HISTORY OF WEATHER OBSERVATIONS
SAN DIEGO, CALIFORNIA
1849—1948

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ACKNOWLEDGEMENTS

Many individual contributed to the existence of the long record of climate in San Diego. The most important contributors were the scores of committed and dedicated observers who gave of their time for little if any recompense. Many other people contributed by making decisions to retain those records, the documents and photographs of historical value, and continuing to preserve them. Thanks to all who acted and now act as archivists.

Special recognition must be made for those who have published climatologies that emphasized the importance of the climate record. Among them were Ford Carpenter's The Climate and Weather of San Diego in 1913, T. E. Evans and D. A. Halvorson's Climate of San Diego, California in 1994, and Miguel Miller's The Weather Guide in 2005.

To those who will read this, thanks for continuing to be interested in the history of weather observations.

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HISTORY OF WEATHER OBSERVATIONS
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INTRODUCTION

The war between the United States and Mexico was the motivation for the United States Army to move into the San Diego area. An Army physician was one of those soldiers in Kearny's Dragoons. On the morning of 1 July 1849, duty required that he record the weather conditions at the post that had been established in the Mission of San Diego de Alcala.[1] So it was that Dr John Edward Summers became the first weather observer in San Diego. His observations for July, August, and September 1849 were submitted months later to the Surgeon General's office in Washington. Figure 1 shows what he had written on the back of the form for that submission.

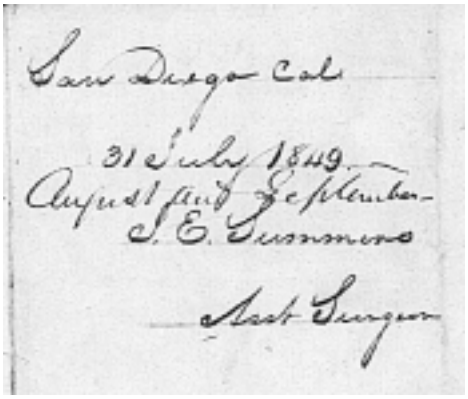


Figure 1. The Back of the First Observations Form Submitted from San Diego
Source: National Climatic Data Center

On the front of the form were the temperature data he had recorded daily beginning on 1 July 1849 and extending through 30 September 1849 (Figure 2). Note that he had crossed out the data from the first nine days of July and commented that the thermometer was out of order.[2] Therefore, the first valid observation in San Diego was made on 16 July 1849.

[1] San Diego, the part now called Old Town, was not incorporated as a city until 27 March 1850
[2] The problem was not identified but one common problem with thermometers was the occurrence of a separation in the column of mercury, perhaps caused in this case by jostling during the trip to San Diego

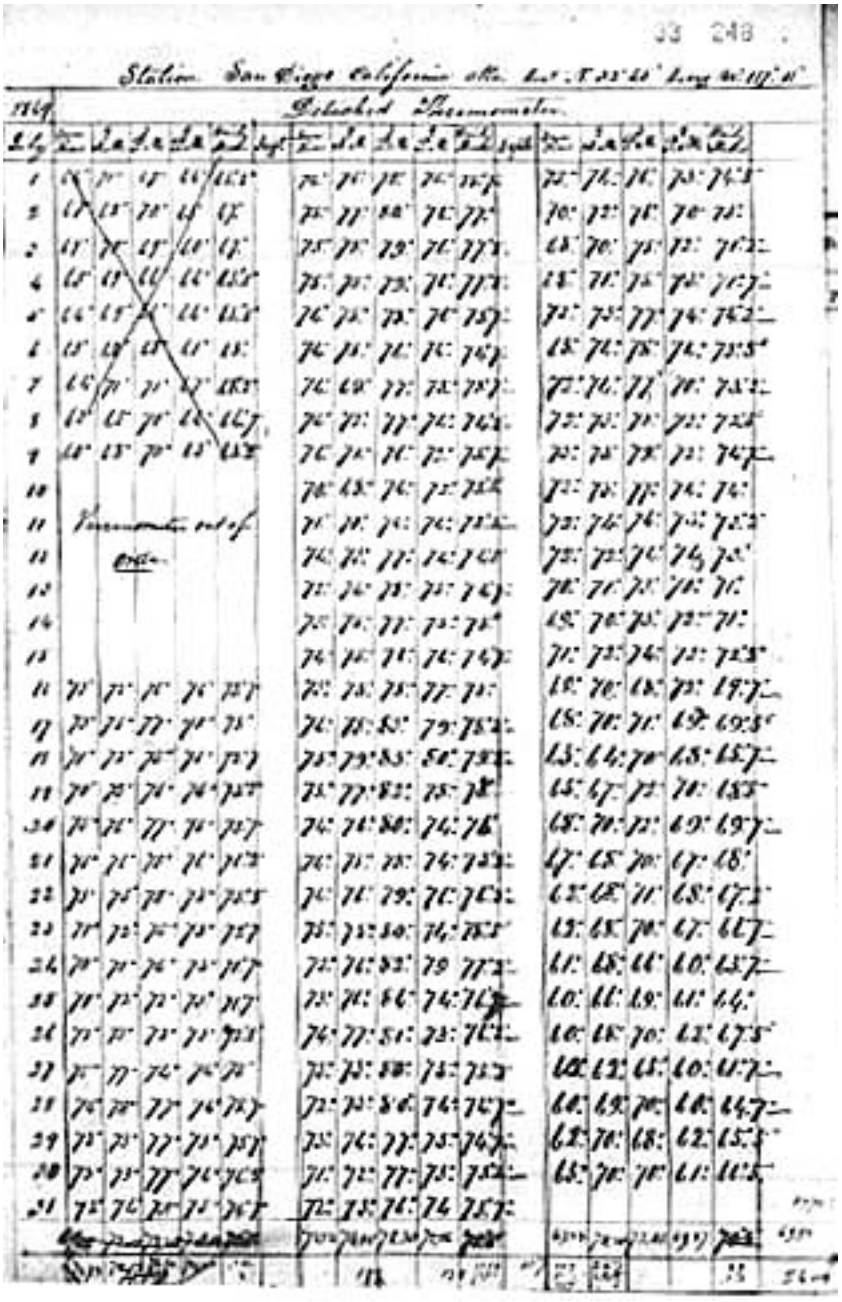


Figure 2. First Weather Observations from San Diego
Source: National Climatic Data Center

The garrison was small. According to the Post Returns of April 1849, there were five officers and eighty-two enlisted men stationed there. The 1850 United States Census was made in San Diego County on 25 July 1850. The census taker included the military members stationed there, fewer in number than the April 1849 returns showed. Among them was Dr. Summers (Figure 3).

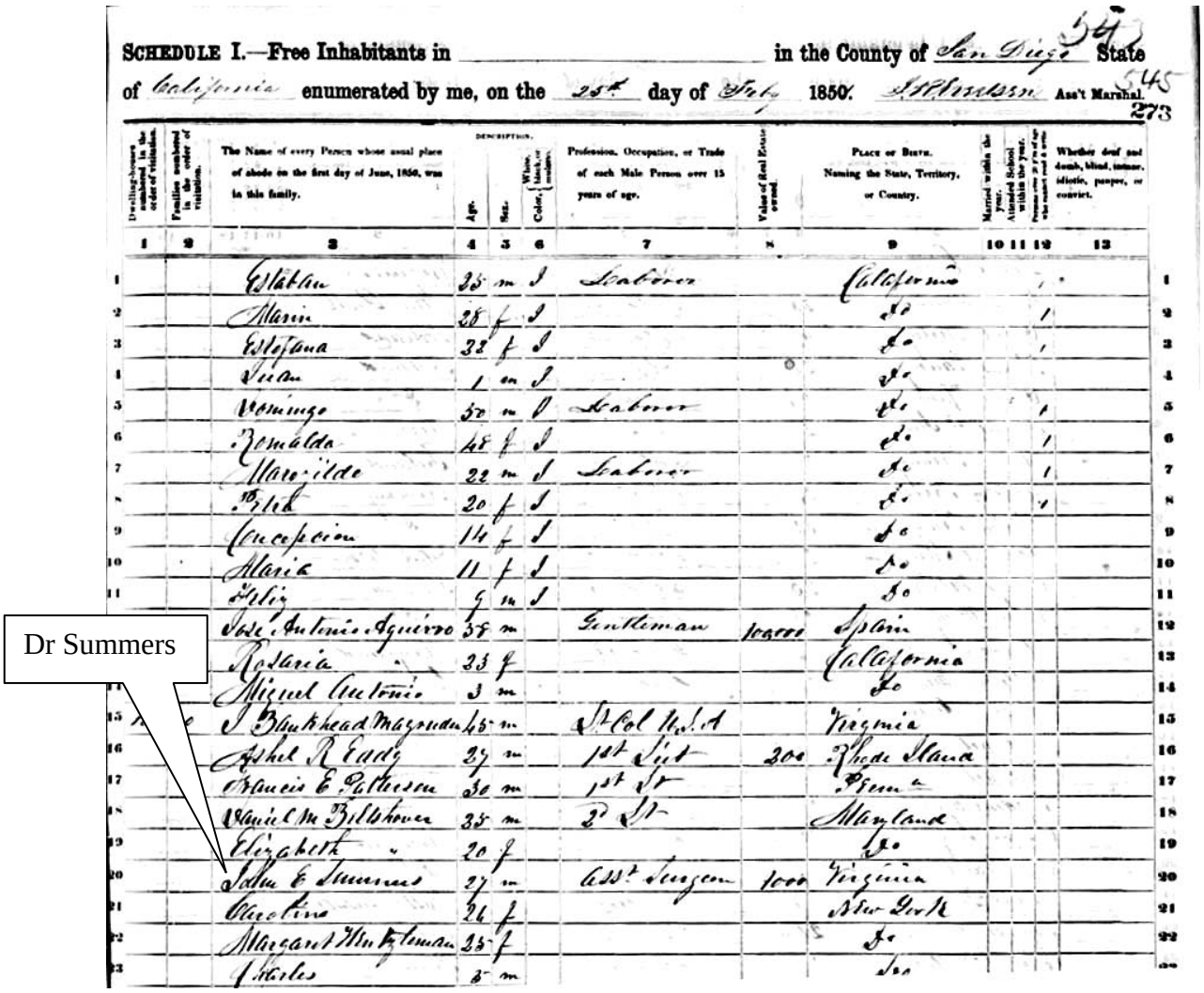


Figure 3. Census Record of Dr John E. Summers
Source: U.S. Census, San Diego County California, 1850

We look back over the hundred sixty-seven years since and are astonished by the survival of these records. The cause of that survival was and is the persistent interest in understanding climate. There were incredible improvements in meteorology between that first observation and the forecasts now being generated by the modern National Weather Service Forecast Office for the San Diego area. None of those advances diminished the climatological value of those first observations and the ones that followed. The building of that climate record continues with observations added each day by the National Weather Service.

The Record

The first weather observations in San Diego were an important continuation and extension of a network of weather observations that had been established at Army posts across the nation. In 1814 during the War of 1812, the Surgeon-General of the Army was James Tilton M.D. He issued a directive to his Army hospital, post, and regimental surgeons to record the weather. Although this beginning was encouraging it was dropped between 1815 and 1817. The effort to collect climate data was renewed by his successor, Joseph Lovell, M.D. in 1818. He ordered each Army surgeon to ".... keep a diary of the weather...." and to note ".... everything of importance relating to the medical topography of his station, the climate, diseases prevalent in the vicinity...." The emphasis was on subjective observations and, at least in effect, data were collected to supplement the observer's remarks.

The motivation for the new task was to determine if there was a cause and effect relationship between climate and the health of the soldiers. Dr. Lovell said the purpose was to ascertain if "in a series of years there be any material change in the climate of a given district of the country; and if so, how far it depends on cultivation of the soil, density of population, etc." Now, nearly two hundred years later, that could still serve as a mission statement.

The medical doctors in the Army were a logical choice to perform these early observations. If there was a connection between climate and disease, they were most likely to find it. They were trained scientists, schooled in the importance of careful observations and reasoned analysis. They were responsible people who could be trusted in this task just as they were in other medical tasks. They fulfilled their obligations as evidenced by the fact that the entries of the observations and the signature of the surgeons were in the same handwriting.

The Army was a logical choice of an organization to assume the climatic data collection. It had the ability to direct action and assure compliance. It had the capacity to collect data in a single standardized format so that geographical differences would be assessed. It had the advantage of having a presence even in the most remote areas of the frontier especially in areas that had few or no cities. That was important because some knowledge could be obtained before large numbers of people migrated into the frontier areas.

Dr John E. Summers was making weather observations on the westernmost frontier at an historic time, exactly what the Surgeon General had envisioned.

Goal of the Study

The goal of this study was to document the weather observational history of San Diego, California. The climatic data, and information from the observations made there, are readily available for the entire period of record. They may be accessed through the National Climatic Data Center, the Western Regional Climate Center, and the State Climatologist of California. The challenge of this study was to identify the role of San Diego in the development of a federal weather observational program and where it fit in the route that followed from the Army Surgeons, the Signal Service Observer Sergeants, and the Weather Bureau meteorologists, to the

current National Weather Service Forecasters and their extensive observational and forecast network of today.

LOCATION OF OBSERVATIONS

The City of San Diego was incorporated on 27 March 1850. The observation site in San Diego changed as the reason for making the observations changed. The Army made the observations from 1849 until 1890. Afterward, the Weather Bureau and its successor the National Weather Service made the observations. From the beginning to the present time, only one short period of less than five years has no extant record.

The first records were made at Army Posts. The location of the Post determined where the observations would be made instead of a site selected for its representative climatic characteristics. Army Posts were added as the frontier moved progressively westward across the Appalachians, the prairies, and deserts. The Army's use of Mission San Diego de Alcala and building of San Diego Barracks were at the westward edge of that movement.

Latitude, Longitude, and Elevation

Latitude and Longitude

The latitude and longitude of the observation sites in Table 1 were measured at the main entrance to the building if the building was still standing or if its position was known. Three buildings no longer stand. Their approximate locations are listed in the footnotes.

Table 1
Latitude and Longitude of Station Locations

Location	Period	Latitude	Longitude
Mission San Diego de Alcala	1 Jul 1849-Aug 1858	32˚47.065'	117˚06.377'
San Diego Barracks[3]	Sep 1858-Apr 1866	32˚ 42.697'	117˚ 10.203'
Dougherty Building[4]	25 Oct 1871-29 Oct 1875	32˚ 42.928'	117˚ 09.738'
Horton Bank Block[5]	30 Oct 1875-23 Apr 1878	32˚ 42.928'	117˚ 09.738'
Western Union Building	24 Apr1878-31 Mar 1886	32˚ 42.950'	117˚ 09.604'
Horton Bank Block[6]	31 Mar 1886-31 Dec 1888	32˚ 42.928'	117˚ 09.738'

[3] Measured at the plaque marking the location of the Barracks
[4] Station was across D Street from the Horton Building, its specific location is approximated
[5] Station was across D Street from the Daugherty Building, its specific location is approximated

Greely-Nesmith Building	Jan 1889-30 Apr 1895	32˚ 42.884'	117˚ 09.615'
Cole Block	1 May 1895-30 Apr 1897	32˚ 42.780'	117˚ 09.637'
Keating Building	1 May 1897-31 Mar 1913	32˚ 42.781'	117˚ 09.637'
Post Office & Court House	1 Apr 1913-1 Feb 1940	32˚ 42.816'	117˚ 09.964'
Admin Bldg, Lindbergh Field	1 Feb 1940 -	32˚ 44’	117˚10’

Instrument Elevations

Table 2
Instrument Elevations

Year	Barometer MSL	Thermometer AGL	Rain Gauge AGL	Remarks
1872	62.0 Feet	20.0 Feet	3.75 Feet	
1875	66.0 Feet	42.0 Feet	23.0 Feet	Changed 30 Oct 1875
1878	67.1 Feet	19.0 Feet	30.5 Feet	Changed 24 Apr 1878
1886	66.0 Feet	65.0 Feet	42.0 Feet	
1889	93.1 Feet	72.0 Feet	66.0 Feet	
1895	69.4 Feet	59.0 Feet	52.0 Feet	
1897	86.83 Feet	94.0 Feet	86.0 Feet	
1913	58.68 Feet	62.0 Feet	55.0 Feet	
1940	37.49 Feet	20.0 Feet	16.0 Feet	
1944			27.0 Feet	Changed 16 Nov 1944

Source: National Weather Service San Diego Forecast Office, San Diego

Street Addresses

Table 3
Street Addresses of Observation Sites

Location	Period	Street Address
Mission San Diego de Alcala	1 Jul 1849- Aug 1858	10818 San Diego Mission Rd[7]

[6] Station was across D Street from the Daugherty Building, its specific location is approximated

[7] Current address, the mission preceded the city

San Diego Barracks	Sep 1858-Apr 1866	North side of Market St[8]
Dougherty Building	25 Oct 1871-29 Oct 1875	Between 3rd & 4th on D[9]
Horton Bank Block	30 Oct 1875-23 Apr 1878	3rd and D
Western Union Building	24 Apr1878-31 Dec 1888	Corner 5th and D
Horton Bank Block	30 Oct 1875-23 Apr 1878	3rd and D
Greely-Nesmith Building	1 Jan 1889-30 Apr 1895	825 5th
Cole Block	1 May 1895-30 Apr 1897	NW Corner 5th and G
Keating Building	1 May 1897-31 Mar 1913	5th and F
Post Office & Court House	1 Apr 1913-1Feb 1940	937 West F
Admin Bldg, Lindbergh Field	1 Feb 1940-	2980 Pacific Highway

Observation Sites

Surgeon General Observation Sites

Jul 1849 Mission San Diego de Alcala

The first observations were taken at the Mission San Diego de Alcala. The location as listed on the first observation form was 32˚ 45' N and 117˚ 11' W. The first forms submitted used "San Diego" as the name but, in July 1850 and after, the name was "Mission San Diego" or "Mission of San Diego." Throughout the period, the latitude and longitude remained the same.

The Mission San Diego de Alcala was the first church in California. It had an interesting history from its origin in 1769. The beautiful Mission (Figure 4) that now stands was the product of restoration.

[8] Between Kettner and Pacific.
[9] Later renamed to Broadway

Figure 4. Mission San Diego de Alcala
Source: Author, 2006

At the time of the Army's occupation, the layout was very different (Figure 5).

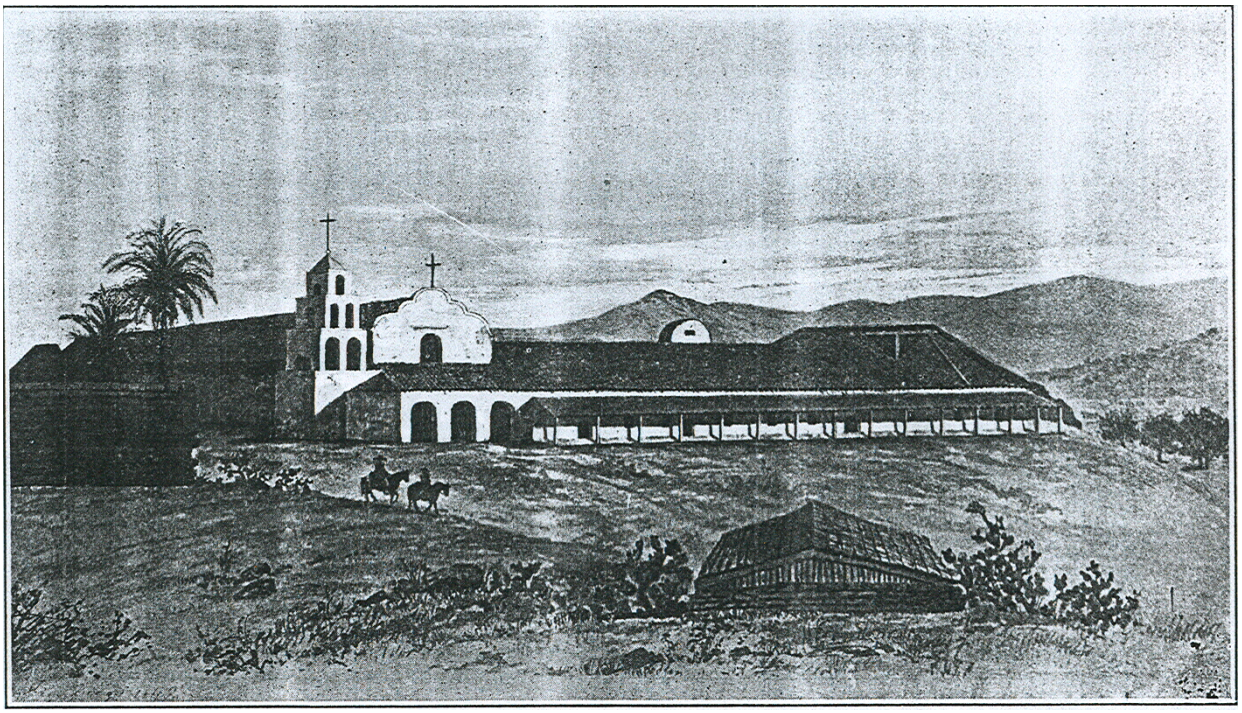


Figure 5. Mission San Diego in 1848
Source: Englehardt's Missions and Missionaries of California

The careful archaeological excavation currently underway is revealing the old layout. Although the exact location of the weather observation site is unknown, it seems probable that it was near where Dr Summers treated his soldiers. According to Hart, the chapel was used as a barracks and as a hospital. He referred to Bartlett's sketch of the grounds made during his boundary commission visit in 1852.

One tantalizing clue may be the recent discovery of human teeth in the excavation.[10] The cure for toothache in the mid 1800's was extraction. One wonders if those teeth mark the physicians' place of work. The excavation of that area (Figure 6) continues.

[10] Janet Bartel the Docent Coordinator related that finding to the author

Figure 6. Excavations at the Mission
Source: Author, 2006

Sep 1858 New San Diego

The Army built a supply depot in 1850 and called it New San Diego.[11] It occupied the block bounded by Pacific, Kettner, Market, and California Streets. The corral block was bounded by Union, State, F, and G Streets. The purpose of the depot was to store rations (flour, rice, beans, etc) for the Army in southern California. According to MacPhail, the lumber used to build the barracks was brought around the horn by ship. A cistern was dug and filled with rainwater.

It was renamed "San Diego Barracks by General Order Number 2, Military Division of the Pacific, San Francisco dated 5 April 1879. The historical marker (Figure 7) on the north side of Market Street between Pacific and Kettner Streets was used as the GPS determined position.

[11] The names New Town Depot and New San Diego Post also appear in other accounts

Figure 7. San Diego Barracks Historic Marker
Source: Author, 2006

Weather observations continued to be made at San Diego Barracks through April 1866. The Army unit was sent to La Paz, Arizona Territory and by June 1866 all the stored supplies were removed. The Barracks (Figure 8) was then abandoned. It was reoccupied from December 1869 through June 1871 when it was abandoned again. But, so far as is known, no weather observations were made during that period.

Figure 8. San Diego Barracks
Source: California State Military Museum

One historical source includes Fort Stockton in San Diego as a possible weather observation site. There are no weather records that indicate that it was such a site. The Mormon Battalion occupied Fort Stockton in late 1847 but abandoned it on 25 September 1848. There are no reasons to believe that they made weather observations while they were there.

Signal Service Observation Sites

A major change of location philosophy occurred when the Army's Signal Service became the primary national weather observation network. Where possible, the Smithsonian's and Surgeon General's temperature observations had been made at eye level over sod and the precipitation measurements were made with rain gauges mounted at or just above the ground. For example, the first observations in 1849 sent to the Surgeon General's office from San Diego were made at ground level.

The Signal Service Observer Sergeants began their observation role in San Diego in 1871. Their emphasis was on the availability of the telegraph to transmit near real time data to Washington where daily weather maps were prepared. The telegraph offices were located in the

middle of cities. The result was that the Signal Service selected observation sites that were downtown on rooftops, preferably the tallest building in town.

The Weather Bureau replaced the Signal Service in 1890 but retained their downtown site philosophy. There Station Regulations of 1905 had instructions for choosing locations.

> In selecting he building in which to establish a Weather Bureau office, special considerations should be given the instrumental exposure, the terms offered, and the accessibility of the structure.
>
> In general, the office building should be the higher than the surrounding structures, preferably with a flat or gently sloping roof, without towers, gables or high chimneys, and should afford facilities for the exposure of the instruments as provided in the circulars of the Instrument Division.

The result of this philosophy was that the rooftops of downtown buildings were the observation sites from 1871 until the moves to airports that began as aviation meteorology needs became the dominant consideration.

The San Diego station moved several time during and after the Signal Service period, but never away from a rooftop.

25 Oct 1871—29 Oct 1875 Dougherty Building D Street[12] between 3rd and 4th Streets

The first Signal Service site was in the Dougherty Building on D Street between 3rd and 4th Streets. The office was on the second floor of a two-story building facing D Street. It was across the street from the Western Union Telegraph Office that was located in the Horton Hotel according to the Inspection Report of October 1872. The rent was $18 per month.

The window shelter was mounted in a north-facing window (Figure 9) with the wind vane indicator affixed to the ceiling of the office. The rain gauge had been place on the roof as a response to the previous one being stolen.

[12] "D" Street is now named Broadway

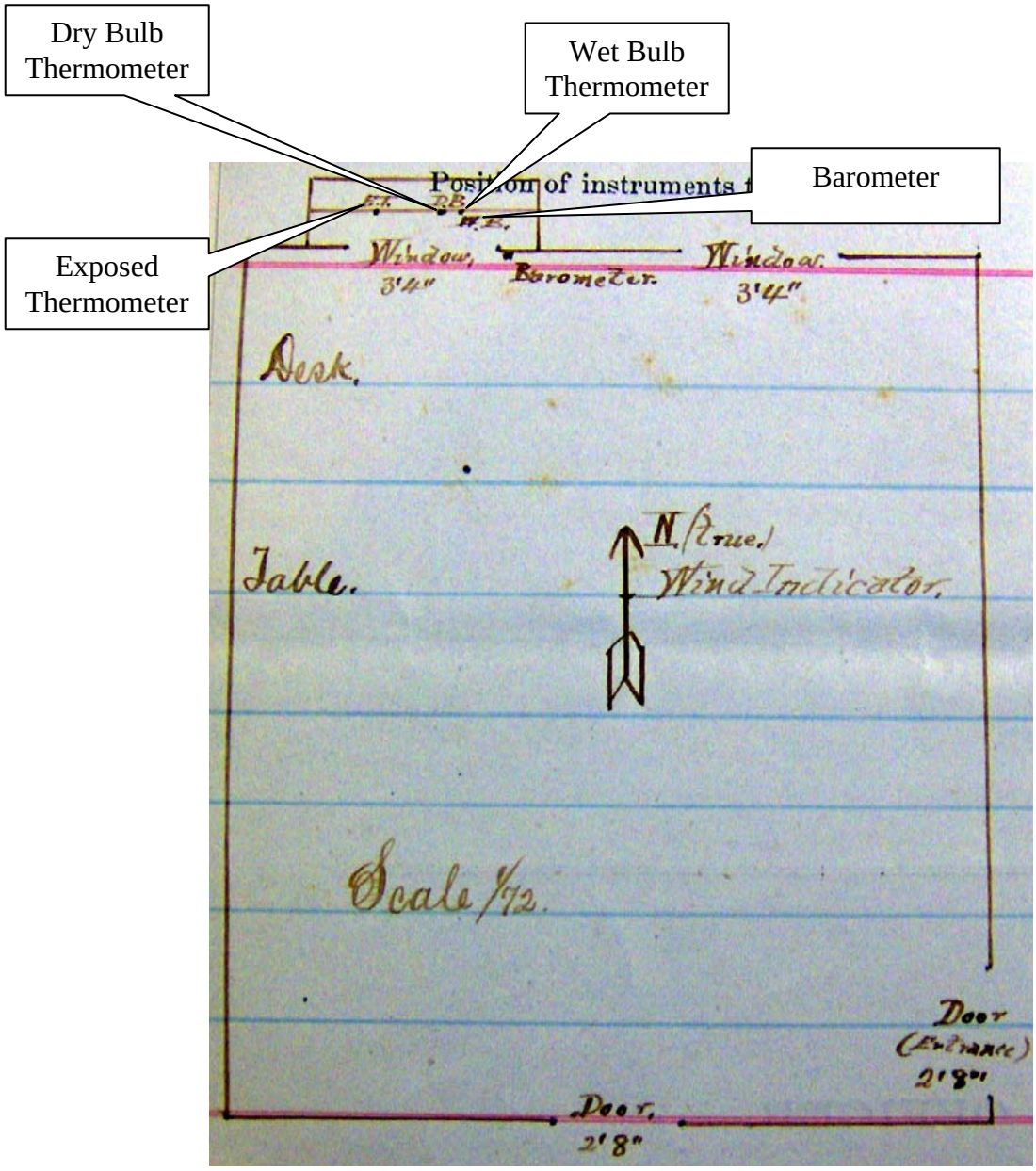


Figure 9. Office Layout Dougherty Building 1872
Source: National Archives and Records Administration

30 Oct 1875—23 April 1878 Horton Bank Block, D Street at 3rd Street

The Horton Bank Block was occupied by the Signal Service on 30 October 1878. This building stood at the corner of D Street (Broadway) and 3rd Street. The office was in Room 7. The Horton Bank Block was described as an excellent location.

24 Apr 1878—31 December 1888 Western Union Building[13] Corner D and 5th Streets

The Signal Service office moved again to a two-story brick building, the first floor of which was occupied by Western Union Telegraph Company on the northeast corner of D and 5th Streets. The rent was $10 per month when they moved in but rose to $60 per month by 1879. The Inspector stated that there was no better location in the entire city.

The photograph of the building (Figure 10) was taken on 4 July 1876 before the Signal Service moved in. Note the flagpole on the roof.

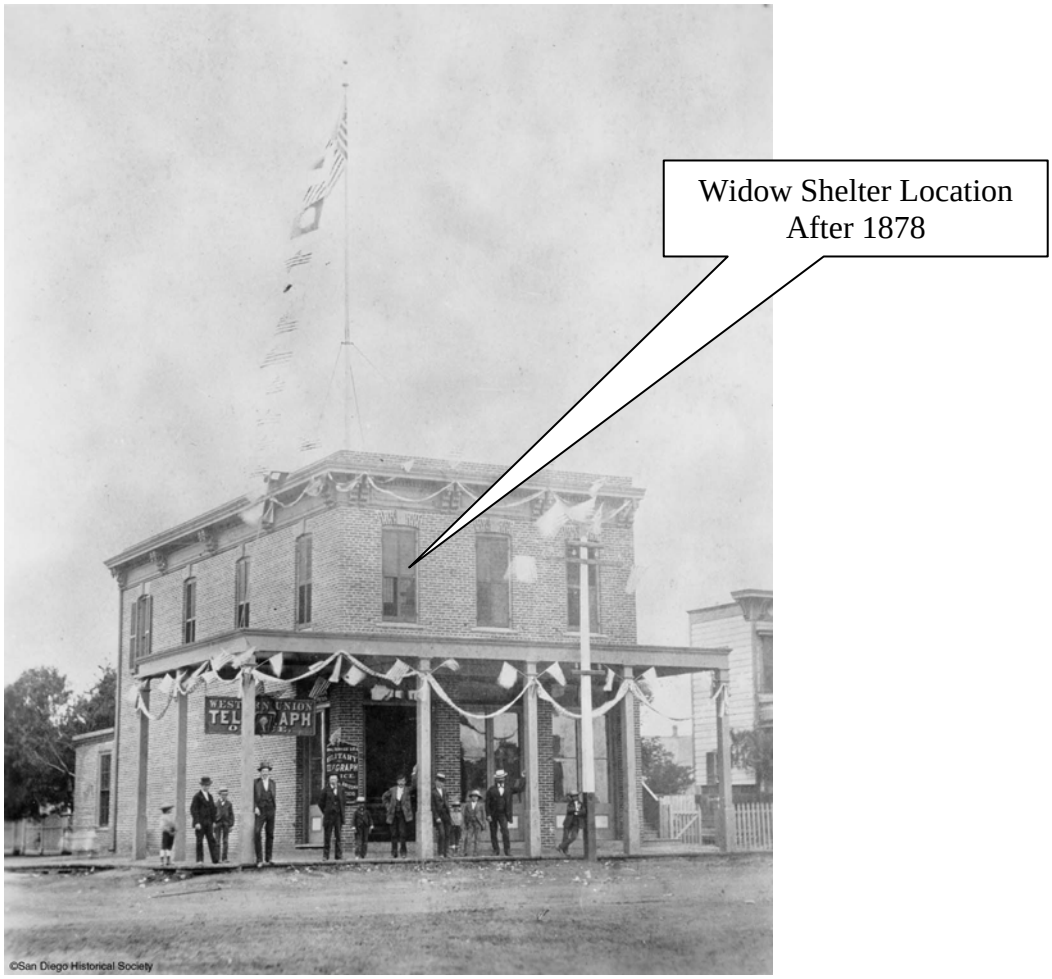


Figure 10. Western Union Building, 1876
Source: © San Diego Historical Society

[13] One source referred to it as the Fosse building

The lower floor had four rooms all of which were occupied by the Western Union and the Signal Corps telegraph offices. The Signal Service office occupied a long room on the second story looking toward the north (Figure 11). One side of the room had a partition to create a storage space.

Figure 11 presents the office layout as it was drawn by the Inspector in 1879. The position marked "SR" was the anemometer register.

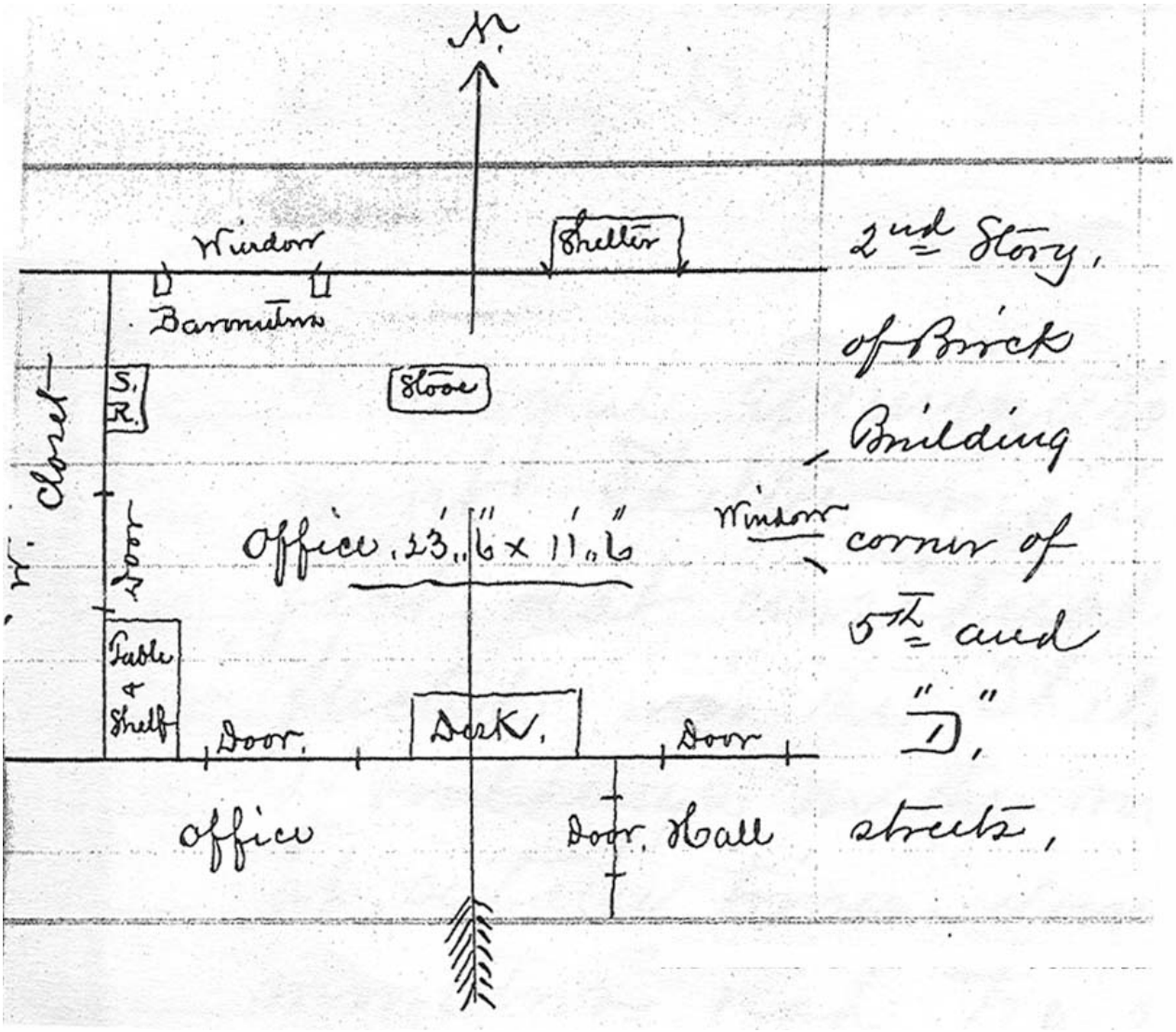


Figure 11. Office Layout, 1879, Western Union Building
Source: National Archives and Records Administration

The Inspector also drew a three dimensional view of the office interior showing the shelter in the window and the vane dial on the ceiling (Figure 12)

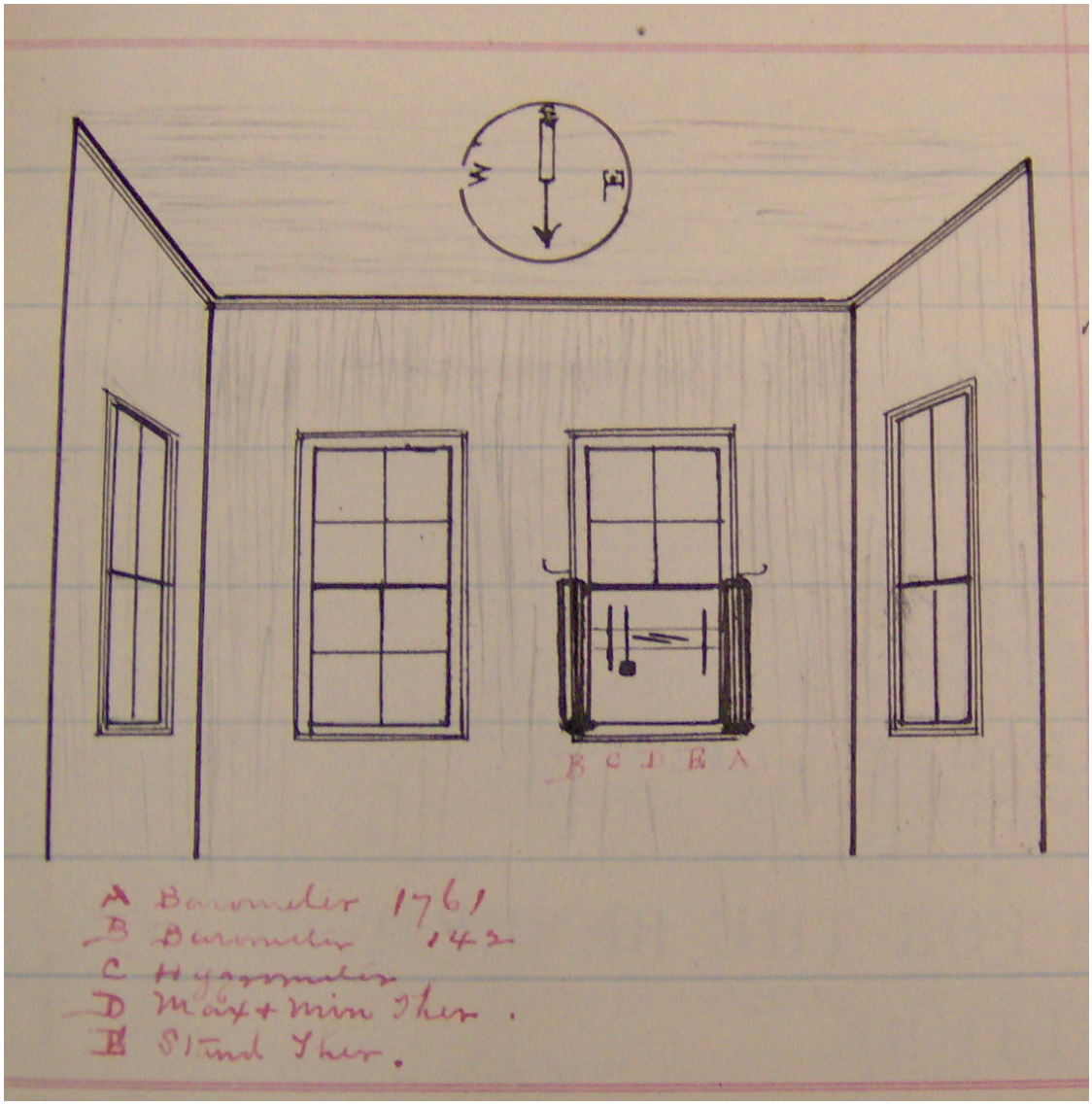


Figure 12. Interior of Office 1878
Source: National Archives and Records Administration

The Horton Bank Building (Figure 13) was occupied for the second time on 31 March 1886. Note that the wind vane and anemometer are visible on the roof and the window mounted instrument shelter is visible too. The office layout in 1888 is depicted in Figure 14.

Figure 13. Horton Bank Block 1886
Source: © San Diego Historical Society

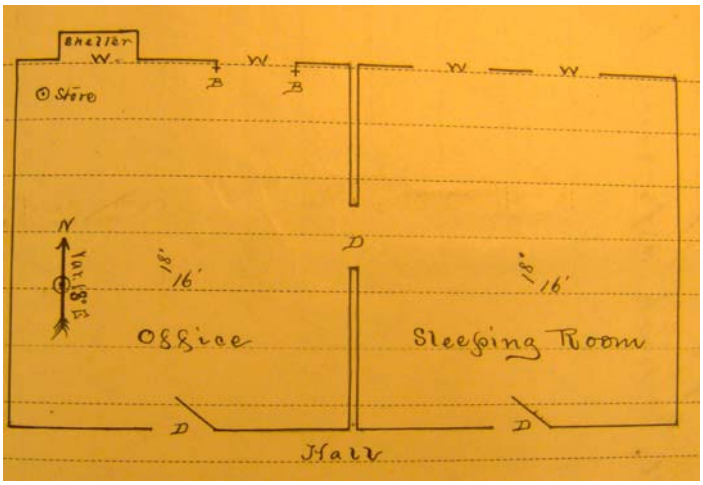


Figure 14. Office Layout 1888, Horton Bank Block
Source: National Archives and Records Administration

1 Jan 1889—30 April 1895 Greely-Nesmith Building, 825 5th Street between E and F Streets

The Signal Service office was located on the 4th floor of the Greely-Nesmith Building (Figure 15) in rooms numbered 40 and 41. Room 41 was used as a storage room. The Signal Service had full and exclusive use of the roof according to the inspection report of 1890. Rent at the Nesmith building was $155 for third quarter of 1889[14].

Figure 15. Greely-Nesmith Building, 2006
Source: Author

[14] Other expenses from that era were for coal, coal oil (kerosene), and frequent repairs of the clocks.

Weather Bureau Observation Sites

1 Mar 1890 Continued at Greely-Nesmith Building, 825 5th Street between E and F Streets

There was no change in location when the observations were changed from administration by the Signal Service to the newly organized Weather Bureau, However, the Inspector in 1895 recommended to a more desirable location that had better exposure and less rental costs.

1 May 1895 Cole Block, 5th and G Streets

The inspectors were not complimentary about the Cole Building (Figure 16). According to their report in February 1897, the rooms were small. There was no elevator so a climb up two stairs was required. The recommendation was that the office be moved to a "semi-fire proof" building that was opening for occupancy nearby.

Figure 16. Cole Block, 2006
Source: Author

1 May 1897 Keating Building[15] 5th and F Streets

The recommendion to move the Weather Bureau Office was adopted. The move to the Keating Building (Figure 17) occurred on 1 May 1897.

Figure 17. Keating Building, 2006
Source: Author

Rent at the Keating building was $90 for the second quarter of 1901. The Weather Bureau Office occupied Rooms 37 and 38. Room 37 was the location of the instruments and room 38 was used mostly for storage. The rooms were described as "light airy rooms of moderate size on the fourth floor." Location was first class and the quarters are well suited to the needs of the service. The

[15] Name was change to McNeese Building on 1 July 1909

roof afforded an excellent exposure for all instruments and was easily accessible. A bank and a stationery store used the first floor. US Collector of Customs and Immigration Bureau officials had their offices there too.

1 Apr 1913 U.S. Post Office and Court House Building, F Street between Union and State Streets

When the new federal building (Figure 18) was completed, the Weather Bureau Office moved into it, as was the case in many other cities in similar circumstances.

Figure 18. U.S. Post Office and Court House Building, 2006
Source: Author

The office occupied four rooms on the third floor and one very large room on the fourth floor. The rooms on the third floor were said to be well lighted and ventilated and really ideal. The room on the fourth floor was used to give instruction to classes from schools and for similar purposes. There was a broad stairway from the fourth floor room to the roof.

The inspection report of 1923 described the building as having a rundown appearance both inside and out. No mention was made about of topic thereafter.

1 Feb 1940

On 1 February 1940, the observation site was consolidated with the one at Lindbergh Field. The observations had been made at the Administration Building there since 19 August 1932. The site was on Pacific Highway on the eastern edge of the airfield.

INSTRUMENTATION

The instruments used throughout the Signal Service observation period were recorded well. The Climatological Record Book from the National Weather Service Office in San Diego was used to document instrument numbers.

On 16 May 1903, the San Diego Union published an account of the visit of Professor Skilling's physical geography class from the State Normal School to the Weather Bureau. It described four barometers, a barograph, five thermometers, a psychrometer, an anemometer, a tipping bucket rain gauge, and a sunshine recorder. In 1913, seventeen instruments used by the San Diego Office were posed on a table (Figure 19).

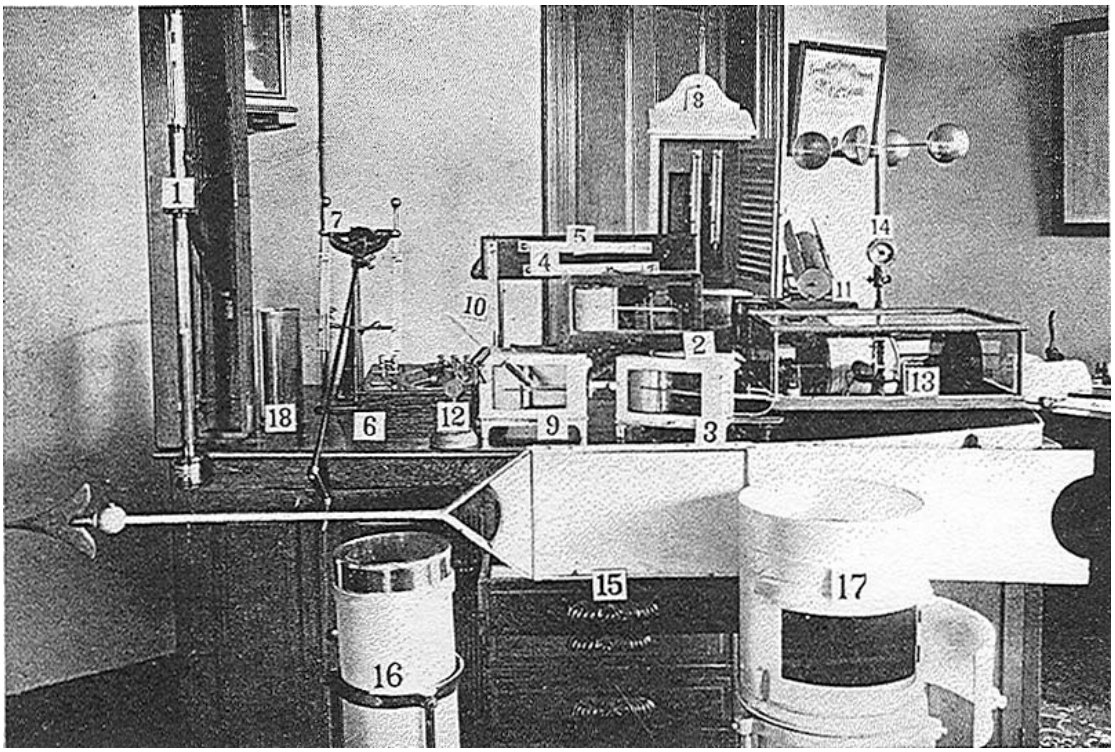


Figure 19. Displayed Instruments, San Diego 1913
Source: Carpenter's Climate and Weather of San Diego

The instruments in Figure 17 were identified as 1 Mercurial Barometer, 2 Barograph, 3 Thermograph, 4 Maximum Thermometer, 5 Minimum Thermometer, 6 Electric Thermometer, 7 Whirled Psychrometer, 8 Marine Hygrometer, 9 Hygrograph, 10 Sling Psychrometer, 11 Photographic Sunshine Recorder, 12 Electric Sunshine Recorder, 13 Metrograph[16], 14 Anemometer, 15 Anemoscope, 16 Rain-gage, 17 Recording Rain-gage, and 18 Rain Measuring Cup

[16] Commonly called the Triple Register

Thermometer

The first observations of temperature in 1849 were probably made at eye level above the ground and the thermometer was likely mounted on a north-facing exterior wall.

The Inspection Report of 1872 mentions a Robinson thermometer. The thermometers were in the window shelter and were 18 feet 11 inches above ground level (AGL).

The Chief Signal Officer's Annual Report for 1879 gave instructions for using the thermometer.

> The thermometer should be hung in the instrument-shelter[17] in such a position that it will always be at least one foot from the windowpanes or the wall of the buildings to which it is attached. The instrument must be hung vertically, with the middle of the scale at a height that will bring it on a level with the eye of the observer. The readings should be made at all time, but especially in the winter, through the panes of glass without raising the sash, when the shelter is built out from a window. When the shelter is built upon the roof, great care must be exercised in making the readings, in order to prevent the instrument from being affected by the heat of the body or the lantern at night. The observations must be made a rapidly as is consistent with accuracy.

The thermometers were to be tested three times each year using the procedures outlined in the 1879 report.

> Place the thermometer to be tested in the vessel provided for this purpose, keep them in a vertical position, pack finely pounded ice around them to a height a little above the freezing point, and let them remain for one hour, at the expiration of which time read off the height of the mercury, without removing them from the ice, note the result of the test of each thermometer in the daily journal, and report it to this Office in the journal abstract.

If instrumental errors were found and reported and if corrections were necessary, they would be authorized by the Chief Signal Service's Office. A record was kept on the errors of the thermometers from 1 November 1871 through 5 June 1902. The greatest error detected in the dry thermometers was 0.2˚, most were smaller. Then wet thermometer's errors were 0.2˚ or smaller with two exceptions, the 9 October 1879 reading and 1 July 1882 were 1.0˚ too high.

The self-registering thermometer was one of the innovations in meteorological observations. It was two J-shaped thermometers each with small wires embedded that acted as index markers for the highest and lowest temperatures since the instrument was reset. These

[17] The reference was to a window shelter

markers moved as the mercury expanded with warming or contracted with cooling and were left in place at their most extreme position. Loomis described a self-registering thermometer (Figure 20) in his Treatise on Meteorology[18] in 1868.

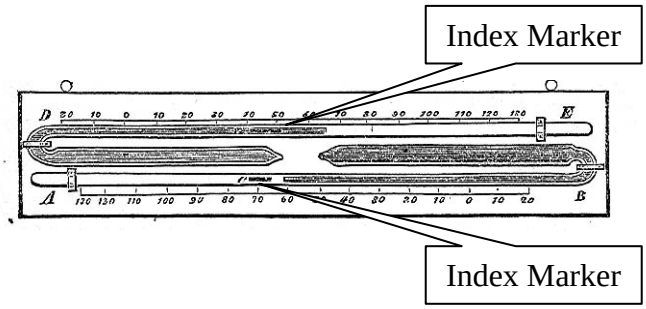


Figure 20. Self-Registering Thermometer
Source: Loomis' Treatise on Meteorology, 1868

Instructions for the maximum thermometer were included in the 1879 report. It cautioned against breakage when spinning it to reset the marker. Table 4 shows the maximum thermometers used in San Diego as recorded in that station's Climatological Record Book. Broken instruments are indicated by *, inaccurate instruments by ** and that convention is used throughout the other tables.

Table 4. Maximum Thermometers Used at San Diego

	In Use	
Number	**From**	**To**
*118	1871	1879
406	1879	1882
426	1882	1884
1224	1886	1888
1731	1888	1889
1285	1889	1892
2900	1892	1903
*9431	1903	15 Feb 1909
2925	15 Feb 1909	15 Mar 1910
*13452	15 Mar 1910	15 Feb 1911
*14474	15 Feb 1911	28 Jul 1911
14475	28 Jul 1911	8 Aug 1912
*15289	8 Aug 1912	10 May 1923
20764	10 May 1923	

[18] The Loomis textbook on meteorology was a classic that was provided to each office. It was required reading by all Observer Sergeants of the Signal Corps. Inspectors tested them on their knowledge of it.

The 1879 instructions cautioned against overheating the spirits when trying to reunite the column when it became separated.

Table 5. Minimum Thermometers Used at San Diego

	In Use	
Number	**From**	**To**
51	1871	1886
1143	1886	1888
1767	1888	1902
2315	1902	1907
*6699	6 May1907	4 May 1911
*10513	4 May 1911	
10536	19 May 1911	
*10513	20 Nov 1911	18 Jun 1915
8904	18 Jun 1915	12 Jan 1916
12623	12 Jan 1916	28 Mar 1916
8904	28 Mar 1916	19 Jul 1918
13020	19 Jul 1918	15 Oct 1920
**14067	15 Oct 1920	6 Nov 1928
8904	6 Nov 1928	

Dry thermometer number 161 was the first one used and it was mounted in the window shelter.

Table 6. Dry Thermometers Used at San Diego

	In Use	
Number	**From**	**To**
161	1 Nov 1871	1 Jul 1882
355	1 Jul 1882	27 Sep 1885
327	27 Sep 1885	30 Mar 1886
1652	30 Mar 1886	15 Jul 1888
2501	15 Jul 1888	1 Mar 1889
1964	1 Mar 1889	12 Sep 1893
3497	12 Sep 1893	1 May1895
2501	1 May1895	1 May 1897
3093	1 May 1897	1 Nov 1897
4019	1 Nov 1897	14 Mar 1906
4705	14 Mar 1906	10 Mar 1910
5223	10 Mar 1910	20 Dec 1916
3800	20 Dec 1916	21 Nov 1928
6163	21 Nov 1928	

The 1879 Annual Report described the proper technique in reading the wet bulb thermometer of the hygrometer.

> When the temperature of the air is below the freezing point, the water will be emptied from the cistern, and in making an observation the wet bulb will be moistened with cold water, and the instant the mercury has reached its minimum, its height will be noted. *Alcohol must not be used.*

The stationary psychrometer was replaced by the whirling psychrometer in 1889.

The humidity tables came into use in 1889 when Guyot's tables were first available. They were replaced by Hazen's Tables in 1897.

In January 1882, wet thermometer number 27 was found to have too large and error and was replaced by number 55.

Table 7. Wet Thermometers Used at San Diego

	In Use	
Number	**From**	**To**
28	1872	1879
26	1879	1882
*27	1882	1882
55	1882	1885
*432	1885	1887
1727	1887	1888
2526	1888	1889
1822	1889	1893
*3464	1893	1898
*3984	1898	1901
3120	1901	14 Mar1906
*4663	14 Mar1906	12 Oct 1910
*5076	12 Oct 1910	12 Oct 1910
*4646	12 Oct 1910	24 Nov 1919
*5116	24 Nov 1919	25 Aug 1925
4376	25 Aug 1925	

Barometer

Each station was equipped with two mercury barometers. Twice each month, ten comparative readings on each of those two days would be made and recorded in the daily journal. Those reading were to exclude elevation corrections, correcting for temperature and instrument error only. The comparison would indicate if there was a variance.

The 1879 inspection stated that the barometers were Green Barometers (Figure 21),

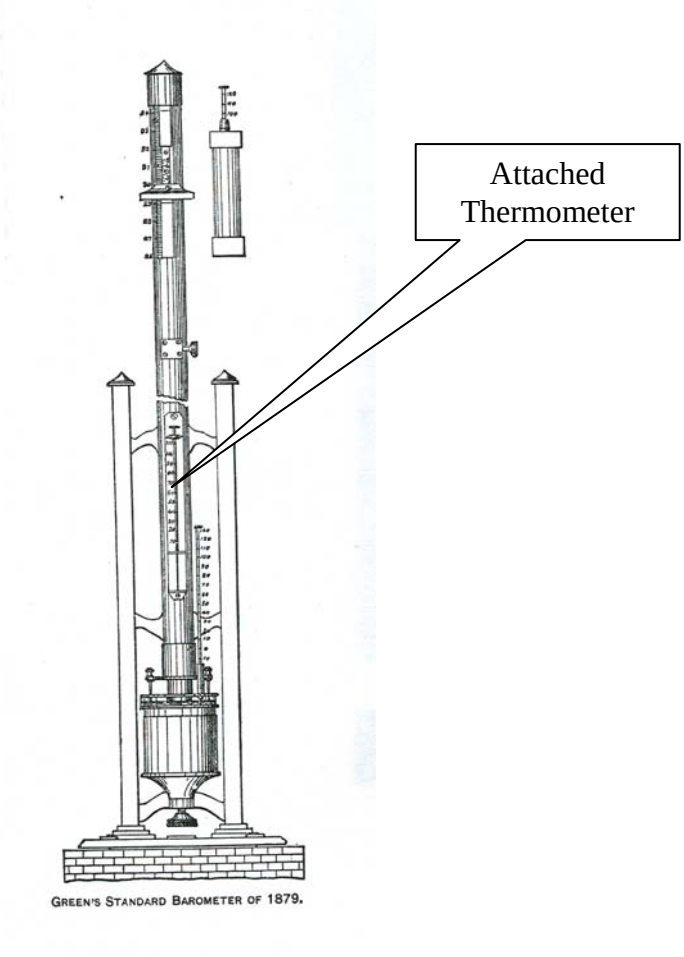


Figure 21. Green's Barometer, 1879
Source: National Archives and Records Administration

The barometer had a thermometer attached. Loomis described the purpose in his Treatise on Meteorology.

> Heat expands the column of mercury; that is, diminishes its specific gravity, and thus a greater height is required to produce a given pressure. Now, since the barometer is daily subjected to changes of temperature, variations in the height of the column do not necessarily indicate variations of pressure. Before we can decide whether there has been a change of pressure, we must compute the effect due to the change of temperature. For this purpose, we must know the temperature of the mercury at each observation; and, accordingly, a thermometer always accompanies a barometer, and is technically called the attached thermometer. At every observation of the barometer the attached thermometer should also be observed. For the purpose of comparison, all

> barometric observations should be reduced to a standard temperature, and the temperature generally agreed upon is that of melting ice. The expansion of mercury from the temperature of melting ice to that of boiling water is 1/55 of its volume, which is about 1/10,000th part for one degree of Fahrenheit's thermometer. In order, therefore, to reduce the observed height of the barometer to the height which would have been indicated if its temperature had been 32°, we must subtract the ten thousandth part of the observed altitude for each degree above the freezing point. If the temperature be below 32°, this correction must be added to the observed altitude. Tables have been computed, from which we may obtain, by mere inspection, the correction to be applied to the observed height of the barometer.

The barometers were cleaned in 1879 and a “small amount of air” was taken from each of the barometers. That was done again in 1882 with the air bubbles described as “small.”

Table 8. Barometers Used at San Diego

	In Use	
Number	**From**	**To**
1761	1 Nov 1871	28 Jan 1892
142	29 Jan 1886	1 Jan 1889
482	1 Jan 1889	17Jan 1913
122	17Jan 1913	30 Apr 1913
482	1 May 1913	

Anemometer

The anemometer’s location in 1872 was judged to be excellent because there was only one building within a half mile that would interfere with wind flow. It was on the roof 39 feet 7 inches above the ground. The vane was 54 feet 8 inches above ground. The roof was covered with tar and painted with fireproof paint. The roof sloped toward the south. There were parapets around the edge of the roof (Figure 22). The building owner was said to object to anyone going onto the roof except when absolutely necessary.

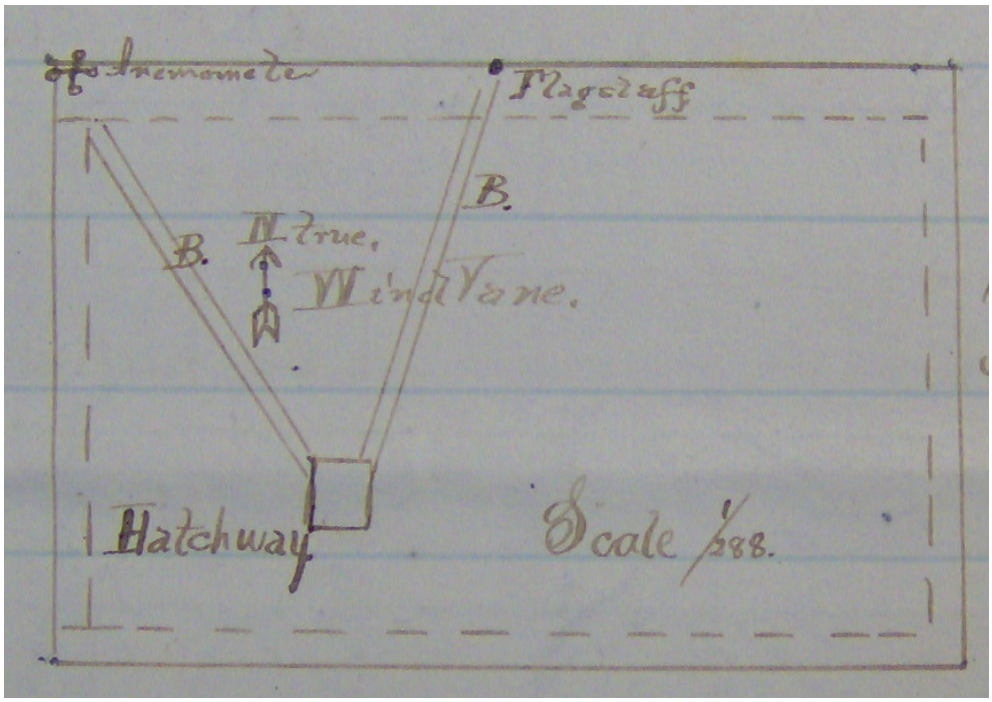


Figure 22. Roof Layout 1872
Source: National Archives and Records Administration

The layout of the roof was somewhat different in 1880 (Figure 23). There was a note that stated that there were "no live chimneys."

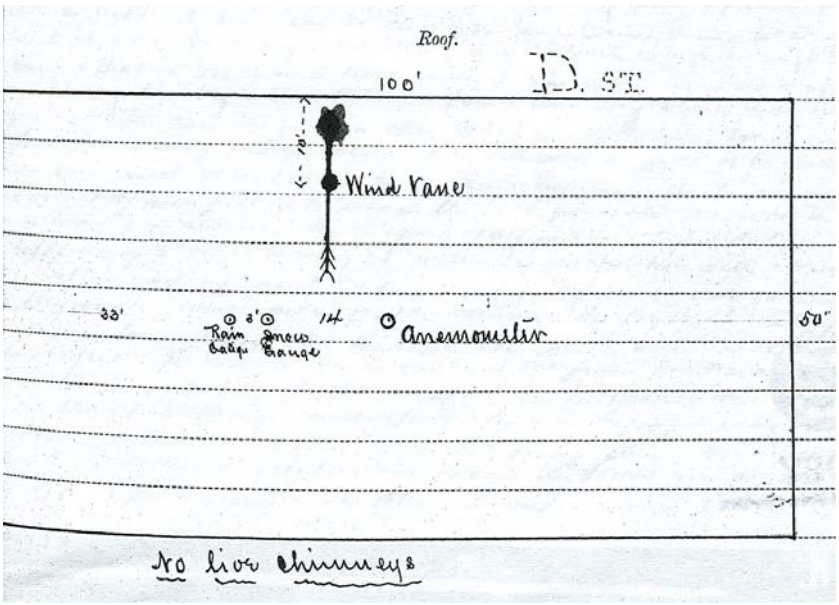


Figure 23. Roof Layout 1880
Source: National Archives and Records Administration

The anemometer readings from 1 May 1895 to 1 May 1897 of winds from southwest to southeast were said to be inaccurate because of the City Hall building that was two stories higher than the roof of the Cole Building. Afterward, the exposure was excellent.

Table 9. Anemometers Used at San Diego

	In Use	
Number	**From**	**To**
127	1871	1872
65	1872	1880
381	1880	1883
391	1883	1888
387	1888	1904
736	1904	1905
302	1905	23 Mar 1920
866	23 Mar 1920	1 Jan 1928
1426	1 Jan 1928	

Wind was measured in two ways. A wind vane that was mounted on the roof determined the wind direction. It swiveled toward the direction from which the wind came. It can be seen in Figures 13. Also mounted on the roof were the anemometer cups. The wind rotated those cups that in turn rotated the shaft to which they were attached. Each time the shaft rotated 500 times, one mile was added to the "total miles run." That is to say, the dial displayed the total number of miles of air that had passed since the anemometer dial was reset. Both the wind direction and the wind speed were electrically connected to the triple register were they were registered on the Triple Register's graph. The difference between the miles run dial and its earlier reading could be divided by the elapsed hours to determine the average wind speed for the period.

Rain Gauges

The 1877 instructions from the Report of the Chief Signal Officer for the rain gauge was to be placed so that the funnel-shaped collector was 12 inches above ground level. When a sufficiently clear site could not be found at ground level, the gauge could be mounted away from obstructions on the roof.

The rain gauge in 1872 was reported to be one foot above ground. It seems likely that it was similar to the one Elias Loomis described that was in use during the period and was depicted it in his famous 1868 book, Treatise on Meteorology. He stated that the gauges were usually 10 inches in diameter but that a cylinder 2 inches in diameter was accurate if carefully made. He described the rain gauge as being one used by the Smithsonian Institution, one that was convenient to use and one that produced accurate measurements. The instrument (Figure 24) dimensions were 2 inch diameter of the funnel (AB), ½ inch diameter (CD) inner cylinder

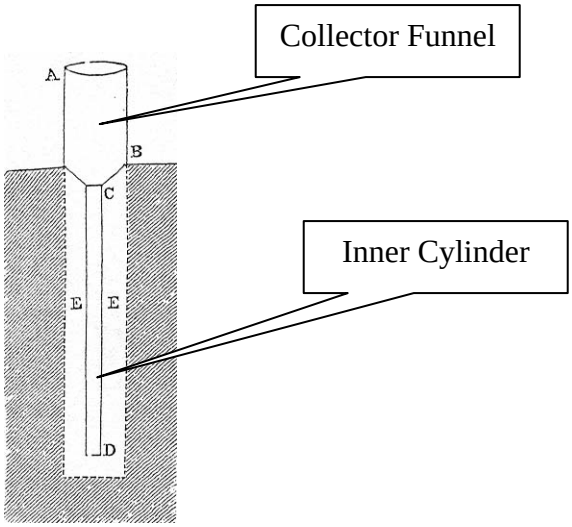


Figure 24. Smithsonian Rain Gauge
Source: Loomis' Treatise on Meteorology, 1868

The 1887 inspection fretted that there was no practicable exposure at the surface and the one on the roof was "fairly well exposed." The layout of the roof is shown in Figure 25.

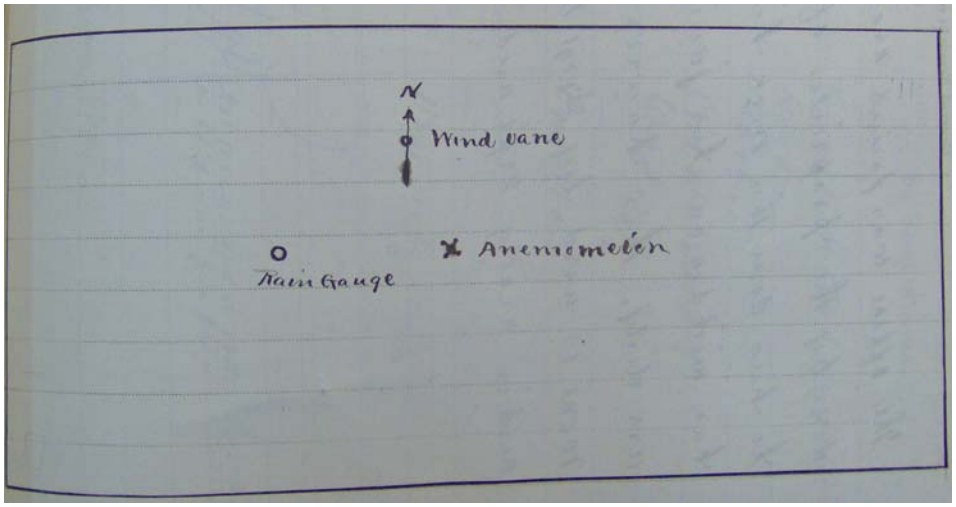


Figure 25. Roof Layout 1888
Source: National Archives and Records Administration

In 1898, a tipping bucket rain gage was mounted on the roof. A funnel directed rainfall into a small "bucket" on one end of a seesaw like device. The seesaw tipped when the bucket filled with one hundredths of an inch of rain. The tipping emptied that bucket and placed the bucket at the other end of the seesaw under the funnel to be filled next. Each time the buckets tipped, an electrical signal marked another 0.01" of rain on the triple register.

Sunshine Recorder

There was a sunshine recorder operating from 1880 until 1897. It was a small brass camera that traced onto a blueprint paper. It was replaced by an electrical recorder in 1897. The sensor was a glass tube with a large bulb at either end that was normally located on the roof. One end was clear, the other coated with lampblack. The tube was partially filled with mercury. In the middle of the tube were two wires. When exposed to sunshine, the lampblack would absorb solar radiation causing the mercury to expand and cover the ends of the two wires. The electrical circuit between the two wires would be completed. That connection would be recorded on the triple register until cooling (as the sunshine ended) caused the mercury to contract and uncover the two wire ends thus breaking the connection. Its description and operation is comparable to the instrument shown in Figure 26.

Figure 26. Sunshine Recorder
Source: Author

Metrograph/Triple Register

The instrument identified by Carpenter in his climatology as a Metrograph was more commonly known as a triple register. It was one of the primary instruments of the Weather Bureau (Figure 27).

Figure 27. Triple Register
Source: Author

The Triple Register was an electrical device that recorded the direction and velocity of the wind each minute, the amount of rainfall as it fell, and the accumulated hours and minutes of sunshine. The information was recorded by pens on graph paper wrapped around a drum that rotated once per week. The working parts of the Triple Register were made of brass and the unit was covered by a glass case to protect the device from dust. It was quite an impressive part of the meteorologist's equipment.

Instrument Shelters

The inspection in 1874 noted that the instrument shelter should be replaced. That opinion was repeated in the 1879 inspection that stated concern about the reflected heat that was causing the daytime temperatures to be too high. The Inspector had a second lattice made for the interior of the shelter and that, he reported, gave better results. That gave the shelter a double lattice for the bottom and left the single lattice at the top. The shelter was 40 inches wide, 40 inches wide, and 15.5 inches deep.

The Expense Book kept by the Signal Service recorded payment for painting the instrument shelter on 16 February 1883, 12 May 1896, 29 December 1914, and 6 September 1922. There is no certainty that it was not painted at other times as well.

The instrument shelter at Lindbergh Field was mounted on the roof of the Administration Building. The exposure was reported to be good other than the presence of a building 22 feet to the north and a 30 foot tower about 30 feet to the south. The concrete runways were about 500 feet to the west and southwest. The intervening area was asphalt.

THE OBSERVERS

Army Surgeon General Observers 1849-1866

An Army unit commanded by Brigadier General Stephen W. Kearny departed from Santa Fe, New Mexico for California in November 1846. They reached San Diego on 12 December 1846 but moved on to Los Angeles. Surgeons were assigned to the unit and they were required to make weather observations when the unit had established a post. Dr. John S. Griffin made such observations in Los Angeles.

In 1849, Kearny's Dragoons moved back to San Diego and Assistant Surgeon John E. Summers began recording temperature.

Jul 1849
Dr John E. Summers

John Edward Summers (Figure 28) began observations in San Diego on 16 July 1849. He was an Assistant Surgeon with Kearny's Dragoons who had moved from Los Angeles to San Diego. He was born in Virginia and joined the Army on 13 December 1847. He was promoted to Surgeon and Major in May 1861 and progressed through the ranks to Colonel by January 1885. During that time he was Medical Director of several Departments beginning with the Army of Northeast Virginia. He retired as the Medical Director Department of the Platte, in Omaha, Nebraska on 24 January 1886.

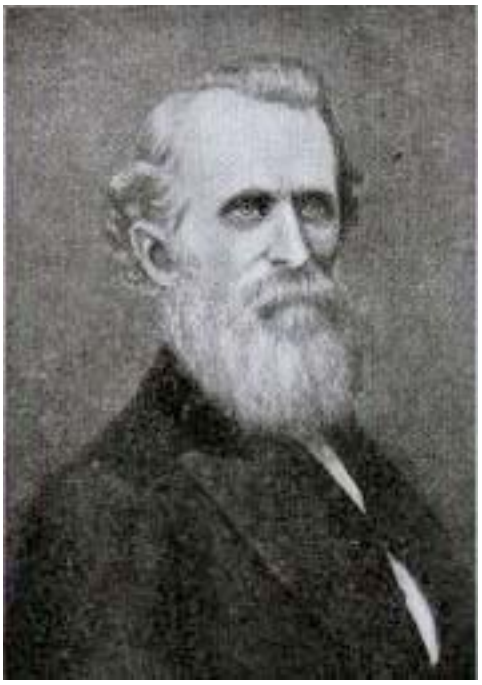


Figure 28. First San Diego Observer, Dr John E. Summers
Source: http://www.rootsweb.com/~neresour/OLLibrary/MWHNE/frames/mwhnp278a.htm

Sep 1852
Dr *William S. King*

William Shakespeare King was an Assistant Surgeon who replaced Dr Summers in September 1852. Dr King was from Pennsylvania and had been in the Army since 29 July 1837. He was promoted to Major, designated Surgeon on 29 August 1856, and transferred to Fort Moltrie, South Carolina. After a long career that included recognition for meritorious service as a Colonel and a Surgeon during the Civil War, he retired to Pennsylvania on 30 June 1882. He died on 2 August 1895.

Mar 1854
Dr *Charles C. Keeney*

Charles Carter Keeney, an Assistant Surgeon, replaced Dr King as observer in March 1854. He was a native of New York who had joined the Army on 12 July 1842. He was discharged on 23 September 1842, and rejoined on 19 March 1845. Thereafter his career progressed through the ranks to Surgeon and later to Colonel on 30 June 1882. He was recognized for meritorious service during the Civil War.

Jan 1856
Dr John. F. Hammond

John Fox Hammond replaced Dr Keeney in January 1856 as the San Diego observer. Dr Hammond was from South Carolina where he became an Assistant Surgeon in the Army on 16 February 1847. The San Diego Union lamented his departure for Oregon in October 1855 stating that he was a gentleman with many warm friends. His service continued through the Civil War and afterward, reaching the rank of Colonel on 14 Dec 1882. He died on 28 September 1886.

Nov 1856
Dr Horace Raquet Wirtz

Horace Raquet Wirtz, who followed Dr Hammond in November 1856, was an Assistant Surgeon from Pennsylvania who joined the Army on 5 December 1846. During the Civil War, he was promoted to Major and Surgeon. On 13 March 1865, he was promoted to Brevet Lt Col for faithful and meritorious service. He died on 24 January 1874.

Dec 1856
Dr John. F. Hammond

John Fox Hammond resumed the observations in December 1856. The San Diego Herald noted that there were just four officers at the Post in 1858, Dr. J. F. Hammond was one and Lt Churchill was another.

Jun 1858
1st Lt Charles C. Churchill

Charles Courcelle Churchill, a Pennsylvanian, was the Army Post's Quartermaster. He was not a physician but he apparently substituted as an observer for Dr Hammond. A few weeks later, the San Diego Herald reported that "desperadoes" were threatening the town. Lt Churchill ingratiated himself when he provided ball cartridges to the citizen defenders and "shouldered his musket and stood guard the first night."

According to the San Diego Herald, Lt Churchill organized a theatrical group and staged a performance in April 1858.

Aug 1858
J. Mulholland

James Mulholland recorded the August through November observations. He signed the form as "Hospital Steward." He too seems to have been a substitute observer. He was the last observer at the Mission. The military men left the mission and moved to New San Diego.

Dec 1858
Dr.John P. Milhan

John J. Milhan was an Assistant Surgeon in Company G, 6th Infantry, who took over the observation duties in December 1858 and was the first observer at the San Diego Barracks in New San Diego. He was born in France but he enlisted in the U.S. Army on 16 April 1851 in New York. He was reassigned to Fort Mohave, New Mexico. He wrote a letter to J. Judson Ames the editor of the San Diego Herald from there on 15 June 1859. He indicated a longing for the San Diego area as he wrote, "After tramping over a good portion of our continent I find myself once more on the banks of the Colorado, subjected to a heat of 114˚ with nothing to please the eye or to divert the mind."

Jul 1859
Capt W. Scott Ketchum

William Scott Ketchum recorded the weather for just one month, July 1859. He was a native of Connecticut who graduated from West Point in 1834, twenty five years before he made the observations. He was Commander of Company G of the 6th Infantry. He led his company on a 2,000 mile march from Fort Leavenworth, Kansas to California. He was stationed at San Diego Barracks and had been promoted to Captain at the time he substituted as observer for his unit's surgeon, Dr. Milhan

During the Civil War, he was promoted to Brigadier General in 1862 and was a brigade commander. In March 1865, he was promoted to Major General. He died at age 58 in 1871.

Aug 1859
Dr William F. Edgar

William Francis Edgar replaced Capt Ketchum in August 1859. He was a native of Jessamine County, Kentucky and graduated from the University of Louisville's Medical School in 1848. He joined the Army on 2 March 1849, just five months earlier. Dr Edgar (Figure 29) was promoted to Major and Surgeon on 21 May 1861.

Figure 29. Dr William Francis Edgar
Source: Warner's Illustrated History of Los Angeles County

He submitted a report in January 1860 from New San Diego. He departed San Diego in November 1861 to for duty in Buell's Union Army. He retired from the Army on 27 August 1862.

Oct 1861
Capt Thomas S. Roberts

Thomas S. Roberts provided the report for November 1861 after Dr. Edgar left. Capt Roberts was the Commander, Company F, 1st Infantry of the California Volunteers. He made a note that there were no medical officers on the Post.

Dec 1861
Dr. P. W. Randle

P. W. Randle was the observer in December 1861. He was an Assistant Surgeon assigned to the Post.

Apr 1862
Dr William Ffrench

William Ffrench[19], a Captain with the 5th Infantry of the California Volunteers, was in charge of the hospital when he submitted the report for April 1862.

May 1862
Dr. D. B. Hoffman

D. B. Hoffman took over the observations in May 1862. He signed as an Acting Assistant Surgeon. He continued to make observations through April 1866. The Barracks at New San Diego was closed in May 1866.

The Missing Years 1866-1869

There are no extant observational records from May 1866 through August 1870 from San Diego. The Barracks reopened in December 1869. Dr. Hoffman's record continued in September 1870. His last submission was in December 1870. However, precipitation records were published by Carpenter for those years. Perhaps Dr. Barnes was the provider.

Smithsonian Institution Observer

Feb 1871
Dr G. W. Barnes

George William Barnes (Figure 30) began recording the weather for the Smithsonian Institution in February 1871.

Figure 30. Dr George W. Barnes
Source: van Dyke's The City of and County of San Diego

[19] Ffrench was the spelling he used

He was a native of Virginia who practiced medicine in Ohio for fourteen years. He moved to California and spent a year observing its climate. On that basis, he chose San Diego for his residence and resided in San Diego even after retirement. He was a Homeopathist whose office was at 6th and D Streets in 1874 according to the 1874 City Directory.

Dr Barnes was a contributing member of the St. Louis Academy of Science and the Wisconsin Historical Society.

Dr Barnes became an observer for the Smithsonian Institution. His first report to them was a hand drawn form that summarized the data from December 1870 and January 1871. In February 1871 he reported using the Smithsonian form. The last extant report from Dr Barnes was in November 1871, the Signal Service picking up the reporting after that.

Mar 1871
Dr C. M. Fenn

C. M. Fenn submitted the record for March and April 1871 as an Acting Assistant Surgeon.

Army Surgeon General Observers 1889—1892

Observations continued to be made at San Diego Barracks by the Surgeons even though the Signal Service was the "official" observer in the City. The Barracks observations were submitted to the Surgeon General's Office in Washington.

Jan 1889
Dr D. L. Huntington

David Love Huntington was a Surgeon who was the observer beginning in January 1889 at San Diego Barracks. He was born in Massachusetts and joined the Army on 11 July 1862. He was awarded the rank of Lt Colonel in 1865 for gallantry and meritorious service during the Civil War. The San Diego Union reported that he had been at San Diego for four years before he moved to the new Barracks at St. Augustine, Florida. The article stated that Dr Huntington was one of the most well known surgeons in the Army. He published "Medical and Surgical History of the Rebellion" a book, it was reported, that was the only one of its kind ever printed by the government. He retired on 10 April 1898 and died on 20 December 1899.

Apr 1891
Dr H. G. Burton

Henry Guild Burton began observations in April 1891 at San Diego Barracks. He was a Captain and an Assistant Surgeon from Bennington County Vermont. He entered the army there on 27 October 1846. He moved from the Barracks at Vancouver to replace Dr Huntington in San Diego. Dr Burton retired on 5 February 1892.

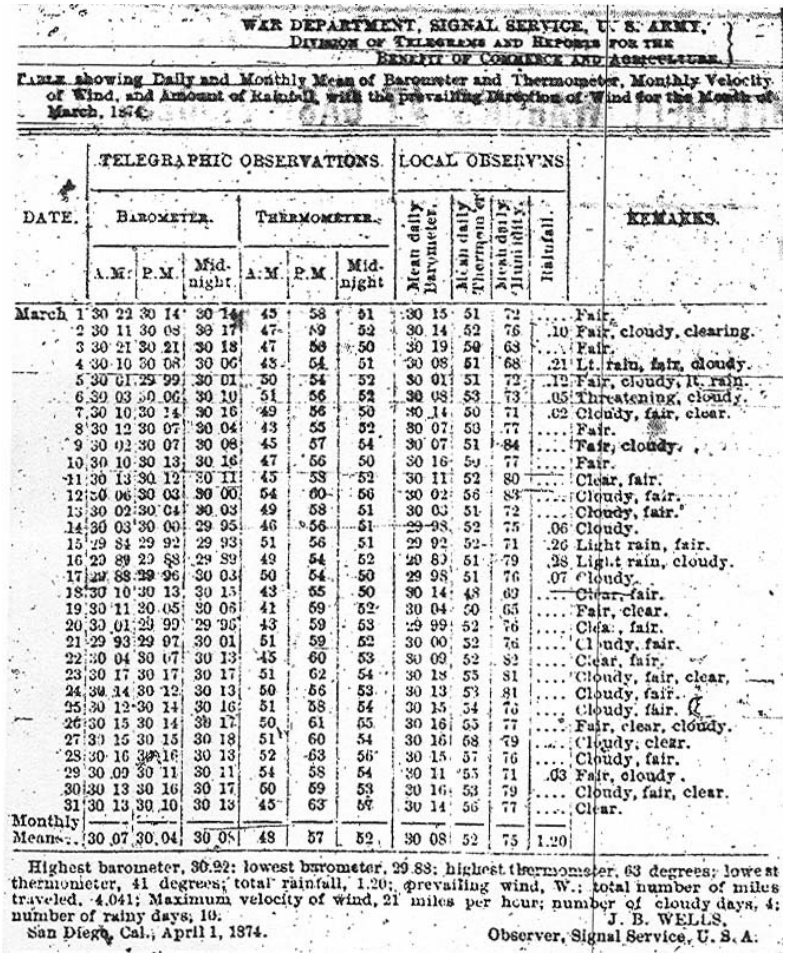
Oct 1891
Dr S. M. Horton

Samuel Miller Horton assumed the observer role in October 1891 at San Diego Barracks. He was a Major and a Surgeon. His army career began in Pennsylvania on 26 August 1861. He served during the Civil War as a surgeon. On 4 December 1893, he was assigned to the Surgeon General's Office in Washington. He retired on 6 June 1894.

Signal Service Observers

Dec 1871
Sgt John B. Wells

John B. Wells was the first Signal Service observer in San Diego. He was assigned there on 27 October 1871. His data (Figure 31) appeared in the newspaper often.



WAR DEPARTMENT, SIGNAL SERVICE, U. S. ARMY,
DIVISION OF TELEGRAMS AND REPORTS FOR THE
BENEFIT OF COMMERCE AND AGRICULTURE.

TABLE showing Daily and Monthly Mean of Barometer and Thermometer, Monthly Velocity of Wind, and Amount of Rainfall, with the prevailing Direction of Wind for the Month of March, 1874.

DATE.	TELEGRAPHIC OBSERVATIONS. BAROMETER. A.M.	P.M.	Mid-night	THERMOMETER. A.M.	P.M.	Mid-night	LOCAL OBSERV'NS. Mean daily Barometer.	Mean daily Thermom'r	Mean daily Humidity.	Rainfall.	REMARKS.
March 1	30 22	30 14	30 14	45	58	51	30 15	51	72	.....	Fair.
2	30 11	30 08	30 17	47	59	52	30 14	52	76	.10	Fair, cloudy, clearing.
3	30 21	30 21	30 18	47	58	50	30 19	50	63	....	Fair.
4	30 10	30 08	30 06	48	54	51	30 08	51	68	.21	Lt. rain, fair, cloudy.
5	30 01	29 99	30 01	50	54	52	30 01	51	72	.12	Fair, cloudy, lt. rain.
6	30 03	30 06	30 10	51	56	52	30 08	53	73	.05	Threatening, cloudy.
7	30 10	30 14	30 16	49	56	50	30 14	50	71	.02	Cloudy, fair, clear.
8	30 12	30 07	30 04	43	55	52	30 07	50	77	....	Fair.
9	30 02	30 07	30 08	45	57	54	30 07	51	84	....	Fair, cloudy.
10	30 10	30 13	30 16	47	56	50	30 16	50	77	....	Fair.
11	30 13	30 12	30 11	45	53	52	30 11	52	80	....	Clear, fair.
12	30 06	30 03	30 00	54	60	56	30 02	56	83	....	Cloudy, fair.
13	30 02	30 04	30 03	49	58	51	30 03	51	72	....	Cloudy, fair.
14	30 03	30 00	29 95	46	56	51	29 98	52	75	.06	Cloudy.
15	29 84	29 92	29 93	51	56	51	29 92	52	71	.26	Light rain, fair.
16	29 89	29 88	29 89	49	54	52	29 89	51	79	.28	Light rain, cloudy.
17	29 88	29 96	30 03	50	54	50	29 98	51	76	.07	Cloudy.
18	30 10	30 13	30 15	43	55	50	30 14	48	69	....	Clear, fair.
19	30 11	30 05	30 06	42	59	52	30 04	50	65	....	Fair, clear.
20	30 01	29 99	29 96	43	59	53	29 99	52	76	....	Clear, fair.
21	29 93	29 97	30 01	51	59	52	30 00	52	76	....	Cloudy, fair.
22	30 04	30 07	30 13	45	60	53	30 09	52	82	....	Clear, fair.
23	30 17	30 17	30 17	51	62	54	30 18	55	81	....	Cloudy, fair, clear.
24	30 14	30 12	30 13	50	56	53	30 13	53	81	....	Cloudy, fair.
25	30 12	30 14	30 16	51	58	54	30 15	54	76	....	Cloudy, fair.
26	30 15	30 14	30 17	50	61	55	30 16	55	77	....	Fair, clear, cloudy.
27	30 15	30 15	30 18	51	60	54	30 16	58	79	....	Cloudy, clear.
28	30 16	30 16	30 13	52	63	56	30 15	57	76	....	Cloudy, fair.
29	30 09	30 11	30 11	54	58	54	30 11	55	71	.03	Fair, cloudy.
30	30 13	30 16	30 17	50	59	53	30 16	53	79	....	Cloudy, fair, clear.
31	30 13	30 10	30 13	45	63	56	30 14	56	77	....	Clear.
Monthly Means	30 07	30 04	30 08	48	57	52	30 08	52	75	1.20	

Highest barometer, 30.22; lowest barometer, 29.83; highest thermometer, 63 degrees; lowest thermometer, 41 degrees; total rainfall, 1.20; prevailing wind, W.; total number of miles traveled, 4,041; Maximum velocity of wind, 21 miles per hour; number of cloudy days, 4; number of rainy days, 10.

San Diego, Cal., April 1, 1874.

J. B. WELLS,
Observer, Signal Service, U. S. A.

Figure 31. Weather Summary for San Diego, March 1874
Source: San Diego Union, 3 April 1874

On 2 November 1871, the San Diego Union reported that Sgt Wells had commenced his observations and would begin providing them to the newspaper for publication. By 1874, that table had grown significantly, a reflection of the public's interest in weather.

Mar 1874
Pvt. O. S. Hubbell

O. S. Hubbell was assigned to San Diego on 6 March 1874. He was the observer for the Signal Service that month. He was relieved on 9 April 1874.

Apr 1874
Sgt John B. Wells

John B. Wells resumed observations in April 1874. He signed as a Sergeant in August 1874.

Jul 1875
Pvt. F. W. Conant

F. W. Conant made the observations during July 1875 substituting for Sgt Wells.

Aug 1875
Sgt John B. Wells

Sgt John B. Wells resumed the observer duties in August 1875.

Aug 1876
Sgt C. E. Howgate

C. E. Howgate replaced Sgt Wells in August 1876. He continued as observer until July 1877 when Sgt C. E. Howgate was transferred to become the first Signal Service Observer Sergeant in Los Angeles. His first observations were made there on 1 July 1877, exactly on schedule at the location Sgt Sickler had prepared.

Jun 1877
Sgt S. E. Patton

S. E. Patton substituted for Sgt Patton during June 1877 until Sgt Sickler, the permanent replacement, took over.

Jul 1877
Sgt M. M. Sickler

Marion M. Sickler assumed the duties of observer in July 1877. He had gone to Los Angeles to rent office space and make other arrangements for the opening of the Signal Service's first site there. He came to San Diego to replace Sgt Howgate who had moved to Los Angeles.

Sgt Sickler remained in San Diego until April 1879. He then served as the Observer Sergeant in Sacramento from l6 April 1879 to 15 March 1881. The California State Library holds a collection of his papers from his Sacramento assignment.

Apr 1879
Sgt W. U. Simons

William U. Simons entered the Signal Corps on April 30, 1872 and was one of many who transferred to the Weather Bureau when it was first organized. He made the observations in San Diego from April through June 1879. He died at Del Rio, Texas on 13 November 13 1917.

Jul 1879
Sgt M. L. Hearne

Martin L. Hearne became the Official in Charge on 26 June 1879 and served in that capacity until 8 November 1879. He would return to San Diego in September 1886 as the Official in Charge.

Jan 1880
Sgt W. H. Clenderson

W. H. Clenderson became the Official in Charge on 8 November 1879. He served until 5 December 1880. An article from the San Diego Union on 23 May 1882 mentioned that he was in Campo at that time and was in charge of the Military Telegraph Station there.

Dec 1880
Sgt William Story

William Story was the Official in Charge from 5 December 1880 until 17 November 1881.

Nov 1881
Sgt Asa C. Dobbins

Asa C. Dobbins became the Observer Sergeant in November 1881. He continued the tradition of publishing the weather information in the local newspaper. Sgt Dobbins died in office.

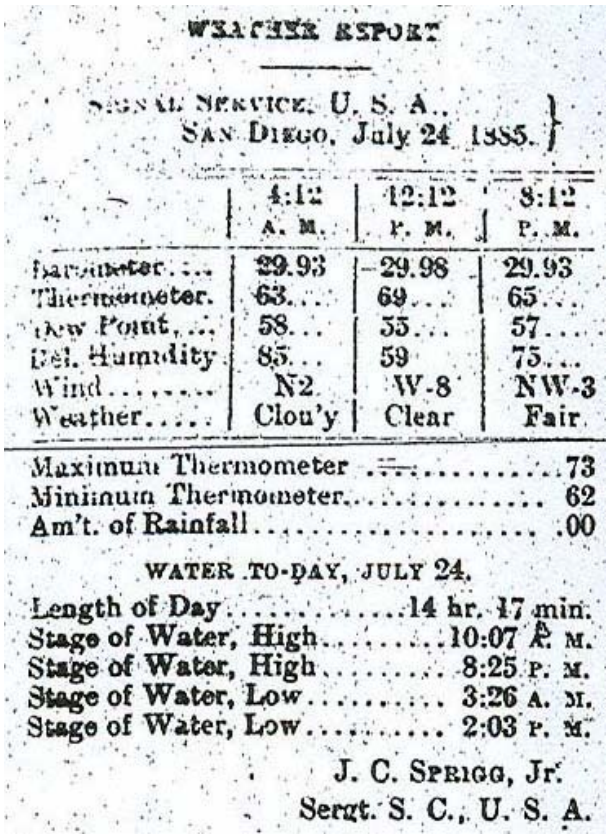
Jul 1883
Sgt F. K. Day

F. K. Day assumed the observation duties when Sgt Dobbins died. He arrived from Arizona on 29 August 1883 according to the San Diego Union. Promotions were difficult for the Observer Sergeants and progression to officer rank was rare. However, Sgt Day was one of the those few to be appointed to the rand of 2nd Lieutenant. As a result of that promotion, he was reassigned on 28 July 1884.

Jul 1884
Sgt J. C. Sprigg Jr.

J. C. Sprigg, Jr. took over when Lt. Day departed. Sgt Sprigg had previously served in the Signal Service Headquarters in Virginia. He would have been exposed to the latest forecast methods being used there. That may have been one reason that the local press seemed to like him.

He continued the close association with the newspaper. On 25 July 1885, the Union published a one and a half column article about the Signal Service and Sgt Sprigg. Also included in that issue was a climatological summary (Figure 32)



WEATHER REPORT

SIGNAL SERVICE, U. S. A.,
SAN DIEGO, July 24 1885.

	4:12 A. M.	12:12 P. M.	8:12 P. M.
Barometer	29.93	29.98	29.93
Thermometer	63	69	65
Dew Point	58	55	57
Rel. Humidity	85	59	75
Wind	N2	W-8	NW-3
Weather	Clou'y	Clear	Fair

Maximum Thermometer 73
Minimum Thermometer 62
Am't. of Rainfall ..... .00

WATER TO-DAY, JULY 24.

Length of Day ..... 14 hr. 17 min.
Stage of Water, High ..... 10:07 A. M.
Stage of Water, High ..... 8:25 P. M.
Stage of Water, Low ..... 3:26 A. M.
Stage of Water, Low ..... 2:03 P. M.

J. C. SPRIGG, Jr.
Sergt. S. C., U. S. A.

Figure 32. Sgt Spriggs' Weather Report 25 July 1885
Source: San Diego Union

The San Diego Union reported on 13 August 1886 that Sgt Spriggs resigned but was remaining as a citizen of the city.

Sep 1886
Dr M. L. Hearne

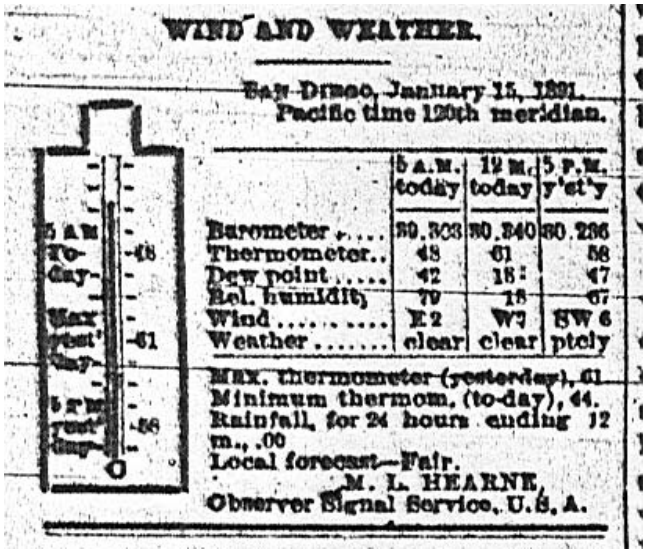
Dr Martin L. Hearne was an Observer Sergeant in the Signal Service who assumed the observer duties in September 1886. Dr Hearne was born in Laurel, Delaware on 4 August 1849. He graduated from the Medical College in Charleston, South Carolina. He entered the Army in 1868 and joined the Signal Service. He was sent to San Diego as an observer in 1877. He was transferred to Prescott, Arizona and returned to San Diego to be Officer in Charge in September 1886. He emphasized public relations and frequently provided data and information to the local newspapers. He also provided weather information for inclusion into the City's promotional materials.

Sep 1889
Sgt Thomas Gibson

Thomas Gibson was an assistant observer who substituted for Dr Hearne from September 1889 to January 1890. He was born in Philadelphia on 15 February 1847. He was in the 9th Infantry from 1867 to 1870 when he joined the Signal Service. On 1 July 1891,he like many others became a civilian member of the new Weather Bureau. Gibson served at many Weather Bureau sites, all of which were in the west. He died at Portland, Oregon on 7 July 1919.

Feb 1890
Dr M. L. Hearne

Dr Hearne resumed his duties as the Officer in Charge in February 1890. His contributions to the newspaper continued. The Daily Sun added a thermometer to his data for each day (Figure 33).



WIND AND WEATHER.

San Diego, January 15, 1891.
Pacific time 120th meridian.

	5 A.M. today	12 M. today	5 P.M. y'est'y
Barometer.....	30.303	30.340	30.286
Thermometer..	48	61	58
Dew point.....	42	18:	47
Rel. humidity	79	18	67
Wind.....	E 2	W 7	SW 6
Weather.....	clear	clear	ptcly

5 AM To-day 48
Max yest'day 61
5 P M yest'day 56

Max. thermometer (yesterday), 61.
Minimum thermom. (to-day), 44.
Rainfall, for 24 hours ending 12 m., .00
Local forecast—Fair.
M. L. HEARNE,
Observer Signal Service, U. S. A.

Figure 33. Hearne's Weather Data
Source: San Diego Daily Sun, 15 January 1891

Weather Bureau Observers

Dr M. L. Hearne

Dr. Hearne continued with the new Weather Bureau. The Inspector commented in 1893 that Dr Hearne had been in the Signal Service for 29 years, was a competent telegrapher, and could translate French. He had no assistant in the Station to help with the daily, weekly, and monthly reports.

He continued to work until his death on 12 March 1896. The San Diego Union obituary stated, “His work was highly satisfactory to the department in Washington, and his accommodating manner won him friends. During his residence here he had accumulated a vast amount of data relating to meteorological phenomena.”

William H. Storey

William H. Storey, who had been in charge in 1880, occasionally replaced Dr Hearne. He had filled in for Dr Hearne during his illness and continued to do so until the replacement was assigned.

Oct 1894
H. E. Wilkinson

According to the Inspection Report of October 1894, H. E. Wilkinson temporarily assumed the Officer in Charge position when Dr Hearne became ill. Wilkinson arrived on 13 October 1894.

Mar 1896
Ford Ashman Carpenter, ScD., LL. D., F.R.G.S

Ford Ashman Carpenter was reassigned from Carson City, Nevada as the replacement for Dr. Hearne on 30 March 1896. He was born in Chicago and had an illustrious career with the Weather Bureau. While at San Diego, he began what would become a very active publication record. He wrote “The Climate and Weather of San Diego” in 1913 and the 118 page document was published by the San Diego Chamber of Commerce. This climatology remains as a valuable document that describes San Diego’s climate and the causes of its characteristics. Among many attributes, it includes monthly rainfall data in tabular form from January 1850 through June 1912.

While in San Diego, he was, among other things, the Director of the San Diego Natural History Society, the Director of the Chamber of Commerce, and the President of the San Diego Camera Club. In 1906 he gave four lectures to the San Diego State Normal School.

He transferred to the Weather Bureau Office in Los Angeles in 1913 and there he continued publishing. He published a collection of his papers in a book “Weather Methods” ca 1924. It included twenty seven papers published between June 1922 and June 1924 in a variety of publications: Proceedings of Royal Meteorological Society, Southern California Business,

Aviation, THE ACE, Proceedings of the American Climatological and Clinical Association, University of California Southern Branch, Bulletin of Southern California Academy of Sciences, California Cultivator, The Players, United States Patent Office, Atlantic Monthly, Los Angeles Herald, Bulletin Los Angeles Consistory, and the Los Angeles Chamber of Commerce.

Carpenter (Figure 34) received an LL.D. from Whittier College in 1913 and was thereafter called "Doctor" by his men in Los Angeles office and by the press. He received a Sc. D. from Occidental College in 1921. In 1919, he left the Weather Bureau and became the manager of the department of meteorology and aeronautics for the Los Angeles Chamber of Commerce.

Figure 34. Ford Ashman Carpenter
Source: Carpenter's Weather Methods

Dr. Carpenter published "Alleged Manufacture of Rain in Southern California" in the Monthly Weather Review that discussed the 1916 rainmaking controversy in San Diego. Charles Hatfield obtained a contract from the city of San Diego to make enough rain to fill the Morena Reservoir. The first fifteen days of January 1916 produced no rain from the "smoke" he produced from towers he built. It began to rain on the 16th and by the 17th all rainfall records for the city had been broken. By the end of the month the reservoir was full, the lower Otay Dam broke, and an estimated twenty people died as a result. The City refused to pay.

Dr. Carpenter's article concluded with a statement refuting the rainmaker's claim of success.

> An examination into the methods of the rainmaker shows a disregard of physical laws, and a review of the history of rainmaking affords no proof of his success.
>
> By far the most important feature of his work consists in playing upon the credulity of mankind. It is therefore a psychological rather than a meteorological problem, for the fundamental factors are those of the mind and not of matter.

Jul 1912
Dean Blake

Dean Blake was temporarily in charge from 1 July to 24 July 1912.

Jan 1913
E. Herbert Nimmo

E. Herbert Nimmo was assigned as the Official in Charge on 24 July 1912. He joined the Weather Bureau on 12 August 1891. He served continuously until 10 February 1917 when illness necessitated him taking a leave of absence. He died on 7 April 1917 in San Diego.

Feb 1917
Dean Blake

Again, Dean Blake took over as the temporary Official in Charge. He served in that capacity from 9 February 1917 until Nimmo's replacement arrived on 29 April 1917.

Jan 1918
Henry F. Alciatore

Henry F. Alciatore was born 28 December 28, 1866 in New Orleans. He enlisted in the Signal Corps' Signal Service on 1 December 1886. He had served at New Orleans, Little Rock, and Reno before being assigned to San Diego. He spoke both French and Spanish fluently. He published several articles in the Monthly Weather Review before moving to San Diego and two after arrival: "Effect Of Change In The Position Of The Thermometer Shelter At Escondido, California, Upon The Minimum Temperature" and "Growth, Settling, and Final Disappearance of a Snow Cover in the Sierra Nevada, 1915-16."

Alciatore suffered from asthma and retired from the Weather Bureau on 10 February 1922 with total disability. He died in New Orleans on 2 February 1923.

Jan 1922
Dean Blake

Dean Blake became the Official in Charge on 10 January 1922. He began his weather career in 1902. He took the examination while still in high school and was graded the highest. He

then quit high school and went to work as a messenger with the Weather Bureau Office in San Diego on 1 March 1902. Those duties included being the janitor. He served as the temporary officer in charge on two occasions before being given the position permanently.

Dean Blake (Figure 35) was another of the Meteorologists in Charge who published in the scientific journals (see Bibliography). Several of those papers concerned San Diego's climate and one was the result of an investigation made aboard an airplane.

Figure 35. Dean Blake
Source: National Weather Service, San Diego

Blake remained in charge of the San Diego Station until he retired on 1 August 1952 after fifty years on station.

THE OBSERVATIONS

The Surgeon General Years

The first observations in July 1849 were taken by Dr. Summers (Figure 1) and entered on the Surgeon General's Form 3, Meteorological Register. Two conclusions can be drawn. It is probable that he had not brought the Surgeon General's Observation Forms with him on the long arduous trip from Santa Fe. Second, he had brought a thermometer along. On that first submission, he recorded the temperature, the clearness of the sky, and the winds at sunrise, 9 a.m., 3 p.m., and 9 p.m. He recorded the beginning and ending times of the rain event that occurred during the next month. He apparently did not have a rain gauge because he did not record amounts of rainfall.

The Surgeon General's observation form subsequently used at the Mission and later at the San Diego Barracks had instructions printed at the bottom that prescribed observation procedures (Figure 36).

N. B.—This register is to be transmitted to the Surgeon General monthly. All fractions are to be expressed in decimals carried out two points. The thermometer and hygrometer, if not connected, will be suspended side by side. One-third of the sum of the three daily observations will be registered as the daily mean. The direction (D.) and force (F.) of the winds will be expressed in accordance with existing regulations. The whole number of times any point of the compass is recorded during the month, gives the "number of observations," and the aggregate of the numbers denoting the force, gives the "sum of force," from that point. The results thus obtained are to be recorded under "Summary of winds and weather." Observations on the weather will be recorded as FAIR or CLOUDY; and the number of fair and cloudy days during the month will be ascertained by dividing the sum total of each record by 3. The number of days on which it rains or snows will be noted separately.

SURGEON GENERAL'S OFFICE, *May* 1, 1857.

Figure 36. Instructions for Observations, 1857
Source: Army Form 2, 1858

The observations from the Mission were published (Figure 37) in the San Diego Herald very early in the station's history. Note that three times per day observations were being made in this 1857 column.

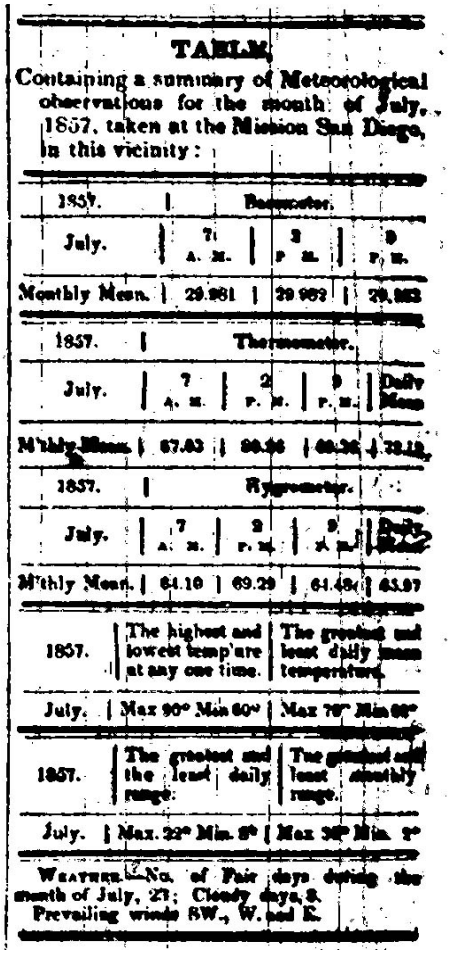


TABLE.

Containing a summary of Meteorological observations for the month of July, 1857, taken at the Mission San Diego, in this vicinity:

1857.	Barometer.			
July.	7 A. M.	2 P. M.	9 P. M.	
Monthly Mean.	29.981	29.982	29.982	

1857.	Thermometer.			
July.	7 A. M.	2 P. M.	9 P. M.	Daily Mean
Mthly Mean.	67.83	80.96	69.26	72.13

1857.	Hygrometer.			
July.	7 A. M.	2 P. M.	9 P. M.	Daily Mean
Mthly Mean.	64.10	69.29	61.48	65.07

1857.	The highest and lowest temp'ure at any one time.	The greatest and least daily mean temperature.
July.	Max 90° Min 60°	Max 70° Min 66°

1857.	The greatest and the least daily range.	The greatest and least monthly range.
July.	Max. 22° Min. 8°	Max 30° Min. 2°

Weather.—No. of Fair days during the month of July, 21; Cloudy days, 8. Prevailing winds SW., W. and E.

Figure 37. Weather Data from the Mission July 1857
Source: San Diego Herald, 8 August 1857

The Smithsonian Institution Years

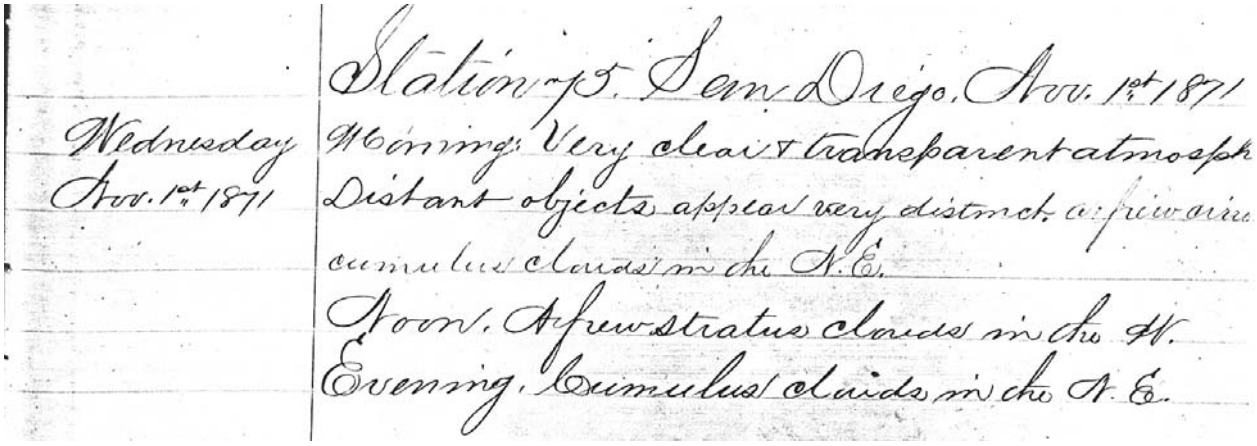
In December 1870 February 1871, Dr. Barnes submitted his first observations as a Smithsonian Institution Voluntary Observer. He had been a member of the Meteorological Committee in 1877 that advised the Signal Service Office on interactions with the community. The form "Register of Meteorological Observations, Under the Direction of the Smithsonian Institution, Adopted by the Commissioner of Agriculture for his Annual Report" had spaces for 48 entries per day. Dr. Barnes reported on all those except for the ten that were related to the barometer. He noted that the "Barometer not received. Probably lost with other goods in shipment from New York." On the back of the form was space for comments.

He reported in the comments, "Temperature of a well 63 feet deep on Lot J Block No. 79 Hortons Addition Feb 1. 70˚." The Smithsonian required that information be submitted once per year.

The Smithsonian Institution reports continued in parallel with the Signal Service reports for a period after November 1871.

The Signal Service Years

The Signal Service kept a variety of records. Some were in the form of journals. The Daily Weather Log contained a narrative summary of the weather each day. The first entry (Figure 38) by Sgt Wells was typical of San Diego weather and typical of the narratives written made each day.


Station at S. San Diego, Nov. 1st 1871

Wednesday Nov. 1st 1871

Morning. Very clear & transparent atmosph
Distant objects appear very distinct. A few ain
cumulus clouds in the N.E.
Noon. A few stratus clouds in the W.
Evening. Cumulus clouds in the N.E.

Figure 38. First Narrative Weather Entry at San Diego 15 November 1871
Source: Daily Weather Log San Diego, Station 5, Box 4, 1874-1953, Special Collections Weather Bureau, Love Library, San Diego State University

The form used by the Signal Service at that time was the War Department Form E. The new station at San Diego had the observational equipment necessary to fill in all the columns. The barometer, thermometer, and rainfall data were entered at a.m., p.m., and midnight. The maximum and minimum temperature for the day was reported with the prevailing wind direction and the maximum hourly velocity of the wind. The number of times the wind was from the cardinal points was entered.

At the bottom left of the form was a climatological summary of the month with twenty statistics indicating means, extremes, and numerical summaries.

At the bottom right of the form was an accounting of the precipitation during the month, including the time the rainfall events began and ended. The form was an impressive collection of data considering that only one person made all the observations and all the entries.

Time of Observations

In 1878, seven daily observations were taken at this station and reports were sent three times per day by the telegraph to the Chief Signal Office in Washington. The station was inspected by a committee for the San Diego Society of Natural History. The committee was highly satisfied with the manner in which the observations were being taken and reported.

For the period prior to the use of "standard time," the term "local time" referred to solar time. The Signal Service's Chief Signal Officer, Cleveland Abbe, in 1875 was one of the government agencies that advocated the establishment of standard time zones. It was needed to facilitate the plotting of weather maps containing data collected at the same moment. All times before 1883 were based on solar noon, when the sun was at its zenith for a given longitude. Instructions for observations to be made at 7 a.m., for example, would actually vary up to four hours depending on the longitude of the observer within the United States. The standard time zones came into use by the railroads in November 1883 and by the Signal Service shortly there after.

The Chief Signal Officer (Cleveland Abbe) tried to have observations made at a single moment in time. He requested in 1875 that, wherever practicable, observers make their observations correspond in local time with those taken at the regular signal service stations: at 7:35 a.m., 4:35 p. m., and 11 p. m., Washington mean time. If it were found impracticable to take all of the observations at these hours, it was suggested that, in that case, the 7:35 a.m. (Washington time) be used. Otherwise, the observations were to be taken at 7 a.m., 2 p.m., and 9 p.m., local time. For stations west of Washington, the local time at the place of observations is slower (that is earlier) than the local time of Washington by (4) four minutes for every degree of longitude—for stations east of Washington it is faster, (that is later). When, it is 7:35 a. m. at Washington, at places ten degrees (10˚) to the westward it is 5:55 a.m.; at places thirty-five and one-half degrees (35.5°) to the westward it is 5:13 a.m.; at places forty-seven and three-quarters degrees (47.75°) to the westward it is 4:24 a.m., etc. In entering the time of observation, the local time at the observation station was to be given. At San Diego, to coincide with Washington time, the observations were made at 4:55 a.m., 1:55 p.m., and 8:20 p.m.

The time of observation was changed and, in 1879, required the observer to make observations at 7 a.m., 2 p.m., and 9 p.m. local time in addition to the 7 a.m., 3 p.m., and 11 p.m. Washington time. All of which required the observer to make observations at 4:15 a.m., 7:00 a.m., 12:15 a.m., 2:00 p.m., 8:15 p.m., and 9:00 p.m. That he accomplished without an assistant for several years in San Diego.

The 1884 Annual Report of the Chief Signal officer described how the problem was reconciled.

> At first the number of station and the area covered by the predictions were limited. But, when once the fact had been established that at any hour of the day or night, the central office could almost instantly call for report from all parts of the country, and receive them from all its stations, taken at the same moment of

> time, and revealing the actual status of the atmosphere over its whole field of inquiry, the sense of security in its scientific processes, and the confidence that the results were build upon "the solid ground of nature," gave it a powerful forward impulse. The method of simultaneous reports, it was felt, was a sure road to the desired goal.

Station Activities

On Wednesday, 1 November 1871, the observer wrote the first entry on the first page of the San Diego Station Memorandum book. The next day the San Diego Daily Union reported that Sgt John Wells had begun his observations the day before. It also reported that these observations would be published by the Union in tabular form. This reflects the Signal Service's desire to become vital to their community.

The Chairman of the Meteorological Committee of the Chamber of Commerce made visits to the Station in 1885. The emphasis on community relations was still maintained.

On 25 July 1885, the San Diego Union published a long article about the Signal Service operation. It described the instrumentation in admiring terms. It also described the duties of the Observer Sergeant in the most supportive ways.

> The care of the instruments, the taking of observations, the recording and telegraphing them, the preparation of reports, the preparation of a monthly tide chart (for he must also record and report the movements of the tides), etc, etc, leaves the officer no time whatsoever to devote to such study as an ambitious man not only desires to do but must do if he would render the most efficient service and keep abreast of progress in meteorological science. Besides, San Diego is becoming more and more a resort and one of the places visitors are sure to inspect is the Signal Station. They expect, and very properly, to be entertained and shown the apparatus. Mr. Sprigg[20] shows the utmost courtesy to all who visit the Station, though in doing so he must certainly often sacrifice himself. The duties of the Station seem to be sufficiently arduous to entitle Mr. Sprigg to an assistant. He is discharging them with fidelity and thoroughness, but it is at a cost of greater effort than one man can long sustain.

Several changes in the reporting format, form, and elements were made over the years. At times it began to overwhelming to the observer. For example, when the newspaper article was written in July 1885, the report that Sgt Sprigg submitted had fourteen pages of tabular data. One must add, without an assistant.

[20] The reference is to Sgt Sprigg who was the Official in Charge at the time

The Weather Bureau Years

The Inspection Report of 1893 mentioned the activity of the Station: daily reports to the newspapers, memorandum reports, reports by telephone to individuals, and maps to the Commission Men and the Chamber of Commerce. It was not issuing weather maps and bulletins otherwise.

In 1900, the Office was providing warnings of rain for the fruit dryers, warnings of frost to the citrus growers, and fog warnings to the ships. These warnings were provided by telephone. The Inspector also commented about the great importance of the records to the medico-climatological people. These were ones who advocated San Diego's climate as therapeutic. Bulletins were distributed that gave the weather at twenty-seven locations. Those were posted in the local hotels.

By 1908, the Office was expanding to solicit observers from the shipmasters using the San Diego port. The Officer in Charge, Ford Carpenter, made visits to the ships in the harbor to obtain their cooperation.

In May 1897, the San Diego Weather Bureau Office began displaying signal flags on the flagstaff of the Keating Building. These were forecast flags to broadcast, so to speak, the current forecast. The San Diego Union on 3 May 1897 presented the new forecast system to the public in an extensive article describing how to interpret the flags. The flags would be displayed from 9 a.m. to 5 p.m. except for Sundays and Holidays.

The forecast flags were to be displayed prominently so that citizens could see what weather conditions were forecast for that location. The use of the flags began shortly after the Weather Bureau took over from the Signal Service. Two versions of the flags were used. One displayed the precipitation forecast, the other temperature.

Square flags (Figure 39) gave the precipitation forecasts; white for fair, blue for rain or snow, and half white—half blue for showers. A pennant gave the temperature forecast by its position on the staff: warmer if above the precipitation flag, colder if below, and no change if it wasn't displayed. A square white flag with a small black square in its center forecast a cold wave.

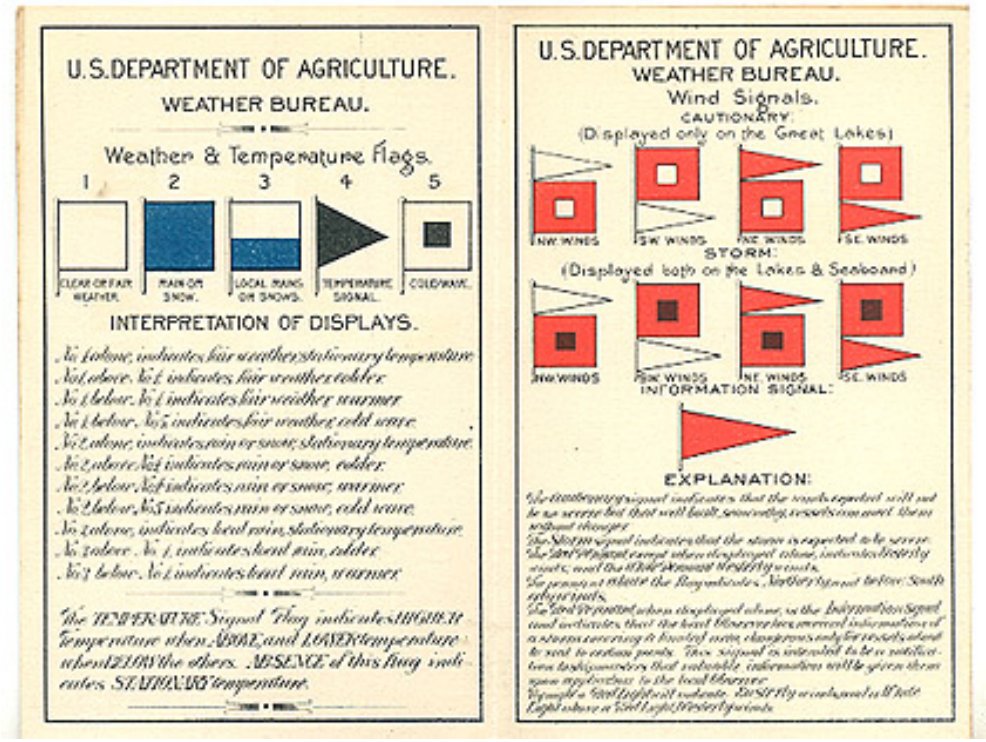


Figure 39. Weather and Temperature Forecast Flags
Source: World's Columbian Exposition Souvenir, 1893

The Weather Bureau issued Station Regulations in 1905. Those rules among other things prohibited smoking in the Forecast Offices. Some of the rules concerned relations with the press.

> The press will be given special consideration in view of the wide distribution afforded by this means. Efforts should be made to furnish matter in such form and at such times as will best conform to the wishes of the managers of the newspapers, and at the same time subserve public interests.

Other rules concerned the observation and reporting of the weather, in particular the barometer.

> Employees are required to use the utmost care to avoid errors in reading, reducing, and enciphering the barometer. An employee who makes two such errors within a period of six months will be admonished, and an employee who is responsible for three such errors within a like period will be subject to disciplinary action.

The Weather Bureau contributed to San Diego in a variety of ways. One of the most innovative was the Kiosk (Figure 40) that was placed in the Plaza in 1909.

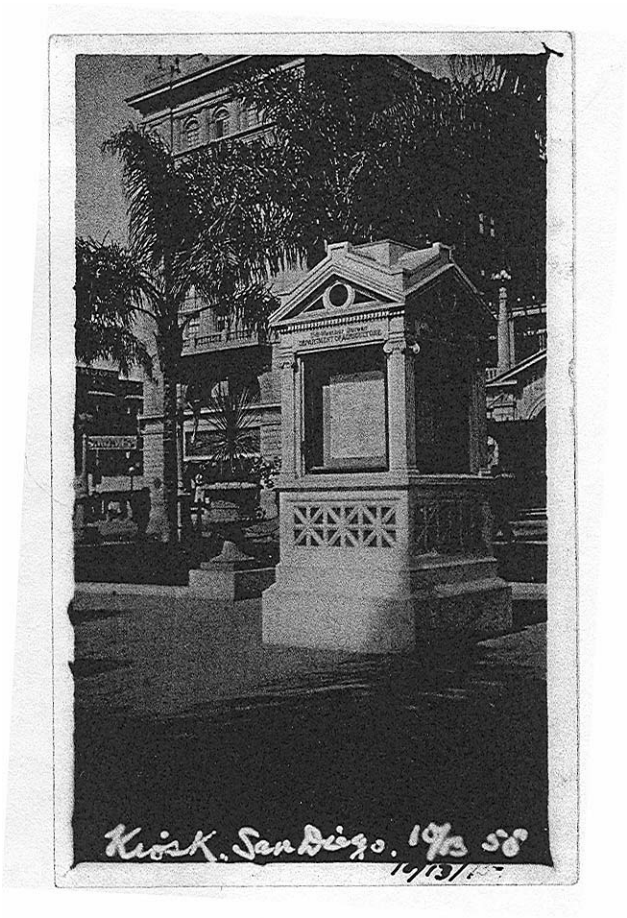


Figure 40. Kiosk in San Diego 1956
Source: National Archives and Records Administration

The Kiosk had windows on each of its four sides. Visible through the north window were the maximum and minimum thermometers, the barometer, and a dial displaying the amount of rainfall as measured by a tipping bucket rain gauge.[21] A copy of the stations' publications were posted in the east window. The south window displayed charts and illustrations of clouds. The west window showed the marine meteorological work of the station. The Kiosk, since removed, was located to the right of the fountain in the Plaza (Figure 41).

[21] The rain was collected through an opening in the top of the kiosk and directed to the gauge

Figure 41. The Fountain in the Plaza
Source: Author

In 1910, the Office made a report on “disputed precipitation entries” at San Diego. That report is in Appendix 5.

By 1913, about 100 weather maps were issued, 52 of which were placed in town and the others mailed to adjacent places. About 50 forecast cards were printed on a Chandler and Price

press in the Office. About twenty of those cards were distributed in town and the others were mailed to outside places. The telephone was used quite extensively in the dissemination of weather information. Frost warnings especially were given a wide distribution by telephone. Storm warnings were displayed at a prominent point on the waterfront, at the Coranado Boat House, and at the Naval Wireless Station at Pt Loma, where the flags were displayed and a wireless distribution made. The morning paper published a table giving maximum and minimum temperature, some local data, and the forecast for the current day. The evening paper published a forecast, some local data, and at times the maximum and minimum temperatures from selected stations over the country. The work of forecast distribution was reported to be well managed and gave satisfaction to the public.

Increased marine forecasting was anticipated. They expected that part of their activity to increase considerably when the Panama Canal was completed because San Diego would be the first American port north of the canal. However, in 1913, not more than one ship a month on an average was now being visited. A few reports were received from the ships of the American-Hawaiian company.

Aviation became an important part of the daily work of the Office by 1923. There developed cooperation among the three airports, Rockwell Field, Naval Air Station, the Fleet Air Station, and the Weather Bureau. It was reported that long flights were rarely taken without first consulting with the Weather Bureau Station.

In 1929, the outreach efforts had expanded. A course of 36 lectures at the State Teacher's College and a ten lecture course at the local flying school had been established.

The Station Memorandum from December 1941 made note of the impact of Pearl Harbor on the operation of the San Diego Weather Bureau Office. The station was "blacked out" from 11 p.m. on the 8th to sunrise on the morning of 9 December 1941. Weather information usually broadcast over radio was stopped with the 6:20 a.m. report. The blackouts continued on the 10th and on the 11th all the window of the office were painted black. On the 12th, an order was received by telegram to be implemented immediately upon receipt.

> Publication of maps, bulletins, and the inclusion of observational data and forecasts in reports to the press by station in this region should cease upon receipt of this telegram.

The Office was notified on the 13th that forecasts would be discontinued from the District Forecaster. The local office assumed that responsibility. On the 15th, the Airway Office was closed to all except aeronautical interests, identified private pilots and government officials. The San Diego's climatological records were restricted to use in the record room of the Office.

The Move to the Airport

On 1 February 1940, the Weather Bureau opened another office in the Administration Building at Lindbergh Municipal Airport. The move from downtown locations to airports marked a change in focus for the Weather Bureau to aviation needs for weather information. In

San Diego, weather observations at the airport had begun in 1930 but the 1940 move gave the responsibility to the Weather Bureau.

Because the move to the airport was a short distance and there was insignificant change in elevation, the climatic data for the station was considered to be continuous. The station there continued to contribute climatic data to the historical record than by now spans 157 years.

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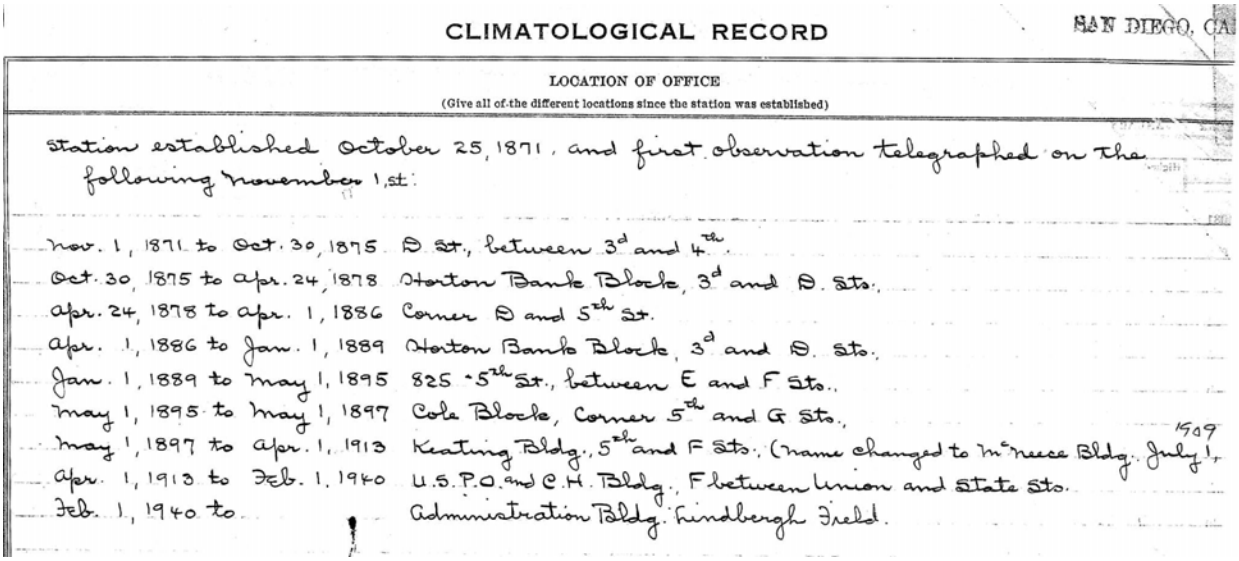
APPENDIX 1

Location of Office
Los Angeles Climatological Record Book



CLIMATOLOGICAL RECORD — SAN DIEGO, CA

LOCATION OF OFFICE
(Give all of the different locations since the station was established)

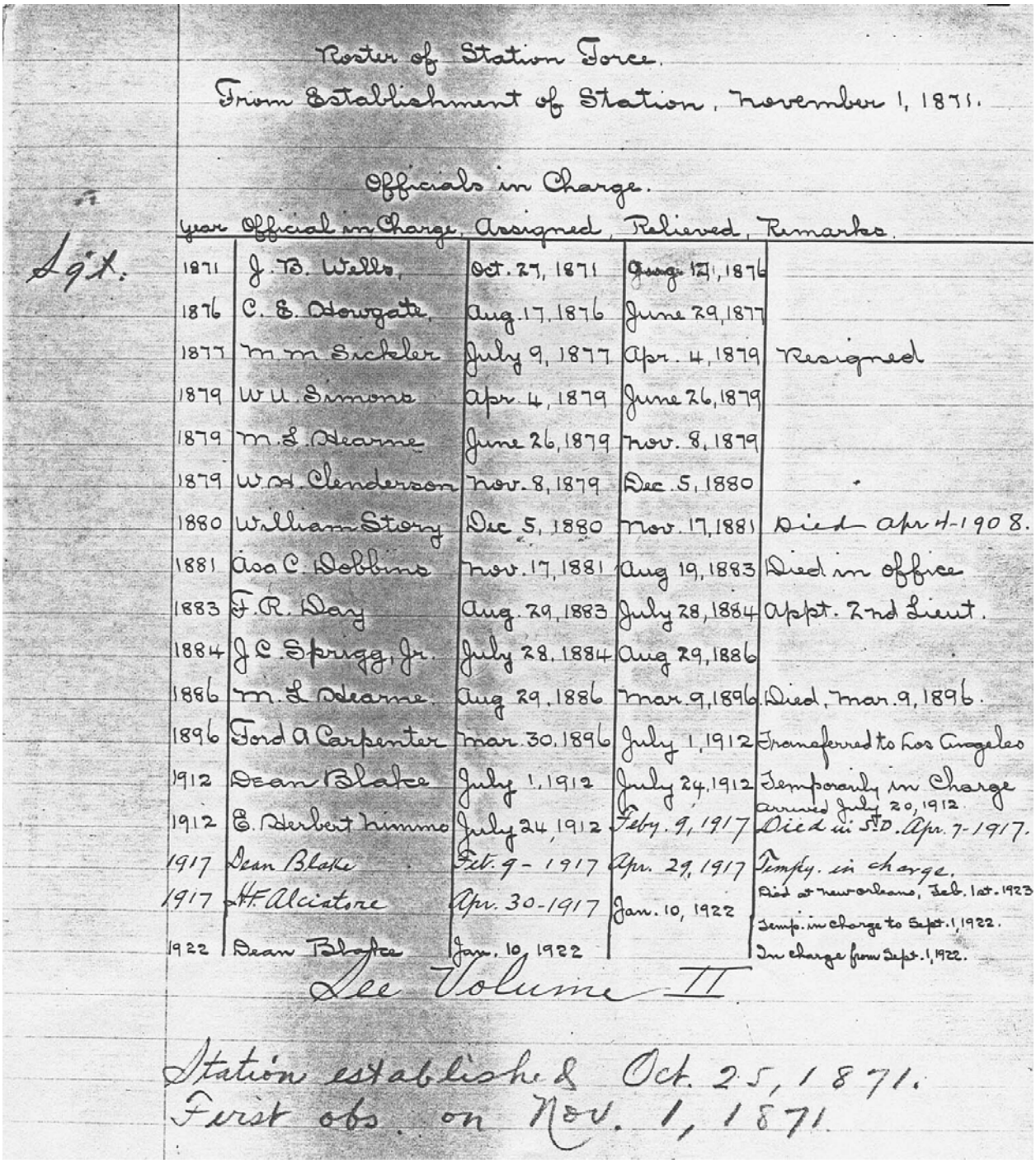
Station established October 25, 1871, and first observation telegraphed on the following November 1, st:

Nov. 1, 1871 to Oct. 30, 1875	D St., between 3d and 4th.
Oct. 30, 1875 to Apr. 24, 1878	Horton Bank Block, 3d and D. Sts.
Apr. 24, 1878 to Apr. 1, 1886	Corner D and 5th St.
Apr. 1, 1886 to Jan. 1, 1889	Horton Bank Block, 3d and D. Sts.
Jan. 1, 1889 to May 1, 1895	825 - 5th St., between E and F Sts.
May 1, 1895 to May 1, 1897	Cole Block, Corner 5th and G Sts.
May 1, 1897 to Apr. 1, 1913	Keating Bldg., 5th and F Sts. (name changed to McNeece Bldg. July 1, 1909
Apr. 1, 1913 to Feb. 1, 1940	U.S.P.O. and C.H. Bldg., F between Union and State Sts.
Feb. 1, 1940 to	Administration Bldg. Lindbergh Field.

Source: National Weather Service Forecast Office, San Diego

APPENDIX 2

Officials in Charge
San Diego 1871—1948



Roster of Station Force.
From Establishment of Station, November 1, 1871.

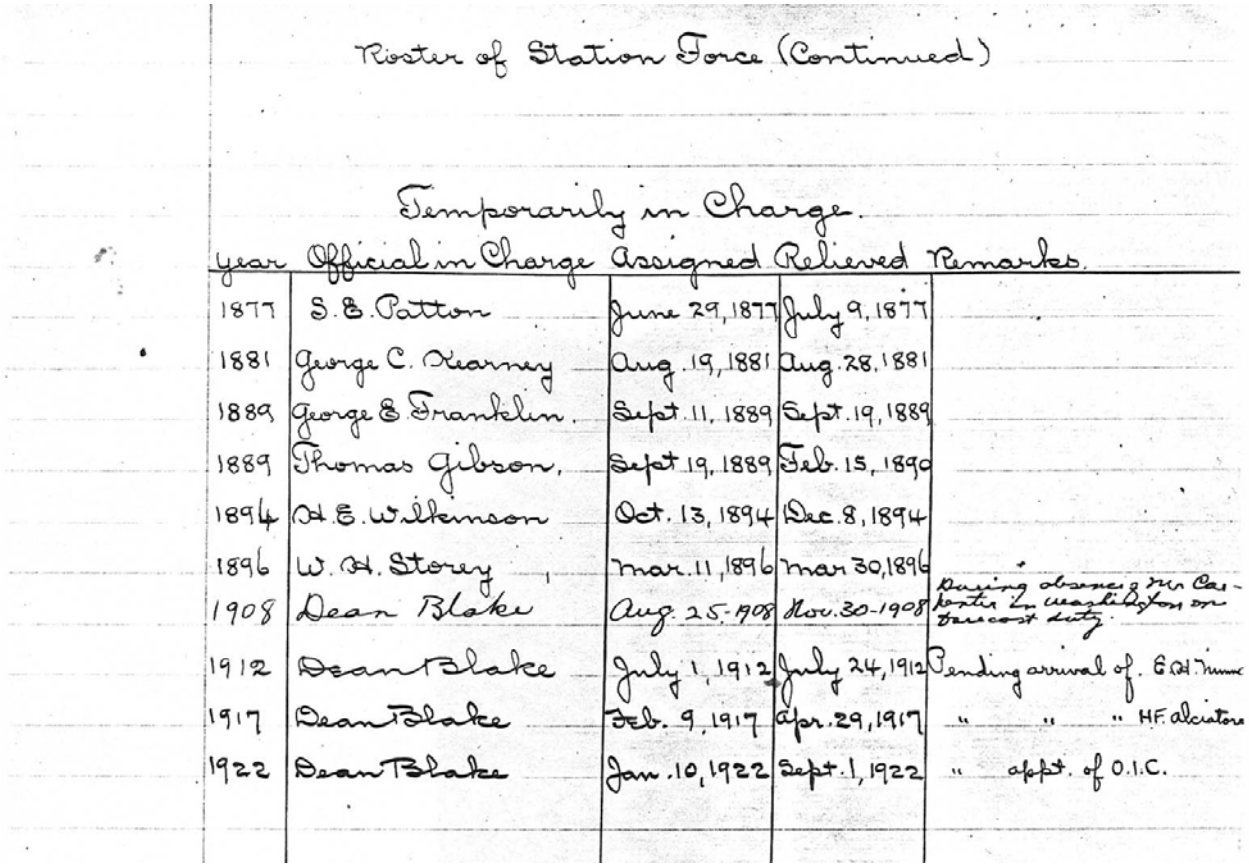
Officials in Charge.

Year	Official in Charge	Assigned	Relieved	Remarks
1871	J. B. Wells,	Oct. 27, 1871	Augt. 17, 1876	
1876	C. S. Hovgate,	Aug. 17, 1876	June 29, 1877	
1877	M. M. Sickler	July 9, 1877	Apr. 4, 1879	Resigned
1879	W. U. Simons	Apr. 4, 1879	June 26, 1879	
1879	M. L. Deame	June 26, 1879	Nov. 8, 1879	
1879	W. M. Clendenon	Nov. 8, 1879	Dec. 5, 1880	
1880	William Story	Dec 5, 1880	Nov. 17, 1881	Died Apr 4-1908.
1881	Asa C. Dobbins	Nov. 17, 1881	Aug 19, 1883	Died in office
1883	F. R. Day	Aug. 29, 1883	July 28, 1884	Apptd. 2nd Lieut.
1884	J. C. Sprigg, Jr.	July 28. 1884	Aug 29, 1886	
1886	M. L. Deame	Aug 29. 1886	Mar. 9, 1896	Died, Mar. 9, 1896.
1896	Ford A Carpenter	Mar. 30. 1896	July 1, 1912	Transferred to Los Angeles
1912	Dean Blake	July 1, 1912	July 24, 1912	Temporarily in Charge arrived July 20, 1912
1912	E. Herbert Kimmo	July 24, 1912	Feby. 9, 1917	Died in SD. Apr. 7-1917.
1917	Dean Blake	Feb. 9 - 1917	Apr. 29, 1917	Temply. in charge.
1917	H. F. Alcistore	Apr. 30-1917	Jan. 10, 1922	Died at new orleans, Feb. 1st. 1923
1922	Dean Blakee	Jan. 10, 1922		Temp. in charge to Sept. 1, 1922. In charge from Sept. 1, 1922.

See Volume II

Station established Oct. 25, 1871.
First obs. on Nov. 1, 1871

Source: Station Activities Log San Diego, Box 4, 1874-1953, Special Collections Weather Bureau Love Library, San Diego State University



Roster of Station Force (Continued)

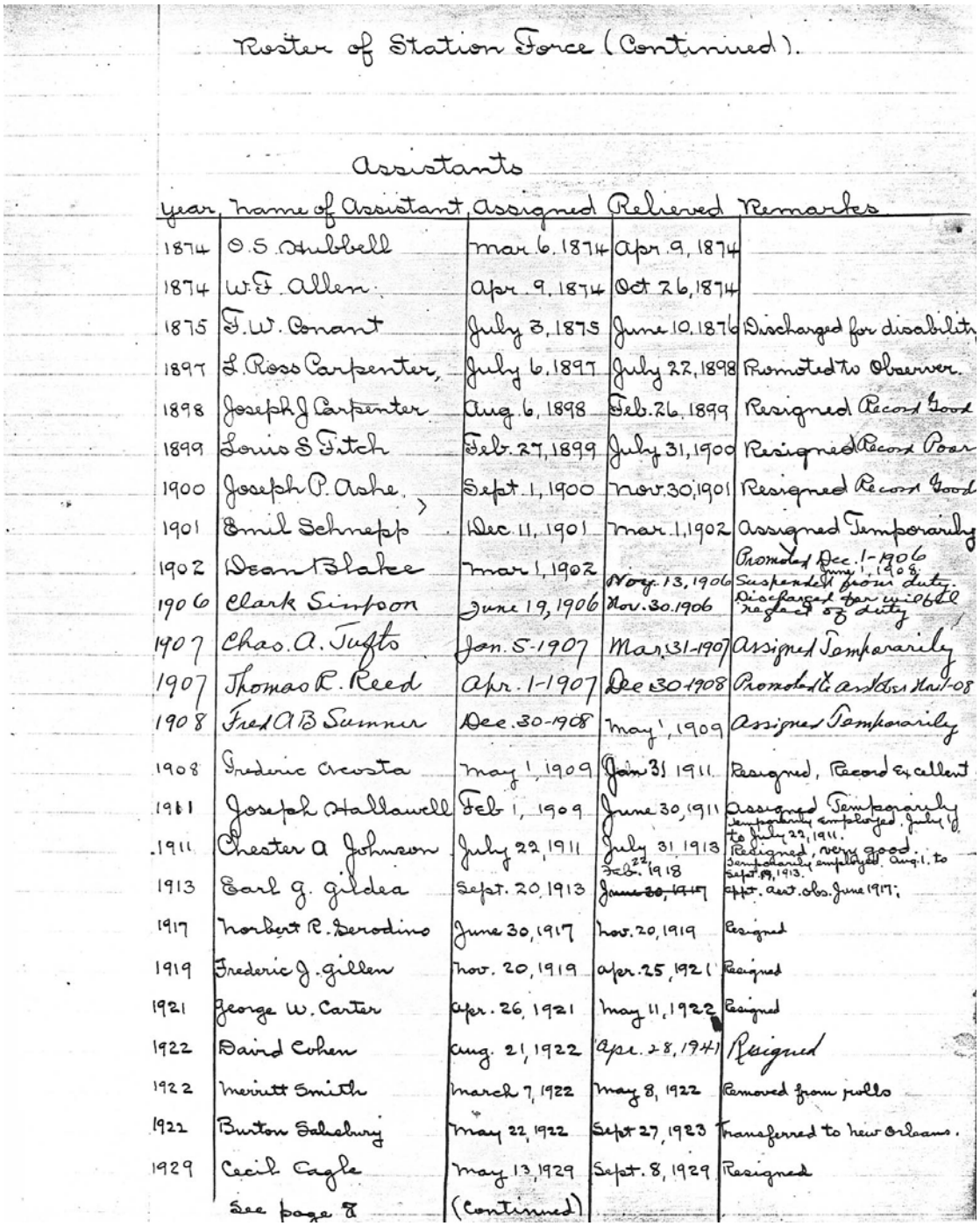
Temporarily in Charge.

year	Official in Charge	Assigned	Relieved	Remarks.
1877	S. B. Patton	June 29, 1877	July 9, 1877	
1881	George C. Kearney	Aug. 19, 1881	Aug. 28, 1881	
1889	George B. Franklin.	Sept. 11, 1889	Sept. 19, 1889	
1889	Thomas Gibson,	Sept 19, 1889	Feb. 15, 1890	
1894	A. E. Wilkinson	Oct. 13, 1894	Dec. 8, 1894	
1896	W. H. Storey	Mar. 11, 1896	Mar 30, 1896	
1908	Dean Blake	Aug. 25-1908	Nov. 30-1908	During absence Mr Carpenter on vacation on forecast duty.
1912	Dean Blake	July 1, 1912	July 24, 1912	Pending arrival of. Mr Thomas
1917	Dean Blake	Feb. 9, 1917	Apr. 29, 1917	" " " H.F. Alcutors
1922	Dean Blake	Jan. 10, 1922	Sept. 1, 1922	" appt. of O.I.C.

Source: Station Activities Log San Diego, Box 4, 1874-1953, Special Collections Weather Bureau Love Library, San Diego State University

APPENDIX 3

San Diego Assistants
1877—1929



Roster of Station Force (Continued).

Assistants

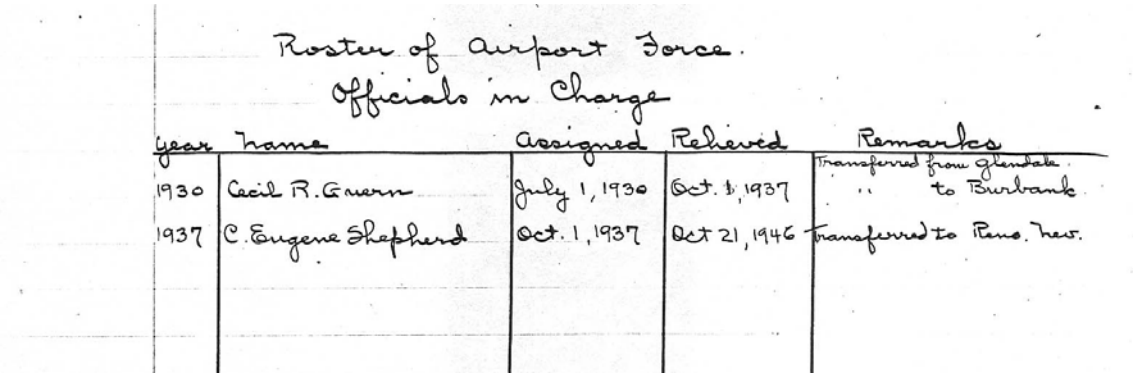
Year	Name of Assistant	Assigned	Relieved	Remarks
1874	O.S. Stubbell	Mar 6, 1874	Apr 9, 1874	
1874	W.F. Allen	Apr 9, 1874	Oct 26, 1874	
1875	F.W. Conant	July 3, 1875	June 10, 1876	Discharged for disability
1897	L. Ross Carpenter	July 6, 1897	July 22, 1898	Promoted to Observer.
1898	Joseph J Carpenter	Aug 6, 1898	Feb. 26, 1899	Resigned Record Good
1899	Louis S Fitch	Feb. 27, 1899	July 31, 1900	Resigned Record Poor
1900	Joseph P. Ashe	Sept. 1, 1900	Nov. 30, 1901	Resigned Record Good
1901	Emil Schnepf	Dec 11, 1901	Mar. 1, 1902	Assigned Temporarily
1902	Dean Blake	Mar 1, 1902	June 1, 1908 Nov. 13, 1906	Promoted Dec. 1-1906 Suspended from duty.
1906	Clark Simpson	June 19, 1906	Nov. 30. 1906	Discharged for wilful neglect of duty
1907	Chas. A. Tufts	Jan. 5-1907	Mar. 31-1907	Assigned Temporarily
1907	Thomas R. Reed	Apr. 1-1907	Dec 30-1908	Promoted Assistant Mar-08
1908	Fred A B Sumner	Dec. 30-1908	May 1, 1909	Assigned Temporarily
1908	Frederic Acosta	May 1, 1909	Jan 31 1911	Resigned, Record Excellent
1911	Joseph Hallawell	Feb 1, 1909	June 30, 1911	Assigned Temporarily temporarily employed. July 1 to July 22, 1911.
1911	Chester A Johnson	July 22, 1911	July 31 1913	Resigned, very good.
1913	Earl G. Gildea	Sept. 20 1913	Feb. 22 1918 ~~June 30, 1917~~	Temporarily employed. Aug 1. to Sept. 19, 1913. Appt. Asst. Obs. June 1917;
1917	Norbert R. Berodino	June 30, 1917	Nov. 20, 1919	Resigned
1919	Frederic J. Gillen	Nov. 20, 1919	Apr. 25, 1921	Resigned
1921	George W. Carter	Apr. 26, 1921	May 11, 1922	Resigned
1922	David Cohen	Aug. 21, 1922	Apr. 28, 1941	Resigned
1922	Merritt Smith	March 7, 1922	May 8, 1922	Removed from rolls
1922	Burton Salisbury	May 22, 1922	Sept 27, 1923	Transferred to New Orleans.
1929	Cecil Cagle	May 13, 1929	Sept. 8, 1929	Resigned

See page 8 (Continued)

Source: Station Activities Log San Diego, Box 4, 1874-1953, Special Collections Weather Bureau Love Library, San Diego State University

APPENDIX 4

San Diego Roster of Airport Force
1930—1946



Roster of Airport Force.
Officials in Charge

Year	Name	Assigned	Relieved	Remarks
1930	Cecil R. Guerin	July 1, 1930	Oct. 1, 1937	Transferred from Glendale. " to Burbank
1937	C. Eugene Shepherd	Oct. 1, 1937	Oct 21, 1946	Transferred to Reno. Nev.

Source: Station Activities Log San Diego, Box 4, 1874-1953, Special Collections Weather Bureau Love Library, San Diego State University

Roster of Airport Force Assistants

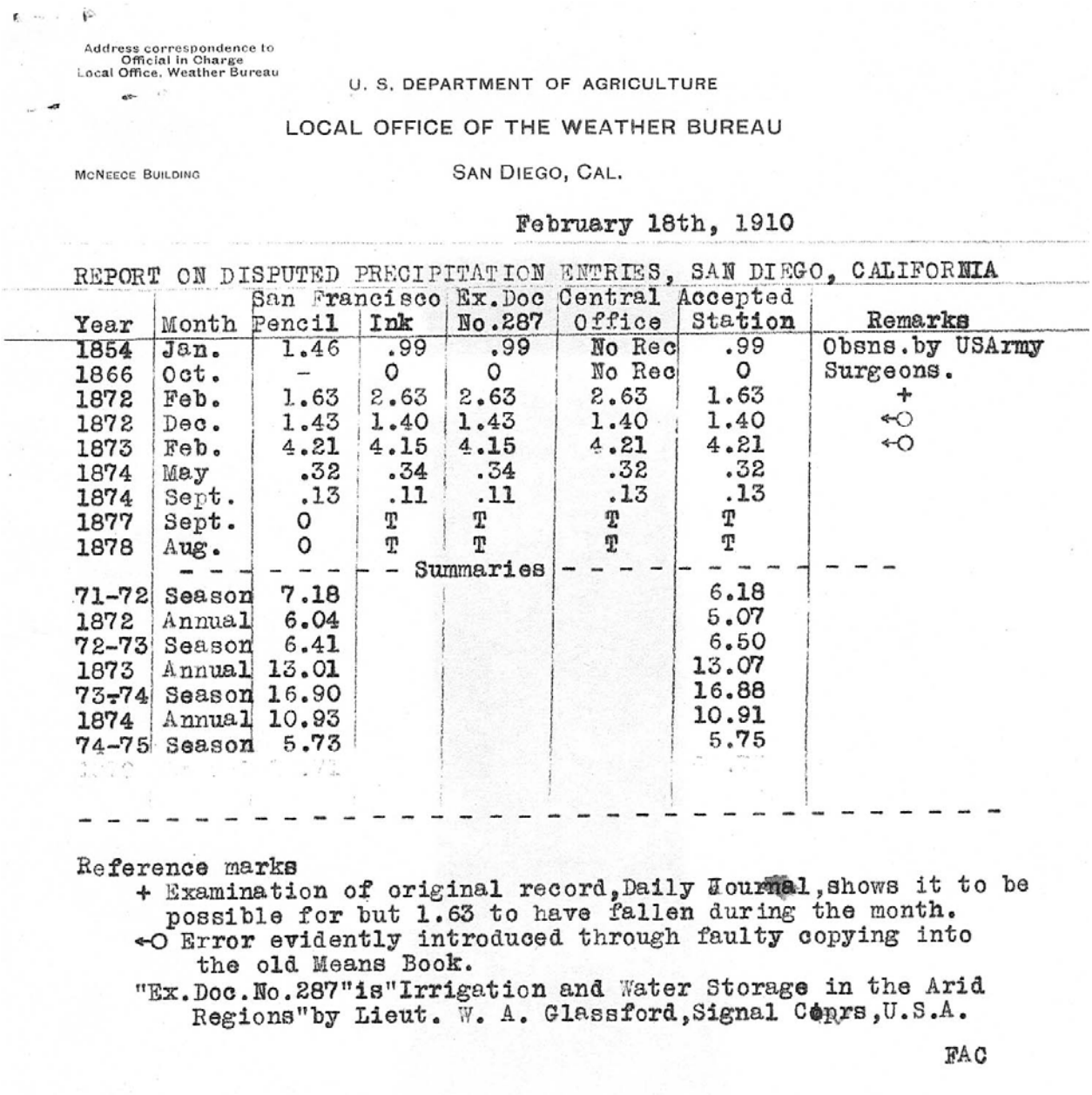
year	Name	Assigned	Relieved	Remarks
1930	Edward E. Wilson	June 20, 1930	Sept. 21, 1931	Promoted and transferred to Habec Airways Stat. on furlough Sept 1, 1931 to
1930	Eugene N. Quinn	July 1, 1930	Sept. 18, 1933	assigned to Portland W.B
1930	C. Eugene Shepherd	July 15, 1930	July 1, 1931	Transferred to City office.
1931	Thomas S. Southwick	July 8, 1931	Jan. 19, 1934	Transferred to Emergency project at Memphis
1931	John C. Eberhardt	Sept 11, 1931	June 9, 1934	Transferred to Cheyenne Wy Exchanged assignment
1931	Woodrow C. Jacobs	Oct. 1, 1931	Oct. 1, 1932	with Erwin J. Hager.
1932	Erwin J. Hager	Oct. 1, 1932	Oct 1, 1934	Ret. to Sandberg, Calif
1934	Woodrow C. Jacobs	Oct. 1, 1934	Sept. 22, 1936	Trans. to Pomona, Calif Exchanged with Franklin
1935	Cecil T. Terry	June 7, 1935	Apr. 1, 1936	at Phoenix.
1935	Leon C. Walton	June 18, 1935	Jan. 16, 1936	Exchanged assignment with C.E. Shepherd.
1936	Horace Franklin	Apr. 1, 1936	June 27, 1939	Transferred to Oklahoma City Transferred from Los Ang.
1936	John W. Fuller, Jr.	Sept. 22, 1936	Jan. 25, 1939	Transferred to Phoenix, Ariz Transferred from Los Ang.
1937	Daniel G. Sullivan	Apr. 16, 1937	Aug. 19, 1942	Resigned.
1937	George W. Kalstrom	Oct. 5, 1937	Jan. 8, 1940	Transferred to Burbank
1939	Delmar J. Taylor	Jan. 23, 1939	Apr. 12, 1940	Transferred to Reno.
1939	William J. Rogers	Sept. 1, 1939	Dec. 11, 1941	Transferred to Pomona.
1940	Virgil V. Nash	Apr. 8, 1940	Aug. 15, 1940	Resigned.
1941	Carl R. Erickson	Mar. 25, 1941	Jan. 25 1943	Transferred to Las Vegas Charleston
1941	Philip B. Mishler	May 12, 1941	June 30 1941	Transferred to N.C.
1941	Dee Francis Taylor	Dec. 10, 1941	Sept. 2, 1942	Military furlough Entered U.S. Navy
1942	George M. Burton	Dec. 8, 1942	Feb. 20, 1943	Entered air Corps.
1942	Helen R. Pickup	Mar. 22, 1943	Dec. 29, 1943	Transferred to Burbank.
1943	Elsie C. Bell	Jan. 18, 1943	June 1, 1943	Entered Marine Corps. Transferred from Phoenix
1942	John W. Fuller, Jr.	Dec. 14, 1942	June 19, 1946	Transferred to Sacramento
1943	Marjorie A. Watrous	Aug. 16, 1943	May 4, 1946	Resigned.
1943	Marjorie E. Strong	July 23, 1943	March 16, 1944	Reenlisted Transferred from Tampa
1943	Ray H. Hargett	July 1, 1943	May 28, 1945	Resigned –

continued on next page

Source: Station Activities Log San Diego, Box 4, 1874-1953, Special Collections Weather Bureau Love Library, San Diego State University

APPENDIX 5

Report of Disputed Precipitation Entries at San Diego 1854—1878



Address correspondence to
Official in Charge
Local Office, Weather Bureau

U. S. DEPARTMENT OF AGRICULTURE

LOCAL OFFICE OF THE WEATHER BUREAU

McNEECE BUILDING — SAN DIEGO, CAL.

February 18th, 1910

REPORT ON DISPUTED PRECIPITATION ENTRIES, SAN DIEGO, CALIFORNIA

Year	Month	San Francisco Pencil	San Francisco Ink	Ex.Doc No.287	Central Office	Accepted Station	Remarks
1854	Jan.	1.46	.99	.99	No Rec	.99	Obsns.by USArmy
1866	Oct.	-	0	0	No Rec	0	Surgeons.
1872	Feb.	1.63	2.63	2.63	2.63	1.63	+
1872	Dec.	1.43	1.40	1.43	1.40	1.40	←○
1873	Feb.	4.21	4.15	4.15	4.21	4.21	←○
1874	May	.32	.34	.34	.32	.32	
1874	Sept.	.13	.11	.11	.13	.13	
1877	Sept.	0	T	T	T	T	
1878	Aug.	0	T	T	T	T	
				Summaries			
71-72	Season	7.18				6.18	
1872	Annual	6.04				5.07	
72-73	Season	6.41				6.50	
1873	Annual	13.01				13.07	
73-74	Season	16.90				16.88	
1874	Annual	10.93				10.91	
74-75	Season	5.73				5.75	

Reference marks
+ Examination of original record, Daily Journal, shows it to be possible for but 1.63 to have fallen during the month.
←○ Error evidently introduced through faulty copying into the old Means Book.
"Ex.Doc.No.287"is"Irrigation and Water Storage in the Arid Regions"by Lieut. W. A. Glassford, Signal Corps, U.S.A.

FAC

Source: Station Activities Log San Diego, Box 4, 1874-1953, Special Collections Weather Bureau Love Library, San Diego State University

APPENDIX 6

Methodology

The primary sources of information for this study were the San Diego observers' daily weather records themselves. Copies of their monthly reports and the data digitized from those reports were available from the Western Regional Climate Center in Reno, Nevada, or the National Climatic Data Center in Asheville, North Carolina. The monthly reports can be considered original sources because they were written by the observers and not altered by subsequent readers.

There were a variety of secondary sources that held information about San Diego, its history, and its people. The author visited and collected information from the holdings of the National Climatic Data Center at Asheville, North Carolina; California State Library and California State Archives in Sacramento, California; Sacramento Public Library; the Library at the California Military Museum in Sacramento, California; the San Diego National Weather Service Forecast Office; the San Diego Public Library; Special Collections of the San Diego State University's Love Library; the San Diego Historical Society's Library and Archive; the National Archives and Records Administration in College Park, Maryland; the Smithsonian Institution Archives in Washington D.C.; and the Western Kentucky University Library, in Bowling Green Kentucky.

The tertiary sources were reference materials that are available on-line. Among those were the metadata prepared by the San Diego National Weather Service Office, the Western Regional Climate Center in Reno, Nevada, and the National Climatic Data Center in Asheville, North Carolina. In addition, substation histories previously prepared were consulted. Two genealogical research sources, Ancestry.com and Genealogy.com, were used to provide some of the personal information about the observers. For location analysis, the interactive maps available from TopoZone.com were used.

There was an attempt to glean information from all these sources that would allow a glimpse into the lives of the observers, the location of the observation site, and the historical environment that produced the climatic history of the San Diego. Maps, drawings, and photographs were included when appropriate to illustrate the information.

Throughout the research for and preparation of this study, the objective was to produce a document that future studies can use to evaluate the validity of the data that were collected at San Diego, judge the trustworthiness of the observers who collected them, and determine the climatological significance of the whatever variability may be discerned.