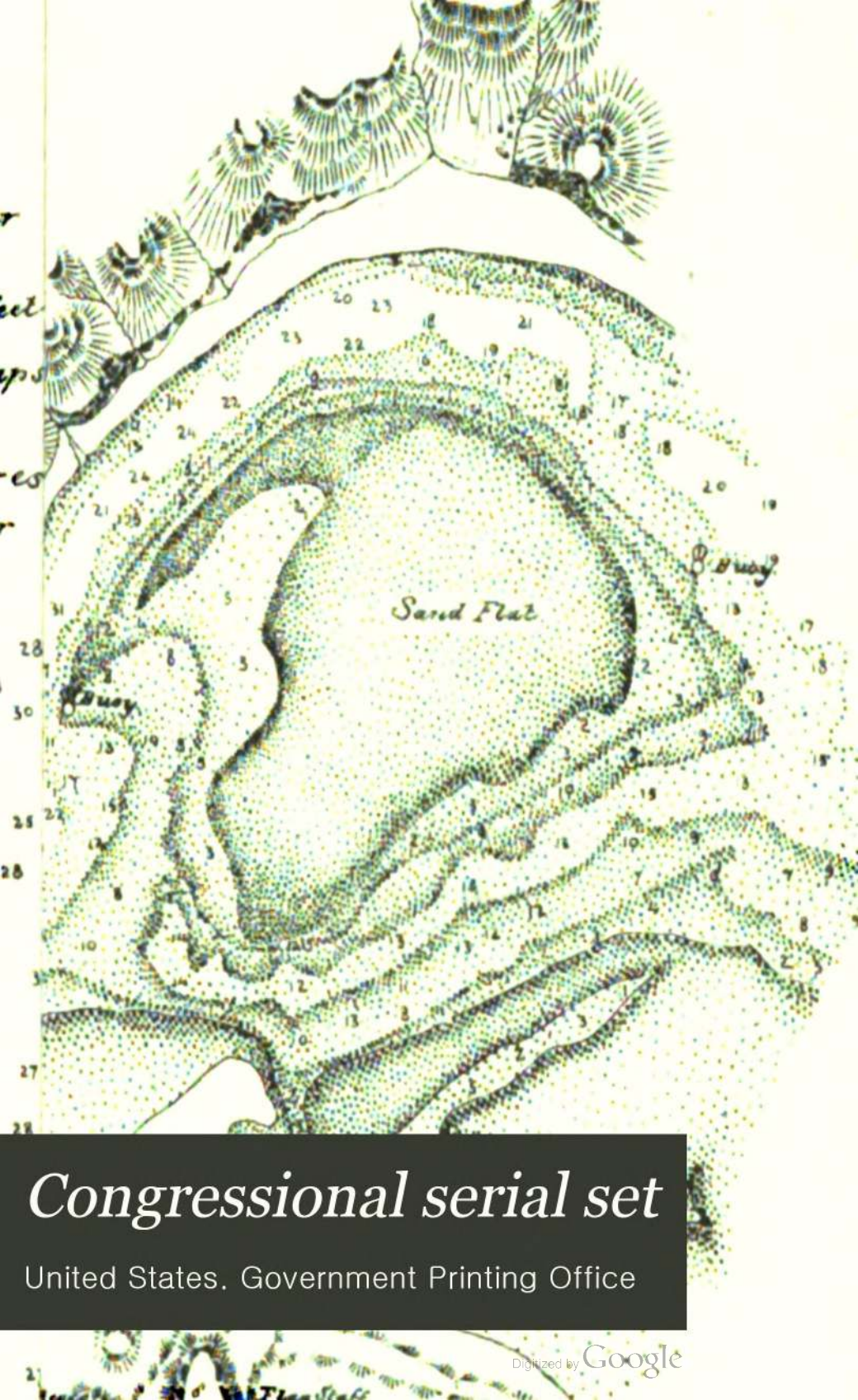

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TO THE

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FOR THE

FIRST SESSION OF THE FORTY-NINTH CONGRESS,

1885-'86.

V.

IN THIRTY-SEVEN VOLUMES.

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APPENDIX Z Z.

EXPLORATIONS AND SURVEYS IN THE DEPARTMENT OF TEXAS.

REPORT OF MAJOR W. R. LIVERMORE, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1885.

HEADQUARTERS DEPARTMENT OF TEXAS,
OFFICE ENGINEER OFFICER,
San Antonio, Tex., September 1, 1885.

GENERAL: I have the honor to submit the following report of operations in the Department of Texas for the year ending June 30, 1885.

The months of July and August were occupied in completing a topographical plat of surveys made during the preceding years. This plat covered an area of about fifty thousand square miles, thirty thousand of which were surveyed in 1883, and the remainder taken from the results of previous years and reports of scouts.

Before starting upon this expedition of 1883, I had made application for the necessary instruments to measure the primary triangulation, but did not succeed in getting them, and was therefore compelled to use inferior ones, designed for rough topographical work, imperfectly graduated, and of too little optical power to show the stations, which were sometimes more than one hundred miles distant; hence the topographical plat was based upon a number of tertiary triangulations, which often had to be extended over distances altogether disproportionate to the length of the bases and depended upon the mountain summits, not always well defined, to indicate the trigonometrical points.

This topographical work was so elaborate and so extensive that it was deemed advisable to complete the primary triangulation for which the stations had already been built and the angles measured with inferior instruments.

In July, 1884, I received from the engineer depot suitable instruments for this kind of work, viz, one secondary-base apparatus, one Troughton & Simms theodolite, 14-inch limb, and one Gambey theodolite, 6-inch limb.

After explaining the matter to the department commander, the following order was issued:

[Special Orders No. 109.]

HEADQUARTERS DEPARTMENT OF TEXAS,
San Antonio, Tex., August 23, 1884.

* * * * * * *

II. An expedition to complete the primary triangulation and latitude determinations of the country west of the Rio Pecos, Texas, and to obtain general knowledge of that region, will be organized and proceed so soon as proper arrangements shall have been completed. The duties will cease not later than December 10 next.

Maj. W. R. Livermore, Corps of Engineers, chief engineer officer of the Department, will command; he will proceed to Fort Davis, Texas, to complete the organization. The following officers and enlisted men will report, as indicated, to Major Livermore, on dates to be fixed by him: Second Lieuts. E. B. Ives, Nineteenth Infantry, and Leighton Finley, Tenth Cavalry, at Fort Davis, Texas. Second Lieut. W. F. Flynn, Eighth Cavalry, at San Antonio, Texas.

* * * * * * *

The commanding officer, Fort Davis, will detail one non-commissioned officer and five privates of cavalry, fully mounted and equipped, and, in addition, one non-commissioned officer and five privates of infantry, to be reported to Major Livermore, on his arrival at that post.

The commanding officer, Fort Clark, Texas, will detail six Seminole Negro-Indian scouts and forward them as may be indicated by Major Livermore.

* * * * * * *

By order of Brigadier-General Stanley.

THOMAS M. VINCENT,
Assistant Adjutant-General.

In compliance with the above order the expedition left Fort Davis on the 13th of September. The transportatation consisted of two army wagons, one escort-wagon, one spring-wagon, two instrument-carts, six pack-mules and four saddle-horses.

A supply camp was permanently established near Marfa.

On the 19th of September, accompanied by Lieutenant Ives, I left the main camp and occupied station Limpia, remaining there until the 26th. In the mean time Lieutenant Finley, with Topographical Assistants Rostock and von Thaden, were occupied in measuring the base line.

On my return to Marfa the parties were divided up as follows: Lieutenants Ives and Finley proceeded on October 2, via Murphyville, to Mount Ord, Santiago, Tarlinga, and San Jacinto Peaks, completing the secondary triangulation and topography of that region November 14.

Meanwhile with Lieutenant Flynn I occupied Cathedral and Baldy peaks and some of the base stations.

Topographical Assistants Rostock and von Thaden measured the base line, occupied the neighboring stations, and took observations for latitude and azimuth at Station E, near Rancheria.

On the 14th of November, with Topographical Assistant von Thaden, I went to Davis Ranch, where we arrived on the 15th. Here we met Lieutenant Ives, and the parties were divided up as follows: Assisted by Lieutenant Ives I made a survey of the country between Davis Ranch and Presidio del Norte, and connected the triangulation with an astronomical point established by the boundary survey of 1852.* Lieutenant Finley, with Topographical Assistant von Thaden, occupied Station Chinati, and Lieutenant Flynn, with Topographical Assistant Rostock, continued work on the base station.

I returned to Marfa from Presidio del Norte November 25, leaving Lieutenant Ives to survey south of San Jacinto and east of Presidio del Norte. Topographical Assistant von Thaden joined Lieutenant Ives after the completion of the work on Chinati summit, and Lieutenant Finley returned to Marfa on the 27th.

November 30, with Lieutenant Flynn, I went by the Southern Pacific Railroad to El Paso, and by the Texas Pacific Railroad from El Paso to San Martin Spring, occupying points along the route necessary to complete the triangulation, and to fill in the topography of such parts of the country as were not surveyed by previous expeditions.

*See Report on the United States and Mexican Boundary, Vol. I, page 193.

While at El Paso the triangulation was roughly connected with an astronomical station located at Fort Bliss by Captain Wheeler in 1878.*

In the mean time Lieutenant Finley and Topographical Assistant Rostock occupied Sierra Blanca and Eagle Mountain.

The parties arrived at Fort Davis December 10, and the expedition was broken up on the same day.

I returned to San Antonio December 16, leaving Topographical Assistant Rostock and von Thaden to determine the longitude of Marfa; but, owing to the impossibility of completing the telegraphic connection, they were recalled December 28. On their return they occupied Tres Hermanos Peak December 31 and connected Maxon Spring railroad station with the triangulation on January 1, 1885.

A preliminary computation of the triangulation was made in the field, showing results which, in point of accuracy, would compare favorably with the best geodetic work on record, and upon this basis a final plot of the topography was commenced in February, and on a scale of 1 inch to 2 miles.

I was notified about this time that funds would be available for lithographing such maps as could be prepared before the end of the fiscal year. This is the first time for five years that any appropriation has been made for this office.

In order to obtain the full benefit of this appropriation, sketches of the whole area, so far as replotted, were sent to Washington on the 20th of June, together with a military map of Western Texas, and one of Southwestern Texas and the adjacent part of Mexico.

The military map of Western Texas was prepared during the spring of 1884, in hopes that it might have been lithographed in that year. The results of the survey of 1883 had not then been plotted.

The map of Southwestern Texas and of the adjacent part of Mexico was prepared in 1880, from the results of odometer surveys made by me in 1879, and from reports of scouts and a compilation of maps previously published.

The military maps of Western and Southwestern Texas are to be published on a scale of 1 inch to 16 miles; the topographical sketches of the country west of the Pecos, on a scale of 1 inch to 4 miles.

Two copies of the map of Western Texas accompany this report. "A" shows the principal lines of the primary triangulation as already completed. "B" serves as an index map for the topographical sheets, and shows the routes followed by the expeditions of 1880, 1881, 1883, and 1884.

The sheets above referred to, that were sent to Washington last June, are those numbered 1, 2, 5, 6, 7, 10, 11, and 15. It will be seen that they cover all the country west of the Pecos, excepting a small strip lying along this river, which has since been mapped by combining our own surveys with some obtained from the Land Office and from the New York and Texas Land Company.

The officers and topographical assistants are entitled to great credit for the manner in which they carried out this work.

Lieutenant Ives had charge of an independent party throughout the season, and did good work in secondary triangulation, topography, and photography. Lieutenant Flynn showed unusual capacity as quartermaster of the expedition as well as in pirmary triangulation. Lieutenant Finley rendered valuable assistance to Lieutenant Ives, and at the end of the season took charge of a party of his own. Mr. Rostock suc-

* See Annual Report of the Chief of Engineers 1879, Appendix O O, page 2058.

cessfully performed the astronomical work required of him, and his work on the primary triangulation could not have been surpassed.

Topographical Assistant von Thaden aided Lieutenant Ives in topographical work, and Mr. Rostock in primary triangulation. Private Joseph Hampl, Troop L, Eighth Cavalry, was detailed to join the expedition on the 1st of October, and was employed first as recorder and afterwards as observer. He did good work in primary triangulation and topography.

Thus the expedition of 1884 completed the work which had been projected the year before, as stated in my last annual report.

The topographical sketches are copied from the office plot on a scale of an inch to 2 miles, which shows most of the topography, especially of the mountains, as accurately as it could be plotted from that scale; but in some cases the meanderings of the streams have been taken from the records of the Land Office.

A great many altitudes have been computed from vertical angles, and the triangulation appears to be as good as can be required. The quadrilaterals and independent systems of triangles show a probable error of less than $\frac{1}{5000}$. If more assistants were available for office work, it might be advisable to extend the computations and perfect the drawings. This, however, could be done at any time, and it is believed that the work is now in good condition to preserve the results of the survey for future reference.

Very respectfully, your obedient servant,

W. R. LIVERMORE,
Major of Engineers.

The CHIEF OF ENGINEERS,
Washington, D. C.