The History Of Weather Observing in Fort Gibson, Oklahoma 1824 - 1890

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Executive Summary

Fort Gibson was built in 1824 on the Grand (Neosho) River about three miles above its junction with the Arkansas River. The fort became a major post in the area, serving as a staging area for several military expeditions sent to explore the western regions of the Territory. Based on the National Climate Data Center database, weather observations at Fort Gibson were taken by the U.S. Army surgeons, beginning in Jul 1824 and continued until Sep 1890, although major observational gaps exist during the 1850s, 1860s, 1870s, and 1880s. Weather observations also were taken by the U.S. Signal Service within the town of Fort Gibson (located approximately one-half mile southwest of the post hospital) beginning in Apr 1873 and continuing through May 1882.

Fort Gibson initially consisted of a stockade located at the base of a hill. The hill was approximately 100 feet in height from its crest to the Neosho River located over one-half mile to the west. The stockade built in 1824 was a little over 200 yards east of the river. With time, the fort migrated up the hill as new buildings were built to replace older versions. One reason for the change toward higher elevation was the high disease rate at the early fort due to the proximity of low swampy type areas. Newer hospitals, like the other buildings, were built on progressively high elevations.

Weather observations at the fort proper most likely were taken in the immediate vicinity of the hospital or medical facilities, and available information indicates that the hospital/medical facilities at Fort Gibson were situated at four separate sites. Initial observations, i.e., from 1824 to 1828 were most likely taken at the stockade since this was the location of the medical facilities. In 1828 the hospital was moved up the hill approximately 200 yard east of the stockade, and in 1870 the hospital moved approximately one-quarter mile northeast to the top of the hill. In addition, for the period 1837 – 1839, weather observations were taken concurrently by Army surgeons at both the infantry hospital and at the Dragoon Hospital (located near the river approximately 350 yards to the west southwest of the Post Hospital).

In 1873 the U.S. Signal Service began taking weather observations in a part of the town of Fort Gibson known as "Old Town." The office was located in the Nash Building which was at the bottom of the hill containing the Army post. For much of the time from 1873 into 1882, concurrent weather observations were taken at the Signal Service Office and at the Post Hospital located approximately one-third mile to the northeast.

No significant information was found regarding weather instruments used by the Army surgeons at Fort Gibson. However, publications of the Army Surgeon General's Office in 1844, 1850, 1856, and 1868 provided general documentation of the observation process at forts for the period. Station journals and inspection reports for the Signal Service Office defined instrument location and exposure for the nine years the office was in operation.

The Signal Service moved the Fort Gibson office to Fort Smith, AR in 1882, but the post continued to function for another eight years, with Army surgeons taking weather observations. In 1890, the Army closed the fort and the surgeons ceased taking weather observations at Fort Gibson.

Fort Gibson Historical Overview

During the early 1800s, Federal forces at Fort Smith, AR were finding the task more difficult of maintaining the peace in the "Indian Territory" and protecting settlers heading west. By 1824, it was obvious another garrison would be required farther west, and in April of the same year, Colonel Matthew Arbuckle led infantry troops to the Three Forks region of present-day Oklahoma (near the current city of Muskogee) to find an appropriate site.

Colonel Arbuckle selected a site on the Grand (Neosho) River about three miles above its junction with the Arkansas River. The Army stockade was built on lowlands a little over 200 yards east of the river and at the base of a hill (approximately 100 feet high). He named the new garrison, Cantonment Gibson (renamed Fort Gibson in 1832) in honor of Colonel George Gibson (see Figure 1 for exact location).

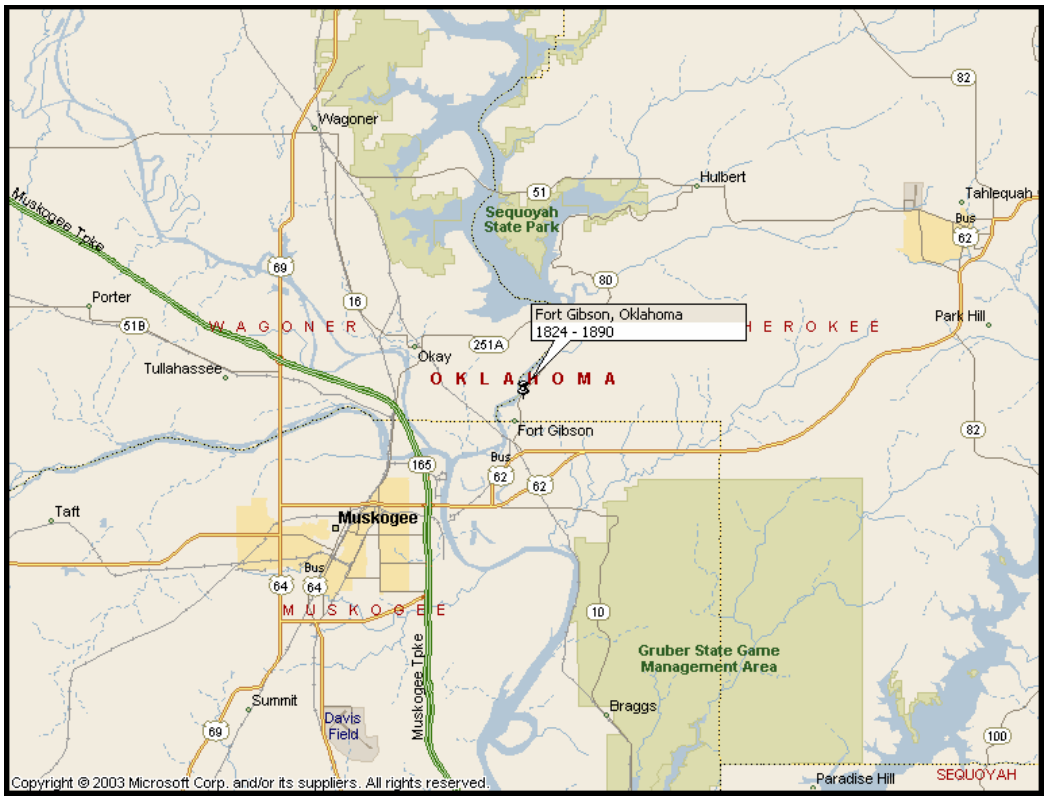


Figure 1. Location of Fort Gibson on a current map of northeast Oklahoma.

Fort Gibson became a major post in the area. In 1832 the fort served as a staging area for several military expeditions sent to explore the western regions of the Territory, and in 1834 the post was designated Headquarters of the Southwestern Frontier.

The original objectives for Fort Gibson were accomplished by the early 1840s but the garrison continued as an active post until 1857 when troops were withdrawn and the buildings and land turned over to the Cherokee Nation. The fort was reactivated in 1863, serving as an important post within the Indian Territory and a sanctuary for pro-Union refugees. Following the Civil War, troops from Fort Gibson rebuilt Fort Arbuckle and established Fort Sill; however, in 1871 most of the garrison was withdrawn and the post designated a commissary supply post, only to be reactivated in 1872 to combat the problem of outlaws and squatters in the region. In 1890, the Army abandoned Fort Gibson for the last time.

From the beginning, the troops at Fort Gibson suffered a high disease rate, primarily due to the proximity of low swampy type areas caused by the river. With time the fort migrated up the hill as new buildings were built to replace old versions. When the fort was permanently abandoned by the Army in 1890, post facilities essentially were located on top of the 100 foot hill.

Based on the National Climate Data Center (NCDC) database, weather observations at Fort Gibson were taken by the U.S. Army surgeons, beginning in Jul 1824 and continued until Sep 1890, although major observational gaps exist during the 1850s, 1860s, 1870s, and 1880s. Weather observations also were taken by the U.S. Signal Service within the town of Fort Gibson (located approximately one-third mile southwest of the existing Post Hospital) beginning in Apr 1873 and continuing through May 1882.

Location Descriptions

NOTE – Based on available information, it appears early Army forts were classified as "cantonment" or "fort (or post)," and these labels may cause some confusion when interpreting the location of weather observations in the NCDC database. Both "Fort Gibson" and "Cantonment Gibson" are listed in the NCDC database, with both names applying to the same location, i.e., the hospitals at Fort Gibson. The Webster dictionary defines cantonment as: "1. A group of more or less temporary billets for troops. 2. Assignment of troops to temporary quarters." Available information suggests that as a fort was being built it generally was referred to as a "cantonment," e.g., Cantonment Gibson." When permanent buildings were in place, the base was referred to as a "fort" or "post." This did not appear to be a hard and fast rule, and as a consequence, a surgeon might label the weather observation form for one month as "Cantonment Gibson" and another month as "Fort Gibson." However, for the most part, the name "Cantonment Gibson" was usually listed on the earlier observations (1824 through 1832) and "Fort Gibson" on the later forms (1832 through 1890).

NCDC Weather Observations Available for Fort Gibson – 1824 - 1890
(Dates observations not available are in parentheses)

Jul 1 1824 – Jun 5, 1826
(Jun 6, 1826 – May 31, 1827 - Weather observations not available)
Jun 1, 1827 – Jul 31, 1835
(Aug 1, 1835 – Sep 30, 1835 - Weather observations not available)
Oct 1, 1835 – Jun 30, 1839
(Jul 1, 1839 – Sep 30, 1839 – Weather observations not available)
Oct 1, 1839 – Feb 29, 1856
(Mar 1, 1856 – Mar 31, 1856 – Weather observations not available)
Apr 1, 1856 – Jan 31, 1857
(Feb 1, 1857 – Mar 1, 1857 – Weather observations not available)
Mar 1, 1857 – Mar 31, 1857
(Apr 1, 1857 – Jun 1, 1857 – Weather observations not available)
Jun 1, 1857 – Jun 21, 1857
(Jun 22, 1857 – Dec 31, 1866 – Weather observations not available)
Jan 1, 1867 – Jan 31, 1867
(Feb 1, 1867 – Apr 30, 1872 – Weather observations not available)
May 1, 1872 – May 30, 1872
(Jun 1, 1872 – Jun 30, 1873 – Weather observations not available)
Jul 1, 1873 – Feb 29, 1876
(Mar 1, 1876 – Apr 30, 1876 – Weather observations not available)
May 1, 1876 – May 31, 1876
(Jun 1, 1876 – Aug 31, 1886 – Weather observations not available)
Sep 1, 1886 – Sep 30, 1886
(Oct 1, 1886 – Jan 31, 1887 – Weather observation not available)
Feb 1, 1887 – Sep 29, 1890
Sep 30, 1890 – Army surgeons ceased taking weather observations at Fort Gibson

Sources indicate that weather observations at Fort Gibson by Army surgeons were taken at the existing medical facilities (before 1828) or hospital (after 1828). This is supported by a few notes on the surgeons' observation forms. As with other buildings at the post, newer hospitals were built on progressively high elevations. The difference in elevation from the lowest observation point (Dragoon Hospital) to the highest (Post Hospital after 1870) was approximately 80 feet.

According to the NCDC database, weather observations were taken at four separate locations within the immediate Fort Gibson area (with elevation varying from around 500 feet to over 580 feet), and at five locations, considering the U.S. Signal Service (see Figure 2). The following are the locations and general timelines for weather observations at Fort Gibson. In some instances, specific times could not be determined.

Jul 1, 1824 – 1828 – Medical facilities at the original Fort Gibson stockade (GPS elevation 515 feet; point "A" in Figure 2).

1828 – 1870 – Post Hospital on slope of the hill (GPS elevation 544 feet; point "B" in Figure 2). Located approximately 200 yards east of the stockade.

Apr 1, 1837 – Sep 30, 1839 – Dragoon Hospital (elevation approximately 500 feet; point "C" in Figure 2). Located approximately 350 yards west of the existing Post Hospital and approximately 180 yards west northwest of the stockade.

1870 – Sep 29, 1890 – Post Hospital at the top of the hill (GPS elevation 583 feet; point "D" in Figure 2). Located almost one-quarter mile northeast of the Post Hospital on the slope of the hill, approximately one-third mile northeast of the stockade, and approximately one-half mile east northeast of the Dragoon Hospital.

Apr 1, 1873 – May 12, 1882 – U.S. Signal Service Office (elevation approximately 510 feet; point "E" in Figure 2). Located approximately one-third mile southwest of the Post Hospital on top of the hill.

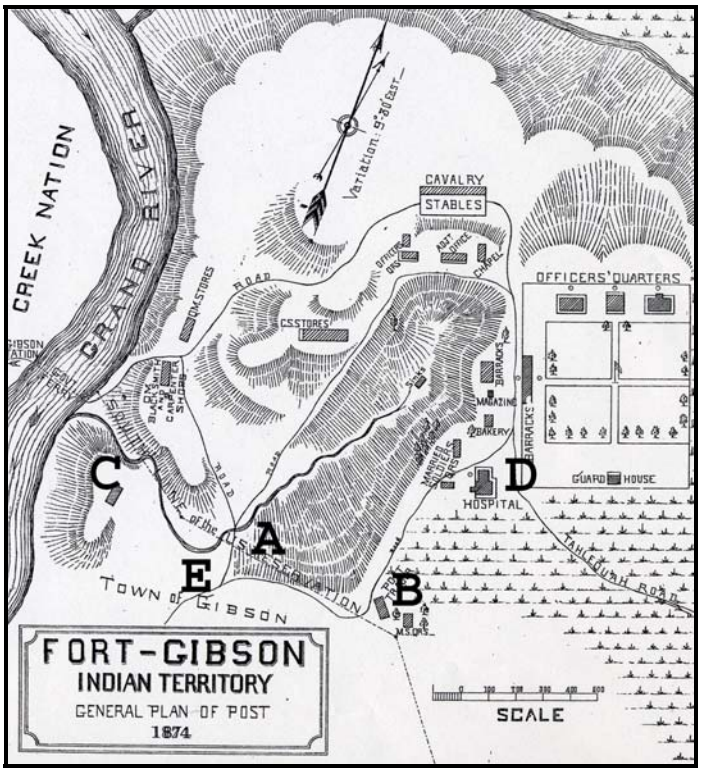


Figure 2. Map of Fort Gibson published in an 1875 document by the U.S. Army Surgeon's Office entitled, *A Report on the Hygiene of the United States Army with Descriptions of Military Posts*. Also shown on the map are locations where weather observations were taken by Army surgeons and Signal Service Observers. Point "A" is the location of the Army stockade medical facilities where observations were taken 1824 – 1828, point "B" is the location of the hospital for observations 1828 - 1870, point "C" is the location of the Dragoon Hospital where observations were taken from 1837 - 1839,

point “D” the location of the Fort Gibson Hospital 1870 - 1890, and point “D” the location of the Signal Service Office (1873 – 1882).

From Jul 1, 1824 until 1828, Army surgeons took weather observations at the post stockade which housed the medical facilities (Figure 3). GPS coordinates for this position are 35°48’14”N 95°15’26”W with an elevation of 515 feet. Oklahoma Historical Society staff at Fort Gibson indicated the stockade housed the medical facilities during the mid and late 1820s.

Figure 3. Approximate location of the medical facilities looking northwest. The river is located to the left in the photograph and the hill is located to the right. Rebuilt stockade is immediate left, but Oklahoma Historical Society on site staff indicated the actual location was a further north. This is supported by an 1834 map in the Oklahoma University Western History Collection.

Notes by Army surgeons indicate a new hospital was built approximately 200 yards east of the stockade in 1828. On the Apr 1828 observation form, the following note was listed: “On the north of the Public buildings immediately arise grounds of considerable elevation on part of which the Hospital is needed, having with the exception of its Northern View a free exposure to open and extensive prairie lands, over which a strong current of air from the southeast must usually prevail.” However, the following note was added to the Jul 1828 observation form: “The Hospital is placed on a commencing point of open Prairie Country, while the Garrison is nearly surrounded by woods and low grounds. A difference of several degrees of temperature must therefore result from the difference of position. The Thermometer for observation for the quarterly entries is kept at the Hospital.” A note on the Jan 1841 form clarified specifics of the hospital with respect to the fort: “The Hospital is located on the slope of a hill about 300 yards east of the Fort and 20 feet above the level of the Garrison.” Figure 4 shows the location of the

Fort Gibson Hospital from 1828 to 1870. GPS coordinates for the new hospital location are 35°48'16"N 95°15'21"W and the elevation is 544 feet.

Figure 4. Location of the Fort Gibson surgeon quarters. View is towards the east-southeast. The hospital (1828 – 1870) was located to the right of the remains of the surgeon quarters in the photograph and in an area currently occupied by private residences shown in the photograph.

Army surgeons took weather observations concurrently from Apr 1837 through Sep 1839 at both the Post Hospital and the Dragoon Hospital which was located almost one-quarter mile west southwest (Figure 5). The Dragoon Hospital was closed around 1840 after many of the Dragoons left the Post. GPS coordinates are not available for the Dragoon Hospital, but based on topographical maps, elevation was around 500 feet.

Figure 5. Approximate location of the Dragoon Hospital. The hospital was located near the structures in the center of the picture.

In 1870 the Post Hospital moved approximately one-quarter mile northeast to a location near the top of the hill (Figure 6). GPS coordinates for this location are 35°48'26"N 95°15'12"W and the elevation is 583 feet. Figure 7 shows the higher elevation of this position as compared to the other locations.

Figure 6. Location of Post Hospital on top of the hill. White building in center of photograph is a reconstructed hospital building. Previous Post Hospital was located to the right of the photograph. View is looking northeast from the Fort Gibson stockade.

Figure 7. West view from the Post Hospital on top of the hill. Previous hospital was located to the left of the photograph, stockade location behind the trees in the right center part of the picture, and location of the Dragoon Hospital on the river in the far background. Neosho River is in the distant background.

The first Latitude/Longitude was listed for Fort Gibson on the Jan 1837 observation form. The coordinates were given as 35°49' N 18°6' W of Washington DC. On the Jul 1841 observation form the coordinates for the fort were changed to 35°47'N 95°10'W. A note at the bottom of the Jan 1844 observation form stated: "The Latitude/Longitude of the Post have recently been determined by Capt. A. Cody – 6th Infantry, to be Latitude/Longitude 35°48'10"N 95°3'15"W instead of 35°47'N 95°10'W." The note continues to state the calculations were based on an 1839 survey and the results should be considered as approximations. The surgeons continued to log 35°47'N 95°10'W on the observation forms until Jul 1847, and then changed to the new coordinates, which continued until observations were terminated in 1890.

No elevations were given for Fort Gibson until Jan 1867. The Aug 1847 observation form first mentions an elevation with the following note: "Low water mark at Fort Columbus 560.696 feet." This note was included on the Sep and Oct 1847 forms, but was dropped on the Nov 1847 form and did not re-appear. On the Jan 1867 observation form, the elevation was listed as 600 feet and was used subsequently.

Signal Service Observations

NOTE – Station journals for the Signal Service office at Fort Gibson from 1873 into 1882, obtained from the Fort Worth, TX branch of the National Archives and Records Administration (NARA), contain considerable detail regarding station operations. Exerts from these journals are included throughout this report, including the following description of the spin-up of the Signal Service office.

Sergeant Thomas A. Taylor opened the Signal Service office in the town of Fort Gibson and began taking weather observations on Apr 1, 1873. Sergeant Taylor sent a letter to the Chief Signal Officer in Washington D.C. on Mar 27, 1873 shortly after his arrival in Fort Gibson. In his letter he made the following comments:

> "The only building which in my estimation is suitable for office purposes is one owned by a Mr. Nash. A two story brick (sic) with two windows with good north exposure for instruments."
>
> "In getting the elevation I shall have to use 515 ft plus the height of mercury in the cistern above ground….I have inquired of all persons here but can find no data or authority for elevation of this place. There are no records by which to find it and the officers do not know. I have called on the Post Master and he has promised to render all the assistance in his power. No Board of Trade or Chamber of Commerce here.
>
> "At Gibson Station there is but one house besides the railroad office…but three substantial houses beyond the fort proper. The rest are huts or log houses the inhabitants of which are in a blissful state of ignorance and from whom I caught but little information."

On Mar 30, 1873, Sergeant Taylor sent the following letter regarding the elevation of his station:

> "The elevation of the station at the fort hospital is 600 feet above sea level. This information is from the report of the Surgeon in Charge and from whom I shall get all the necessary data."

A letter on Apr 4, 1873 from Sergeant Taylor clarified the location of the office and elevation:

> "The observer's office is situated on the corner of two streets which run north and south and east and west in the village of Fort Gibson <u>at the foot of the hill</u> (emphasis added). I think that the elevation is 30 or 35 feet less than the fort proper but I have no authority for it. The streets are not named but the building is owned by Mr. Nash, a merchant here. It is the best one in town for the purpose."

In the same letter, Sergeant Taylor also provides some insight regarding establishing the elevation of the fort hospital.

> "The elevation of this place above sea level, six hundred feet, is taken from the report of Assistant Surgeon, Doctor Alfred Delaney, U.S. Army War Dept., Surgeon General Office, Washington D.C., Dec 5, 1870 Report on Barracks and Hospitals with Description of Military Posts; this is the only authority I have on the subject that I have been able to find."

The elevation was finally established at 511 feet on Aug 4, 1873.

NOTE - From 1874 through 1881, the U.S. Signal Service conducted four inspections of its Fort Gibson, OK weather office. The inspection reports, available at the College Park, MD office of NARA, contain drawings and textual information regarding weather instrument placement and exposure. The quantity and quality of information varied, depending primarily on the inspector. However, these reports contained revealing information not available from other sources.

The Signal Service inspection report descriptions of the office for the period 1874 through 1881 (first inspection report was Feb 20, 1874 and the last inspection Apr 17, 1881) collaborate Sergeant Taylor's description. The inspection reports indicate the office was located in the center of town, i.e., "old town" located at the bottom of the hill containing the Fort, and on the second floor of "Nash's Building" – a two story brick building that was described by the inspection reports as "best building in the town" with "excellent exposure" for the roof instruments and a "fair exposure" for the thermometers.

The proximity of the Signal Service Office to the Fort was indicated in the book, *Fort Gibson: Gateway to the West*, which states, "Fort Gibson was first incorporated Nov 27, 1873. During this period most of the business was in what is generally called 'Old Town' in the vicinity of the present stockade."

Instrumentation Descriptions

Army Surgeon Observations

Specific information regarding number, type, location, and exposure of weather instruments at Fort Gibson for Army surgeon observations was not available. However, general inferences can be made from the monthly weather summaries, as well as from documented instructions from headquarters of the Army Surgeon General's Office.

<u>Rain Gage</u>

The following are instructions and information taken from a book published in 1851 entitled, *Meteorological Register: Observations Made by the Officers of the Medical Department of the Army at the Military Posts of the United States*:

> "In 1836, rain gauges were furnished to many of the posts, by which the daily falls of rain and snow could be measured and entered upon the tables in inches and the fractions of an inch. The instrument employed is the conical rain gauge of De Witt; and observations are ordered to be made immediately after every shower or fall of rain or snow. The following are the instructions issued by the Department for its observers:'

'The instrument used to measure the quantity of rain which falls, is the conical rain gauge. It will be kept remote from all elevated structures at a distance at least equal to their height, and still further off, where it can be conveniently done. It is to be suspended in a circular opening, made in a board, which is to be fixed to a post, eight feet from the ground; the opening to be five inches in diameter, and beveled, so as to fit the side of the gauge, into which the cap is to be fixed, base downwards, to prevent evaporation.'

'In freezing weather, when the rain gauge cannot be used out of doors, it will be taken into the room, and a tin vessel will be substituted for receiving the snow, rain, or sleet that may then fall. This vessel must have its opening exactly equal to that of the rain gauge, and widen downwards to a sufficient depth, with a considerable slope. It should be placed where nothing can obstruct the descending snow from entering, and where no drift snow can be blown into it. During a continued snow storm, the snow may be occasionally pressed down. The contents of the vessel must be melted by placing it near the fire, with a cover to prevent evaporation, and the water produced poured into the gauge to ascertain its quantity, which must then be entered into the Register."

These instructions with respect to the rain gage remained in effect until the summer of 1868. On Aug 10, 1868, the Army Surgeon General's Office issued the following with regard to the rain gage:

"The rain gauge now issued by the Department is a brass cylinder seven and a half inches high, and with a diameter at its mouth of one and ninety-seven hundredths (1.97) of an inch; this diameter being fixed upon for the reason that one inch of rain falling through such an aperture will measure exactly fifty cubic centimeters (50 cc), and centimeter graduates are furnished with each gauge for the purpose of making such measurement.'

'The most desirable place for a rain gauge, other things being equal, is at the surface of the ground, but since it is not easy to protect an instrument in that situation, the gauge will be placed on the top of a post eight feet high,…'

'For measuring very heavy snow falls, a snow gauge must be used having a mouth of the same size with that of the rain-gauge, but wider at the bottom, so as not to be easily overfilled. The snow which falls in it is to be melted and measured in the centimeter graduate."

<u>Thermometer (Exposed and Wet Bulb)</u>

Based on available information, Army field surgeons were given considerable flexibility in locating the station's detached (or exposed) thermometer. According to instructions from the Army Surgeon General in 1844:

> "The Thermometer will be placed in a situation having a free circulation of air, not exposed to the direct or reflected rays of the sun, and sheltered from rain. Its situation should be remote from massy walls, which slowly imbibe or part with caloric. In making observations avoid breathing on the instrument, or touching it; and at night manage your lamp so as not to cause a rise of the mercury by its heat."

NOTE – No changes occurred in the Army Surgeon General instructions with regard to the thermometer from 1844 through 1868.

On Aug 10, 1868, the following instructions were issued to Army field surgeons by the Surgeon General's Office regarding thermometer placement:

> "The thermometer should be placed in the open air, but under a roof of some kind, and should be well sheltered toward the South. It should be protected not only from the direct rays of the sun, but from the influences of all surfaces which strongly reflect the sun's heat, and of all bodies, such as thick walls, large rocks, etc., which become great reservoirs of heat during the day, and of cold during the night.'
>
> '…The height which it is deemed best to fix upon is that of four feet from the ground to the thermometer bulb, and the surface under the thermometer should be of short grass, sufficiently exposed to the sun and wind to keep it from habitual dampness.'
>
> 'A thermometer box, in which most of the thermometers observed and recorded at the station are suspended, is generally used for the best conducted meteorological observations, and one should be made and set up at every post where there are means of constructing it. This box, which should be at least two feet square, is preferably made of louver-boards or overlapping slates, but ordinary boards pierced with numerous half inch holes may be used instead. It should be open at the bottom, and have a roof which will shed rain. One of the sides should be hinged for convenience of access to the interior, or the box may be left permanently open toward the North, a piece of board or of canvas being used to protect it against driving winds from that quarter. This box is to be well secured on posts, at the proper height from the ground. It should be sheltered from the sun between sunrise and 7 AM, and between 11 AM and 3 PM, special screens being erected for the purpose if necessary. These screens, as well as the box itself, should be whitewashed or painted white."

It appears maximum and minimum thermometers were provided to the Army surgeons at Fort Gibson by 1867. Maximum and minimum temperatures were recorded at Fort Gibson as early as Jan 1867 (Jan 1867 was the only month of weather observations at Fort Gibson for the 1860s), with the readings being different than the 7 AM and 2 PM temperature readings. The Surgeon General's instructions in 1868 are the first mention of maximum and minimum thermometers from the headquarters office:

"Maxim and minimum registering thermometers will be supplied to certain posts for the purpose of enabling the greatest cold of the night and the greatest heat of the day to be recorded. They are to be hung in a horizontal position, and observed once a day, preferably in the morning, when they will give the minimum of the preceding night and the maximum of the preceding day. After the readings have been taken the instruments are to be set and not disturbed until the same time the next day.'

'The maximum thermometer is of the same plan as the maximum clinical thermometer furnished to Medical Officers, and special instructions will be sent with it when issued.'

'The minimum is a spirit thermometer, in the bore of which a double-headed rod of black enamel floats. This rod or index is drawn back when the alcohol recedes, by reason of the resistance of the surface of the liquid to rupture or change of form, and thus reaches the lowest point to which the thermometer falls…"

Hygrometer

The 1844 instructions also state the following with regard to obtaining the wet bulb temperature:

"The most easy method of finding this (wet bulb temperature) is to wet the bulb of a Thermometer covered round with fine gauze, and swing the instrument in the open air, in the shade, until the mercury sinks as low as it will."

"The current of air upon the wet-bulb should be kept up (by swinging) as long as the mercury continues to descend in the tube of the instrument, and for a few minutes after it becomes stationary, in order to ensure the full effect of the evaporation and the lowest degree to which the mercury can be forced to descend by this process, will constitute the observation required…"

NOTE – No mention is made of the hygrometer or wet-bulb temperature in the 1850 instructions from the Surgeon General since the wet bulb temperature ceased to be measured on Feb 1, 1850. Wet-bulb temperatures began to be measured again in the Army Medical Department on Jan 3, 1856 and the 1856 instructions contained the following:

"The hygrometer adopted by this Department consists essentially of a thermometer, the bulb of which is covered with floss silk enclosed in a piece of thin muslin, the ends of the silk sufficiently long to dip into water contained in a brass reservoir secured immediately below the bulb. In the top of this reservoir is a small opening to admit the silk, and to the front is attached a cylinder communicating with the interior by a small hole. The reservoir is to be kept

always supplied with water poured into it through the cylinder, and the bulb will be constantly moistened by capillary absorption."

The 1868 instructions elaborated on taking wet-bulb temperatures:

> "An apparatus for swinging a pair of thermometers – a wet and dry bulb – has been constructed at this Office, and will be issued to a certain number of posts for making specially accurate observations. In using this apparatus the covering of the wet bulb is to be moistened with a soft brush before each observation, and the apparatus then whirled round for a few minutes…'
>
> 'When a stationary wet bulb is used it is to be placed in the box with the other thermometers, but far enough from them not to communicate cold to their bulbs. All casings around the lower part of such a thermometer should be removed, and a piece of wick which dips by one end into a receptacle of rain water, should have its other end coiled around the stem and resting on the top of the bulb, in such a way as to keep the muslin covering uniformly and sufficiently wet. If the wick is connected with the lower part of the bulb, the wetting is more apt to be unequal."

<u>Barometer</u>

With regard to the barometer, the 1844 instructions from the Army Surgeon General indicated the following:

> "The instrument adopted by the Department is the siphon Barometer of Bunten. …The Barometer will be suspended perpendicularly in a good light, in an apartment having an equable temperature, and a dry atmosphere."
>
> "When once suitably placed, the position of the instrument should not be changed, unless from absolute necessity – in which case the circumstances will be carefully noted on the Register, under the head of 'Remarks."

NOTE – This instruction did not appear to be followed at Fort Gibson when the surgeons moved to the new hospitals.

Instructions in 1856 stated, "The barometer now in use by the Department are the siphon, of Bunten, and the cistern, of Green." No other changes are documented with respect to the barometer from instructions in 1844 through the instructions in 1856.

NOTE – Based on recorded temperatures of the attached thermometer, as well as instructions from the Surgeon General's Office, it appears the barometer at Fort Gibson may not have been located in a working or living space. A clerk at the Post Hospital at Carlisle Barracks, PA in 1867 indicated the barometer was located in an outside kiosk along with the thermometers. Recordings from the attached thermometer during the winter months at Fort Gibson are too warm to be located in an un-heated outside building, but are also too cold to be located in a heated inside room.

Instructions issued by the Surgeon General's Office on Jul 1, 1868 stated that two forms of barometers were in use at Army field stations-a cistern barometer for low altitudes (below 2,000 feet) that applied to Fort Gibson, and one for high altitudes (above 2,000 feet). The primary difference between the two barometers was that when taking an observation using the high-altitude barometer, the observer had to adjust the level of the mercury in the cistern (by means of an adjustment screw) until the mercury touched the ivory point. This was not required for the low altitude barometer.

Wind Instruments

Available documents suggest that no wind instruments were available to Army field surgeons prior to the 1860s. Instructions from the Surgeon General's Office in 1844, 1850, and 1856 provided guidelines for subjective observations. Wind directions were to be expressed by the points of a compass, as done by observing the general direction from which the wind was blowing, and wind force was to be express by a subjective scale ranging from 0 to 10 (e.g., "A gentle breeze" for a scale value of "2," "A brisk breeze" for a scale value of "4," and a scale of "6" for "A very strong wind"). No definitions for these terms have been found. These guidelines appeared to have remained in effect until around the 1860s.

Instructions from the Surgeon General's Office issued on Aug 10, 1868, provided the following descriptions regarding wind instruments:

> "The direction of the wind is to be determined in the usual way by a vane or weathercock placed as far above the ground as practicable and at a distance from all buildings, trees, etc., higher than itself. The staff of the wind vane should have attached to it bars indicating the direction of each of the four points of the compass.'
>
> 'Anemometers, or instruments for measuring the velocity of the wind, with instructions for their use, will be issued by the Department to those posts where observations on the winds are of the most importance.'
>
> 'Where special instruments are not furnished for the purpose, the velocity of the wind may be estimated by observing the horizontal motion of light bodies – as clouds of smoke, the pollen of plants, handkerchiefs thrown in the air, etc., when blown before the wind. A motion of one yard per second may be estimated as equal to two miles per hour.'
>
> 'If means can be found for estimating the pressure on a surface of known size, as on a piece of board held perpendicularly to the direction of the wind, or an open umbrella with its concave surface toward the wind, the velocity may be calculated from it. The square root of two hundred times the pressure expressed in pounds per square foot, will give the velocity expressed in miles per hour."

The wind scale in the 1868 instructions changed to reflect quantitative values, e.g., a scale value of "2" represented a wind speed between 5 and 10 mile per hour, a scale value of "4" represented a wind speed between 15 and 20 miles per hour, and a scale value of "8" represented winds between 50 and 60 miles per hour.

Special Observations

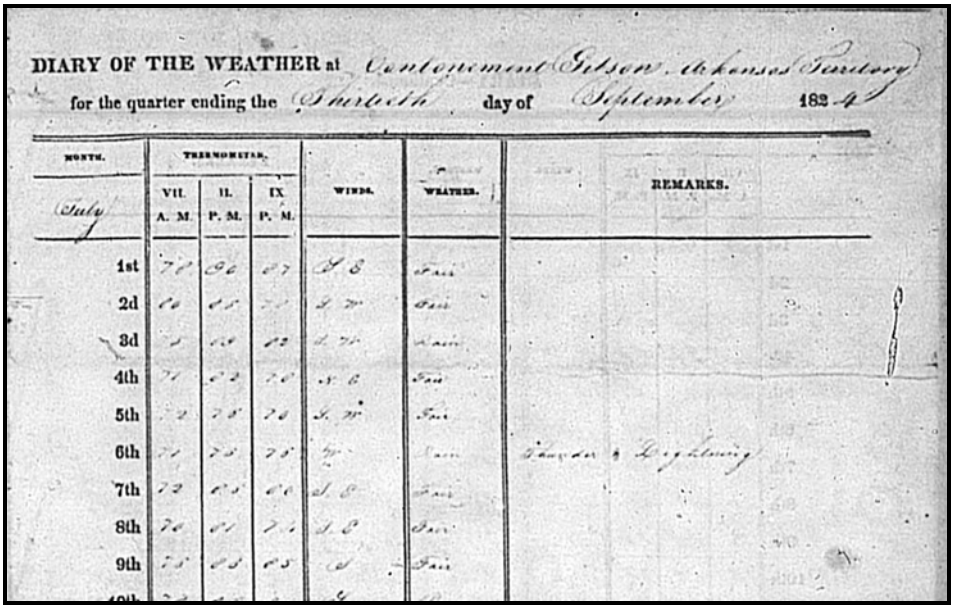
The following was listed in the Army Surgeon General instructions in 1844 with regard to taking special weather observations:

> "Hourly Observations of the Barometer will be taken for 24 hours, at the equinoxes and solstices, to correspond with those already instituted at numerous points of Europe and America, at the suggestion of Sir John Herschel. The days fixed upon for these observations are the 21st of March, June, September, and December. But should any one of these 21st days fall on Sunday, then the observations will be deferred till the next day, the 22nd."
>
> "The observations at each station will commence at 6 o'clock, A.M. of the appointed days, and be continued at the beginning of each hour till 6 A.M. of the following days, care being taken to obtain the correct time."
>
> "The exact maximum and minimum of temperature of the 24 hours should be recorded, under the head of 'Remarks,' at the precise hour and minute at which they occur."
>
> The value of these hourly observations will be greatly enhanced, if they be extended to all the objects embraced in the daily Register. If there be a storm about those times, hourly observations of all the phenomena, from the beginning to the end of the storm, will also be valuable."
>
> "All special observations will be recorded separately."
>
> "Connected with meteorology are many interesting subjects of inquiry, which can only be elucidated by wide-spread, simultaneous observations. The Medical Officers of the Army are therefore confidently invited to co-operate in the collection of data tending to advance the interests of science. For the accuracy of our observations, (quoted as they will be both at home and abroad,) it is hardly necessary to say, the reputation of the Department is pledged."

NOTE – The instructions in 1850 contained the same information as depicted in 1844 regarding special observations. However, no mention is made of special observations in the 1856 instructions nor in the 1868 instructions, indicating this requirement was dropped.

Routine Observations by Army Surgeons at Fort Gibson

The first observation available in the National Climate Data Center (NCDC) database for Fort Gibson, OK was on Jul 1, 1824 (Figure 8).



DIARY OF THE WEATHER at Cantonment Gibson Arkansas Territory

for the quarter ending the Thirtieth day of September 1824

MONTH.	THERMOMETER. VII. A. M.	II. P. M.	IX. P. M.	WINDS.	WEATHER.	REMARKS.
July 1st	70	96	87	S. E.	Fair	
2d	80	95	77	S. W.	Fair	
3d	72	88	82	S. W.	Warm	
4th	71	92	76	N. E.	Fair	
5th	72	78	76	S. W.	Fair	
6th	74	78	78	W.	Warm	Thunder & Lightning
7th	72	85	80	S. E.	Fair	
8th	76	91	74	S. E.	Fair	
9th	75	85	85	E.	Fair	

Figure 8. First weather observation form ("Diary of the Weather") for Fort Gibson, OK (Jul 1824). NOTE – Most weather observations for Fort Gibson in the NCDC database from Jul 1824 to Apr 1832 are listed under the file labeled "Cantonment."

Initial measurements/observations at Fort Gibson were made for the following parameters:

1. Temperature (Fahrenheit) – Measured three times daily (7 AM, 2 PM, and 9 PM).
2. Wind direction (eight points on the compass) – One value recorded daily.
3. Sky condition (initially recorded as "rain," "cloudy" or "fair") – One value recorded daily.
4. Significant weather recorded in the "Remarks" section.

NOTE – Army surgeons took weather observations based on local times, as opposed to the U.S. Signal Service which took observations based on Washington DC times. Based on Meridian Time used by the Signal Service Office at Fort Gibson, observations were taken 72 minutes earlier than listed on the forms, e.g., a 7 AM observation actually was taken at 5:48 AM. Recorded observations at 7 AM by Army surgeons were also taken at 7 AM.

NOTE - It was not apparent from the data as to the meaning of the one wind direction and sky condition, i.e., did the values represent one observation at a particular time. This format continued until Jan 1, 1836.

Weather observations continued unbroken from Jul 1, 1824 until Jun 5, 1826. On the Jun 5th observation a note was included that stated, "Thermometer broken." No observations were available the remainder of 1826 (including all parameters), and were not started again until Jun 1, 1827.

Also on Jan 1, 1836, the observation form changed and temperature measurements were listed on the form only as "AM," "PM," and "Evening." It was not apparent whether temperature observations continued to be taken at 7 AM, 2 PM and 9 PM and logged as "AM," "PM," and "Evening," or whether Army surgeons were given latitude for timing of the observations. Wind direction and sky conditions were listed only as "AM" and "PM." The new form also contained a column for rainfall (in inches), but the Fort Gibson surgeons only recorded whether rain occurred (i.e., only the term "rain" was listed) with no amounts. The observers began recording daily rainfall amounts in Jul 1836.

Beginning Apr 1, 1841, temperature observation times changed, with no changes occurring with the other parameters. After Apr 1, 1841, temperatures were measured at sunrise, 2 PM, sunset, and at 9 PM. This continued until Jan 1, 1843.

On Jan 1, 1843, changes occurred in the Army weather observation program that continued into the 1850s. These changes were reflected at Fort Gibson. Temperature measurements were made four times daily at: "Sunrise," "9 AM," "3 PM," and "9 PM." According to the Annual Report of the Surgeon General, these times were selected to correspond with the observational times adopted by the Royal Society of London, with the exception that Army surgeons took the observations a "little before sunrise" versus the 3 AM observation recommended by the society.

Also clearness of the sky, wind direction and force, and clouds were observed the same time as the temperatures. This represented a significant step for the Army Medical Department toward taking synchronized weather observations/measurements. Also Jan 1, 1843 represented the first day wet bulb temperatures (degrees Fahrenheit) were measured at Fort Gibson. Daily rainfall measurements (to nearest one-hundredth of an inch) were continued with beginning and ending times of the rain added (to the nearest hour).

The following indicates the parameters measured/observed at Fort Gibson beginning Jan 1843:

1. Temperature measurement – Four times daily (degrees Fahrenheit)
2. Clearness of the sky – Four times daily (the amount of clear sky at the hour of observation expressed from "0" to "10," with "0" indicating no clear sky and "10" indicating no clouds)

3. Wind direction and force – Four times daily (direction expressed on an eight-point compass and wind force expressed on a scale from "0" for calm conditions, to "10" for a "violent hurricane"; e.g., SW4)
4. Clouds – Four times daily (direction from which the clouds were moving (eight-point compass) and cloud movement expressed on the same scale used for the force of the surface wind, i.e., "0" for no movement to "10" for movement corresponding to a "violent hurricane," e.g., NE2 or SE1)
5. Wet bulb temperature – At sunrise and 3 PM (degrees Fahrenheit)
6. Daily rainfall – Beginning, ending, and amount
7. Significant weather in Remarks section

On May 1, 1843, Fort Gibson began recording barometric readings (recorded in centimeters of mercury and changed to inches of mercury on Mar 1, 1844) during the four observation times (sunrise, 9 AM, 3 PM, 9 PM). Also, for the same times, temperatures were recorded on the "Thermometer Attached" (degrees Celsius and changed to degrees Fahrenheit Mar 1, 1844) and "Thermometer Detached" (degrees Fahrenheit). Although barometric pressures were recorded, no elevation was indicated for the station.

On May 19, 1846, a note was included on the observation form stating the wet bulb thermometer was accidentally broken and wet bulb measurements ceased until Dec 10, 1847. Wet bulb temperatures stopped being recorded on Feb 1, 1850 and continued until the wet bulb parameter was dropped from a new form beginning Feb 1852.

No observations were made from Aug 15, 1848 until Sep 13 1848 and no reason was given for this absence.

Beginning Jul 1, 1855, the following atmospheric measurements/observations were taken daily at 7 AM, 2 PM, and 9 PM:

1. Temperature (degrees Fahrenheit) – Detached and attached thermometers.
2. Wind direction (eight point compass) and force (based on a wind scale)
3. Weather (fair or cloudy)
4. Barometric pressure (inches of mercury)

In addition, daily rainfall was recorded, along with the time rain began and ended. Significant weather was recorded in the "Remarks" section. Beginning Apr 1, 1856, wet bulb temperatures were recorded for the three observation times (7 Am, 2 PM, and 9 PM).

On Jun 21, 1857, weather observations ceased at Fort Gibson with the following note attached to the end of the monthly form: "The Command left this Post on the 23rd of June and the Hospital's property has been packed and is ready for transportation."

The next set of observations for Fort Gibson in the NCDC database are for Jan 1867 (NOTE – From Jun 21, 1857 until Jul 1, 1873, only two months of observations are in the

NCDC database-Jan 1867 and May 1872). At that time, the following atmospheric parameters were measured/observed at 7 AM, 2 PM, and 9 PM:

1. Temperature (degrees Fahrenheit) – Exposed thermometer only.
2. Maximum/minimum temperatures (degrees Fahrenheit).
3. "Movement of the Atmosphere" – Wind direction (eight point compass), wind force (represented by a wind scale), and "Motion of Clouds" (eight point compass).
4. "Amount of Cloudiness" (in tenths coverage).

In addition, daily rainfall was recorded, along with the time rain began and ended, and significant weather was recorded in the "Remarks" section.

Following the 1850s, the first near-continuous record of observations at Fort Gibson began Apr 1, 1873 when the U.S. Signal Service began taking weather observations outside the post in the city of Fort Gibson (see Figure 2). Weather observations by the Army surgeons (taken at the fort hospital) again appeared in the NCDC database beginning Jul 1, 1873 and continued through Feb 29, 1876 (although one month of observations were recorded in May 1876) with the same observing and recording format described for the Jan 1867 observations. Based on the NCDC database, the Signal Service observers and Army surgeons essentially took weather observations concurrently from Jul 1, 1873 until May 31, 1876 (with the exception of a two-month gap from Mar 1, 1876 through Apr 1, 1876).

No observations exist in the NCDC database from the Fort Gibson surgeons from Jun 1, 1876 through Aug 31, 1886. Although one month of observations are listed for Sep 1886, the continuous record of Army surgeon weather observations at the Fort Gibson Hospital is not started until Feb 2, 1887.

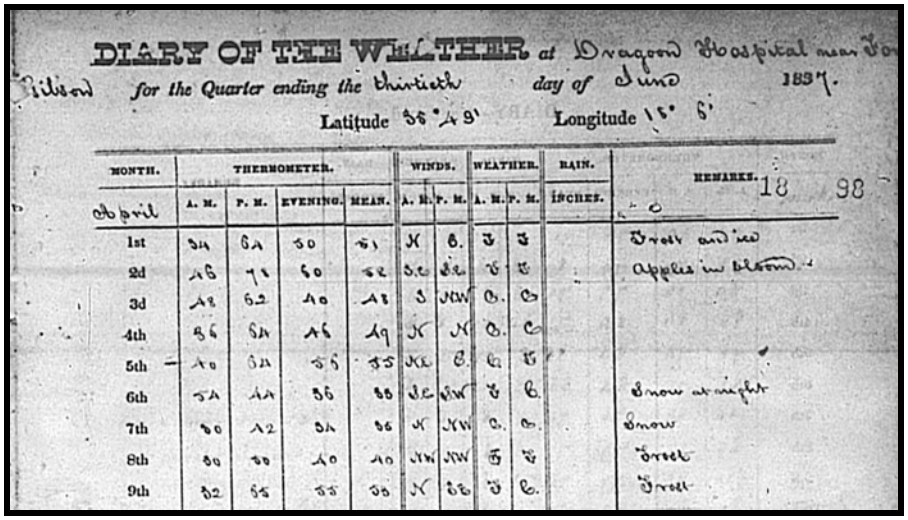
In Sep 1888 the Army surgeons changed to a simpler observation program. Only maximum and minimum temperatures were recorded, as well as the times of beginning and ending of precipitation. Also, total precipitation and depth of snowfall were recorded, along with the general direction of the wind. The Fort Gibson surgeons began the new program on Sep 8, 1888 due to a delay in receiving the new forms. This observational format continued, along with continuous weather observations until Sep 29, 1890 when weather observations at the Fort Gibson Hospital were permanently terminated. The note on the Sep 1890 form by Assistant Surgeon Chase states: "Post abandoned officially and instruments forwarded to the Post-Surgeon, Fort Sill, O.T. September 30, 1890.

Dragoon Hospital

Based on records from NCDC, weather observations were taken by Army surgeons at the Dragoon Hospital concurrently with observations at the Fort Gibson Hospital from Apr 1, 1837 through Sep 30, 1839 (see Figure 2 for the location of the Dragoon Hospital). No comments were indicated with regard to ceasing weather observing at the Dragoon

Hospital on the last available observation form (i.e., Sep 1839). Only one note was found in the Dragoon Hospital observations related to a weather instrument. A note attached to the Jan 1839 observation form stated: "Having had charge of this Hospital but a short time I have not been able to have a proper place selected for the rain gauge. For interest in that particular, I refer you to the Infantry Hospital report at the Post."

Weather observations by Army surgeons at the Dragoon Hospital during the mid to late 1830s were the same format as the hospital at Fort Gibson during the same period (Figure 9). Temperatures were recorded as "AM," "PM," and "Evening." Wind direction (eight point compass) and weather ("cloudy" or "fair") were recorded as "AM" and "PM." Daily rainfall was reported to the nearest one-hundredth of an inch, when available. Significant weather was included in the remarks section initially, but by early 1838, all remarks had ceased.



DIARY OF THE WEATHER at Dragoon Hospital near Fo
Gibson for the Quarter ending the thirtieth day of June 1837.
Latitude 35° 49' Longitude 15° 6'

MONTH.	THERMOMETER.				WINDS.		WEATHER.		RAIN.	REMARKS.
April	A. M.	P. M.	EVENING.	MEAN.	A. M.	P. M.	A. M.	P. M.	INCHES.	18 98
1st	54	64	50	51	N	E.	F	F		Frost and ice
2d	46	71	60	59	S.E.	S.E.	F	F		Apples in bloom
3d	48	62	40	48	S	NW	C.	C		
4th	56	64	46	49	N	N	C.	C		
5th	40	64	56	53	NE	E.	C.	F		
6th	54	44	36	38	SE	NW	F	C.		Snow at night
7th	30	42	34	36	N	NW	C.	C.		Snow
8th	30	30	40	40	NW	NW	F	F		Frost
9th	32	54	33	33	N	SE	F	C.		Frost

Figure 9. Observation form for the Dragoon Hospital, OK for Apr 1837.

Signal Service Observations

Initial Signal Service observations in the town of Fort Gibson measured barometric pressure, temperature, wet bulb temperature, wind, and precipitation. NOTE – Interactions between the Army surgeons at the fort and Signal Service observers in the town likely were common as indicated by the note on the Oct 1875, Signal Service form: "Minimum temperatures from Oct 18 to Oct 24 inclusive, observed from Post Hospital."

Figure 10 shows a picture of the Nash Building that was located in the flat area between the river and the hill containing the Post. The Signal Service Office was located on the second floor on the north-northeast corner of the building. The office was located at the rear of the building with an arrangement as shown in Figure 11 from a drawing during the Feb 20, 1874 inspection.

Figure 10. The Nash Building in the town of Fort Gibson that housed the Signal Service Office. View is generally north. Signal Service Office was located at the north corner and at the back of the building. From the Oklahoma Historical Society.

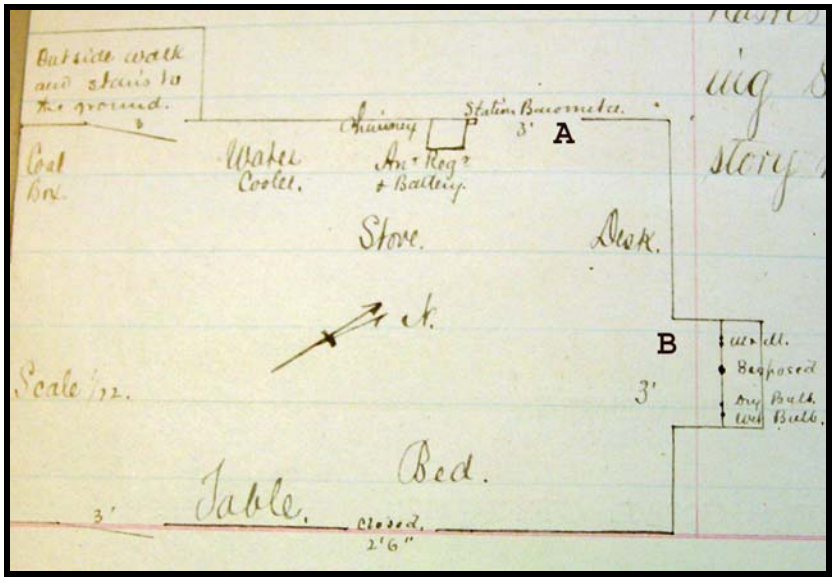


Figure 11. Drawing from the Feb 20, 1874, inspection report showing the Signal Service Office in the Nash Building. North is toward the upper right of the drawing. Point "A" is the location of the station barometers and point "B" the location of the "window" or "thermometer" shelter. The station journal listed the office size as 12 feet wide, 18 feet long, with 12 foot ceilings. From the National Archives and Records Administration.

The 1874 Annual Report of the Chief Signal Officer lists the following instruments for Fort Gibson: Two standard barometers; two standard thermometers; two standard

maximum thermometers; one standard minimum thermometer, one standard hygrometer, one standard anemometer, one self-register for anemometer, one small wind vane, and one standard rain gage.

Signal Service inspection reports and local office journals indicate the following information existed with respect to weather instruments in the town of Fort Gibson from Apr 1, 1873 through May 12, 1882:

Barometer – The office had two mercurial barometers. Elevations of the barometers initially were listed as 619 feet above sea level (based on the height of the fort hospital at 600 feet and interpolated to the second story of the Nash Building in the old town of Fort Gibson) but changed to 511 feet above sea level on Aug 4, 1873 (office location did not change). The elevation of the ground at the Signal Service office location was determined to be 493 feet above sea level with the barometers located approximately 18 feet above ground. Figure 11 shows the location of the barometers on Feb 20, 1874. Based on the drawing, the barometers were located near the office stove and chimney and were moved to just west of the instrument shelter by the Jul 15, 1876 inspection. Exposure of the barometer was listed as "fair" on the 1874 report and changed to "good" on the 1876 inspection and on subsequent inspections.

Instrument Shelter – The instrument shelter was located in a window with a northern exposure. Figure 12 shows arrangement of the thermometers in the shelter. The office had two thermometers (dry bulb and exposed; elevations 20 feet above ground), one wet bulb thermometer (21 feet above ground), and maximum/minimum thermometers (approximately 21 feet above ground). Exposure of the thermometers was rated as fair to good. The dimensions of the instrument shelter from the inspection reports were approximately 7 feet high, 3 feet wide, and 2 feet deep. The thermometers in the shelter were placed 12 inches from the panes of the window and approximately in the middle of the instrument shelter. The station journal stated the thermometers were placed "about the height of the eye." The station journal contained a letter written May 9, 1882 to Washington D.C. regarding moving all instruments to Fort Smith, AR following the cessation of weather observations at Fort Gibson: "I find upon examination the instrument shelter will not bear transportation. It is old and badly decayed, and I would soon have asked for a new one had I remained here."

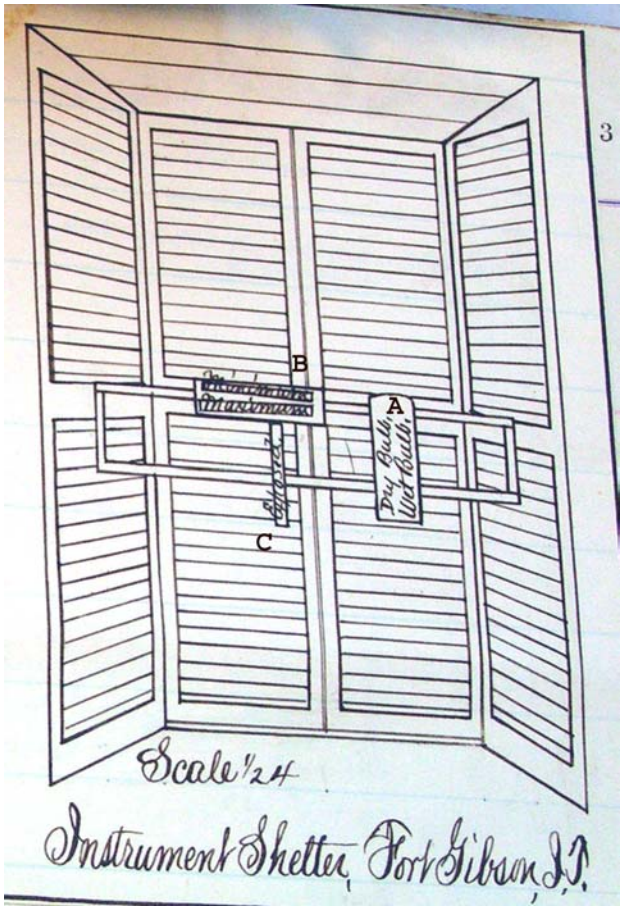


Figure 12 – Drawing from the Feb 20, 1874 Signal Service inspection report showing the instrument shelter, as well as the location of the mounted thermometers. Point "A" is the location of the dry bulb and wet bulb thermometers, point "B" the location of the maximum/minimum thermometers, and point "C" the location of the exposed thermometer.

Rain Gage – The rain gage was located on the roof of the building, 36 feet above the ground. Exposure of the rain gage was rated as good by the Signal Service inspectors.

Wind Instruments – The anemometer and wind vane were located on the roof of the building. The anemometer was 40 feet above ground and was raised to 46 feet above ground by Feb 1874. The wind vane was 38 feet above ground and was raised to 42 feet above ground by Feb 1874. Exposure of the wind instruments was rated as fair to good. An anemoscope (an instrument for indicating the existence and direction of the wind) was installed by Mar 8, 1877, located 41 feet above ground.

Additional Equipment – A self register was installed in the northern corner of the office by Dec 18, 1878.

The final observations at the Signal Service office in Fort Gibson on May 12, 1882 contained the following note: "Observations discontinued after the 11 PM report of the 12th. Instruments, records, and furniture packed up for the purpose of moving the office to Fort Smith Arkansas."

Observer's Stories

The station journal for the Signal Service office confirms the concerns early observers had for their safety. A letter written by Sergeant Taylor to Washington D.C. on Apr 2, 1873, asked:

> "I would respectfully suggest that this office be furnished with a Colt revolver for personal protection as it is unsafe to be out of doors after dark in this section of the country."

A letter from the Fort Gibson office to Washington D.C. dated Aug 23, 1881, lists the following benefit of Signal Service weather information:

> "Cattle dealers are benefited, more especially the buyers who come down from Kansas early in each spring and purchase large herds from the south. By consulting the Signal Service records, they can readily conclude when they should begin to gather their cattle with safety, the date on which to start the drive, and approximately what kind of weather they will encounter before reaching Kansas."

Acknowledgments

Gary D. Moore of Fort Gibson, OK provided considerable insight and help regarding the locations of the post hospitals and the Signal Service Office. Gary provided text and photos on the Signal Service Office that were invaluable in identifying the location of the weather instruments. Mike Bradley also was helpful in identifying areas at the fort and in the town of Fort Gibson relevant to this research. Mike took the time to give an informative tour of the Fort Gibson area. The generosity and patience of Gary and Mike are greatly appreciated.

John Phillips and Suzanne Holcombe of the Oklahoma State University Library made available the university's extensive library on government publications. Two critical documents published by the Army Surgeon General's Office in the mid 1800s were found at the library. Without their help, these documents may not have been located.

Steve Doty developed the procedures and methodologies used in developing this report. Without the extensive work of Steve in developing the appropriate process, this research would not have been possible.

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Data Sources

Data regarding weather instrument location and exposure at Fort Gibson during observations by the Army surgeons is sparse to non-existent. The NCDC database was the primary source of weather observations by the surgeons at Fort Gibson from 1824

into 1890, but no information was available on instrument location, exposure, or type of instruments used at this location. In addition, the surgeons themselves appeared to take meticulous weather observations, but did not include any information on the forms with respect to the instruments.

Primary information regarding weather instruments used by the Army surgeons and procedures used to take the observations came from publications by the Army Surgeon General's Office (1844, 1850, 1851, 1856, and 1868) which provided instructions to be used by field surgeons.

Annual reports by the U.S. Army Surgeon General were reviewed for the years 1825 through 1875 with only bits and pieces of revealed information. The primary exception was the annual report for 1844 which contained a summary of instructions for taking weather observations; however, a more detailed document was obtained from the National Library of Medicine in Bethesda, MD. Several publications by the Army Surgeon General were obtained from the extensive government library microfiche collection at Oklahoma State University.

The Fort Worth, TX branch of the National Archives and Records Administration (NARA) contained considerable specific information in station journals regarding the timeline of the Signal Service Office beginning with the spin-up of the station in 1873, to the cessation of weather observations on May 12, 1882.. Also, considerable information regarding the Signal Service observing station was available from station inspection reports located in NARA. These inspections provided drawings and detailed textual information on the placement and exposure of weather instruments in1874, 1876, 1877, 1878, and 1881.

Tracking office location and instrument exposure on a semi-routine basis was important to ensure no information gaps existed. Consistent information was obtained from the Annual Reports of the Chief Signal Officer for the 1870s and early1880s. These reports also contained sporadic information regarding weather observing at the Signal Service field office in the town of Fort Gibson.

Some information was obtained about Fort Gibson from the Oklahoma Historical Society and the Oklahoma University Western History Collection, primarily maps from the 1830s and 1870s and a few publications. Considerable help was provided by two resident experts at the Fort Gibson Historical Site (see Acknowledgments) regarding the location of the medical facilities in the initial stockade, two Infantry Hospitals, the Dragoon Hospital, and the Signal Service Office . Other possible sources of information checked include the Fort Gibson Public Library, Muskogee Public Library, Tulsa Public Library, and Northeastern State University Library.