navigators respected the accuracy of the charts. But a private firm could not keep up with more than one thousand miles of ever-changing coastline. Blunt himself acknowledged that he “had undertaken a duty, the performance of which belongs rather to a nation than to an individual.”

The newly minted United States government was slow to take up the slack. Presidents and lawmakers focused on more immediate problems: continuing strained relations with the recent enemy, Great Britain; a near conflict with a recent ally, France; and efforts to find a formula for governing that would survive those and other tensions. Maritime interests petitioned Congress. Sporadic, uncoordinated surveys were undertaken on Long Island Sound and on the North Carolina and Louisiana coasts. At the turn of the nineteenth century,
with a growing population and increasing maritime commerce, the United States was falling behind in the understanding of its own coastline as wind and currents made the inadequate stock of existing charts obsolete. By 1807, the year Congress began to respond to the need, total American exports had increased to more than $108 million, in contrast to less than $10 million at the end of the Revolutionary War. Between 1791 and 1807 New England exports alone grew by a factor of sixteen from $3.8 million to $24.1 million. Despite interference by both the French and British, who victimized American shipping in pursuing their wars against each other, the tonnage of American shipping had increased by more than 500 percent to 1,208,735 tons. Total registered tonnage for the entire British Empire in the same year was 2,281,621.

The problem was lack of focus, not lack of capability. The methods available to chart makers had evolved significantly since the publication of The English Pilot in 1689. Mapmakers in that era frequently built their charts based on their own experience and recollection of the coasts they had sailed rather than on actual surveys. Others who had never actually seen the coast built charts based on hearsay evidence from those who had. Surveys, when they were made, were made with the most basic of tools—compass, log, lead line, and hourglass. These were running surveys made as the survey vessel moved along the coast. A compass bearing was taken on some feature of the coast, a headland, an island, or the mouth of a river. When the vessel had moved some distance along its course, a second bearing was taken on the same feature. The course and distance that the ship ran provided a baseline that, along with the compass bearings, could be used to estimate the distance from the ship to the coastal feature. Combining a series of these estimates, the surveyor constructed a chart of the coast. The results were approximate at best. Baseline distances depended on estimates of the course and speed. Unfamiliar tides and currents continually varied the ship’s course. Distance run on the uncertain course was equally uncertain. The math was straightforward enough—distance equaled speed multiplied by time. But the speed was measured by trailing a knotted rope over the side. An hourglass measured the time.

Land surveyors, prompted by European kings and nobles interested in the size and defense of their holdings, developed the techniques and tools to eliminate most of the uncertainties in the running surveys. In Libellus de locurum, published in 1533, Gemma Frisius, teacher of Gerhardus Mercator, described the most fundamental of those techniques—triangulation, a method that would be the basis of precision surveying until the twentieth century. Frisius’s method was mechanical. The surveyor measured with all possible precision a baseline connecting two observation points. From these points, he measured
the horizontal angles to distant survey points, a series of man-made and natural features—steeples, hills, and rock pinnacles. He then transferred the baseline to a plotting sheet at a chosen scale. To reproduce the relationships between the baseline and a survey point, he drew lines from the ends of the baseline, duplicating the angles measured for that survey point. The intersection of the lines marked the position of the point, re-creating on paper the direction and distance measured in the real world. Plotting the remaining points, the surveyor made a map—a precise planar model of the baseline and the points sighted from either end of it.

A Dutch mathematician and professor at Leyden University, Willebrord Snell, extended Frisius’s method from the mechanical and local to the mathematical and global. He decided in 1615 to undertake the modest task of measuring the circumference of the earth. He established a network of triangles between Alkmaar in the north of Holland and Bergen op Zoom in the south. Carefully measuring a single baseline, he used the result to calculate the length of the sides of his triangles, using trigonometrical formulas. Knowing these measurements, he could determine the distance between the towns. Astronomical measurements gave him the latitudes of the same two towns, allowing him to calculate the length of a degree of latitude and consequently the circumference of the earth. The figure he arrived at was within 4 percent of the actual value. Snell had invented modern geodesy, the branch of applied mathematics concerned with the size and shape of the earth. More important, he had developed methods that could be used to measure and map precisely large areas of the earth’s surface.

The French took the next step—the trigonometrical survey of a whole country. In 1666 Louis XIV directed Jean-Baptiste Colbert, his minister for home affairs, to create the Académie Royale des Sciences and charge it with the task of correcting and improving maps and charts of France. The royal timing was about right. In the interval since Frisius had made his first measurements, European innovation had produced techniques and technology with the potential to revolutionize mapmaking. French cartographers combined those methods and tools to impose scientific rigor on a process long dominated by hearsay, speculation, myth, and proselytizing. Snell’s mathematical triangulation technique was well known. Galileo Galilei and Christiaan Huygens had developed tools that dramatically increased the precision of the angle measurements and astronomical observations essential to Snell’s triangulation. In 1609 Galileo improved the design of a primitive Dutch invention—the telescope. The French astronomer Jean Picard, one of the first of France’s premier scientific mapmakers, added Galileo’s telescope to the quadrant, a quarter circle, graduated from 0 to 90 degrees, that had been used at sea and
LONGITUDE BY WIRE

on land for two hundred years for measuring vertical and horizontal angles. With the upgraded instrument surveyors could measure the angles of the triangulation network with an error of less than one minute of arc. Astronomers used the same instrument to measure the altitude of the sun at apparent noon. Straightforward calculations using that angle and a table of declinations that gave the sun's angle above the equator yielded the latitude of the observer. In 1616 the ever-innovative Galileo developed a method for measuring the last coordinate needed to make the French maps—the longitude. He recognized the possibility of using the regular eclipses of the moons of Jupiter, which he had discovered with his telescope, as a timepiece to measure longitude. Comparing the local time difference between two locations viewing the same eclipse yielded the longitude. The missing element was a clock reliable enough to measure the local time of the Jovian eclipses. In 1657 Huygens met the need with the first reliable pendulum clock, accurate to within ten seconds a day. A good spring-driven clock of the period might have had an error of four hundred seconds a day. Responding to the royal directive, the French cartographers could precisely measure their triangles, fix them firmly to the real world by measuring the latitude and longitude of major triangulation points, and then calculate the direction and distance between the major features of a greatly improved map of the royal domain.

Four generations of the Cassini family, beginning with Jean-Dominique, whom Colbert had invited from Italy to spread the message of longitude by the Jovian moons, doggedly drove the triangulation network across the French countryside through the reigns of three kings and a bloody revolution. The final product of more than a century of labor and innovation, the Carte di Cassini, was published in 1793. It was the first topographic map of an entire country, based on trigonometrical surveys. It was a physically impressive product, drawn on a scale of 1:86,400 and engraved on 180 sheets that if joined together would make a map thirty-three feet high and thirty-four feet wide. The map was remarkable too because the French had mastered the essential technical details of precision mapmaking. Along the way they discovered that the world to which they fixed those triangles was not a sphere but an oblate spheroid. Their successors would improve instruments and multiply available map projections, but the French had demonstrated every task essential to precision mapping.

In parallel with the work on the Carte di Cassini a group of the king's engineers worked to revise the existing charts of the French coast, making detailed surveys anchored by astronomical observations supplied by the Académie. In 1693 the elder Cassini and Hubert Jaillot, an artist who gave up sculpture to become one of the outstanding geographers of the seventeenth century,
published the results in an atlas of coastal charts, *Le Neptune françois*. The French engineers replaced charts that had been based on hearsay, unreliable recollection, or at best running surveys with carefully measured graphic depictions of the coast and its hazards. The *Neptune* charts used the map projection developed in 1569 by Flemish geographer Gerhardus Mercator. Mercator’s projection used a rectangular grid of latitude and longitude lines to map the spherical earth. The grid distorted the size of objects but preserved shape and direction—the two features essential to safe navigation. The French charts showed sandbars, soundings, and scales in French, English, Spanish, and German leagues as well as in French toises. Although they retained the rhumb lines that connected them to the ancient portolan charts, and the prime meridian passed through the Azores twenty degrees west of Paris, they were otherwise thoroughly modern.

The French initiative also made the political imperative clear. Even before the French map was published, national surveys were becoming commonplace on the Continent. Austria initiated a survey in 1762. Sweden, Denmark, and Norway all had begun work by 1773. The British initiated the Ordnance Survey in 1791. Large-scale mapping and charting was beyond the capabilities of private surveyors. Only governments could focus the essential self-interest, authority, and resources.

By 1800 every technical and organizational model that the American government needed to map its coast was available—on the other side of the Atlantic Ocean. The gods who watch over technology picked a peculiar messenger and a tortuous path for the transfer of this European mapmaking experience to the New World. Ferdinand Rudolph Hassler was born into a wealthy and well-known family in the Swiss town of Aarau on October 7, 1770. As a teenager he came under the influence of Johann Georg Tralles, a brilliant, demanding professor of mathematics and physics in Bern. Tralles inspired in Hassler a lifelong dedication to mathematics and geodesy. The young Hassler made trips to France and Germany to meet the famous astronomers and geodesists of the day and to collect books and instruments. He gained practical experience as well, participating in a trigonometrical survey of his home canton of Bern. What might have been a life dedicated to science in his home country was abruptly altered in 1789 when the French army marched into Bern. The Swiss survey was suspended. Five years passed in inconclusive discussions about how French and Swiss scientists might collaborate. In 1803 it became evident that the French meant to control the Swiss surveys. Tralles, determined not to be subordinate to the French, left Switzerland for Berlin. With his mentor gone and Europe in turmoil, Hassler became involved in a scheme to purchase land in South Carolina or Louisiana.
The land venture failed. Hassler found himself in America stressed both financially and physically. He sold books from his scientific library and borrowed money to keep his family going. In Philadelphia he became acquainted with a number of prominent men with interests in science. Several of them, including Professor Robert Patterson, director of the Philadelphia Mint, described Hassler’s background in geodetic surveying to President Thomas Jefferson. When Secretary Gallatin issued a circular letter on March 25, 1807, asking prominent scientists to propose a plan for a survey of the coast, Hassler received a copy. He replied, in French, on April 3. Gallatin notified Hassler that his proposal had been selected on July 23. On December 22 Congress, at the urging of Jefferson, passed the Embargo Act in response to British and French interference with American shipping. International trade was suspended. Twenty thousand seamen were out of work. Surveying the coast had little priority. Hassler’s new career evaporated. Fortunately Hassler had had the foresight to keep his day job. But that work wouldn’t last either. In February 1807 he had accepted a position as a professor of mathematics at West Point. Early in 1810 William Eustis, the new secretary of war, decided that employing civilians at West Point was not authorized. The sudden policy change gave Hassler his second lesson in the government-induced turmoil he would encounter repeatedly throughout his career. Forced to resign, he then became professor of natural philosophy and mathematics at Union College in Schenectady, New York, where he entered into an uneasy truce with his restless students.

In 1811 President James Monroe reconstituted the survey. Gallatin sent Hassler to England to procure the required instruments. Caught abroad by the War of 1812, he did not return to the United States until 1815. On August 3, 1816, after seven months of haggling over salary, authority, and responsibility, Hassler officially became superintendent of the Coast Survey. Hassler’s response to the appointment in an August 18 letter to his new boss, Secretary of the Treasury Alexander James Dallas, was decidedly low-key and all business. Privately Hassler must have felt considerable satisfaction. After all, no one believed more fervently than Ferdinand Hassler that Ferdinand Hassler was the right man to be the first superintendent of the U.S. Coast Survey. He immediately began the first fieldwork the Coast Survey accomplished, a reconnaissance trip on Long Island. By June 1817 he had measured the first triangulation baseline between Cherry Hill and Vreeland, New Jersey.

In April 1818 the U.S. government delivered another ugly surprise. Critics of Hassler’s painstaking, time-consuming trigonometric survey methods had lobbied Congress claiming that “chronometric surveying” carried out by military officers with sextant and timepiece was a faster and cheaper way of
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mapping the coast. Sextants would measure the latitude. Longitude was literally a matter of time—one hour of time represented fifteen degrees of longitude. The difference in local time between survey locations would provide their difference in longitude. Transporting chronometers from a place of known longitude to a place of unknown longitude would supply the local time difference. The latitude and longitude of key survey points plotted on an appropriate map projection produced a coastal chart. Hassler contended that the timepieces were too prone to error. Chronometric surveys would never produce maps good enough to meet the needs of American mariners or win the respect of the European scientific community. Hassler frequently stressed the second point more than the first, much to the annoyance of pragmatic congressmen who wanted charts and wanted them now. Influenced by the critics, Congress began to press for progress reports and a completion date for the survey. Without waiting for Hassler’s response, they passed a law requiring that military personnel execute the survey. Once more out of a job, Hassler took a position as surveyor of the northeastern boundary between the United States and Canada. After just thirteen months, he resigned because of a dispute over his salary.

Again unemployed, Hassler continued to defend his meticulous, time-consuming method of trigonometric surveying, while he struggled on the edge of poverty, maintaining himself by writing textbooks, teaching, and undertaking an occasional surveying job. His most telling response to his critics in both Congress and the military services came in a document titled *Papers on Various Subjects Connected with the Survey of the Coast of the United States*, which he delivered to the influential American Philosophical Society in 1820. Captain Albert Theberge, in his history *The Coast Survey, 1807–1867*, describes it as “the defining document for the Survey of the Coast.” It included “Hassler’s philosophy and vision of what the Coast Survey should be” and minutely detailed descriptions of instruments and field procedures.\(^7\)

While Hassler took his case to the public, the sheer ineptitude of the military surveyors supported his arguments. In 1828 Secretary of the Navy Samuel Southard reported on the maps and charts available to the government, saying, “They do not furnish a satisfactory survey of the coast for the following reasons: (1) They exhibit detached parts unconnected with each other, (2) they are generally confined to the shores and do not extend to the ocean, (3) there were many of them made by incompetent men, and with incompetent means, (4) they were governed by no fixed principles or certain guides, in ascertaining the latitudes and longitudes of the principal points and positions, (5) they do not embrace the whole coast. For these and other reasons, they are unsafe, and in many instances, useless and pernicious.”\(^8\)
Finally in 1832, when it became inescapably evident that the navy’s effort was mismanaged and insufficient, Congress reestablished the survey. Andrew Jackson reappointed Hassler. Hassler accepted the appointment despite his grievances about how the government had treated him. He needed the work, having barely survived the long interval since his dismissal. He was a scientist who desperately needed to pursue his calling. And in nineteenth-century America, before the days of the “big science” that is so much a part of our culture, the Coast Survey was the only game in town. Congress appropriated twenty thousand dollars, Hassler collected his equipment, and the survey crew was on its way to Bald Hill.