HISTORY OF WEATHER OBSERVATIONS
Wickenburg, Arizona
1875—1948

May 2006

Prepared By
Glen Conner
9216 Holland Road
Scottsville, Kentucky

This report was prepared for the Midwestern Regional Climate Center under the auspices of the Climate Database Modernization Program, NOAA's National Climatic Data Center, Asheville, North Carolina.

ACKNOWLEDGEMENTS

The librarians at the Arizona State Library in Phoenix and at the Public Library in Wickenburg were most helpful with the research done there.

Most of all, recognition should go to those who created the records used in this study, to those who preserved them through the years, and to those who share an interest in our weather observational history.

CONTENTS

Acknowledgements	ii
List of Illustrations	iv
Introduction	1
The Location	2
Record	2
Goal of the Study	4
Location of Observations	5
Signal Service Years	5
Gap in the Record 1886–1907	13
Weather Bureau Years	14
Railway Years	14
Gap in Record 1943–1944	17
Barnette Years	17
Wickenburg Sun Years	17
Instrumentation	18
Thermometer	18
Hygrometer	19
Rain Gauge	19
Barometer	21
Shelter	21
Wind Instruments	24
The Observers	26
The Signal Service Years 18751892	26
The Weather Bureau Years 1908–1948	28
The Observations	30
Observations 1875–1883	30
Observations 1883–1886	33
Gap in the Record 1886–1908	34
Observations 1908–1948	34
Climatological Studies	35
Appendices	
Appendix 1, Methodology	36
Bibliography	37

ILLUSTRATIONS

Figures

1.	First Weather Observations from Wickenburg	3
2.	Stage Coach Office 1869	5
3.	Stage Company Newspaper Ad 1889	6
4.	Wickenburg's Weather Station 1877	7
5.	Ad for Magnolia Brewery	8
6.	Wickenburg Office 1878	9
7.	Wickenburg Office 1879	10
8.	Wickenburg Office 1882	11
9.	Wickenburg Office 1884	13
10.	Depot 2006	14
11	Rear Of Depot 2006	15
12.	Railway Depot Area	16
13.	Green Maximum and Minimum thermometers	19
14.	Standard Rain Gage	20
15.	Interior of Instrument Shelter 1882	22
16.	Standard Shelter	23
17.	Anemoscope	24
18.	Arizona Map 1892	29
19.	Observations September 1878	31
20.	Observations July 1880	32
21.	Observations October 1883	33

HISTORY OF WEATHER OBSERVATIONS
Wickenburg, Arizona
1875 –1948

Glen Conner
Kentucky State Climatologist Emeritus

INTRODUCTION

The afternoon sky was fair and the wind was from the west when Pvt. John Carroll of the United States Army read the thermometer in Wickenburg in the Arizona Territory for the first time. The temperature was 66˚F that 13th day of November 1875. Could he have known the importance of his observations as the beginning of a continuum that now spans 131 years? Probably not, but the Army's interest in climate had begun many years earlier.

The Army Surgeon General, Joseph Lovell, initiated efforts to create a climate network in 1817. By 1819, the network was collecting daily weather observations from Army Posts located in the then 22 states. The observers in that network were the Surgeons at the Posts. Their reports were forwarded to the Surgeon General's office in Washington. Surgeon General Lovell stated clearly that the purpose of the network was to determine if climate change was then occurring.

> On the question whether in a series of years there be any material change in the climate of a given district of country; and if so, how far it depends upon cultivation of the soil, density of population, &c, the most contradictory opinions have been advanced. While one contends, that as population increases and cultivation extends the climate becomes warmer, another is equally convinced that it becomes colder and a third, that there is no change in this respect.

Before any determination about climate change could be made, a base line of data had to be collected. It was essential that those data be collected before the "natural" climate was altered by the intrusion of human activities. Surgeon General Lawson noted in 1840 that the place to do that was on the frontier.

> ….the hope is indulged that the medical corps of the army, more especially as many of the military posts afford an opportunity of making observations in regions still in a state of nature, will ere long be furnished with the means of prosecuting more extensive researches, and of keeping pace with the progress of Science

Location

Wickenburg was on the frontier[1] in 1875 by any standard of measurement. Weekly stagecoach service from Phoenix passed through three times each week on the way to the northern part of the Territory. Hodge in 1877 described the town.

> Wickenburg is a small town in the southwestern part of the Territory, on the Hassayampa, and the general transfer station of the California and Arizona Stage Company. Passengers, mails, and express, are here transferred from the main line via Ehrenburg to Prescott, and intermediate stations north, and to Phoenix, Florence, and other stations south.

The inspector of the weather station at Wickenburg commented in 1879 that it was "a small village [of] about 60 inhabitants." He said that it had been larger previously but many had departed. The town was on the frontier but it lacked an Army post with surgeons to make weather observations. However, the weather station would arrive with another much more important asset to the area—the telegraph.

The Army's Signal Corps established telegraphic lines that connected San Diego, California, to Yuma, Maricopa Wells, Phoenix, Florence, Tucson, Prescott, Wickenburg, and Camps Whipple, Verde, McDowell, Lowell, Grant, Apache, and Bowie. About one thousand miles of telegraph wires had been built in the Territory. Army telegraph operators were stationed along the way to serve the public's need for telegraphy. Pvt. John Carroll was one of those operators.

Record

The requirement for Pvt. Carroll's weather observations had an origin different from that of the telegraph office. In 1870, President U. S. Grant signed a law that established a new weather network. The responsibility for the network was given to the Army because "military discipline would probably secure the greatest promptness, regularity, and accuracy in the required observations." The Signal Service within the Army's Signal Corps began telegraphing weather reports to Washington on 1 November 1871. Those observations were used to formulate forecasts[2] that were distributed using the telegraph. Pvt. Carroll made observations of temperature at 7:35 a.m., 4:35 p.m., and 11:35 p.m. and recorded daily rainfall totals. At the end of that first month (November, 1875), he forwarded the completed form (Figure 1) to the Signal Service Headquarters in Washington. The report arrived there on 28 December 1875. By 1878, reports were being received from 284 locations around the country, including from the observer in Wickenburg.

---

[1] Arizona had been organized as a Territory in 1863 but it would not become the 48th state until 1912

[2] Called "probabilities" in those days

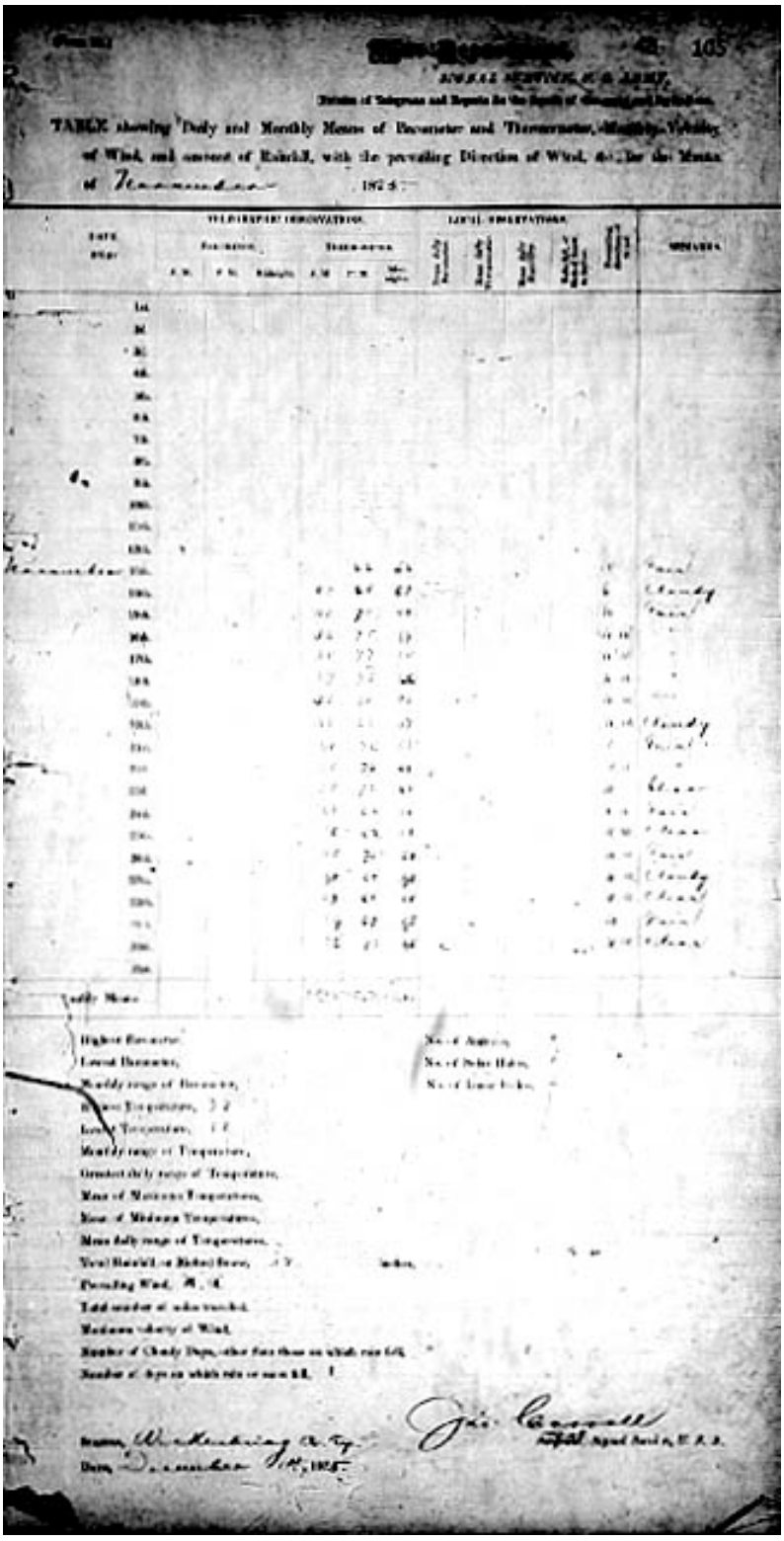


TABLE showing Daily and Monthly Means of Barometer and Thermometer, Monthly Velocity of Wind, and amount of Rainfall, with the prevailing Direction of Wind, &c., for the Month of November 1875

Figure 1. First Observations from Wickenburg, November 1875
Source: National Climatic Data Center

The weather record at Wickenburg continued to the present time with only one interruption during the 1887 through the 1907 period. During the past 131 years, the observation site changed only slightly and the growth of the town did not spawn the urbanization that would have contaminated the record with the heat that cities generate. It therefore represents an important location for studies of long-term climate variability.

Goal of the Study

The goal of this study was to document the weather observational history of Wickenburg, Arizona. 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 Arizona. The challenge of this study was to identify the role of Wickenburg 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 Observers, and the Weather Bureau meteorologists, to the current National Weather Service Forecasters and their extensive observational and forecast network of today.

LOCATION OF OBSERVATIONS

Signal Service Years

The tents of the earliest settlement provided shelter for the people who were drawn to Wickenburg by the success of the Vulture Mine. The gold fever that brought them was sometimes accompanied by malaria, the sources of which were the stagnant pools of water in the Hassayampa River. The tents were soon replaced by adobe buildings. Pry wrote that by 1871 the town had five saloons and one restaurant to serve the prospectors. Their comings and goings kept the town bustling. The bustle disappeared when the mine closed in 1873. Korwin confirmed that description at the time when the telegraph came to Wickenburg on 10 January 1874.

> …the glory of the town had faded and by 1875, the luster was almost completely gone. The mine was poorly managed, the richest easiest veins had been tapped. The town hung on, as its populations dwindled to barely 50. It was referred to as a ghost town until the turn of the century, but a few souls still hung on. ”

It was to that scene that the Army came to build telegraph lines in the area and to install a telegraph office in the town. They also brought the first weather instruments.

The original location for the weather observations was described in the first Signal Service Inspection Report for Wickenburg two years later in 1877. The building was provided by Dr. John H. Pierson, rent-free. According to Hanchett, he was the Physician for the Vulture Mining Company. He was the son-in-law of James Grant who founded the California and Arizona Stage Company and, after his death, owned the stage line with his brother-in-law Edmond O. Grant. In 1875, he was running the stage office (Figure 2).

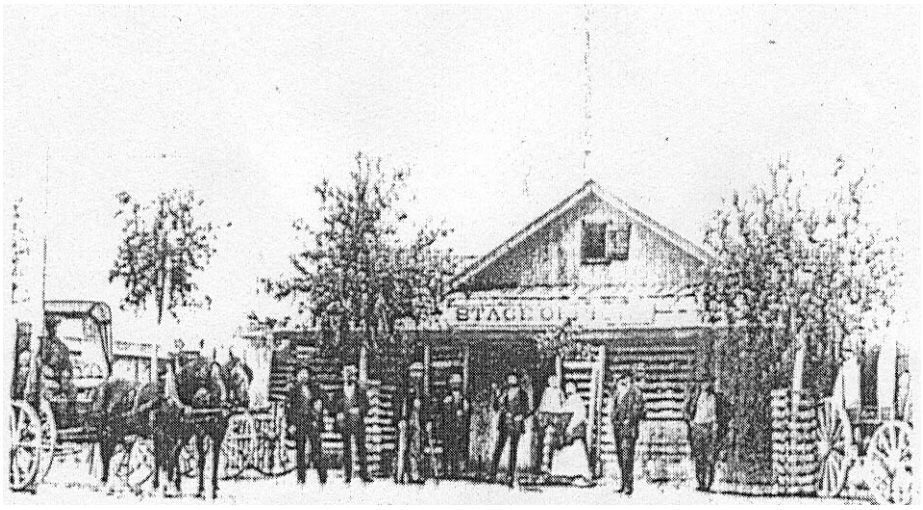
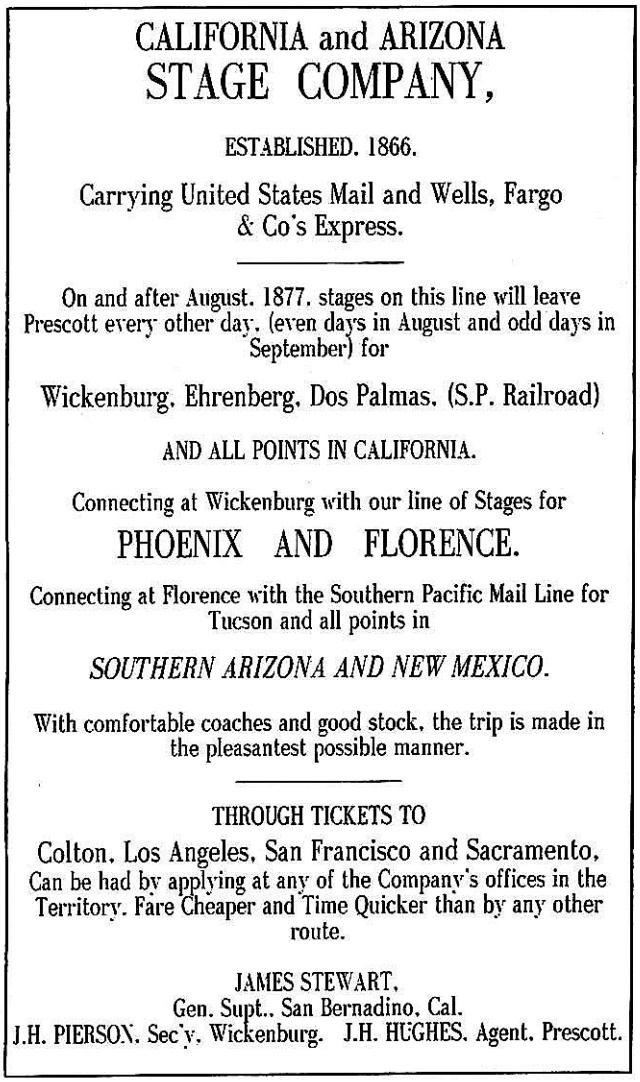


Figure 2. James Grant’s Stage Office ca. 1869, Location of the First Weather Station in 1875
Source: Wickenburg Public Library

The stage line was the primary link to the outside world. Cargo was brought by ship by way of the Gulf of California and steamers up the Colorado River to Ehrenburg. From there cargo moved by wagon and passengers by stage[3] to Wickenburg. The stage line continued north to Prescott and south to Phoenix and Florence with tri-weekly service in each direction. At Florence, it connected with the Southern Pacific Mail line (Figure 3).



CALIFORNIA and ARIZONA
STAGE COMPANY,

ESTABLISHED. 1866.

Carrying United States Mail and Wells, Fargo & Co's Express.

On and after August. 1877. stages on this line will leave Prescott every other day. (even days in August and odd days in September) for

Wickenburg. Ehrenberg. Dos Palmas. (S.P. Railroad)

AND ALL POINTS IN CALIFORNIA.

Connecting at Wickenburg with our line of Stages for

PHOENIX AND FLORENCE.

Connecting at Florence with the Southern Pacific Mail Line for Tucson and all points in

SOUTHERN ARIZONA AND NEW MEXICO.

With comfortable coaches and good stock, the trip is made in the pleasantest possible manner.

THROUGH TICKETS TO

Colton, Los Angeles, San Francisco and Sacramento,
Can be had by applying at any of the Company's offices in the Territory. Fare Cheaper and Time Quicker than by any other route.

JAMES STEWART,
Gen. Supt., San Bernadino, Cal.
J.H. PIERSON, Sec'y, Wickenburg. J.H. HUGHES, Agent, Prescott.

Figure 3. California and Arizona Stage Company Newspaper Ad
Source: Clampett, 1889

[3] The two stage lines in Arizona in 1877 employed 100 men, 400 horses, and 50 coaches according to Hodge

The Army Inspector, Lt. A. W. Greely, came in 1877 for the weather station's first inspection. He drew a diagram of the weather office (Figure 4) that faced west on the "Main Road," streets did not as yet have official names. Note the north arrow on the diagram.

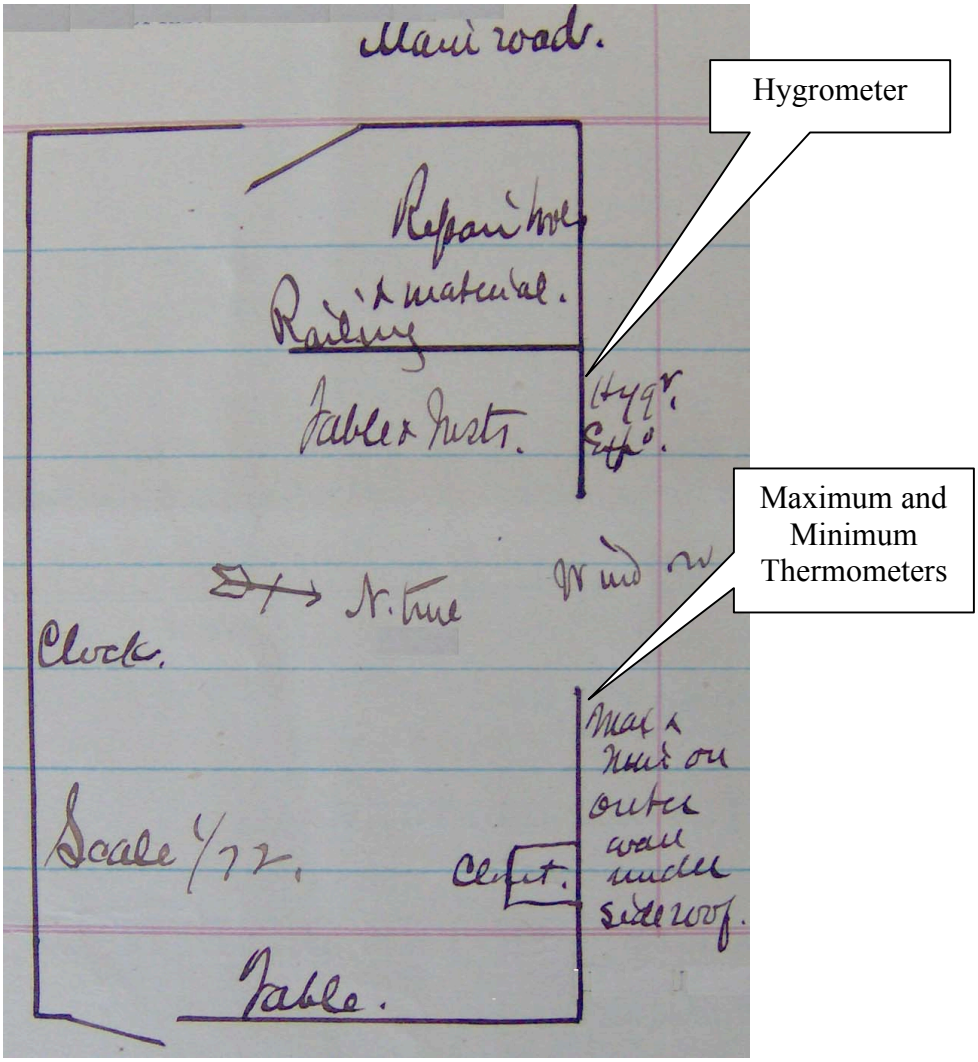


Figure 4. Wickenburg Weather Station, 1877
Source: National Archives and Records Administration

The office was described by a traveler in the 9 January 1875 issue of the Arizona Miner as quoted by Hanchett.

> …You are landed in the once flourishing village of Wickenburg, but which exists as the old missions of the southern part of this territory, a wreck of its former self …As it is, there is no place of life except at the quarters of the stage company. They have the

only good buildings in the town, apparently do most of the business; and the weary traveler finds a satisfactory rest and good treatment which, without as doubt, is equaled by no other place on the post roads of our territory, at least your humble correspondent found it so, in his own experience.

The inspector seemed to agree and described the office as large and commodious. Note that the instruments were mounted on the north facing exterior wall under the side roof that extended outward about six feet. The building's owner, Dr. Pierson became a Justice of the Peace in 1880 and, in later years, an agent of Western Union.

The office was closed from the 5th through the 12th of August 1877. A note on the observation form said that Privates Guild and DuSouchet were "exchanging stations in compliance with Special Order No. 15 Office Officer in charge." The reason for that amount of time was not stated but thereafter DuSouchet signed as the observer.

According to the Observation Form for February 1878, no observations were made during the 20th and 21st because the office was being moved. The inspection conducted in October 1878 confirmed that indeed the office had moved. The new office was located in a building provided rent-free by Abraham Peeples. He had served in the Texas Rangers during the Mexican War and subsequently came to Wickenburg as one of its first settlers. He advertised his Magnolia Brewery in the Arizona Miner in 1868 (Figure 5). The 1880 census listed him as a Hotel and Saloon Keeper.

"MAGNOLIA"
BREWERY AND SALOON,
Wickenburg, Arizona.

THE UNDERSIGNED RESPECTfully informs the public and his old friends, that he is now manufacturing, and keeps constantly on hand, a superior quality of

Lager Beer.

In connection with the Brewery is a first-class Bar, which is always supplied with the best of

LIQUORS AND CIGARS.

The patronage of the public is solicited.

A. H. PEEPLES, Proprietor.

Wickenburg, March 12, 1868. m14

Figure 5. Ad for the Magnolia Brewery
Source: Arizona Miner, 24 October 1868

The office (Figure 6) that Peeples provided was in a one-story frame building with an adjoining room used for storage. Note the north arrow.

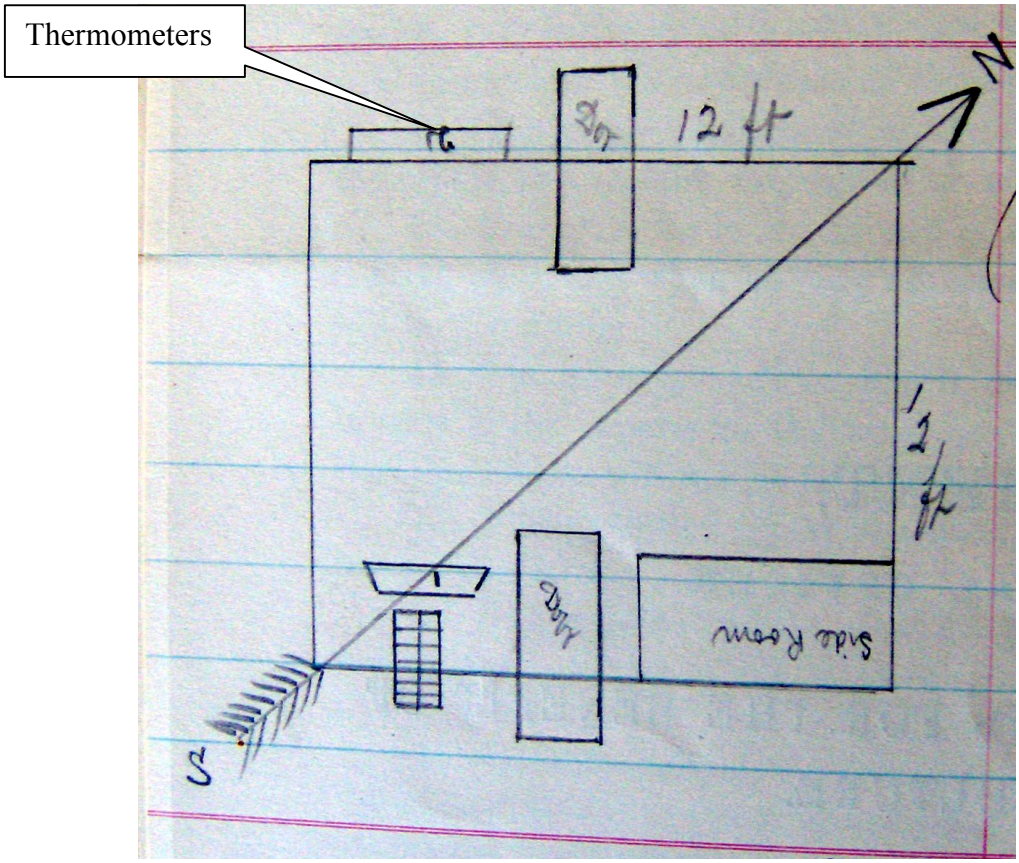


Figure 6. Wickenburg Office, 1878
Source: National Archives and Records Administration

The inspector in 1878 stated that there was no shelter. The thermometers in Figure 6 were hanging on the exterior wall.

By the time of the next inspection in September 1879, the office had relocated again. It had moved across the street to a one-story adobe building that had three rooms. The rooms had dirt floors. The inspector reported that nearly all other buildings in town were similar to it. He commented that the office had been left as a repair station. That was a reference to the telegraph operation that was continuing to operate. He also commented that about 75 people resided in Wickenburg. Note that in the office diagram (Figure 7), there are beds. It was common during this period for the weather observer to sleep in the office.

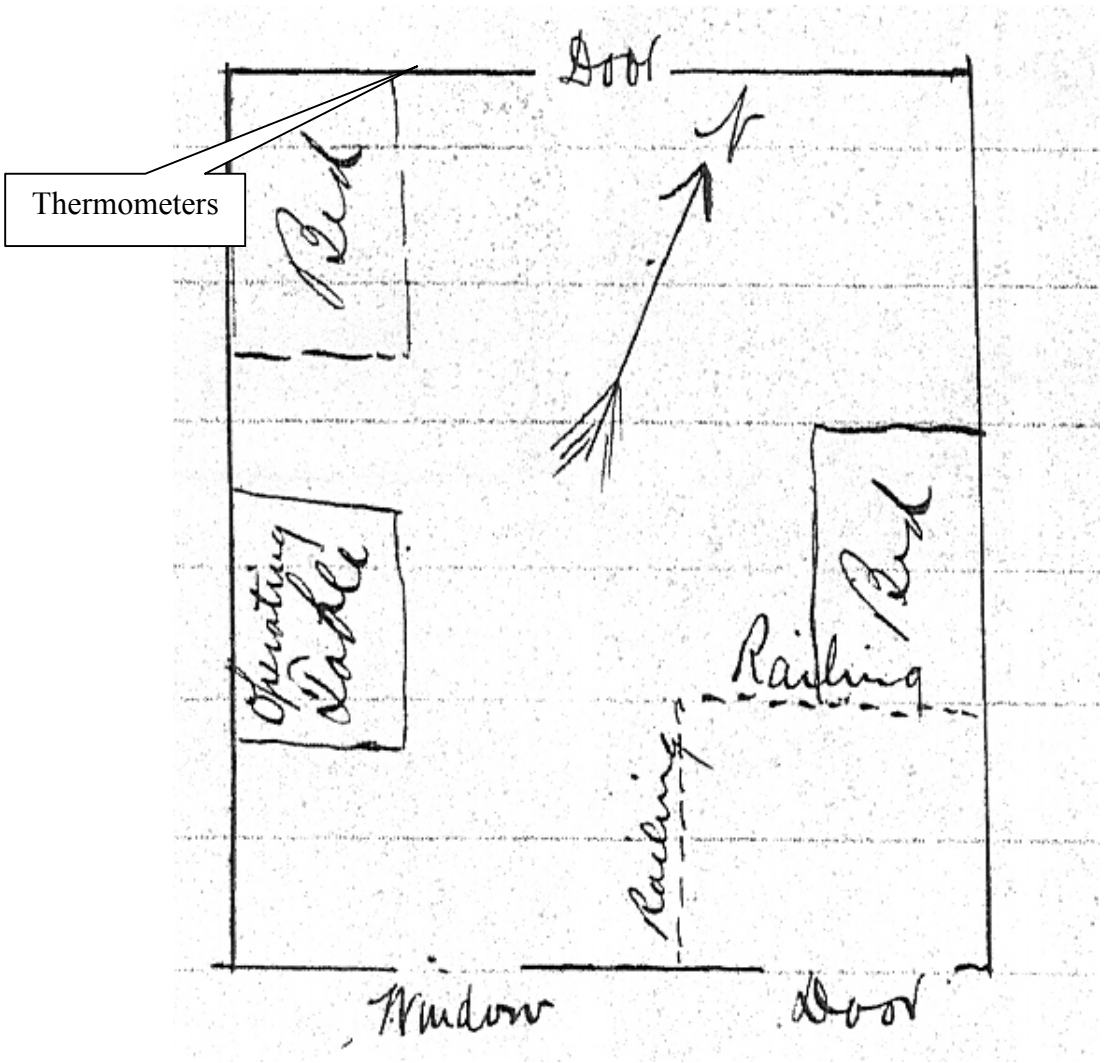


Figure 7. Wickenburg Office, 1879
Source: National Archives and Records Administration

In 1880, Dr. Pierson and Mr. Grant were given a contract with Wells Fargo to provide service to Wickenburg. It was one of several Wells Fargo offices opened in Arizona at places that had both train and stage lines operating. The 1880 inspection reported the location as being on the "north side of Hassyampa Square."

In February 1882, the office (Figure 8) was described as being located "near entrance to the village." Note the direction of the north arrow.

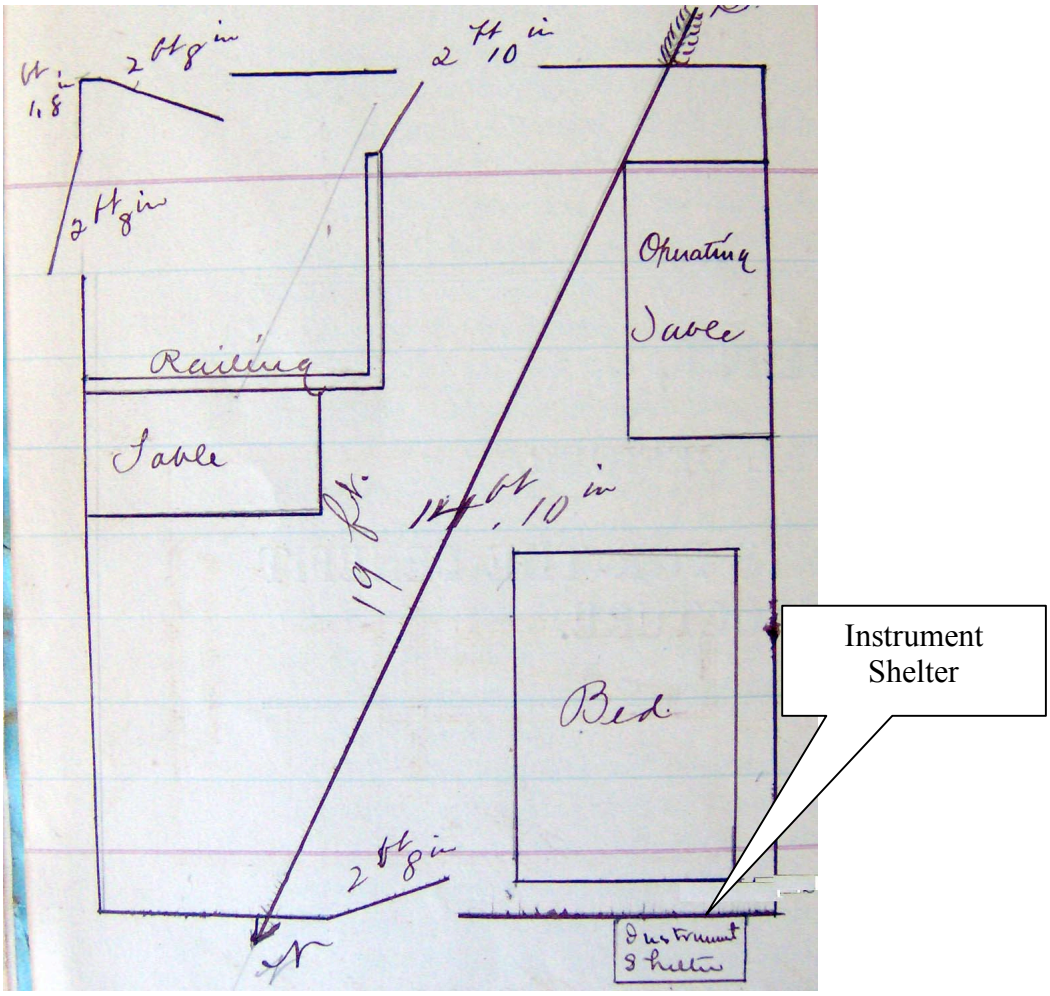


Figure 8. Wickenburg Office, 1882
Source: National Archives and Records Administration

The previous location that was opposite of the stage station was considered a better location. A Mr. Henry provided the space rent-free.

The inspector was unhappy with the appearance of the interior of the office. The walls were covered with old newspapers and pictures cut from Harpers Weekly, Police Gazette, and other such publications. The inspector ordered all of them taken off the walls. The building was adobe and very old and worn and the office could not, in his opinion, be made to look decent without being papered and painted. The cost for that was estimated to be about $20.

Extant observation records end with the April 1882 observations without comment. The records before that date were microfilmed by the National Archives and Records Administration. Images of those observation forms are accessible through the National Climatic Data Center's WSSRD system. Two events caused this gap in the record. The first was that the office building

was destroyed by fire on 10 September 1882. All the records of the office were destroyed in the fire as well. The second event was that the Signal Service then designated the station as a 3rd Class Station. On 3 April 1883, instructions for operation of a 3rd Class Station were sent to Wickenburg with orders to begin observations upon receipt of that letter. The National Archives and Records Administration have records from the Third Order Signal Service Stations from 1883 through 1898 that had not been microfilmed. Among them are the Signal Service Forms 119 submitted from Wickenburg for October 1883 through January 1886.

The reason for the designation of Wickenburg as a Third Class Station was not stated. However, the timing coincides with the loss of population of the town that followed the closure of the mine. The Phoenix Gazette reported on 26 June 1883 on those losses.

> Wickenburg is at present a relic of the past. Fifteen years ago it was in its glory—the glory of a frontier mining camp. Here are one hundred empty houses, many in good condition and hotels, dwellings, saloons, dance-halls—all deserted. The present population may be counted on the fingers of both hands, and even the very atmosphere of the place bears an air of expectations; a sort of waiting for better times.

One of those few who stayed was the Signal Service's weather observer.

All of the earliest forms used at Wickenburg had no place for latitude and longitude to be entered. The Form 119 submitted for October 1883 contained the first latitude and longitude information available for the Wickenburg station. That position was recorded as 34˚ 0' N and 112˚ 44' W. Elevation was listed at 1,400 feet on that and subsequent forms but it was a gross error. The floodplain of the Hassayampa River at Wickenburg is greater than 2,000 feet. The Substation History Form from 1952 lists the Signal Service's location as 33˚ 58' N and 112˚ 44' W at an elevation of 2,072 feet. That location and elevation appears to be correct. The Arizona State Climatologist used those data in his 1967 Climate of Arizona.

The new location that replaced the one that was destroyed by fire was reported by the inspection of September 1884. The office location was said to be the best in the village, on its highest point. The inspector noted that there were no street names and none of the buildings had house numbers with which to locate the building. He wrote that it was "in the middle of the village" and that there were no hills within a half-mile.

The new location was in the stagecoach office. There was only one stage running through Wickenburg at that time. Stage service had begun in 1866 by the California and Arizona Stage Line, one of two stage lines in the Arizona Territory. It connected with the Southern Pacific Railroad at Indian Wells in California by way of Ehrenburg on the Colorado River to Wickenburg. From there, the stage line branched; one branch going to Prescott and the other to Phoenix and Florence. It connected with the Southern Pacific Mail Line in Florence. The stages ran tri-weekly.

The collocation of the telegraph office, the stage office, and the weather station would have made for an interesting layout (Figure 9).

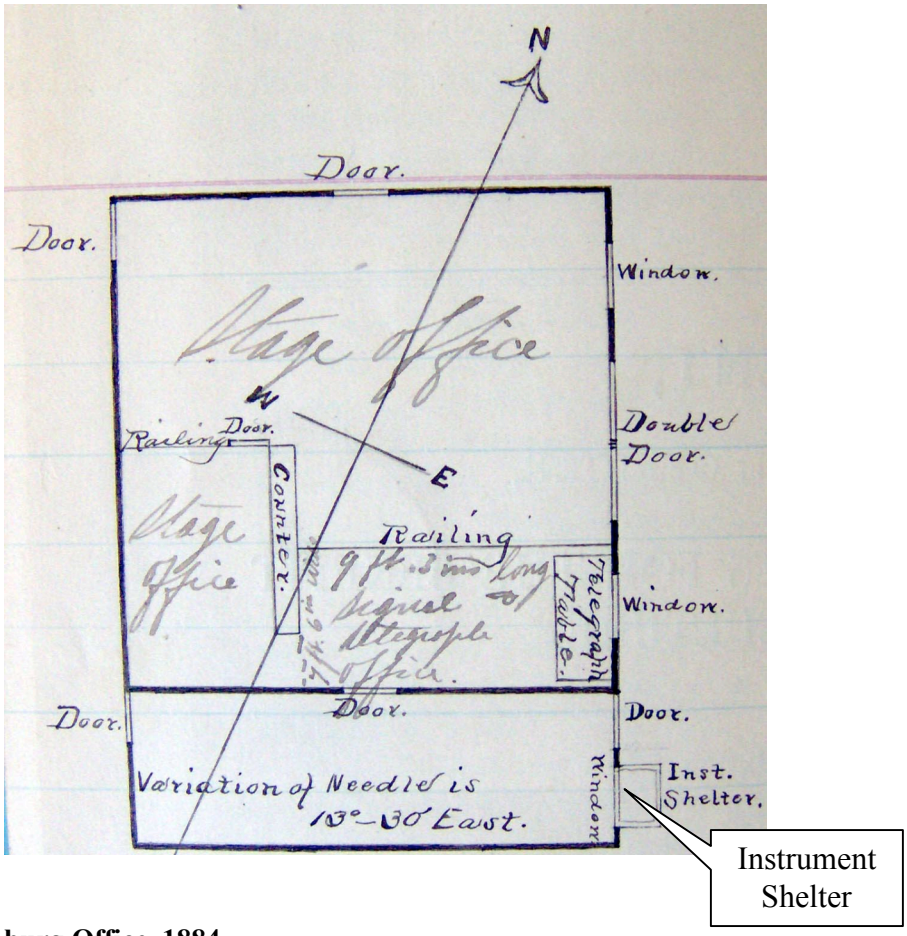


Figure 9. Wickenburg Office, 1884
Source: National Archives and Records Administration

The 26 November 1885 Inspection Report by 2nd Lt R. B. Watkins of the Signal Corps questioned in value of the station at that time. Apparently, there was only one person remaining to staff the office and that person was deemed unqualified both as a telegraph operator and as an observer of the weather. He was described as a telegraph line repairman. The inspector's recommendation must have been accepted. The last observations from Wickenburg were submitted on the form for January 1886.

The Gap in the Record 1886-1907

A Substation History Form 530 dated 17 October 1952 was prepared by the Weather Bureau Office in Phoenix. It notes the actual gap in the Wickenburg data that began on 1 February 1886. The Climatological Data for Arizona lists Wickenburg as an observation site in

that December 1907 issue. Therefore, the actual gap in observations must have extended from 1 February 1886 through November 1907.

The gap in the record was not the result of the infamous flood. In the early morning hours of 22 February 1890, a dam upstream from Wickenburg at Walnut Grove was breached. A wall of water reported to be forty feet high swept through Wickenburg a few hours later. All the houses along the river were destroyed. The floodwaters in the Hassayampas River swept away everything in its path. Four years earlier, the weather station had been removed and had not yet been reestablished.

Weather Bureau Years

Railway Years

Weather observations may have begun when the Agent for the P. & P. Railway (Prescott & Phoenix) at Wickenburg was listed as a Voluntary Observer in the Annual Report for 1907. The Depot is currently the home of the Wickenburg Chamber of Commerce (Figure 10).

Figure 10. Wickenburg Depot in 2006
Source: Author

According to Korwin, the railroad had arrived in 1895 linking Prescott and Phoenix and saving Wickenburg as a town. However, weather data from Wickenburg were not published until the March 1908 issue of the Climatological Data for Arizona included its daily maximum and minimum temperature and its daily precipitation. The Weather Bureau recorded an inspection of the station on a Form 4029 in April 1908. That form listed the location as being 33˚ 57' N and 112˚ 45' W at an elevation of 2,072 feet. The observations were taken from a site 100 feet from the nearest building. The terrain was described as "generally mountainous" but that it was one mile from the nearest hill on Railroad Street.

In June 1940, the site was identified as being at 33˚ 58' N and 112˚ 44' W at an elevation of 2,072 feet. The site was on the Santa Fe Railroad right of way near the Depot and about 1,700 feet west from the Post Office. That position as determined by GPS placed its location at a point across the railroad tracks southwest from the back door of the Depot (Figures 11 and 12).

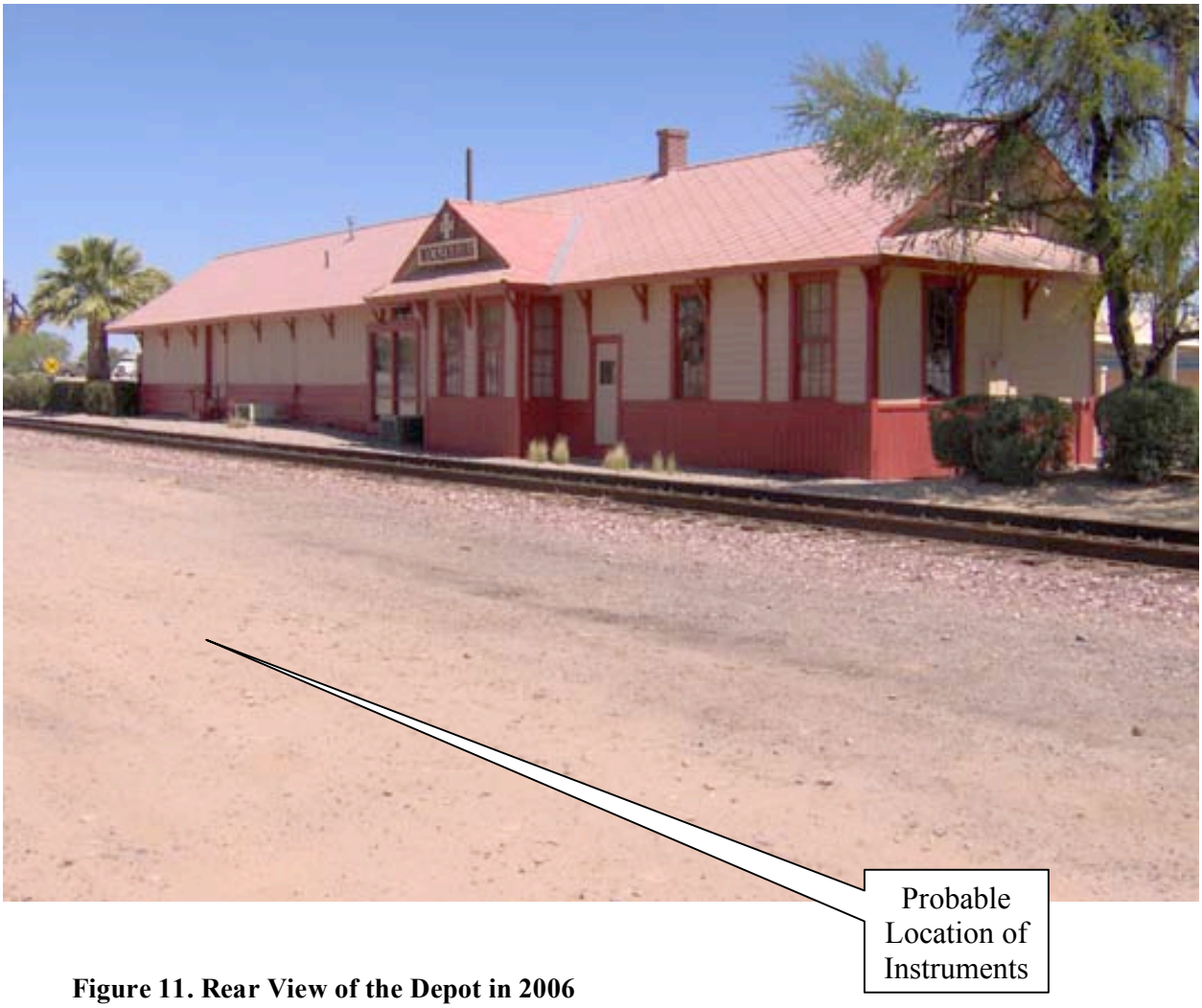


Figure 11. Rear View of the Depot in 2006
Source: Author

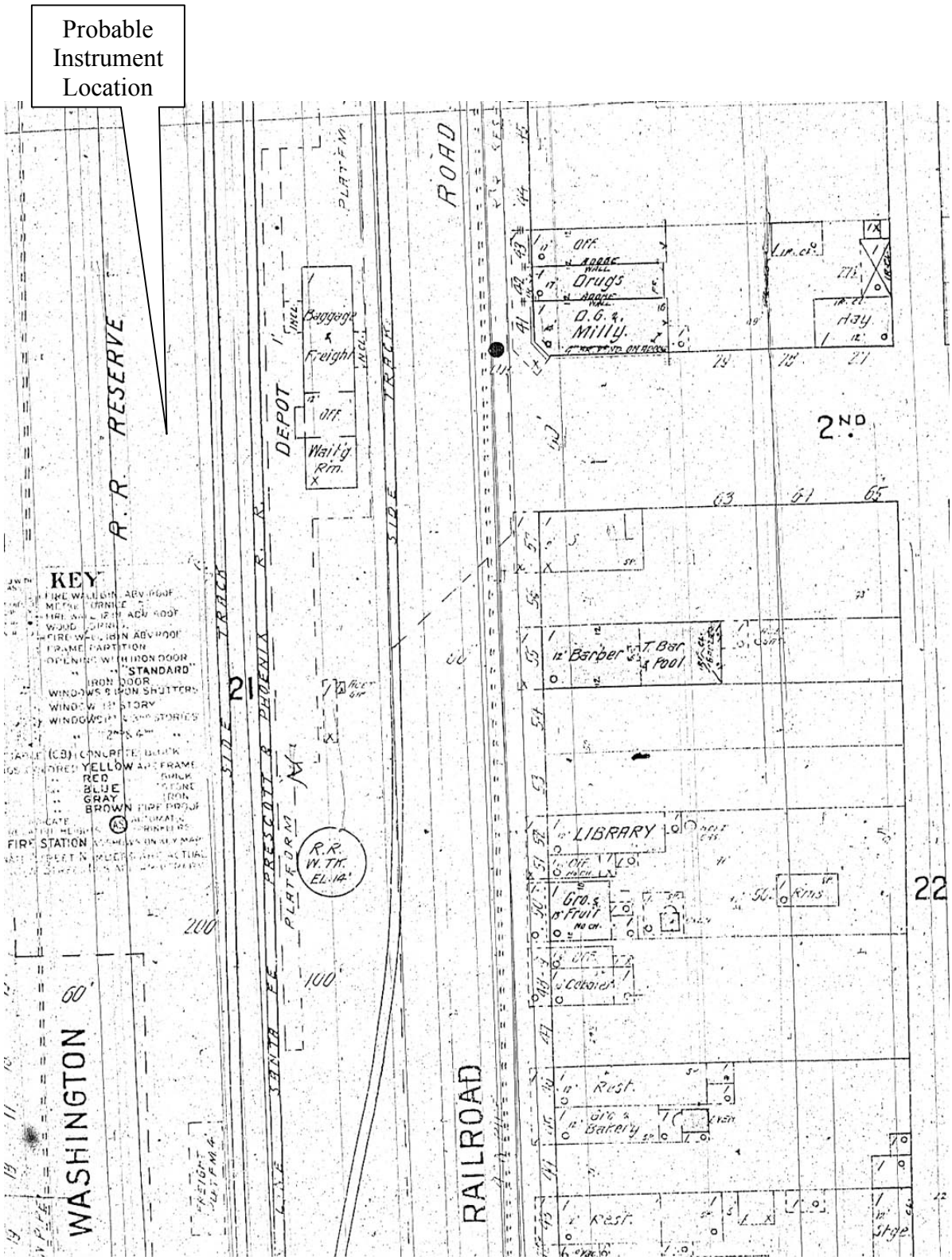


Figure 12. Railway Depot Area
Source: Arizona State Library

Gap in Record September 1943 through February 1944

There was a short gap in the observation record between the last observations at the Depot until the first observations by J. R. Barnette.

Barnette Years

The weather observation site was relocated in March 1944 when J. R. Barnette became the observer. The elevation of his site was given as 2,070 feet MSL. The observations were made at 162 Swilling Avenue in Wickenburg.

.

Wickenburg Sun Years

The Weather Bureau Form 531-1 dated 14 April 1953 , defined a new location. It was 1,500 feet west of the Hassayampa River, "just at the rear of the Valley National Bank" at 112 North Frontier Street. The Sun Newspaper Office was about 500 feet west northwest of the Bank. The elevation was at 2,070 feet MSL at 33˚ 58' N and 112˚ 44' W.

INSTRUMENTATION

The Arizona Miner newspaper reported on 3 December 1875 that Sgt Phoedovius had visited Wickenburg to adjust the weather instruments. Thus, from the very beginning of observations, there was an objective of assured instrument accuracies and observer proficiency. Although subsequent mention of instruments was mostly restricted to inspection reports, in each report a section was included on the instruments at the station. Most of the following descriptions come from those reports.

Thermometer

The exposed, maximum, and minimum thermometers in 1877 were fastened to the exterior of the wall at a height of 5' 6" above ground level (AGL). They were sheltered from the sun by the roof that had an overhang of about six feet on that side of the building. The inspector rated the exposure as "fair" but recommended that a shelter be used.

Maximum and minimum temperatures were reported beginning in October 1877 marking the instruments first use in Wickenburg.

In September 1879, the thermometers in use were #325 as the exposed thermometer, #24 as the maximum thermometer, and # 227 as the minimum thermometer. They hung under an adobe shed on its north wall 4.5 feet above the ground. The inspector noted that the thermometers were not calibrated because there was no ice available. The Chief Signal Officer's Annual Report for 1879 gave instructions for calibrating the thermometers using ice.

> 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.

In February 1882, the maximum thermometer # 701 was in use. The previous #24 was not mentioned. The other thermometers were the same numbers as listed three years before.

Maximum thermometer #699 and minimum #534 were in use by September 1884 and mounted within a latticed shelter.

The type of thermometers used at Wickenburg was not recorded but they probably were Green thermometers on Townsend mounts, the common equipment for the period. An example of them is shown in Figure 13.

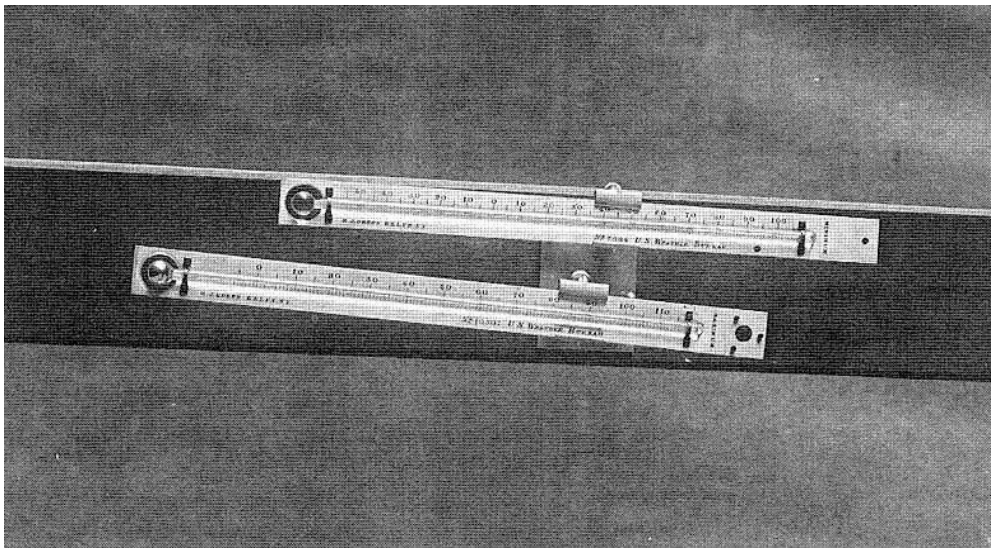


Figure 13. Green Maximum and Minimum Thermometers
Source: National Archives and Records Administration

In 1908, maximum and minimum temperatures were being recorded daily.

In January 1937, a bubble was removed from the minimum thermometer. In December 1938, another bubble was removed from the minimum and a replacement maximum thermometer was provided.

The inspection in January 1942 found a thermometer to be within 0.7˚ of the inspector's instrument.

Hygrometer

The hygrometer in 1877 was mounted on the exterior of the wall with the thermometers at a height of 5' 6".

There were two hygrometers, numbers 369 and 340, on hand in 1879. In February 1882 they were reported to be at 4' 6" AGL.

Rain Gauge

The location of the first rain gauge used in Wickenburg in 1877 was said to be well located with excellent exposure. Its height was ten feet AGL. In 1879 the height was 2' 1" AGL.

The 1880 inspection reported that the measuring stick was "badly broken." In 1882, there apparently had been a replacement for the original rain gauge that was reported to have a hole in the bottom.

In April 1908, the rain gauge was located on the ground about five feet away from the instrument shelter and about 100 feet away from the nearest building.

In January 1919, the rain gauge was one foot above the ground with satisfactory exposure and in good condition. In January 1937, the top of the rain gauge was three feet AGL.

The rain gauge in service in December 1938 was 8" in diameter and was properly exposed. However, there was a warning that it would have to be moved in "a year or two" because of growing trees nearby. There was an interfering object 30 feet away to the south that may have been the tree that was growing.

The rain gauge, that was in standard use for many years and was probably one of the type used in Wickenburg, is shown in Figure 14.

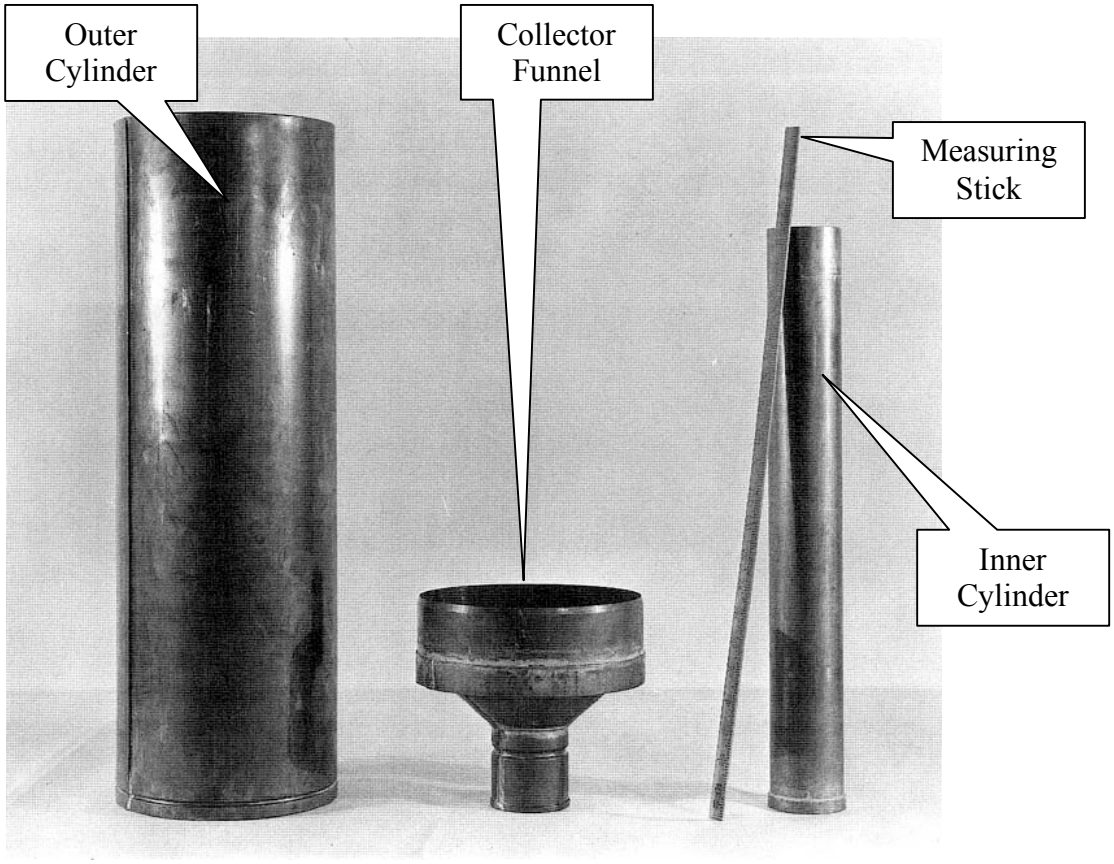


Figure 14. Standard Eight Inch Rain Gauge
Source: National Archives and Records Administration

The funnel of standard rain gage was placed over the inner cylinder and directed the water into it. The area of the top of the funnel was ten times the area of the top of the inner cylinder.

Therefore, an inch of rainfall would stand ten inches deep in the inner cylinder. The measuring stick was magnified (in effect) ten times, to an actual length of twenty inches, and was marked in rainfall inches and hundredths of an inch. The inner cylinder and funnel were placed into the outer cylinder. The outer cylinder caught the overflow when the amount was greater than two inches and could be used to catch snowfall in the winter.

In June 1940, the rain gauge was located on the Santa Fe Railroad right of way near the Depot. It was 40 feet from the nearest obstacle and its top was 38 inches above ground.

The object interfering with the rain gauge was 8.5 feet away from it in January 1942 and it was noted to be partially sheltered from the wind.

Barometer

The barometer was first mentioned in the inspection report of September 1879. The instrument in use was #160. The barometer was reported broken when it arrived from San Diego by way of Phoenix. That was the third one that was reported broken by the same observer. The inspector voiced an opinion that the observer intentionally broke them to avoid having to read them[4].

The 1880 inspection recommended that a barometer be provided.

Shelter

The first inspection of 1877 noted that no shelter existed and contained a recommendation that an instrument shelter be constructed to house the instruments.

A shelter was not constructed until 1879 when the inspector himself built one from a packing crate. He perforated the sides with an auger to allow circulation of air through it. The shelter was on the north side of the adobe shed that was attached to the north side of the office building.

By November 1880, the shelter was apparently still in use. It was then described as a small pine box outside the office building with holes to admit circulation of air. It was covered by brush to protect it from the sun. In February 1882, the shelter seems to have continued to be in use. “The shelter consists of a box placed against the north side of the house. The box is perforated with holes and is placed 4’ 3” about the ground.”

[4] Mercury was used in the processing of gold providing a possible reason for others to break the barometers.

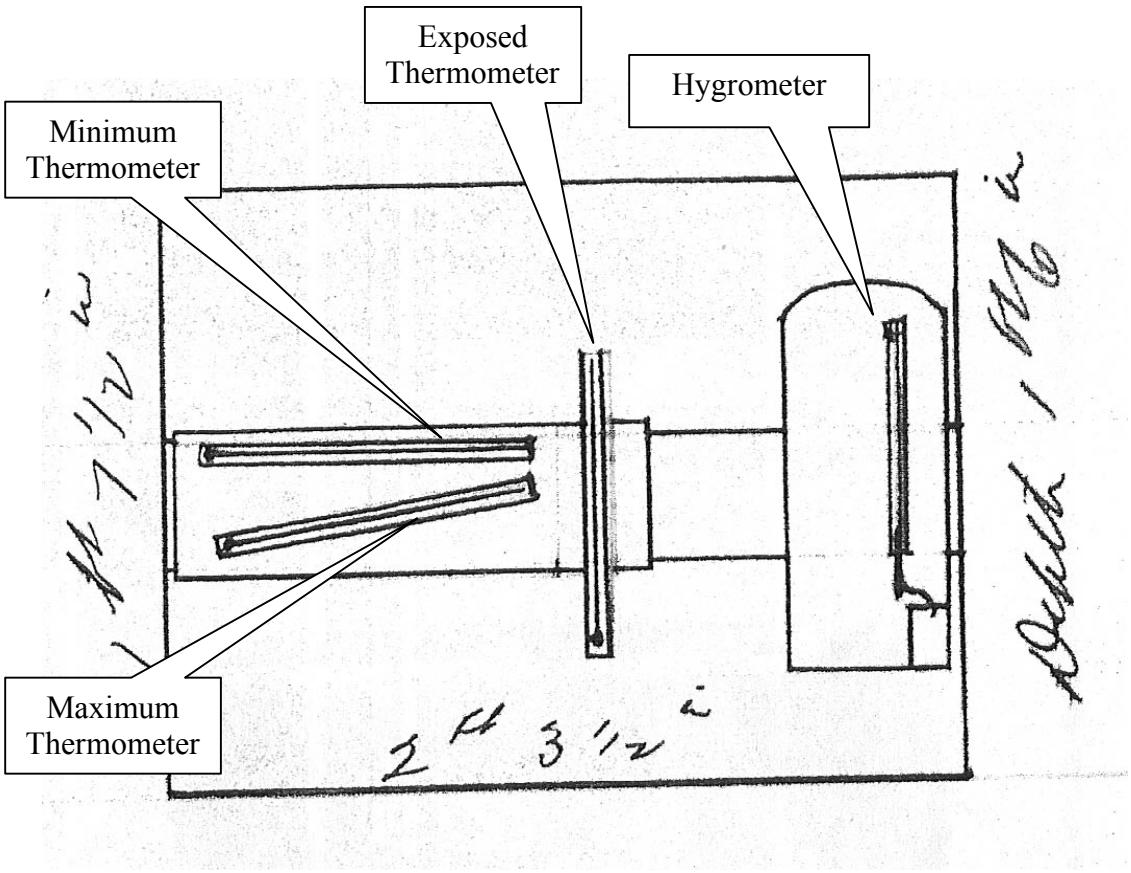


Figure 15. Interior of Instrument Shelter, 1882
Source: National Archives and Records Administration

The inspection of September 1884 reported that a new shelter was in use. It had double-latticed walls and a slatted floor. The height of the of the shelter measured at the gable as 4’ 1”, its sides were 2’ 9” high, the width as 2’ 3”, and the depth was 1’ 11”. The thermometers were mounted inside as prescribed by page 5 of the Instructions to Observers. The shelter description fits the standard cotton region shelter (Figure 16) in use during that period

Figure 16. Cotton Region Instrument Shelter of a Type Used in Wickenburg
Source: National Archives and Records Administration

In 1908, the shelter was located over sod, the floor was four feet above ground. The door of the shelter opened on the south side of the shelter.

In 1914, the shelter was described as facing north with the floor four feet above the ground surface that was composed of turf and gravel. Paint was provided in June to repaint the shelter.

In January 1937, the shelter was in need of repainting. It was replaced by a new shelter in September 1938. The new shelter was in the same location as the previous one and faced north.

In June 1940, a Cotton Region shelter was located over "uncultivated gravelly ground" on the Santa Fe Railroad right of way. It was 40 feet from a tree that was the nearest obstacle. The door opened north. The floor was 52 inches AGL.

The bottom of the shelter in January 1942 was 4.2 feet above a surface composed of sand, gravel, and some grass. Paint was provided for repainting it.

Wind Instruments

The wind vane in 1877 was relocated during the inspection in August to a "fine place and condition." It was at 20' 0" AGL.

In 1879, the inspector reported that the station was equipped with an anemoscope.[5] The type was not recorded. The anemoscope at the Wickenburg station was first mounted on a telegraph pole but that pole was crooked. The pole was replaced. It was subsequently moved to the roof of the office. One type in use during that period operated by a rod that was connected from the wind vane on the roof to a gear that turned an indicator of wind direction on a dial in the room below (Figure 17).

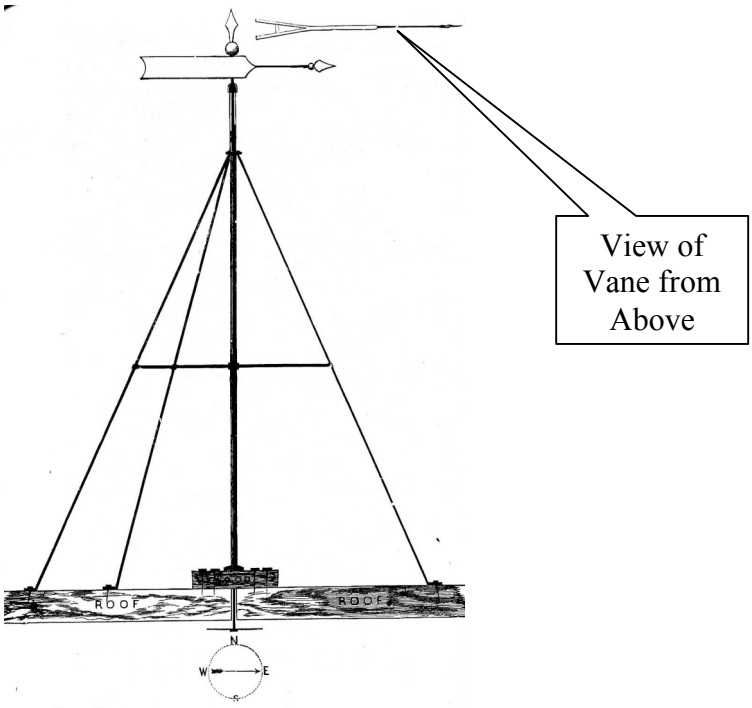


Figure 17. Weather Vane used by Signal Service Volunteer Observers
Source: Instructions to Volunteer Observers, 1882

[5] The word anemoscope, in this case, refers to a weather vane.

In February 1882, the anemoscope's height at Wickenburg was listed as 21' 8" AGL.

OBSERVERS

Signal Service Years

13 Nov 1875
Pvt. John Carroll

John Carroll was the first observer at Wickenburg. An article in the Arizona Miner of 3 December 1875 reported that Sgt Phoedovius, an instructor in meteorology, had departed from Camp Verde for Prescott. He may have been the trainer of Pvt. Carroll as he was for Pvt. DuDouchet two years later.

Sep 1876
Sgt William E. Guild

William E. Guild was a Pvt. in October 1876 when he replaced Pvt. Carroll. He had been promoted to Sergeant when he made his report in June 1877. On 26 July 1877, he was transferred to Florence.

Aug 1877
Pvt. H. A. DuDouchet

H. A. DuDouchet replaced Sgt Guild in August 1877. He was instructed on meteorology and on the use of meteorological instruments. Sgt. Phoedovius from Fort Whipple in Prescott was the instructor. Pvt. DuCouchet was transferred to Prescott.

Jun 1878
Pvt. E. J. Falconer

Pvt. E. J. Falconer was temporarily in charge from 11 June to 17 July 1878. Falconer had been in meteorology training at Fort Whipple in Virginia but, before completion, was reassigned to Wickenburg as a telegraph operator.

Jun 1878
Cpl William J. Dailey

William J. Dailey of the Signal Corps was in charge until 19 May 1879. The inspector remarked that he was "sober, industrious, and attentive to duty and the records were neatly and correctly kept." He was transferred to Phoenix on 22 May 1879.

The inspector noted that there was a copy of Loomis' "Meteorology" in the office. It was the standard textbook that was provided to each Signal Service station. The observers were required to study it and the inspectors would test them on their knowledge of it.

Jul 1879
Pvt. Isaac R. Birt

Isaac R. Birt was at Wickenburg in the interval between Cpl Dailey's departure for Phoenix and the arrival of Pvt. Hayes. Pvt. Birt submitted no observations but was in charge from 19 May 1879 until 1 August 1879. Records indicate that he was well known to the Signal Service Headquarters. He had reported that the barometer sent from San Diego had been broken en route. The Headquarters noted that it was the third barometer he had reported broken. He had also

broken the maximum thermometer. He never used its replacement. The Inspector believed that the instruments were deliberately broken. In any case, he was subsequently sent to the hospital for medical treatment and was discharged.

Aug 1879
Pvt. James E. Hayes

James E. Hayes was in charge from 8 September 1879 to 13 February 1880 . He was described by the inspector as willing but not particularly bright.

Feb 1880
Pvt. Frank Ridgway

Frank Ridgway replaced Pvt. Hayes on 1 March 1880 and submitted the observations from the previous month. He had graduated from the Signal Service meteorology school at Fort Whipple, Virginia on 5 July 1879. The 1880 United States Census for Wickenburg recorded that he was just nineteen years old born in New York. He was listed as a telegraph operator. No other telegraph operator or signal corps individual was identified. It seems certain that these early observers were the telegraph operator, telegraph line repairman, and weather observer without assistants. The inspection of November 1880 reported that his examination indicated an "inattention to meteorology and station duties. But, he was well thought of by the people in this place. I think he would soon make an excellent assistant."

In his 1880 annual report, he described the importance of his telegraphic work

> The utility of the telegraph line was signally demonstrated during the military operations against the Chemjuevis Indians in May last, when this line became the principal medium of communications between the department commander at Prescott and his subordinates and agents in the field and at this point. Full instructions and lengthy detailed reports of operations were exchanged at short intervals, enabling all parties to act with promptness and intelligence, and thus avert what threatened to be a bloody Indian war.

Feb 1881
Cpl C. C. Corbin

C. C. Corbin replaced Pvt. Ridgway on 15 February 1881.

Apr 1881
Pvt. Charles E. Truesdell

Charles E. Truesdell repladed Cpl Corbin on 6 April 1881.

Jan 1882 – Apr 1882
Pvt. Tr. H. T. Kremp, 6th Cav'y

H. T. Kremp of Company M 6th Cavalry replaced Pvt. Truesdell on 29 December 1881. According to the inspector, he was intelligent and anxious to learn. He had a good reputation in the community.

No observers May 1882-Sep 1883

Oct 1883- ??
Pvt. H. F. Knabe

Pvt. H. G. Knabe was mentioned in the 1884 report as being well spoken of and who seemed attentive to his duties.

Nov 1885 (or earlier) to Jan 1886
Thomas O'Mara

Thomas O'Mara replaced Pvt. Knabe on 17 November 1885. He signed the observation forms as "observer" without a rank. The inspector reported him as a civilian and he thus would be the first civilian weather observer at Wickenburg.

When 2nd Lt. R. B. Watkins for the Signal Corps inspected the station in November 1885, he commented that O'Mara was "no operator and still less an observer." He was a "splendid" line repairman who noted that line repairs were the reason for missing observations, as much as four consecutive days. Lt. Watkins added that he was a good man about 40 years old but remarked that he knew nothing from the meteorology textbooks. His recommendation was that the office be closed. He also recommended that O'Mara be retained as a repairman.

O'Mara's last observations were submitted for January 1886.

No observations taken during the 1886-1907 period.

Weather Bureau Years

Mar 1908
C. H. Widmeyre

C. H. Widmeyre was the agent for the Prescott & Phoenix Railway.

Aug 1919-Aug 1943
Michael D. Burns

Michael D. Burns was the observer for over twenty-four years. He was the Agent for the Sante Fe Railroad. According to the 1930 United States Census he was born in Iowa to Irish parents. In the January 1937 inspection, he was 66 years old and was described as "a dependable observer." He was still the observer in January 1942 at age 72.

Mar 1944-Mar 1953
J. R. Barnette

The last observer for the period of this study was J. R. Barnette.

OBSERVATIONS

Weather observations in Arizona varied in the type of information collected, the forms on which it was recorded, and the publications prepared for the public. All the variations had a single focus, the understanding of Arizona's climate. Presentations of data in map form often contain historical information in addition to climate data. Figure 18 is one such map from 1892.

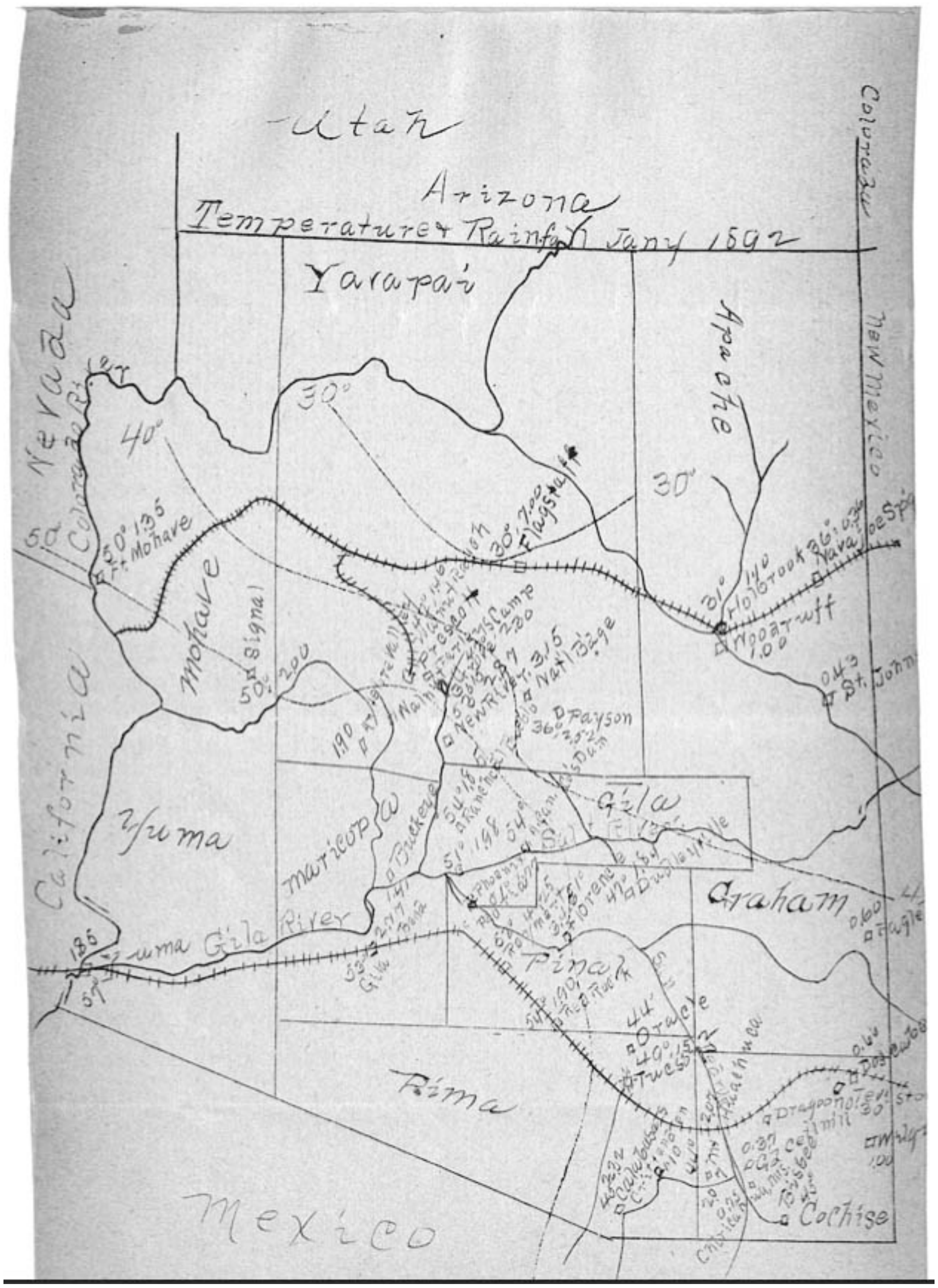


Figure 18. Temperature and Precipitation in Arizona, January 1892
Source: National Climatic Data Center

Observations 1875-1883

According to the Chief Signal Officer's Annual Report or 1876, each Signal Corps telegraph office in Arizona was required to submit at least one weather report each afternoon and to forward it by telegraph to the Central Office in Washington. There were twelve such stations in Arizona including the one at Wickenburgh.[6] It was reporting temperature, wind direction, clouds, and weather.

The first observations at Wickenburg were recorded on the Signal Service's Form 22. The form had columns for three times per day readings the barometer and thermometer. The times were A.M., P. M., and Midnight. There were columns for the means of daily barometer, daily temperature, and daily humidity. There were columns for the amount of rainfall or melted snow and the prevailing direction of the wind. A remarks column was used to amplify or explain the data. The bottom third of the Form 22 was used for a climatological summary of the month being reported. It included the highest and lowest values, ranges, totals, and number of days with some occurrence. Auroras, lunar haloes, and solar haloes were totaled as well. Only the columns related to temperature, precipitation, and wind direction were reported in the beginning. The remarks column was used to report sky conditions using terms like clear, fair, cloudy, etc.

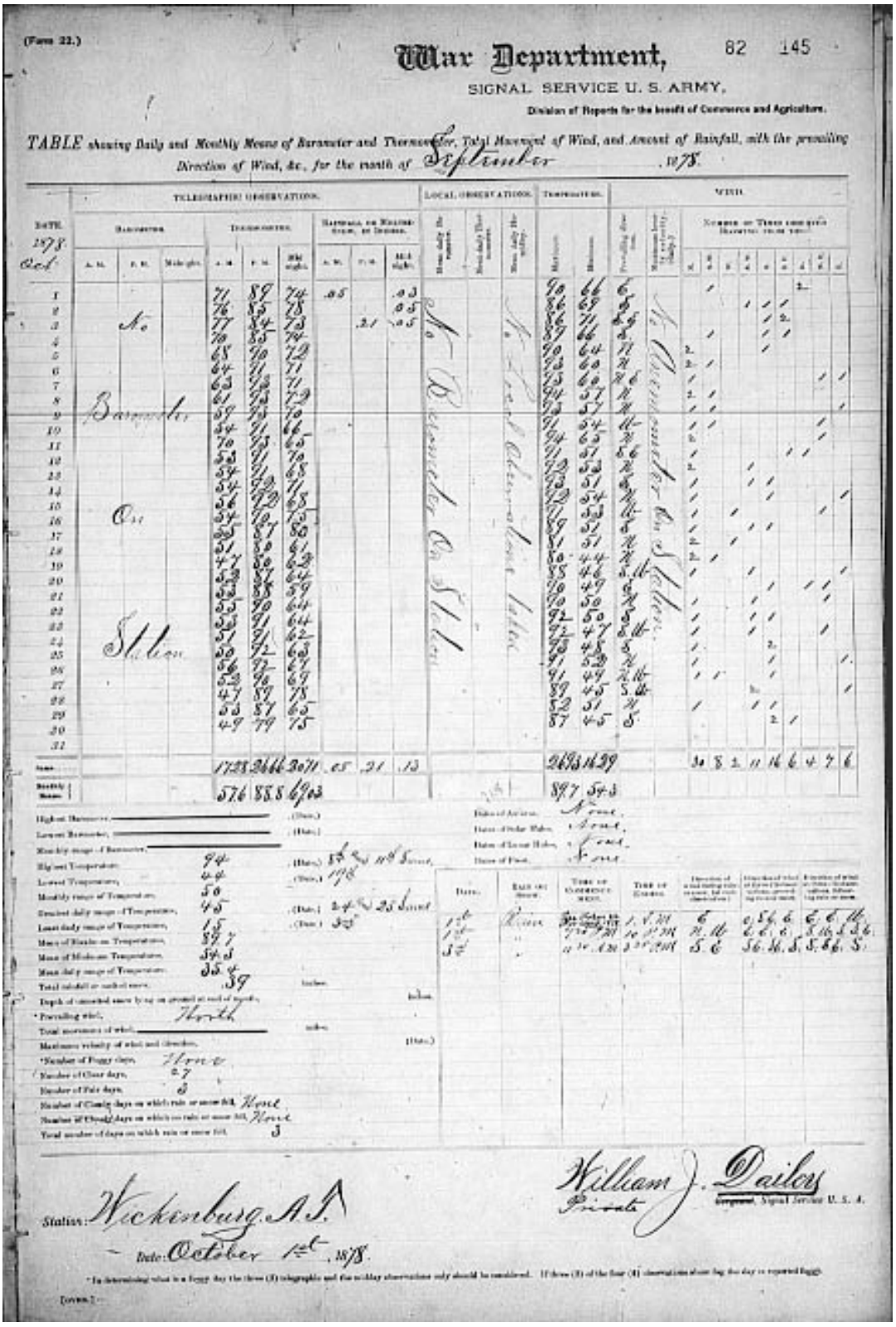
In October 1877, a new version of the Form 22 was used (Figure 19). Additional columns were added to report the daily maximum and minimum temperature. Nine new columns allowed reporting of the number of times winds were observed blowing from each of eight directions and the ninth one for calm conditions.

The inspection report of 1878 listed the books possessed by the station. The list included Loomis Meteorology, the standard textbook of that era.

In 1878, the station was making and then sending their observations by telegraph three times each day until 1 April. Afterward they were forwarded by mail.

In 1879, the sunset observations were transmitted by telegraph. Other observations were forwarded by mail at the end of the month.

[6] The spelling is as used in the report



(Form 22.)

War Department,

82 145

SIGNAL SERVICE U. S. ARMY,

Division of Reports for the benefit of Commerce and Agriculture.

TABLE showing Daily and Monthly Means of Barometer and Thermometer, Total Movement of Wind, and Amount of Rainfall, with the prevailing Direction of Wind, &c., for the month of September, 1878.

Station: Wickenburg A.T.

Date: October 1st, 1878.

William J. Dailey
Private
Sergeant, Signal Service U. S. A.

Figure 19. Wickenburg Observations during September 1878
Source: National Climatic Data Center

In July 1880, a new and expanded form (Figure 20) was provided.

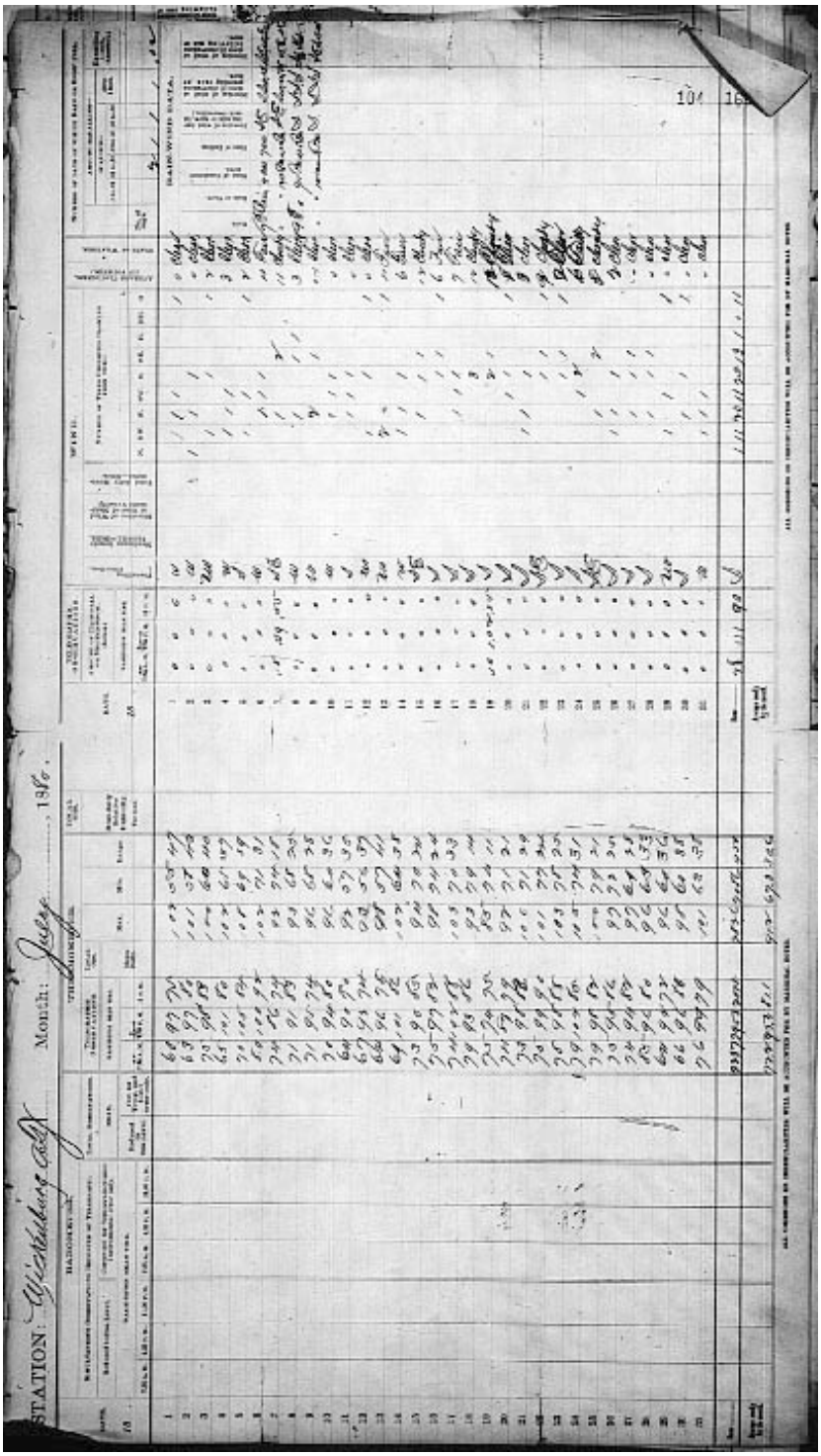
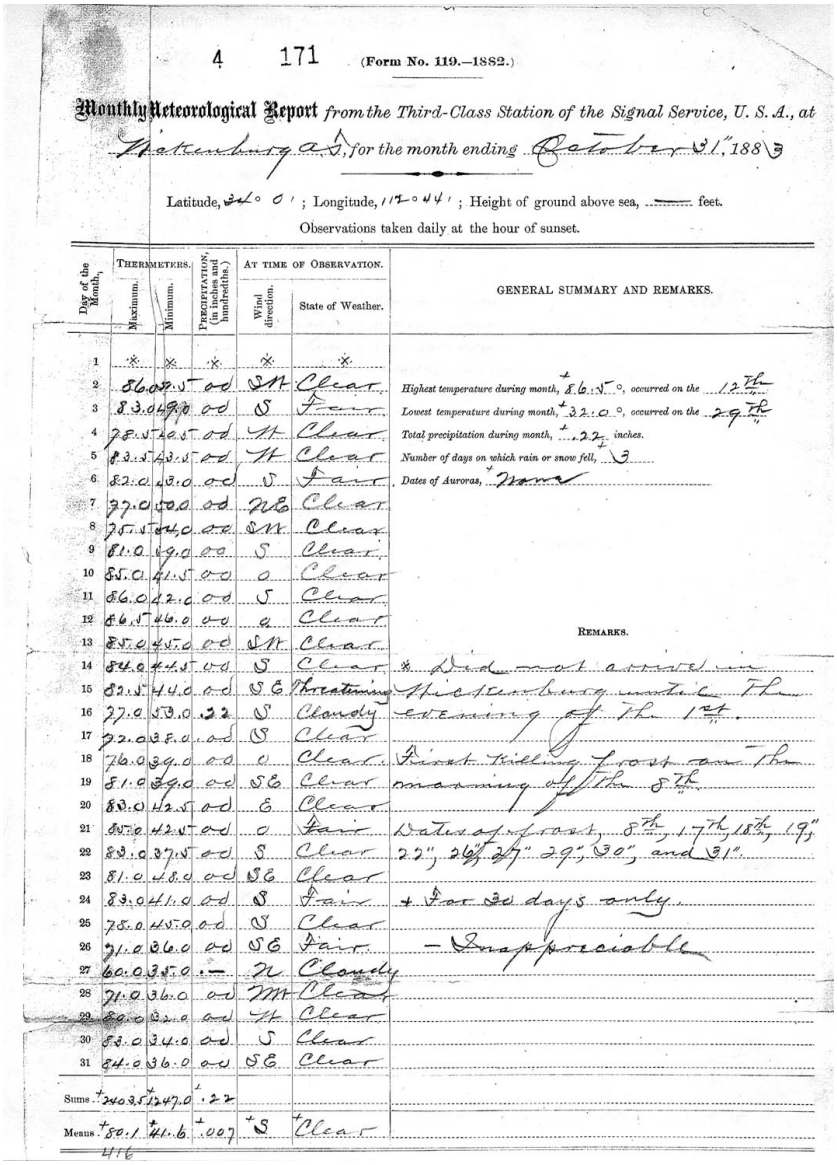


Figure 20. Wickenburg Observations July 1880
Source: National Climatic Data Center

The Signal Service Station at Wickenburg was closed on 30 April 1882.

Observations 1883-1886

During the period of Wickenburg's observations as a Third Class Station and submitted their forms to the Signal Service on the Signal Service Form 119 (Figure 21). It allowed entries for the maximum and minimum temperatures, the daily precipitation amount, the wind direction in cardinal points, and the state of the weather. The latter entries were generally "fair, clear, cloudy, threatening, etc."



4 171 (Form No. 119.—1882.)

Monthly Meteorological Report *from the Third-Class Station of the Signal Service, U. S. A., at* Wickenburg A.T. *for the month ending* October 31, 1883

Latitude, 34° 0′; Longitude, 112° 44′; Height of ground above sea, ——— feet.

Observations taken daily at the hour of sunset.

Day of the Month.	Thermometers. Maximum.	Minimum.	Precipitation. (in inches and hundredths.)	At time of Observation. Wind direction.	State of Weather.
1	*	*	*	*	*
2	86.0	42.5	00	SW	Clear
3	83.0	49.0	00	S	Fair
4	78.5	40.5	00	W	Clear
5	83.5	43.5	00	W	Clear
6	82.0	43.0	00	S	Fair
7	77.0	50.0	00	NE	Clear
8	75.5	44.0	00	SW	Clear
9	81.0	49.0	00	S	Clear
10	85.0	41.5	00	0	Clear
11	86.0	42.0	00	S	Clear
12	86.5	46.0	00	0	Clear
13	85.0	45.0	00	SW	Clear
14	84.0	44.5	00	S	Clear
15	82.5	44.0	00	SE	Threatening
16	77.0	53.0	.22	S	Cloudy
17	72.0	35.0	00	S	Clear
18	76.0	39.0	00	0	Clear
19	81.0	39.0	00	SE	Clear
20	83.0	42.5	00	E	Clear
21	80.0	42.5	00	0	Fair
22	83.0	37.5	00	S	Clear
23	81.0	48.0	00	SE	Clear
24	83.0	41.0	00	S	Fair
25	75.0	45.0	00	S	Clear
26	71.0	36.0	00	SE	Fair
27	60.0	35.0	—	N	Cloudy
28	71.0	36.0	00	NW	Clear
29	80.0	32.0	00	W	Clear
30	83.0	34.0	00	S	Clear
31	84.0	36.0	00	SE	Clear
Sums	2403.5	1247.0	.22		
Means	80.1	41.6	.007	S	Clear

416

GENERAL SUMMARY AND REMARKS.

Highest temperature during month, 86.5°, occurred on the 12th

Lowest temperature during month, 32.0°, occurred on the 29th

Total precipitation during month, .22 inches.

Number of days on which rain or snow fell, 3

Dates of Auroras, None

REMARKS.

* Did not attend station Wickenburg until the evening of the 1st.

First killing frost on the morning of the 8th.

Dates of frost, 8th, 17th, 18th, 19th, 22", 26th, 27th, 29th, 30th, and 31st.

+ For 30 days only.

— Inappreciable.

Figure 21. Form 119, October 1883
Source: National Archives and Records Administration

Gap in Observations 1886 to 1908

The period from February 1886 through February 1908 had no observational record. In December 1908, Wickenburg was listed in the Climatological Data for Arizona but with no accompanying data. In the March 1908 edition, both temperature and precipitation data were published.

Observations 1908 -1948

In 1908, the observations were taken at sunset with maximum and minimum temperature and total precipitation for the day. The observations were made for the Weather Bureau and submitted to them at the close of each month. The daily temperature and precipitation data were published monthly in the Climatological Data Arizona.

Beginning in August 1909, publication of the Climatological Data Arizona was discontinued except for the Annual issue published at the end of each year. The meteorological journal Monthly Weather Review replaced the Climatological Data Arizona and published Wickenburg's daily data each month in their Monthly Weather Review, District 9, Colorado Valley.

In January 1914, the publication of Climatological Data Arizona resumed and the Monthly Weather Review discontinued publication of Arizona's data.

Observation time in 1940 was at 8:00 a.m.

Since 1908, the daily maximum and minimum temperature and the daily total rainfall were reported.

CLIMATOLOGICAL STUDIES

The climatology of Wickenburg has been published several times over the years. The earliest compilation of climate data was published in The Climate of Arizona, by Howard V. Smith, in 1930. It included Wickenburg through 1928. He published a revision in 1945 that contained thirty-one years of temperature data and forty years of precipitation data for the city. He published a third revision in 1956. In it, two periods of record for Wickenburg were used: 1875-1886 and 1908-1953.

In 1960, William D. Sellers published Arizona Climate. It was a collection of Local Climatological Data publications one of which was for Wickenburg. It included a narrative summary of its climate as well as data summaries. In 1974, he published an update in collaboration with Richard H. Hill. That version was similar to the 1960 edition but added some photographs and a section in the back on station histories from 1931 to 1972. It also contained a map of the geographic sections of Arizona that would provide any climate researcher with a basis for understanding the variation of climate across the state.

In the years since 1973, the Office of the State Climatologist at Arizona State University has been the official source of information about Arizona climate. They have published studies that represent a comprehensive presentation of Arizona's climate in virtually all major areas of investigation. The Office is housed within the Department of Geography and the current State Climatologist for Arizona is Dr. Andrew W. Ellis.

APPENDIX 1

Methodology

The primary sources of information for this study were the Wickenburg observers' daily weather records themselves. Copies of their monthly reports and the data digitized from those reports are available from the Arizona State Climatologist at Arizona State University, in Tempe, Arizona; 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 Wickenburg, its history, its people, and its climate. The author visited and collected information from the holdings of the Arizona State Library and Archives in Phoenix. Arizona, the Phoenix Public Library, the Wickenburg Historical Society, the Wickenburg Public Library, the National Archives and Records Administration in College Park, Maryland, the Smithsonian Institution Archives in Washington D.C., the Western Kentucky University Library in Bowling Green, Kentucky; and the National Climatic Data Center at Asheville, North Carolina.

The tertiary sources were reference materials that are available on-line. Among those were the metadata preserved by the National Climatic Data Center. 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 Wickenburg. 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 Wickenburg, judge the trustworthiness of the observers who collected them, and determine the climatological significance of the whatever variability may be discerned.

BIBLIOGRAPHY

Agnew, S. C., 1974. *Garrisons of the Regular U.S. Army: Arizona, 1851-1899.* Council on Abandoned Military Posts, Arlington, Virginia

Altshuler, Constance W., 1981. *Chains of Command: Arizona and the Amy, 1856-1875.* Arizona Historical Society, Tucson, Arizona

Altshuler, Constance W., 1982. *For Better or For Worse: Frontier Army Life.* Pronto Press, Sedona, Arizona

Altshuler, Constance W., 1991. *Cavalry Yellow & Infantry Blue: Army Officers in Arizona between 1851 and 1886.* Arizona Historical Society, Tucson, Arizona

Arizona's Yesterday, Being a Narrative of John H. Cady, Pioneer, page 65, on being a stagecoach driver from Wickenburg

Boggs, Edward M., 1897. *Arizona Weather and Climate.* Bulletin No. 27, Arizona Experiment Station, University of Arizona, Tucson Arizona

Chief Signal Officer, 1877. *Annual Report of the Chief Signal Officer.* Government Printing Office, Washington

Chief Signal Officer, 1879. *Annual Report of the Chief Signal Officer.* Government Printing Office, Washington

Chief Signal Officer, 1880. *Annual Report of the Chief Signal Officer.* Government Printing Office, Washington

Chief Signal Officer, 1881. *Annual Report of the Chief Signal Officer.* Government Printing Office, Washington

Clampitt, John W., 1889. *Echoes from the Rocky Mountains: Reminiscences and Thrilling Incidents of the Romantic and Golden Age of the Great West; with a Graphic account of its Discovery, Settlement, and Grand Development.* Bedford, Clarke & Company, Chicago

Durrenberger, Robert W., 1979. *Is Our Climate Changing?* Office of the State Climatologist, Phoenix, Arizona

Gierson,B. H., 1889. *Annual report of Colonel B. H. Grierson, Tenth Cavalry: Brevet Major-General, U.S. Army, Commanding, Department of Arizona, 1889.* Headquarters Department of Arizona, Los Angeles

Goldbacher, Ernest, 1879. 1851-1878 *Illustrated Catalogue and Price List of Optical, Meteorological and Mathematical Instruments*. Bardon and Von der Luhe, New York

Green, Christine R. and William D. Sellers, 1964. *Arizona Climate.* University of Arizona Press, Tucson, Arizona

Hamilton, Patrick, 1881. *The Resources of Arizona.* Under Authority of the Legislature, Prescott, Arizona

Hammond, John F., 1852. *A Surgeon's Report on Socorro, N.M. 1852.* In Statistical Report on Sickness and Mortality in the Army of the United States, pages 419-425, United States Surgeon General's Office Washington D.C.

Hawkins, Helen B., 1950. *A History of Wickenburg to 1875.* Masters Thesis, Arizona State University

Heitman, Francis B., 1903. *Historical Register and Dictionary of the United States Army, from Its Organization, September 29, 1789, to March 2, 1903.* Government Printing Office, Washington D. C.

Hinton, Richard J., (1830-1901), *The Handbook to Arizona: Its Resources, History, Towns, Mines, Ruins, and Scenery.* Tucson, 1954 [Arizona Silhouettes] 431 pp.

Hodge, Hiram C., 1877. *Arizona As It Is: or, The Coming Country compiled from notes of travel during 1874, 1875, and 1876.* Hurd and Houghton, H. O. Houghton and Company, New York

Howard, O. O., 1886. *The Roster of Troops Serving in the Division of the Pacific.* Assistant Adjutant General's Office, Division of the Pacific, U. S. Army, San Francisco

Joseph Miller (1899-) ed. *The Arizona Story Compiled and Edited from Original Newspaper Sources; With drawings by Ross Santee.* New York, 1952 [Hastings House] 345 pp.

Korwin, Alan, 1994. *Wickenburg: The Ultimate Guide to the Ultimate Western Town.* Bloomfield Press, Phoenix, Arizona

Lawson, Thomas, 1844. *Directions for taking Meteorological Observations Adopted by the Medical Department of the United States Army*. Surgeon General's Office, Washington, D.C.

Lawson, Thomas, 1840. *Meteorological Register for the Years 1826, 1827, 1828, 1829, and 1830 from Observations made by the Surgeons of the Army and Others at the Military Posts of the United States.* Surgeon General's Office, Haswell, Barrington, and Haswell, Philadelphia

Lawson, Thomas, 1851. *Meteorological Register for Twelve Years from 1831 to 1842 Inclusive Compiled from Observations made by the Officers of the Medical Department of the Army at the Military Posts of the United States*. Surgeon General's Office, C. Alexander Printer, Washington D.C.

Lovell, Joseph, 1826. *Meteorological Register for the years 1822, 1823, 1824, & 1825 from Observations made by the Surgeons of the Army at the Military Posts of the United States.* U. S. Surgeon General's Office, Edward De Krafft, Washington DC

Martin, Judy. 1997. *Arizona Walls, If Only They Could Talk.* Double B. Publications, Phoenix, Arizona

McCook, A. McD., 1891. *Annual report of Brig. General A. McD. McCook, Brevet Major General, U.S. Army: Commanding Department of Arizona, 1891.* Headquarters Department of Arizona, Los Angeles

National Archives, 1965. *Returns from U.S. Military Posts, 1800-1916 [Microform].*National Archives and Records Administration, Washington D.C.

Pry, Mark E., 1997. *The Town on the Hassayampa:a History of Wickenburg, Arizona*. Desert Caballeros Western Museum, Wickenburg, Arizona

Quebbeman, Frances E., 1966. *Medicine in Territorial Arizona.* Arizona Historical Foundation, Phoenix, Arizona

RG-27, Records of the Weather Bureau, Administrative and Fiscal Records, Station Inspection Reports, 1871-ca 1930. NC-3 Entry 53, Vol. 101 of 105, National Archives and Records Administration

Sanborn Fire Insurance Maps, Wickenburg 1915, 1931

Sellers, William D, and Richard H. Hill, 1974. *Arizona Climate, 1931-1972.* University of Arizona Press, Tucson Arizona

Sellers, William D., Editor, 1960. *Arizona Climate.* Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona

Smith, Howard V., 1930. *The Climate of Arizona.* Agricultural Experiment Station, University of Arizona, Tucson, Arizona

Smith, Howard V., 1945. *The Climate of Arizona.* Agricultural Experiment Station, University of Arizona, Tucson, Arizona

Smith, Howard V., 1956. *The Climate of Arizona.* Agricultural Experiment Station, University of Arizona, Tucson, Arizona

Surgeon General, 1868. *General Meteorological Instructions.* U.S. Army Surgeon General's Office, Washington DC

Wodward, James, 1985. *Wickenburg Historic Resource Survey: Final Report Prepared for the City of Wickenburg*. Janus, Phoenix, Arizona