NPS Form 10-900 SG-1980 OMB No. 1024-0018
United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

1. Name of Property

Historic name: Salt Lake South East and North West Base Monuments (Salt Lake Base Line)
Other names/site number: The Chimney
Name of related multiple property listing:
N/A
(Enter "N/A" if property is not part of a multiple property listing

2. Location

Street & number: 1002 S. 3200 West and 209 South 4500 West
City or town: Layton and West Point State: UT County: Davis

Not For Publication: [ ] Vicinity: [x]

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this X nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

___national ___statewide __X_local
Applicable National Register Criteria:

__X_A ___B ___C ___D

11.20.17

Signature of certifying official/Title: **Date**

Utah Division of State History/Office of Historic Preservation

State or Federal agency/bureau or Tribal Government

Salt Lake South East and North West Base Monuments
Name of Property

Davis County, UT
County and State

In my opinion, the property ___ meets ___ does not meet the National Register criteria.

Signature of commenting official: **Date**

Title : **State or Federal agency/bureau or Tribal Government**

4. National Park Service Certification

I hereby certify that this property is:

✓ entered in the National Register

___ determined eligible for the National Register

___ determined not eligible for the National Register

___ removed from the National Register

___ other (explain:) _____

Signature of the Keeper Date of Action

5. Classification

Ownership of Property

(Check as many boxes as apply.)

Private: [X]

Public – Local [ ]

Public – State [ ]

Public – Federal [ ]

Category of Property

(Check only **one** box.)

Building(s) [ ]

District [ ]

Site [ ]

Salt Lake South East and North West Base Monuments
Name of Property

Davis County, UT
County and State

Structure ☐

Object ☒

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
		buildings
		sites
		structures
2		objects
2		Total

Number of contributing resources previously listed in the National Register 0

6. Function or Use
Historic Functions
(Enter categories from instructions.)
OTHER: Survey Monuments

Current Functions
(Enter categories from instructions.)
OTHER: Survey Monument
OTHER: USGS earthquake subsidence measurement

7. Description

Architectural Classification
(Enter categories from instructions.)
No style

Materials: (enter categories from instructions.)
Principal exterior materials of the property: Concrete, Brick

Narrative Description
(Describe the historic and current physical appearance and condition of the property. Describe contributing and noncontributing resources if applicable. Begin with **a summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity.)

Summary Paragraph

The Salt Lake South East and North West[1] Base Monuments are brick survey monuments which make up the Salt Lake Base as part of the Nevada Net developed during the Great Triangulation in the Great Salt Lake region (Figure 1). Although the two monuments are at two discontiguous locations 11 kilometers apart, they were built at these exact locations, distance and angle, separated purposefully and functioned as a set, each identifying the two ends of the Salt Lake Base Line. They acted as line of sight monuments in order to survey this important base line and also to demonstrate the efficacy of the Duplex Base Apparatus. Although there were altogether ten base lines like this one used during the Great Triangulation across the United States, no other monuments such as these two were built. They are a unique set to themselves. The area retains its historic setting and feeling. The monuments are oriented in a Northwest-Southeast at exactly 315/135 degrees. They are supported on a brick and concrete foundation 48 inches square and 48 inches below ground. The monuments are comprised of red fired brick and lime mortar. Each monument is an exact copy of the other and from the foundation to their top they are 9 feet tall. They were built in seven levels each slightly smaller in diameter than the one below making the monuments upright in character and tapered to the top. The form allows the monuments to take on an angled shape typical of this kind of structure. Sedimentation has built up in the area leaving the monuments' bases somewhat below existing grade. A low wooden pole fence has been added surrounding the South East Base structure to prevent livestock from rubbing against it and causing damage. The North West Base Monument is situated in a pasture. Both of the Salt Lake Monuments retain their historic integrity of Location, Design, Setting, Materials, Feeling, and Association.

[1] This is how Eimbeck spelled them (as opposed to Southeast/Northwest). He spoke and wrote English well, but his native language was German.

Narrative Description

The Salt Lake South East and North West Base Monuments are nine foot tall brick survey monuments situated on the terrace to the east of the Great Salt Lake. The placement of the monuments was not accidental as the flat terrain was necessary for the survey work to be completed. Each upright monument tapers to the top and each is oriented in a northwest-southeast direction at exactly 315/135 degrees. They are supported on a concrete foundation 48 inches square. Each is comprised of fired red brick and lime mortar and were built in seven levels each slightly smaller across than the one below making the monument upright in character reaching nine feet in height. The form allows the monument to take on an angled shape typical of this kind of structure. These Monuments represents the broader survey network and are a representation of the grid established in this region.

The monument locations retain their historic integrity of Location, Design, Setting, Materials, Feeling, and Association. Its design was a conscious effort of William Eimbeck in order to optimize his skill as a survey engineer (Figure 2). Eimbeck chose the location because of its undeveloped character and the flatness of the terrain. Looking southwest towards Deseret Δ Station in the Stansbury Mountains, northeast to Ogden Peak in the Wasatch Range, and west towards Antelope Island and its Δ station, one can still envision the Coast Survey signaling from the monument to the heliographers positioned there with an unimpaired view. Often, survey markers were only semi- permanent. Eimbeck meant for this monument to last forever. Sometimes they made of logs or 4 x 4 posts stuck in the ground. More permanent markers in or near urban areas could correspond with some man-made physical feature. Some of Eimbeck's nearby examples such as these include the spire on the Ogden Union Pacific Depot, the flagpole in Grantsville, or the corner of the Church of Jesus Christ of Latter-day Saints Salt Lake Temple in Temple Square. Here at the Salt Lake North Base Line (Figure 3) the monument, made of fired brick and concrete, was made to last—to be used again and again. In fact, the line between the two monuments is still being used as a marker for modern development to the north. The feeling of the area still retains its wild character and the land is still used in the same manner more than 100 years later. The monument and the surrounding area are associated with the demonstration of a scientific instrument meant to improve both the efficiency and accuracy of long survey shots. In the days of instrument survey, accuracy was defined by the experience of the surveyor and the quality of the instrument. The Duplex Base Apparatus was invented to improve both (Figure 4).

The foundation of the monuments is 48 inches square and first brick "base" was constructed to fit it. The height this first tier of bricks is 28 inches. The next brick "base" is 45 inches square and 12 inches in height leaving a 1 ½ inch inset around its perimeter above the first base. The third tier of bricks is 42 ½ inches square and 12 inches tall. A 1 inch inset is found along its circumference at its top. From here to the top of the monument each tier of bricks is 12 inches tall and inset 1 inch. The fourth tier is 39 ½ inches square, the fifth is 30 ½ inches, the sixth is 35 ¾ inches and the top is 32 and ½ inches across. There are two openings in the brick monument. One is in the center of the top and measures 14 inches square. The other is in the northwest side and is approximately 12 inches tall and 6 inches wide. The entire center of the monument is hollow. Bricks are 8 inches long x 2 5/8 inches tall x 3 ¾ inches wide. Mortar was hand mixed and was comprised of lime cement, white-to-gray in color, and a variety of sands and small gravels. Markings on the foundation inside may represent a date but they cannot be clearly discerned. At time of construction, a brass bolt was embedded into the concrete to act as a permanent datum for future survey work. Despite it age, the monument is in good shape, missing only a couple of bricks. Several names of past visitors have been scratched into the monument but because the brick was well fired they are mostly surficial. A few bullet holes/ chips can also be seen on its surface. These do not

detract from its magnificent appearance in the field. Nor do they affect the object's historic significance. The lack of development in the area helps contribute to the historic feeling which retains original location and setting.

The two monuments, Salt Lake North West and South East Base Monuments are located 11.2 km apart. A line between the two, demarcated at 1 km and ½ km points served to triangulate the Salt Lake Base Line to various survey stations surrounding this monument such as on Antelope and Ogden Peaks. These two monuments and survey line between were constructed and used to also test Eimbeck's invention, the Duplex Base Apparatus. In turn, these locations and others served to build what has been referred to as the Nevada Net which were part of a greater effort to map the 39th Parallel across the entirety of the United States, an effort which took more than 20 years in the last half of the 19th century. William Eimbeck was the surveyor in charge for the Nevada, Utah, and the western half of Colorado for the United States Coast and Geodetic Survey.

The Salt Lake South East Base Monument is located in Section 36 of Township 4 North, Range 2 West. The monument is located at the Great Salt Lake Shorelands Preserve owned by The Nature Conservancy. It is approximately 350 meters east of the boardwalk platform and south of the parking area. Access can be gained through a gate just south of the entrance to the Preserve. From here it is approximately 900 meters straight line to the monument. A small stream and flooded areas require the visitor to walk east and then south. It can easily be seen from a distance because it is the tallest feature in the vicinity.

The North West Base Monument is found on private property located in Section 6 of Township 4 North, Range 2 West. Both can be found on U.S.G.S. 7.5' Topographic Map Clearfield, UT, 1999.

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [X] A. Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] B. Property is associated with the lives of persons significant in our past.
- [ ] C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] D. Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

- ☐ A. Owned by a religious institution or used for religious purposes
- ☐ B. Removed from its original location
- ☐ C. A birthplace or grave
- ☐ D. A cemetery
- ☐ E. A reconstructed building, object, or structure
- ☐ F. A commemorative property
- ☐ G. Less than 50 years old or achieving significance within the past 50 years

Areas of Significance
(Enter categories from instructions.)
EXPLORATION/SETTLEMENT
INVENTION
SCIENCE

Period of Significance
1896

Significant Dates
1896

Significant Person
(Complete only if Criterion B is marked above.)

Cultural Affiliation

Architect/Builder
Eimbeck, William

Statement of Significance Summary Paragraph (Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations.)

The Salt Lake South East Base and North West Base Monuments were built in 1896 by William Eimbeck, Assistant, U.S. Coast and Geodetic Survey. The two discontiguous monuments are locally significant under Criterion A because they embody several important Areas of Significance in the history of the United States. Areas of Significance include Exploration/Settlement, Invention, and Science. Eimbeck was inventing new instrumentation, testing new engineering methods, testing scientific theories, and discovering new science with his observations. All the while he and his men were exploring areas that were only known to a few individuals. The period of significance for the two monuments is 1896—the year they were constructed and implemented in the testing.

In the area of Exploration/Settlement the Salt Lake South East and North West Base Monuments are part of and represent the undertaking and completion of a larger effort to map the United States along the 39th parallel. Between 1879 and 1895 the United States Coast and Geodetic Survey conducted measurements between the Washington D.C. and San Francisco areas. The monuments demark the Salt Lake Base Line which was used to anchor the Nevada Net both vertically and horizontally (elevation, latitude and longitude) for the purposes of distance for coast to coast, elevation and location of locations and physical features. The information collected was important in providing exact locational information making possible the connection of place to place. This survey assigned latitude/ longitude designations to physical locations for the first time. He also recorded magnetic measurements and curvature of the earth, neither of which had been widely completed before.

In the area of Invention, the monuments are significant for their part in Eimbeck's invention and successful testing of the Duplex Base Apparatus (Bars no. 15 and 16), a new instrument at this location using the Salt Lake South East and North West Base Monuments. This instrument helped shoot straight lines necessary for mapping exact coordinates and determining elevation of the locations on the Nevada Net. His invention was also important because it was more accurate and time efficient.

In the area of Science, the invention and successful testing of the Duplex Base Apparatus contributed to the development of technology and the understanding of metal conductivity which improved the field of survey engineering. Eimbeck's overall survey and recordation helped delineate the exact location of magnetic north and the curvature of the earth (its size).

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

The Salt Lake South East and North West Base Monuments were built in 1896 by William Eimbeck, Assistant, U.S. Coast and Geodetic Survey. The monuments are eligible under Criterion A because they embody several important Areas of Significance or Themes in history of the United States. These Areas of Significance/Themes under Criterion A include Exploration, Invention, and Science.

Criterion A Significance: Exploration/Settlement

The Salt Lake North West and South East Base Monuments were part of a larger survey base line which was used to triangulate the Salt Lake area as part the "Great Survey" across 39th parallel of the United States. Many of these areas were little explored and inaccessible. He hired John Muir to assist him explore routes and chose locations for his survey stations. The monuments anchored this effort locally and regionally. It was also instrumental for testing the Duplex Base Apparatus. The monuments built for this test were unique for any of the triangulation points in Utah. Although simple in construction, it was planned and constructed to exact height and width as part of a greater effort. The Salt Lake North West and South East Base Monument played a vital role in marking the exact location of the end points of the Salt Lake Base Line and a sight point in order to operate the Duplex Base Apparatus. Their importance was exemplified by the fact that the monuments were built to be permanent. The monuments and the base line are still used today to anchor present day projects to the local, state, and national land mapping grid. Maps constructed by George M. Wheeler and John W. Powell were not fixed to any known point until Eimbeck tied his larger triangulation to points established by these earlier explorers.

Criterion A Significance: Invention

Eimbeck invented and successfully demonstrated the effectiveness of Duplex Base Apparatus at the Salt Lake South East Base Monument on the Salt Lake North Base Line (Figure 3). The Apparatus was considered so important, that before it was used in the Salt Lake valley, it was on display at the Worlds Colombian Exposition in 1893 and later the Geodetic Conference in Washington D.C. in 1894 where it was recommended that it be tested in the field as soon as possible. What made the apparatus better than previous bars (optical instruments for shooting lines) was that it was primarily made of brass rather than several different metals. Its optical qualities were constant even during extreme changes in temperature. It was also constructed of two brass tubes that joined together with optics inside rather than one piece. They were equal in length (5 meters) and could be separated and easily flipped around to survey 180 degrees in the opposite direction. These qualities made the apparatus infinitely more adaptable to survey in rough conditions. After successfully demonstrating the effectiveness of the Apparatus it was determined to be an improvement for survey of base lines over the previous method of using steel tapes. It was tested a second time in 1901 in Sheldon Kansas.

Criterion A Significance: Science

The invention and successfully demonstrating the effectiveness of the Duplex Base Apparatus contributed to the development of technology and the understanding of metal conductivity which improved the field of survey engineering. The Salt Lake Base Monuments were a necessary part of the infrastructure to complete the testing of the apparatus. With improved instrumentation mapping was made more efficient and more accurate.

> *The question of the location of a primary base of verification within the thirty-ninth parallel triangulation in Utah has received much attention in connection with the development and the execution of that triangulation through eastern Nevada and Utah. The extent and scope of the geometric figures of this triangulation are exceptional and without precedent in practical geodesy (William Eimbeck 1896 b).*

The monuments were constructed and used in 1896 to triangulate previously established survey locations derived during the Great Survey of the 39th Parallel. The Salt Lake North West and South East Base

Monuments were also used to demonstrate improvements for leveling with Eimbeck's re-engineered Duplex Base Apparatus. He had improved earlier versions changing materials and other attributes which enhanced thermal qualities and ease of use. The location was specifically chosen because of its flat terrain and its proximity to heliograph stations on Deseret, Mt. Ellen, Ogden Peaks, and Fray Peak on Antelope Island as well as survey locations in towns in the region.

He built the Salt Lake North West and the Salt Lake South East Monuments to be permanent. *"It is not probable that the pier will be not disturbed and it not molested, it will stand indefinitely. It is a large enclosure and bounded on the West by the Salt Lake; it is used as a pasture for cattle and horses* (The area surrounding the monuments). *There is no natural object in the neighborhood to which it can be referred. The edge of the water of the Great Salt Lake is probably two miles from the edge of the grass."(*J. J. Gilbert, Davis County, Utah, 1896 correspondence. National Archives, College Park, Maryland).

The setting in the vicinity of these monuments has changed very little since they were built. They are surrounded by fields with livestock and farms as they were when the monuments were placed and used. The same wetlands are to the south. Eimbeck chose the location because of its undeveloped character and the flatness of the terrain. One can still view the Stansbury Mountains to the southwest where Eimbeck's Deseret Δ Station was located, northeast to the Ogden Peak Δ Station in the Wasatch Range, and west towards the Antelope Island Δ Station.

Eimbeck was inventing new instrumentation, testing new survey methods, testing scientific theories, and discovering new science with their observations. All the while they were exploring areas that were only known to a few individuals. These findings helped the government determine the location of local communities, and geographic features. The Great Survey determined the width of the continent for the first time, determined latitude and longitude and elevation of cities and towns across the country allowing for more accurate surveys for boundaries and ownership. This survey was the basis for the cadastral system and maps we have continued to use even today.

Construction and Use of the Salt Lake North West and South East Base Monument

After identifying the proposed location for the Salt Lake Base Line in 1893, Eimbeck returned to Utah from Washington D.C. and traveled to Salt Lake City in early June of 1896. During the second half of the month he and his crew worked from Ogden, Kaysville, and Hooper Bench laying out the beginnings of the Salt Lake Base Line. The Salt Lake South East Base Monument is positioned at the south end of this line. The North West Base Monument is at the north-west end. The north-west/ south-east oriented line specifically determined by Eimbeck in order to utilize the flat terrain along the edge of marsh lands and to avoid farms as much as possible. The
line was situated was situated between Kaysville and Hooper. Scaffolding was erected at each end of the two Base Lines in order to see distance over buildings and other objects. Scaffolding was commonly used on surveys on large flat areas such as the Salt Lake Valley and the Mid-western United States. On Monday the 13th they bought the lumber in Ogden and had it shipped to the north end of the Salt Lake Base Line.

Eimbeck visited both bases and started planning the scaffolds. At the North West Base they built the scaffolding to 48 feet the first day. The next day they finished it at 60 feet. Next, they erected a target on a 16 foot pole on top. It was not until the 21st that they received the lumber at for the South East Base. There he began constructing the platform and tied guy wires to it. It took one day to build the scaffold

with the help of two men. They finished the 60 foot scaffold on the southeast end of the Salt Lake North Base Line on the 25th of the month. Once complete, it was 57.5 feet tall with the target at 72.5 feet above a brass survey bolt placed on the monument's foundation slab.

Eimbeck and his men began building the monument under the scaffold at Salt Lake South East Base location. He set the capstone at 8.77 feet above the bolt. The bolt, made of brass and set in the cement base of the monument, was the official measuring point for both elevation and location at these Δ stations. Then on Monday they built steps and railing at Salt Lake South East Base Monument before going to Salt Lake North West Base location to build the brick monument. By Thursday he had set the capstone at Salt Lake North West Base.

They continue to work along the North Base Line during August. They began constructing a moveable shelter or sled. They set flags and posts along the base line. On the 22nd they established a permanent camp at Craddler Ranch. On the 23rd of the month they are joined by a photographer (see the photographs below). Between the monuments they set the line using flags every half- km. The flags were then replaces at the Km marks with large rocks with an inset metal pin. 4 x 4 inch posts with a nail in the top of each one were placed at the half-km locations.

"During the month of August party was engaged chiefly upon the occupation of North Base Δ Station, i.e., the completion of the Base Line connecting net and the more perfect preparation of the site for measurement producing a double simultaneous line" (Eimbeck Correspondence August 1896. NARA College Park, Maryland). The double simultaneous line was achieved by turning around and back shooting with the Duplex Base Apparatus.

The sled, pulled by horses, covered the Duplex Base Apparatus (Figure 4). The apparatus was not attached in any way but was useful in order to keep the instrument cooler. Instead it sat on a series of tripods. They began at the north monument using the apparatus to shoot a line towards the south end. The apparatus, with the help of the tripods, kept the instrument level vertically (Figures 4, 6, 7, 8, 9, and 10). The optics in the instrument does the same horizontally. About mid-day they reached the half-km point and flipped the instrument 180 degrees and shot the same line back to the start. Each half-km the same process was completed until they reached the South East Base Monument 18 days later. Most days they could only complete about a km of survey because of the many fences, ditches, and the Syracuse Railroad. Near the South East Base Monument at the 11th km on the night of the 18th, there was a "Hurricane" that damaged the shelter sled and one of the bars between the rods. They spent the next two days repairing it and damage to the base line. At this point they turned around and worked backwards from the 11 km mark back to where they started. At the end of the season the Duplex Base Apparatus was delivered to Washington D.C. where it was inspected for damage from the hurricane and wear of one of the "Agate Knives." Eimbeck, its inventor submitted a report on the apparatus' performance on the Salt Lake North and South Base lines. Accompanying this document is another dated January 7, 1897 which reveals *"a new second pendulum of the compound type, its form being that of a disk, and his report sets forth the numerous advantages possessed by this instrument over the various forms heretofore used gravity determinations"* (USC&GS Annual Report ending June 1897).

Additional Historical Context

These monuments were built as part of a larger effort to map the United States. Between 1879 and 1895 the United States Coast and Geodetic Survey conducted measurements between the Washington D.C. and San Francisco areas. The western portion, from the Nevada's western boundary to Pikes Peak in central Colorado was managed by William Eimbeck (Figure 2). William Eimbeck, Assistant to the U.S. Coast

and Geodetic Survey was an astronomer, mathematician, explorer, inventor, scientist, and mover-and-shaker. He was integral to the East Coast scientific community which included mathematicians, scientists, and politicians. He was a founding member of the Cosmos Club in Washington D.C. along with John Wesley Powell among others. The Salt Lake Base Line and the Salt Lake North West and South East Monuments were constructed to demonstrate the effectiveness of Eimbeck's invention, the Duplex Base Apparatus.

Using optical instruments Eimbeck and his men triangulated angles between mountain tops in order to construct a grid or net. The net was used, among other things, to measure distance between the coasts and between physical features and landmarks such as cities and towns. They also measured magnetism, latitude and longitude of places and elevation. In order to complete these tasks here, he triangulated from nearby peaks in Utah such as Deseret, Mt. Ellen, Ogden Peak, Fray Peak on Antelope Island, and others.

The following quote serves to exemplify the importance of William Eimbeck as a scientist, astronomer, engineer, and inventor to the development and growth of the United States.

> *As a geodesist his name is indelibly connected with the trigonometrical survey along the 39th Parallel of Latitude from the Atlantic to the Pacific Ocean, the great mountain stretch in this work extending from the Sierra Nevada Mountains to Pike's Peak, having been completed by him. This involved a combination of Geodetic operations unparalleled in any country by reason of: the difficulties involved in their execution; the extent of high mountain work completed by him; the lengths of the lines in the figures; and the average elevations of the stations occupied.*
>
> *One line in this scheme is 183 miles long, which exceeds the greatest line in the figure, which spanning the straits of Gibraltar, connects the triangulation of Europe and Africa, and which hitherto contained the longest line observed as part of a regular triangulation scheme. Among the memorials to his ability as a student and investigator are his improvement on the Chronograph, his invariable Reversible Pendulum and the Duplex Base Apparatus designed for and constructed by the Coast and Geodetic Survey.*
>
> (NOAA History, A Science Odyssey. Profiles in Time - C & GS Biographies. http://www.history.noaa.gov/cgsbios/bioe6.html)

William Eimbeck

Born in 1841 in Brunswick Germany, Eimbeck attended public schools but was self-taught in mathematics and astronomy. After graduating he proceeded to St. Louis, Missouri where he became a draftsman for Palm & Robertson, makers of the locomotives that were used on the North Missouri Railroad (later the Wabash). Three years later in 1860, Eimbeck became a surveyor for St. Louis County and then shortly after that because a county engineer (Bryan 1909). Here he completed work on the Eads Bridge, the first bridge to cross the Mississippi River at St. Louis. The bridge is now a National Historic Landmark. Eimbeck determined the latitude and longitude of St. Louis. This was the first exact determination of longitude for this city. During this period, he was also appointed to complete survey and engineering work for the Army of the Tennessee, under General Ulysses S. Grant.

Eimbeck became the first professor of engineering and practical astronomy at Washington University in St. Louis in 1868. Because of his experience with both survey and astronomy, the U S Coast and Geodetic Survey sent him to Sicily to observe the total eclipse of the sun on December 22, 1870. Ten

miles before reaching their destination, the ship struck a rock and sank. Eimbeck, saving only his instruments and an American flag, finished the journey in a life boat and then completed his assignment.

The U. S. Coast and Geodetic Survey

The U.S. Survey of the Coast was renamed the U.S. Coastal and Geodetic Survey in June of 1878. Beyond dealing with mapping the coastal areas of the continent, now they were also charged with a geodetic survey across the continent to connect each of the three coasts. From the Pacific coast, the triangulation of the 39th parallel was started.

Because of Eimbeck's impeccable work in St. Louis and in Europe, He was appointed to the U. S. Coast and Geodetic Survey by the Secretary of the Treasury as a subassistant on July 1, 1871. His first assignment was to continue survey work of the 39th parallel in the Great American Bottom near St. Louis where he determined latitudes, longitudes, and azimuths of locations in Kansas, Texas, and Louisiana. In early spring, he was ordered to the Pacific Coast for five years of astronomical observations, magnetic elements and primary triangulation work along the coast of Oregon to the tip of Baja California.

Engineering, Instrumentation, and Invention

William Eimbeck also had a talent for the improvement and invention of instrumentation for survey. He devised improvements for the Hipp Chronograph in 1872. This instrument was used then to determine longitude. He wrote a letter with drawings to his supervisor George Davidson. In another letter Davidson wrote" This improvement is ingenious, … ." At his suggestion, the letter subsequently appeared as Appendix in the 1872 Annual Report (USGS 1872). Improvements were also made to the Invariable Reversible Pendulum which was used to measure gravity.

It was not until 1876 and 1879, that preliminary explorations were conducted in Nevada and Utah. Notable persons involved with this early work were Professor Davidson, William Eimbeck, A F Rogers, and John Muir, the noted environmentalist. Muir was hired to assist the surveyors in the early explorations of Nevada and Utah.

In 1879 "Assistant" Eimbeck was put in charge of the crews in Nevada, Utah, and western Colorado. He and his surveyors, teamsters, and laborers, established camps and stations on the top of mountains which they had previously scouted to use to build the *Net.* From there they shot angles with theodolites and mirrors to establish trigonometric grids between points (features). With the measurements from the Nevada and Utah Nets he could determine distance the vast expanse. They also determined elevation, variations in magnetism, and longitude. Working in summer and fall of each year, they worked their way across Nevada and into Utah from 1879 to 1883. They finished in Colorado in 1895/6. During the winter and spring of each year he would work in Washington D.C., San Francisco, or Salt Lake City depending on the needs of the government.

Note: All of the following photos and drawings are used courtesy of the National Archives and records Administration, College Park, Maryland or the National Oceanographic and Atmospheric Administration except those taken by the author.

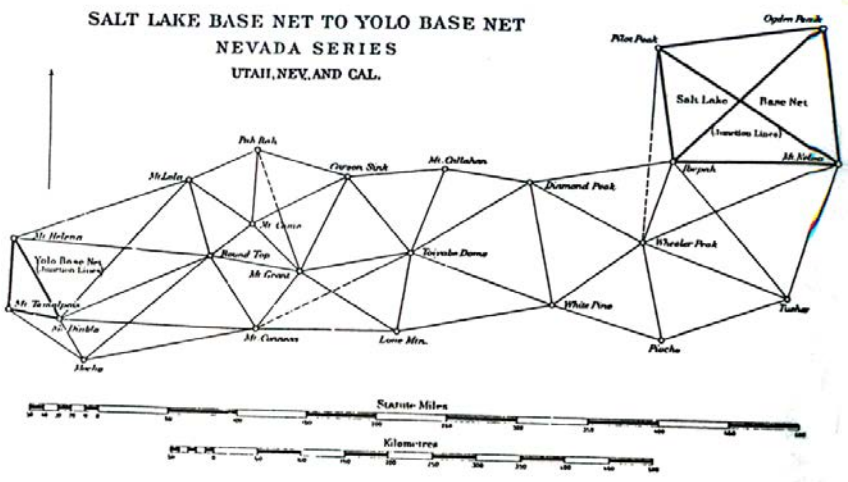

Figure 1. Sketch of the California and Nevada Nets from California to Salt Lake Base.

Figure 2. William Eimbeck in his middle years.

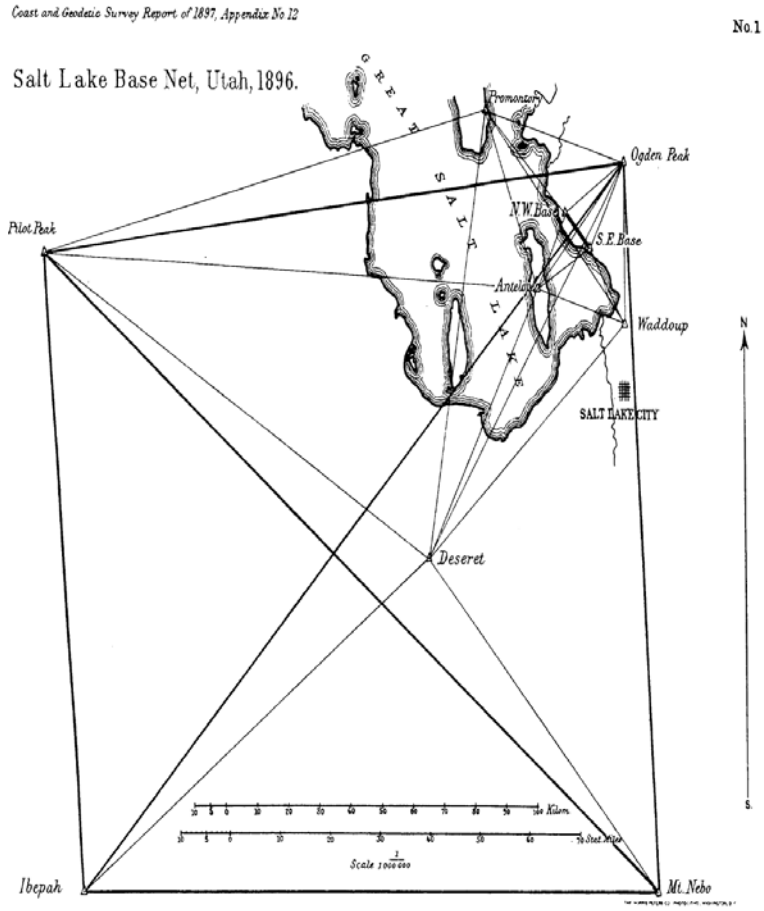

Figure 3. Salt Lake Base Line and Net showing the North West and South East Base Monuments on the east side of Great Salt Lake. This map shows the northeast end of the Nevada Net shown in Figure 1.

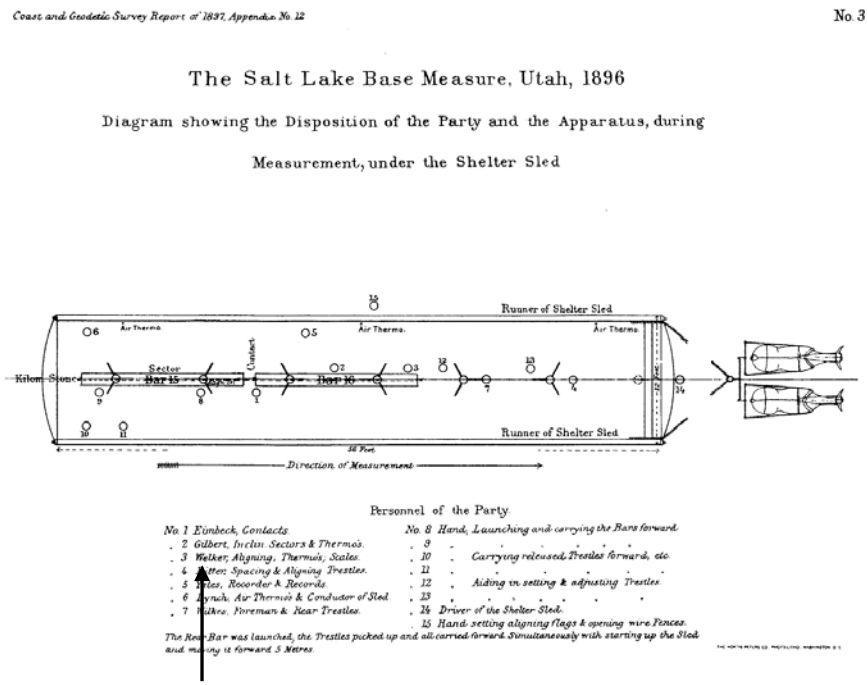

Figure 4. Details of the sled, apparatus and positions of the crew necessary to conduct the survey. The black arrow depicts William Eimbecks position.

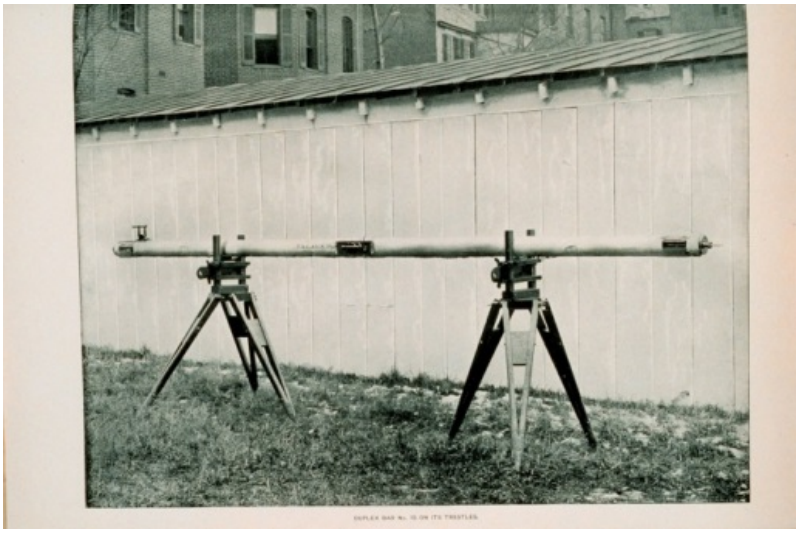

Figure 5. Duplex Base Apperatus positioned on tripods. The tripods were used under the sled while operating the insturment.

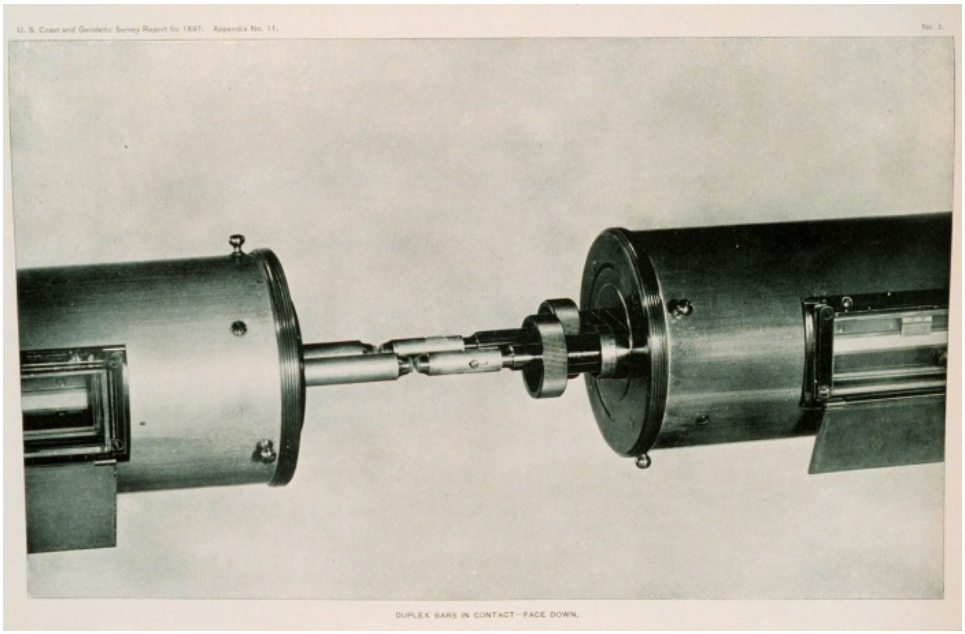

Figure 6. Closeup of the rods and agate knives between the two parts of the Duplex Base Apparatus.

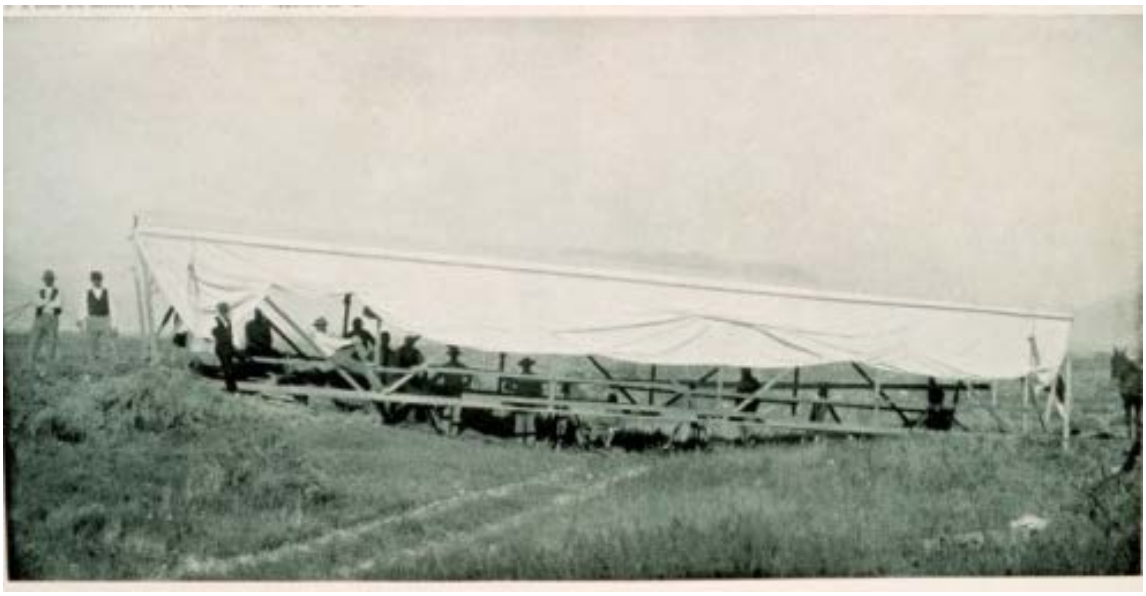

Figure 7. Photograph of the sled crossing a ditch on the survey line between the monuments.

Figure 8. Closeup of the Duplex Base Apparatus on its tripods inside of the shed. William Eimbeck to left inside sled with the hat?

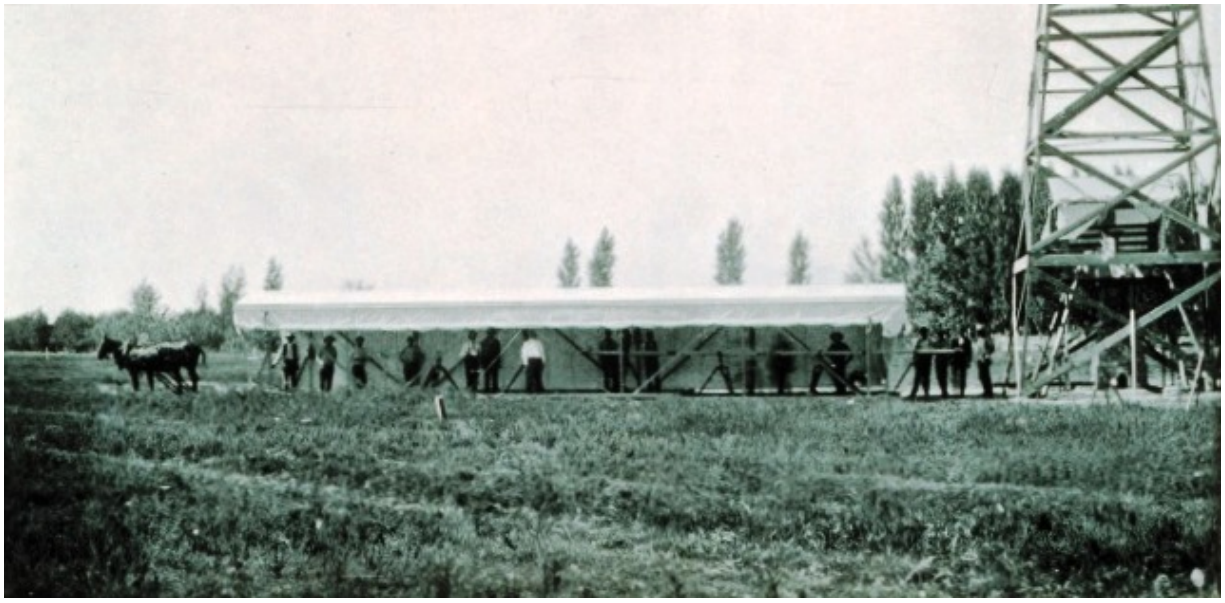

Figure 9. 1893 photograph of the North West Base Monument, scaffolding, crew, Duplex Base Apparatus at the North West Base Monument. View to northwest.

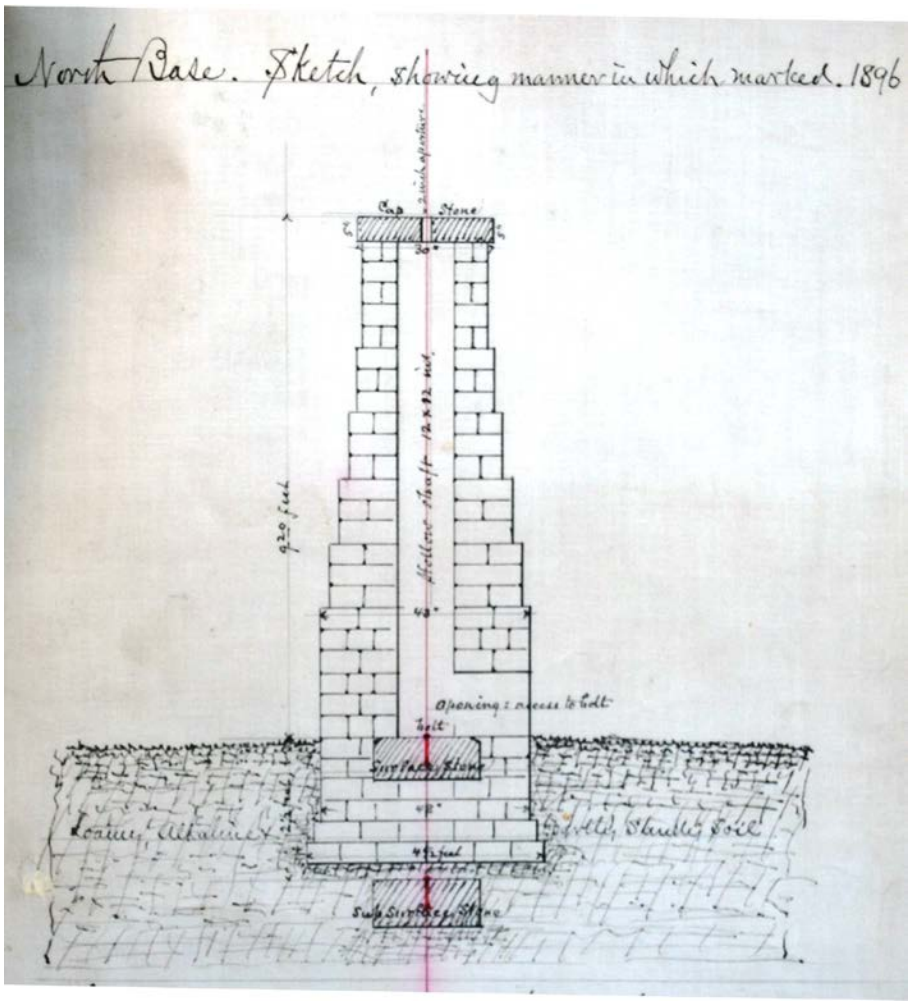

Figure 10. Sketch of Base Monuments drawn in 1896.

9. Major Bibliographical References

Bibliography (Cite the books, articles, and other sources used in preparing this form.)

Bowie, William
1914 *Preliminary Triangulation on the One Hundred and Fourth Meridian, and on the Thirty-Ninth Parallel in Colorado, Utah, and Nevada*. Department of Commerce, U.S. Coast and Geodetic Survey, O.H. Tittman, Superintendent. Special Publication No.19. Washington DC. Government Printing Office.

Eimbeck, William
1898a The Duplex Base Apparatus, and Directions for its use in the field. In *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1897, parts 1and 2.* Washington, Government Printing Office.

1898b Report on the Measurement of the Salt Lake Base Line, in Utah. 1 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1897, parts 1and 2.* Washington, Government Printing Office.

1896 Correspondence August. NARA College Park, Maryland).

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http://www.history.noaa.gov/cgsbios/bioe6.html

Schott, Chas A.
1900 *The Transcontinental Triangulation and the American Arc of the Parallel. Special Publication No. 4*. U.S. Coast and Geodetic Survey. Government Printing Office, Washington.

United States Coast and Geodetic Survey
1885 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1884.* Washington, Government Printing Office.

1886 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1885.* Washington, Government Printing Office.

1887 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1886.* Washington, Government Printing Office.

1889 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1887.* Washington, Government Printing Office.

1889 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1888.* Washington, Government Printing Office.

1890 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1889.* Washington, Government Printing Office.

1891 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1890.* Washington, Government Printing Office.

1892 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1891, parts 1 and 2.* Washington, Government Printing Office.

1893 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey during the Year of 1892, part 1.* Washington, Government Printing Office.

1893 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey Fiscal Year Ending with 1892, part 2.* Washington, Government Printing Office.

1894 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey Fiscal Year Ending with 1893, parts 1and 2.* Washington, Government Printing Office.

1895 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey Fiscal Year Ending with 1894.* Washington, Government Printing Office.

1896 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey Fiscal Year Ending with 1895.* Washington, Government Printing Office.

1897 *Report of the Superintendent of the United States Coast Survey, Showing the Progress of the Survey Fiscal Year Ending with 1896 parts 1 and 2.* Washington, Government Printing Office.

Previous documentation on file (NPS):

____ preliminary determination of individual listing (36 CFR 67) has been requested
____ previously listed in the National Register
____previously determined eligible by the National Register
____designated a National Historic Landmark
____ recorded by Historic American Buildings Survey #_____
____recorded by Historic American Engineering Record # _____
____ recorded by Historic American Landscape Survey # _____

Primary location of additional data:

____ State Historic Preservation Office
____ Other State agency
____ Federal agency
____ Local government
____ University
____ Other
Name of repository: _____

Historic Resources Survey Number (if assigned): _____

---

10. Geographical Data

Acreage of Property ____less than 1_____

Use either the UTM system or latitude/longitude coordinates

Latitude/Longitude Coordinates (decimal degrees)
Datum if other than WGS84:_____
(enter coordinates to 6 decimal places)

1. Latitude: 41.110675 Longitude: 112.110963 South East Base
2. Latitude: 41.11032222 Longitude: 112.11083333 North West Base
3. Latitude: Longitude:
4. Latitude: Longitude:

Or
UTM References
Datum (indicated on USGS map):

☐ NAD 1927 or ☐ NAD 1983

1. Zone: Easting: Northing:
2. Zone: Easting: Northing:
3. Zone: Easting: Northing:
4. Zone: Easting : Northing:

Verbal Boundary Description (Describe the boundaries of the property.)

The boundaries include the two discontiguous monuments location. Although the two monuments are at two discontiguous locations 11 kilometers apart, they were built at these exact locations, distance and angle, separated purposefully and functioned as a set, each identifying the two ends of the Salt Lake Base Line. They acted as line of sight monuments in order to survey this important base line and also to demonstrate the efficacy of the Duplex Base Apparatus. Although there were altogether ten base lines like this one used during the Great Triangulation across the United States, no other monuments such as these two were built. They are a unique set to themselves. The South East Base Monument is located in the eastern portion of the Great Salt Lake Shoreland Preserve. The North West Base Monument is on private land in West Point. Each boundary is directly around the monument base and does not include any other lands.

Boundary Justification (Explain why the boundaries were selected.)

The monuments are each situated on large parcels with no association to that parcel except where each is situated.

---

11. Form Prepared By

name/title: Gregory R. Seymour
organization: _____
street & number:3649 Malner Lane
city or town: Las Vegas state: NV zip code: 89130
e-mail: seymourg@trailspast.com
telephone: 702-525-0966
date: October 26, 2017

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.
- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.
- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

Photographs

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels (minimum), 3000x2000 preferred, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

Photo Log

Name of Property: Salt Lake South East and North West Base Monuments

City or Vicinity: Layton / West Point

County: Davis State: Utah

Photographer: Greg Seymour

Date Photographed: March 24, 2017

Description of Photograph(s) and number, include description of view indicating direction of camera:

1 of 10. Overview of the Salt Lake South East Base Monument on the North Salt Base Line. View to the southeast.

2 of 10. Close up of the Salt Lake South East Base Monument southwest side. View to the northeast.

3 of 10. Close up of the Salt Lake South East Base Monument northwest side with the access hole for the survey pin. View to the southeast.

4 of 10. Close up of the Salt Lake South East Base Monument southeast side. View to the northwest.

5 of 10. Close up of the Salt Lake South East Base Monument northeast side. View to the southwest.

6 of 10. View of the top of the Salt Lake South East Base Monument showing capstones and hole to triangulate on survey pin on foundation. View down standing on southeast side of monument.

7 of 10. View of interior of monument.

8 of 10. View of North West Monument looking northwest.

9 of 10. View of North West Monument looking southeast.

10 of 10. showing 1972 Abrams benchmark adjacent to North West Base Monument by the National Center for Earthquake Research. Owner of monument reports that surveyors determine elevation of Monument by surveying form Ogden and Antelope (Fray) Peaks.

Photograph No. 1

Photograph No.2

Photograph No. 3

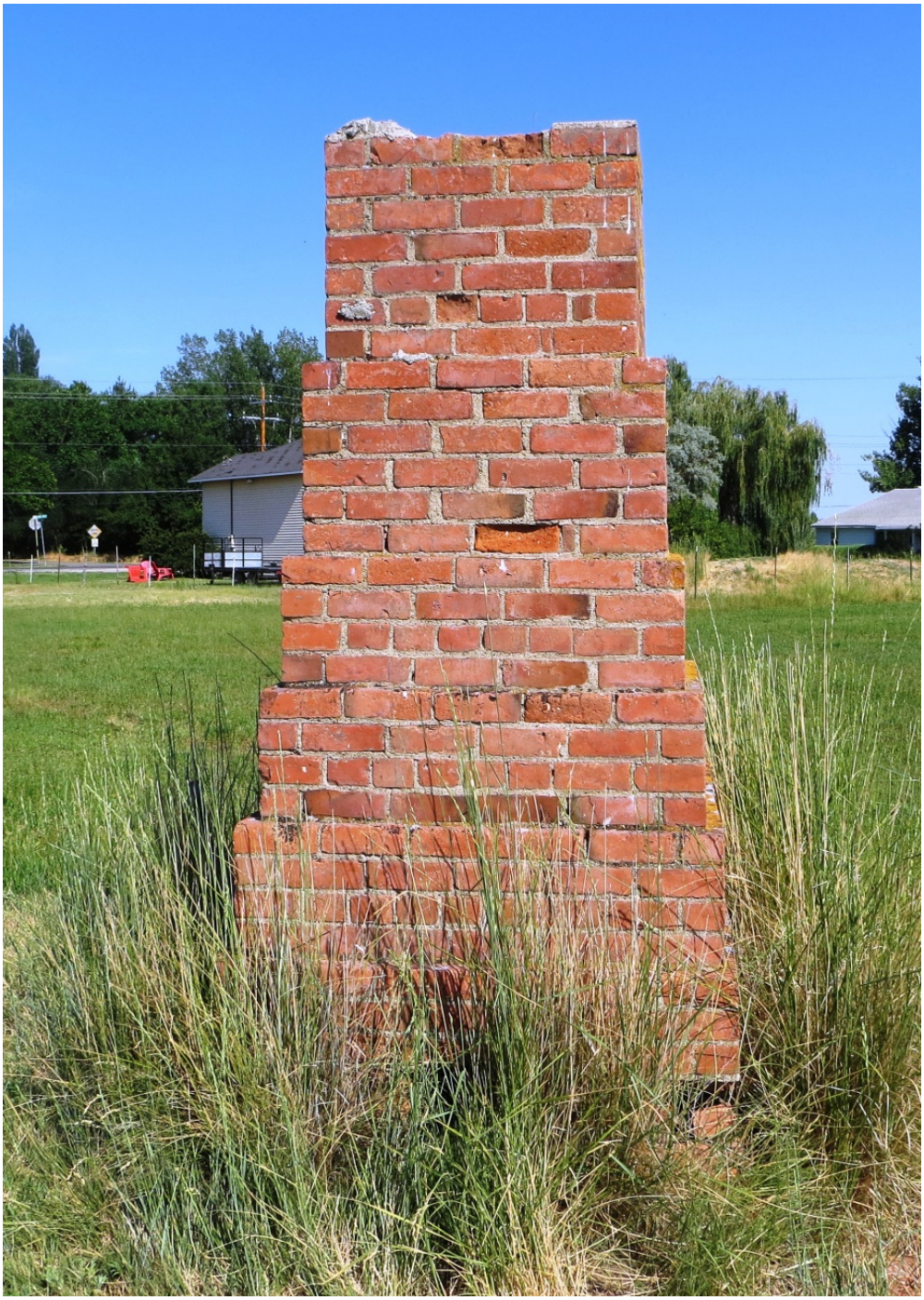
Photograph No. 4

Photograph No. 5

Photograph No. 6

Photograph No. 7

Photograph 8

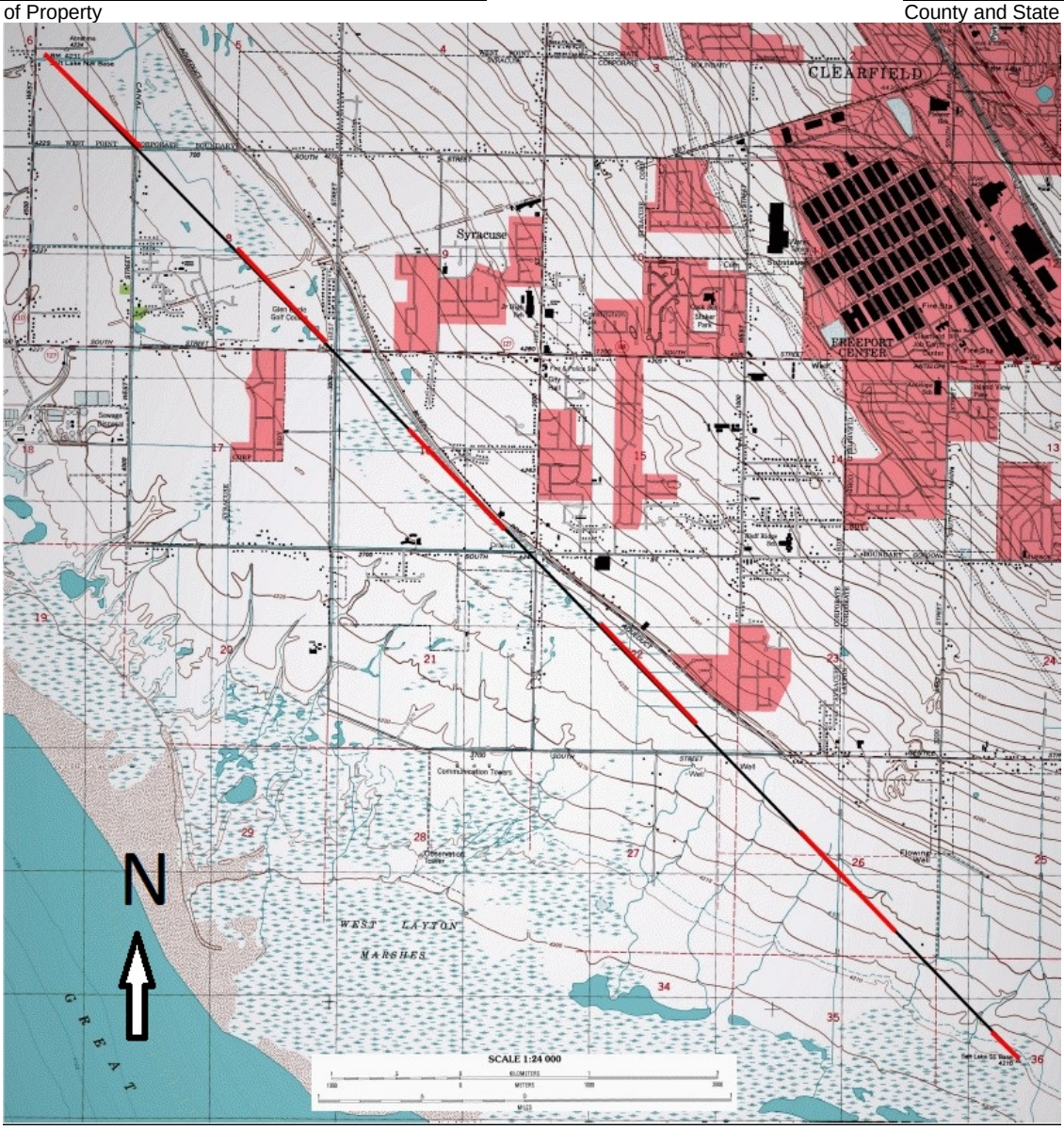


Photograph 9.

Photograph 10

Salt Lake South East and North West Base Monuments | Davis County, UT

Name of Property | County and State



USGS Topographic Map Clearfield Ut. 1999 depicting Salt Lake Base Line with Salt Lake North West (Latitude: 41.11032222, Longitude: 112.11083333) and South East Base Monument (Latitude: 41.110675, Longitude: 112.110963).

Salt Lake South East and North West Base Monuments
Name of Property

Davis County, UT
County and State

N

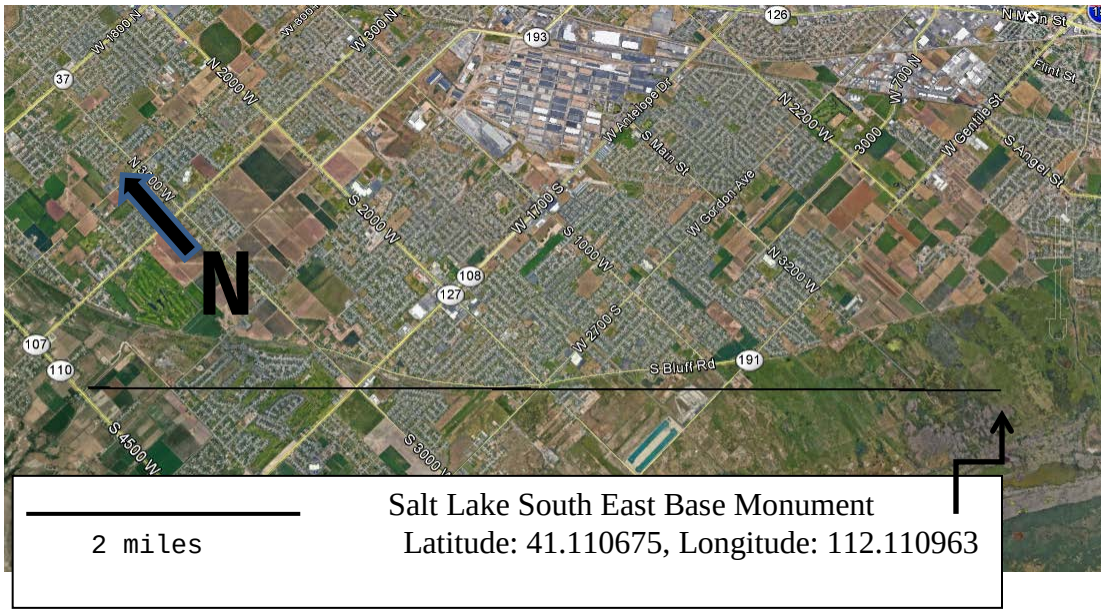
Arrow depicts the location of the Salt Lake North West Base Line Monument at Latitude: 41.11032222, Longitude: 112.11083333, Davis County, Utah.

1“ = approximately 1000 ft.

N

Arrow depicts the location of the Salt Lake North West Base Line Monument at Latitude: 41.11032222, Longitude: 112.11083333, Davis County, Utah.

1“ = approximately 50 ft.



Photograph of the vicinity of the North Salt Lake Base Line with both ends and survey line calculated by William Eimbeck in 1896 In Davis County, Utah.

Salt Lake South East and North West Base Monuments
Name of Property

Davis County, UT
County and State

1" = approximately 500 ft.

N

Arrow depicts the location of the Salt Lake South East Base Line Monument at Latitude: 41.110675, Longitude: 112.110963, Davis County, Utah.

N

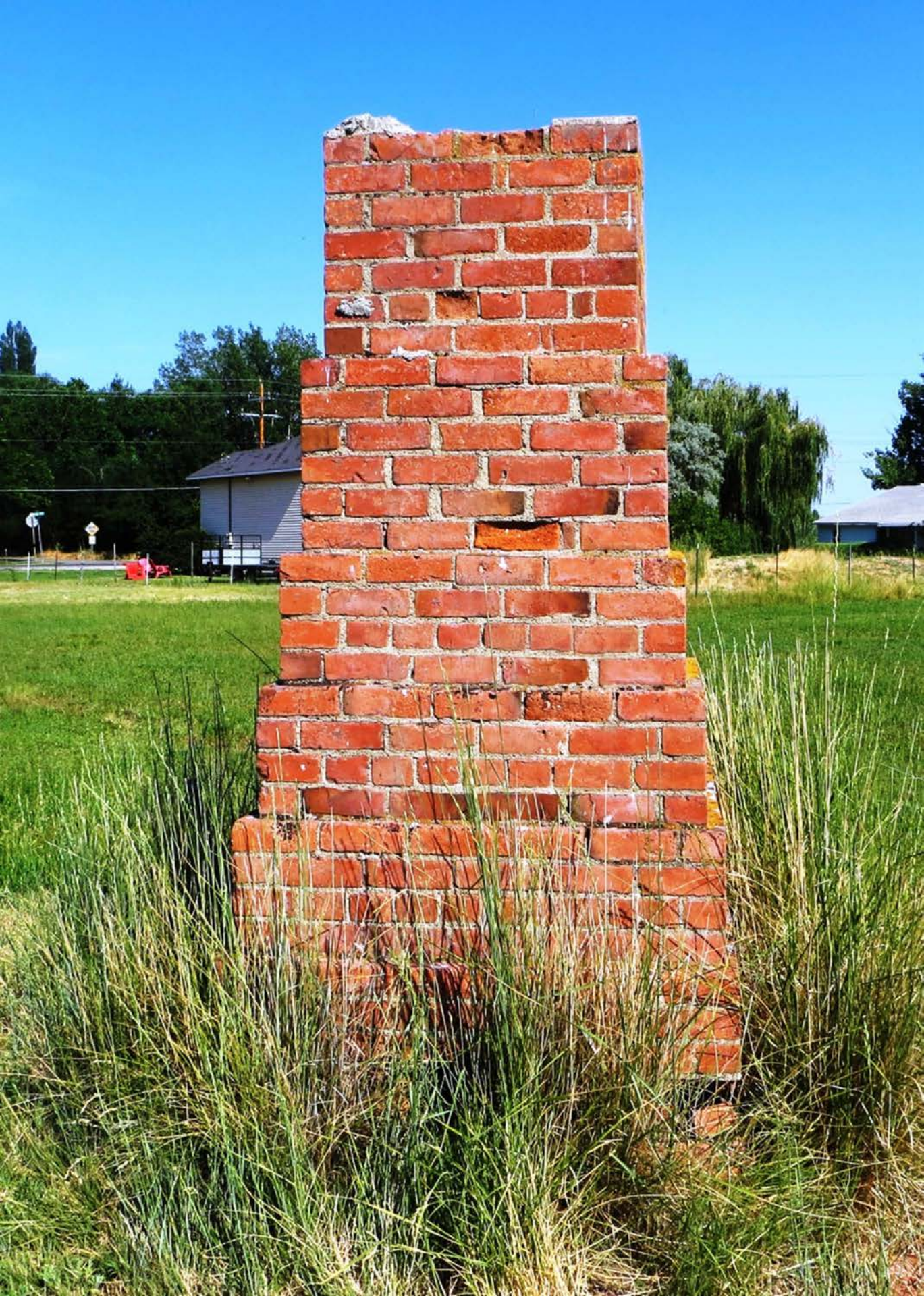
30 ft

Salt Lake South East Base Monument Davis County, Utah
Latitude: 41.110675, Longitude: 112.110963

Salt Lake South East and North West Base Monuments	Davis County, UT
Name of Property	County and State

Paperwork Reduction Act Statement: This information is being collected for applications to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C.460 et seq.).

Estimated Burden Statement: Public reporting burden for this form is estimated to average 100 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Office of Planning and Performance Management. U.S. Dept. of the Interior, 1849 C. Street, NW, Washington, DC.

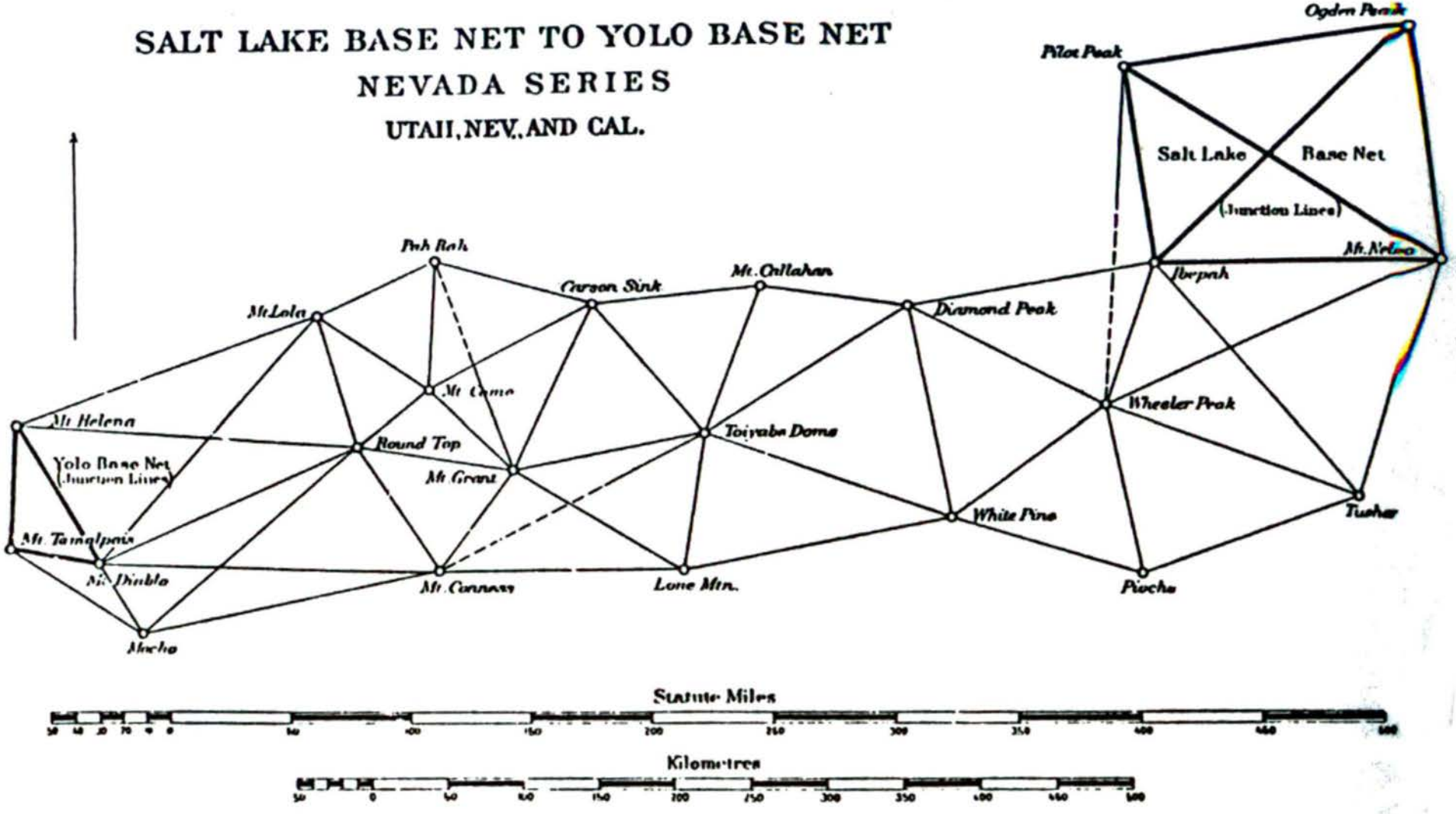



U.S. DEPARTMENT OF INTERIOR
NATIONAL CENTER FOR
EARTHQUAKE RESEARCH
ABRAMS
1972
MENLO PARK, CALIF.
GEOLOGICAL SURVEY

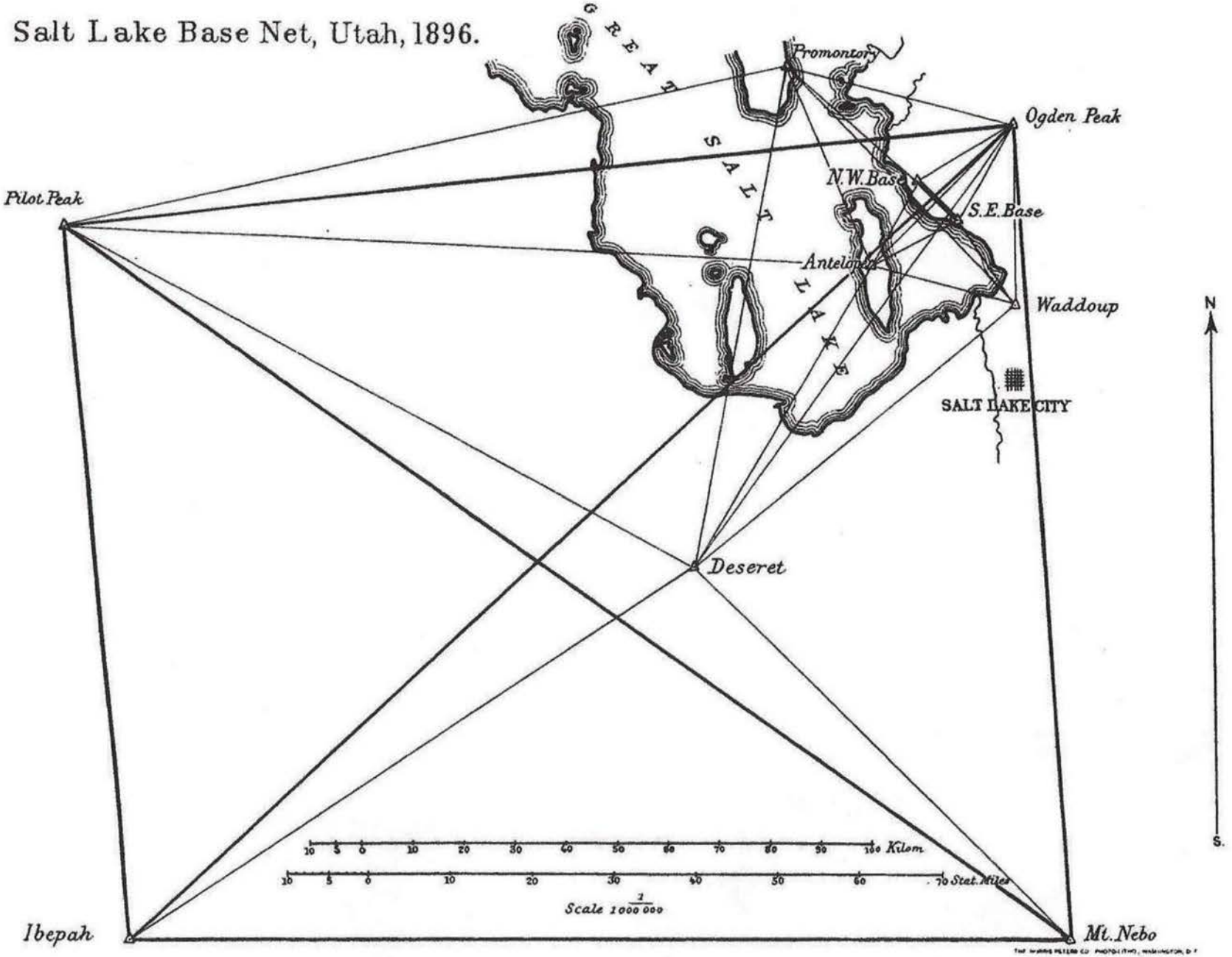
SALT LAKE BASE NET TO YOLO BASE NET

NEVADA SERIES

UTAH, NEV., AND CAL.

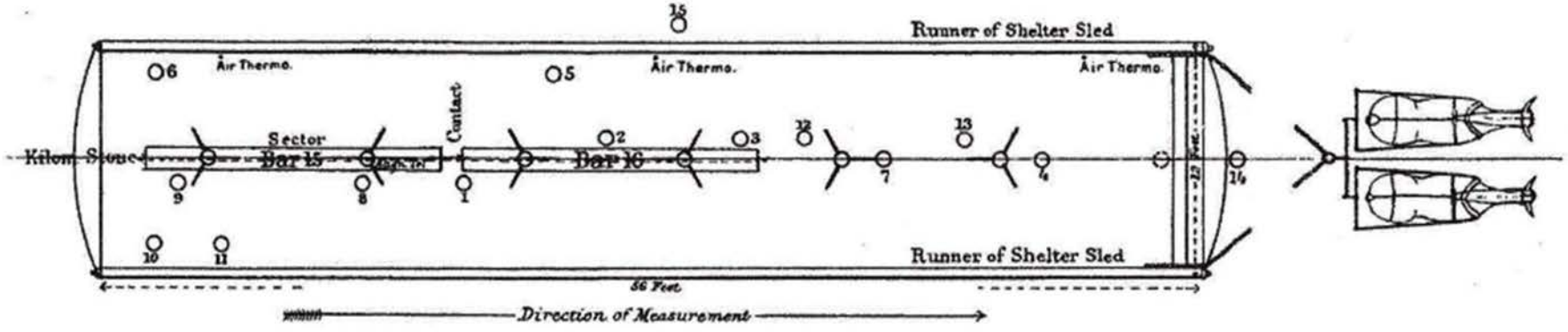


Salt Lake Base Net, Utah, 1896.



The Salt Lake Base Measure, Utah, 1896

Diagram showing the Disposition of the Party and the Apparatus, during Measurement, under the Shelter Sled

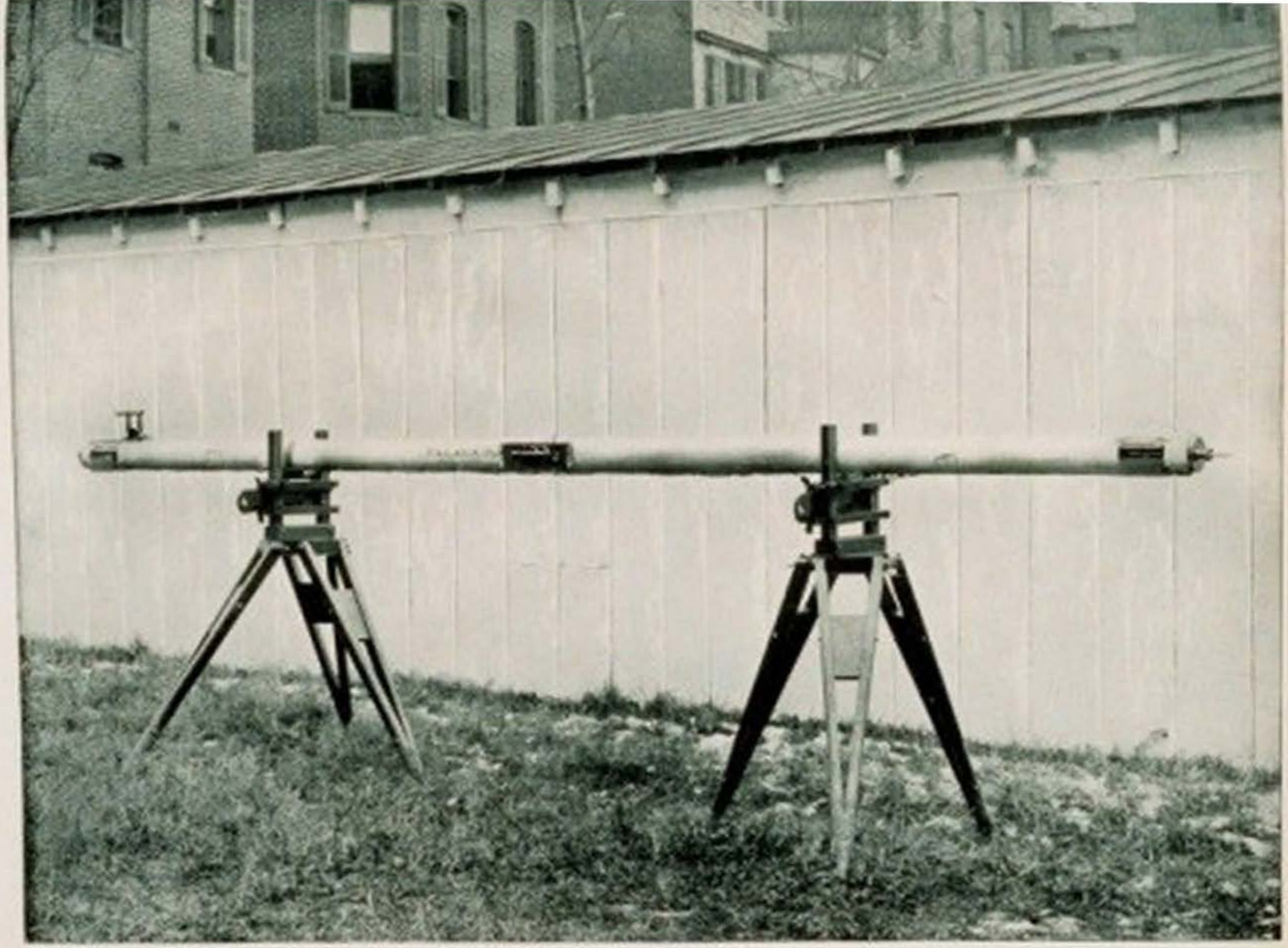


Personnel of the Party.

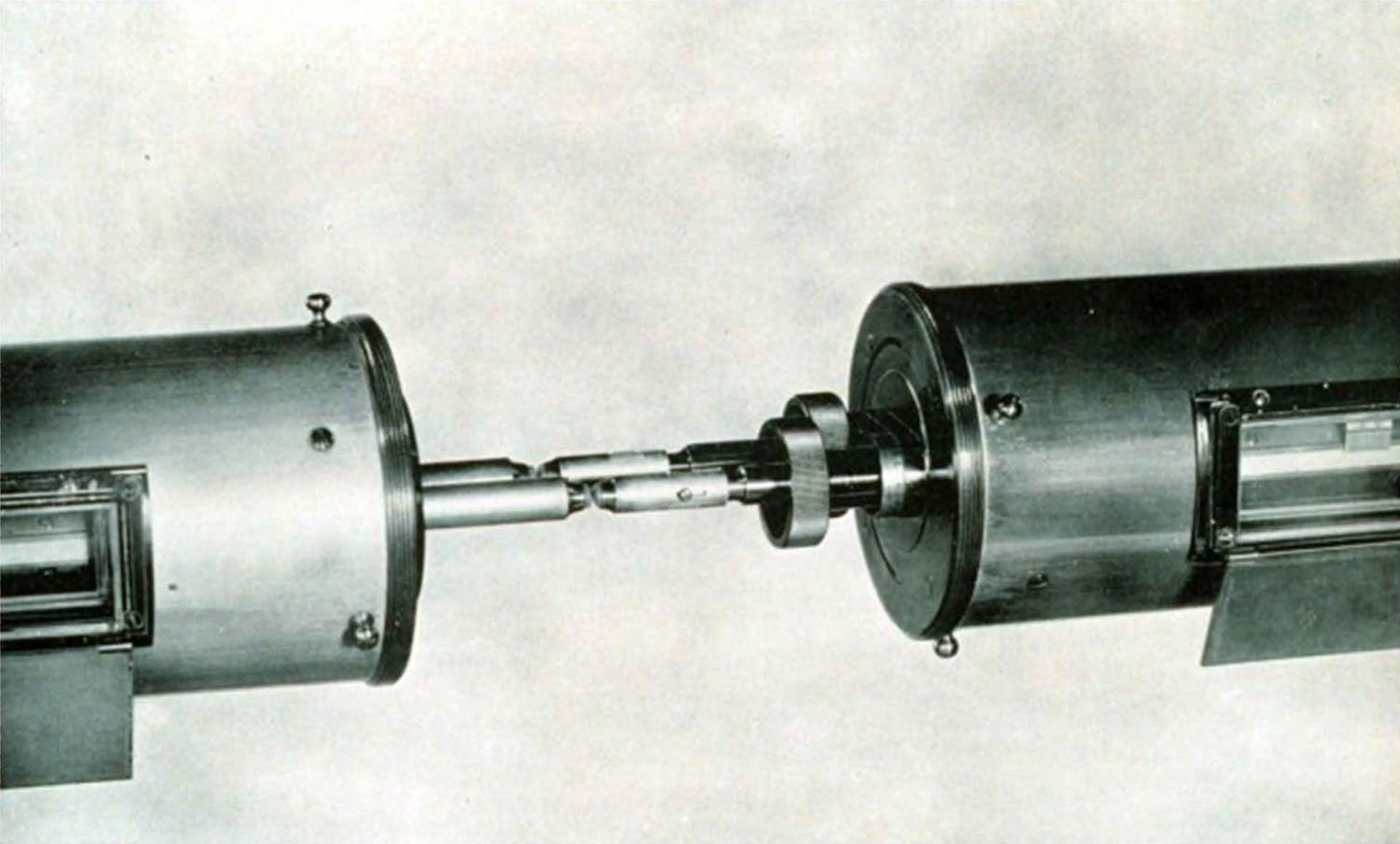
No. 1	Einbeck, Contacts.	No. 8	Hand, Launching and carrying the Bars forward
" 2	Gilbert, Inclin. Sectors & Thermo's.	" 9	" " " " " "
" 3	Welker, Aligning, Thermo's; Scales.	" 10	" Carrying released Trestles forward, etc.
" 4	Ritter, Spacing & Aligning Trestles.	" 11	" " " " " "
" 5	Yates, Recorder & Records.	" 12	" Aiding in setting & adjusting Trestles.
" 6	Lynch, Air Thermo's & Conductor of Sled.	" 13	" " " " " "
" 7	Wilkes, Foreman & Rear Trestles.	" 14	Driver of the Shelter Sled.
		" 15	Hand setting aligning flags & opening wire Fences.

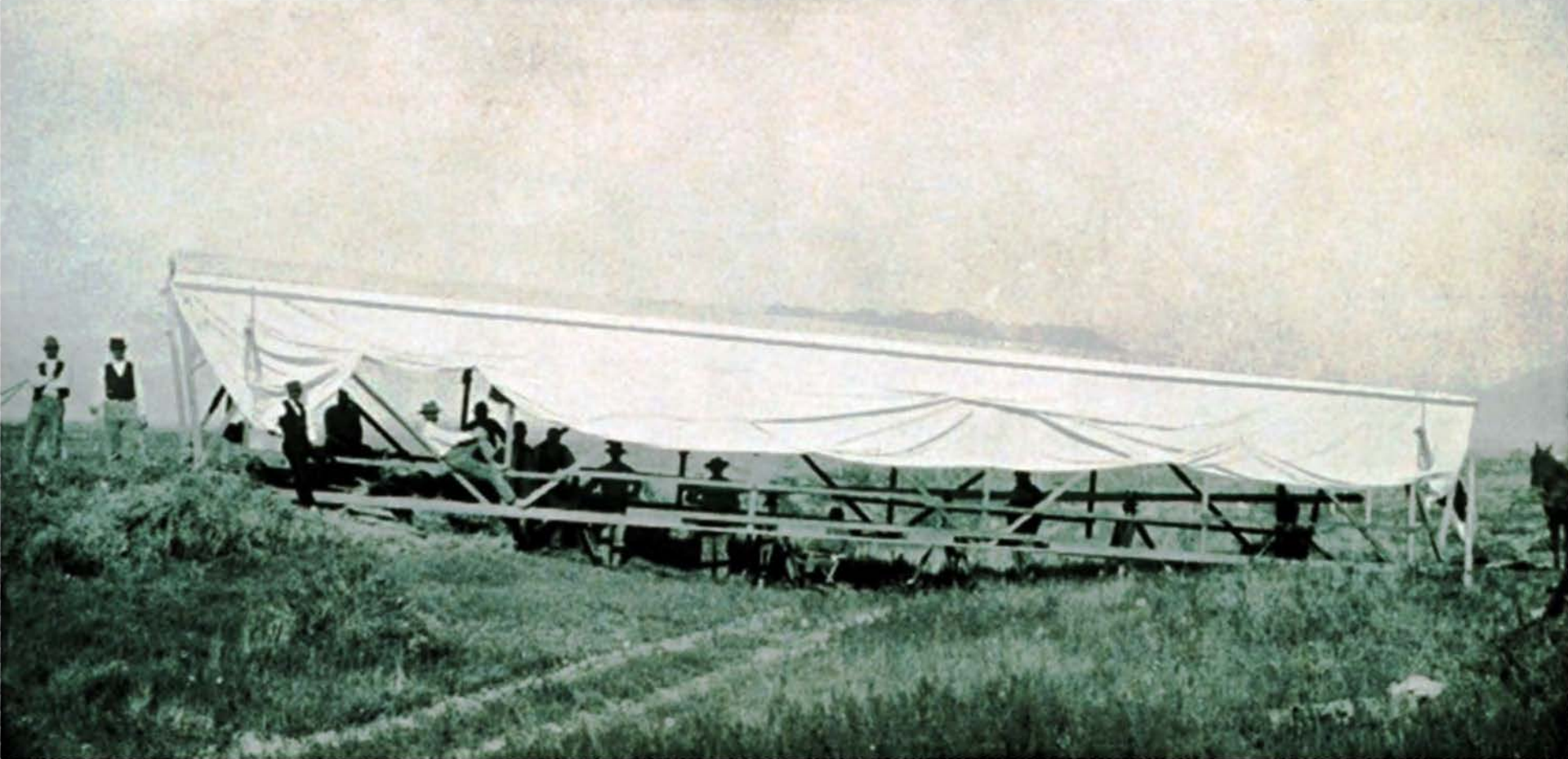
The Rear Bar was launched, the Trestles picked up and all carried forward. Simultaneously with starting up the Sled and moving it forward 5 Metres.

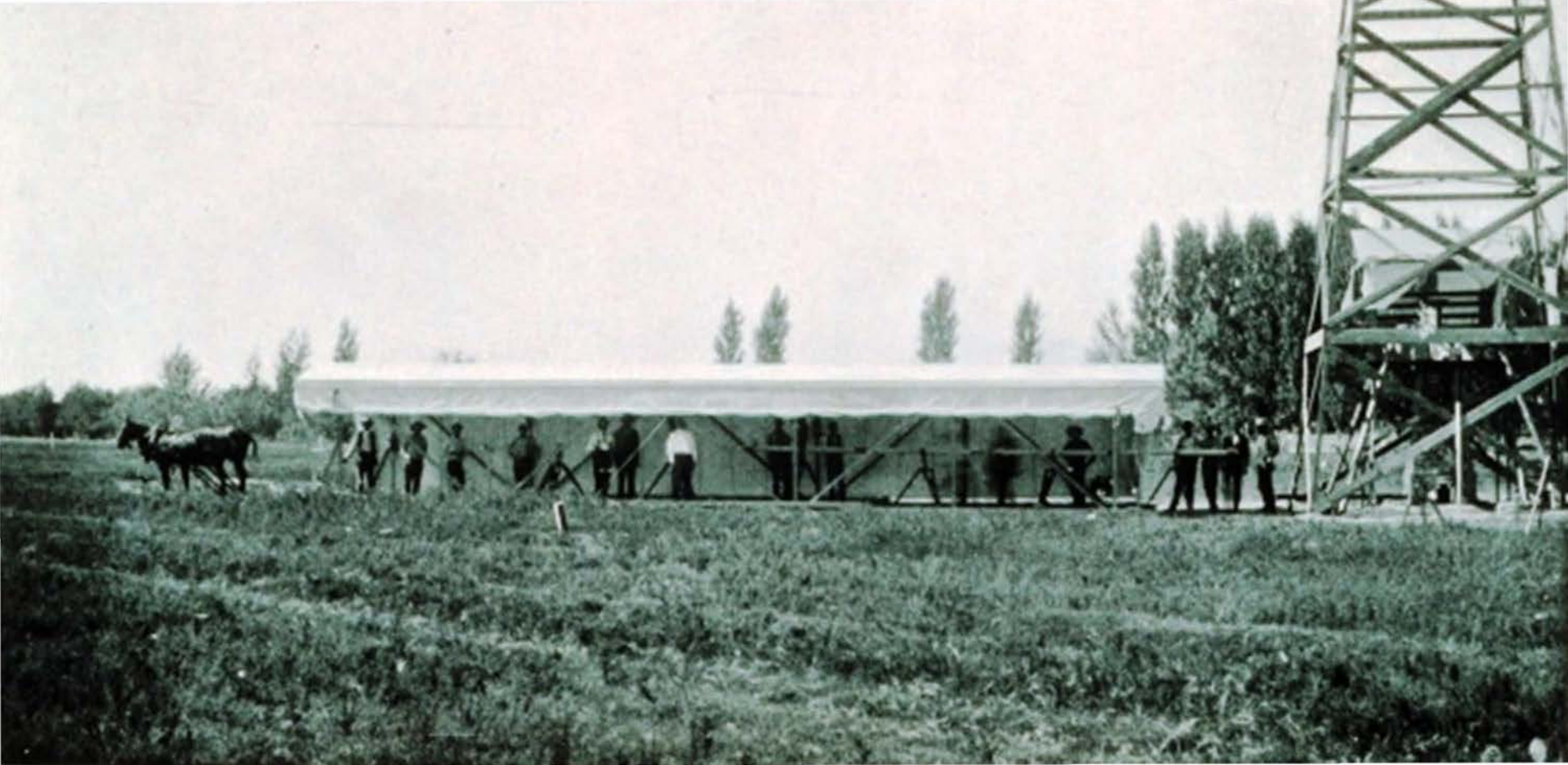
THE HORTH PRESS CO. PHOTO-LITHO. WASHINGTON, D. C.



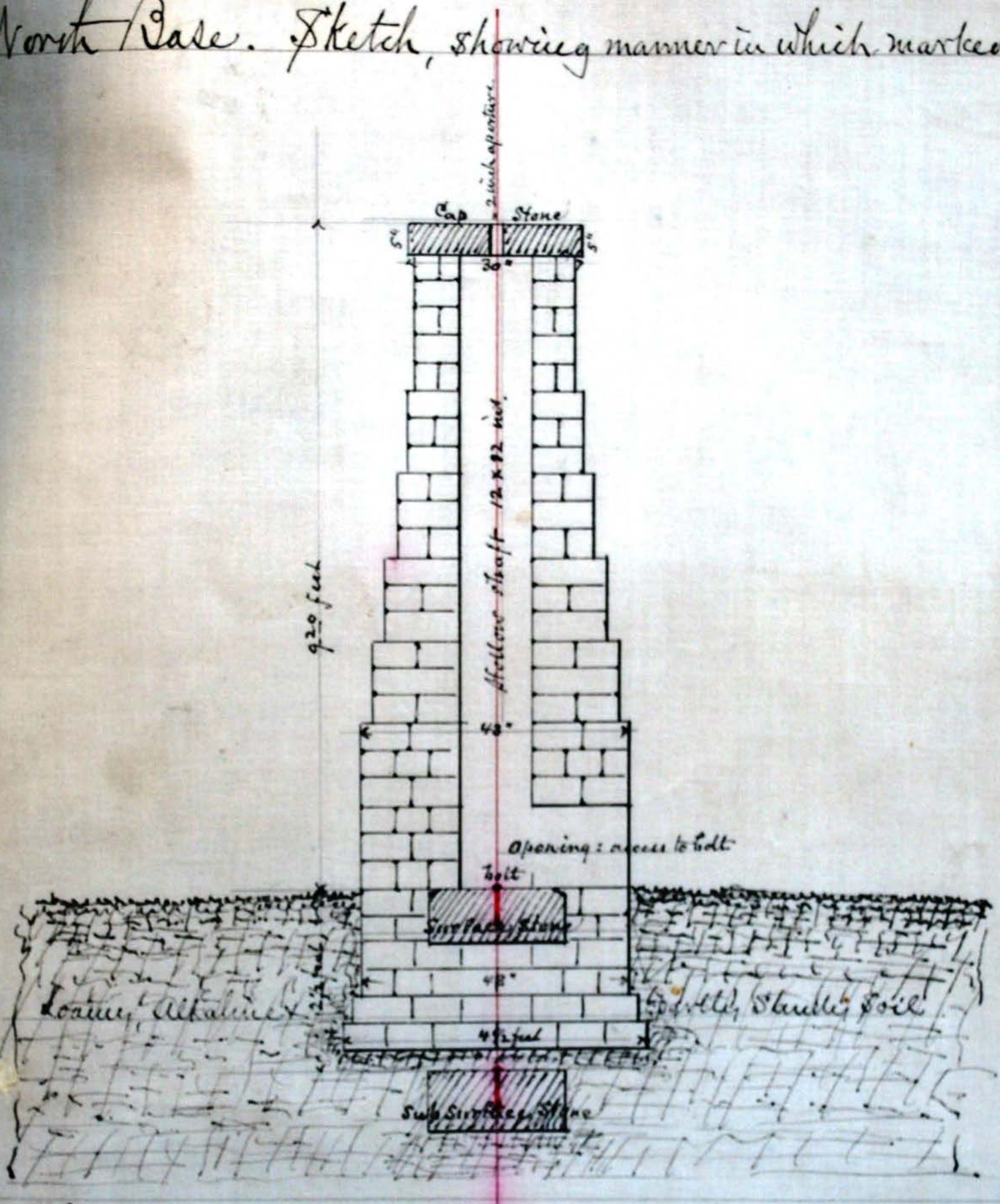
DUPLEX GUN No. 15 ON ITS TRESTLES.







North Base. Sketch, showing manner in which marked. 1896



UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

Requested Action:	Nomination
Property Name:	Salt Lake South East and North West Base Monuments (Salt Lake Base Line)
Multiple Name:	
State & County:	UTAH, Davis

Date Received:	Date of Pending List:	Date of 16th Day:	Date of 45th Day:	Date of Weekly List:
12/4/2017	1/4/2018	1/19/2018	1/18/2018	1/19/2018

Reference number:	SG100001980
Nominator:	State

Reason For Review:

X Accept _____ Return _____ Reject **1/18/2018** Date

Abstract/Summary Comments:	All procedural requirements have been met; The nomination form is adequately documented; The nomination form is technically and professionally correct and sufficient.
Recommendation/ Criteria	Accept

Reviewer Edson Beall Discipline Historian

Telephone _____ Date _____

DOCUMENTATION: see attached comments : No see attached SLR : No

If a nomination is returned to the nomination authority, the nomination is no longer under consideration by the National Park Service.

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Jill Remington Love
Executive Director
Department of
Heritage & Arts

Utah Division of
State History

Brad Westwood
Director

November 28, 2017

TO: Mr. J. Paul Loether, Keeper and Chief
National Register of Historic Places
Mail Stop 7228
1849 C St, NW
Washington, D.C. 20240

FROM: J. Cory Jensen, National Register Coordinator
Utah State Historic Preservation Office

RE: Salt Lake Base Monuments, Davis County, National Register of Historic Places nomination

Mr. Loether,

The enclosed disk contains the true and correct copy of the nomination form for the **Salt Lake Base Monuments** to the National Register of Historic Places. The other disk contains the photograph image files of the property in TIF format. Should you have any questions, please contact me at coryjensen@utah.gov or 801/245-7242.

Thank you,

J. Cory Jensen

Enclosures:
__1__ CD with PDF of the NRHP nomination form and correspondence/additional info
__1__ CD with digital images (tif format)
__1__ Physical Transmission Letter
__1__ Physical Signature Page, with original signature
_____ Other:

Comments:
_____ Please ensure that this nomination receives substantive review
_____ The enclosed owner(s) objection(s) do_____ do not_____ constitute a majority of property owners.
_____ Other: