

History Corner: Retracing Colorado's South Line

Professional Surveyor Magazine - July 2010

In principle, surveyors will agree that the original monument, once set and relied upon, defines the location of a corner even if it wasn't set exactly in the intended location. Furthermore, evidence of the original monument's location is as good as the monument, in theory.

The problem I have encountered is that in practice not all surveyors will use this principle; they will attempt to correct a poorly performed but original survey by setting monuments in the mathematically proper location rather than accepting the original or trying to re-establish the location of the original based on evidence. Well, we're not the only ones who have difficulty determining what to do in these situations. This article demonstrates how the GLO and the Congress of the United States have had difficulties making that decision too.

In 1857, Army Colonel Joseph E. Johnson established a monument while surveying the 37th parallel (the Oklahoma-Kansas line) at what he thought was 103° west longitude from the Greenwich meridian, as instructed. However, there were errors in his determination of longitude, so in 1859 Captain Macomb was instructed to set a monument that would become the northwest corner of the Oklahoma panhandle, approximately 11,582' east of Johnson's monument.

A map of the states will also show that Johnson's survey defined a portion of the south boundary of the Territory of Colorado, which was formed in 1861. The Enabling Act, which defined the boundaries of the State of Colorado, was written in 1864, even though Colorado was not admitted as a state until 1876. In 1868, Ehud Darling was contracted to continue the survey of the 37th parallel of latitude starting at Macomb's monument westward to the "thirty-second degree of longitude west from Washington," the definition of the west boundary of Colorado.

The Darling Line



Image courtesy of the Utah Historical Quarterly

The four corners prior to the construction of the current monument



The Jefferson Pier was erected in 1804 and recovered and re-erected in 1869 in Washington, D.C.—*photo courtesy: Fletcher Henderson.*

Darling surveyed his arc of latitude west for 211 miles until he reached a place now known as Ewell Canyon. At 211 miles and 70 chains, he describes finding a “Canyon 1000 feet deep, bears NW nearly perpendicular sides of sand stone.” He set a monument there that would become known as the “South Angle Point.” He then proceeded to set a flag in the Navajo river plain on the west side of the canyon and completed a set of astronomical observations there, only to find that he was approximately two-fifths of a mile south of the 37th parallel of latitude. Understandably, surveying the arc of latitude Darling was attempting was much more difficult a task than surveying a line of longitude. He traversed north the distance and established his Astronomical Station No. 7 on the 37th parallel at mile 214 and 25.7 chains.

At this point he had a decision to make. He was getting paid by the mile but he needed to correct his line back eastward, which would not pay any additional funds. His notes claim that from

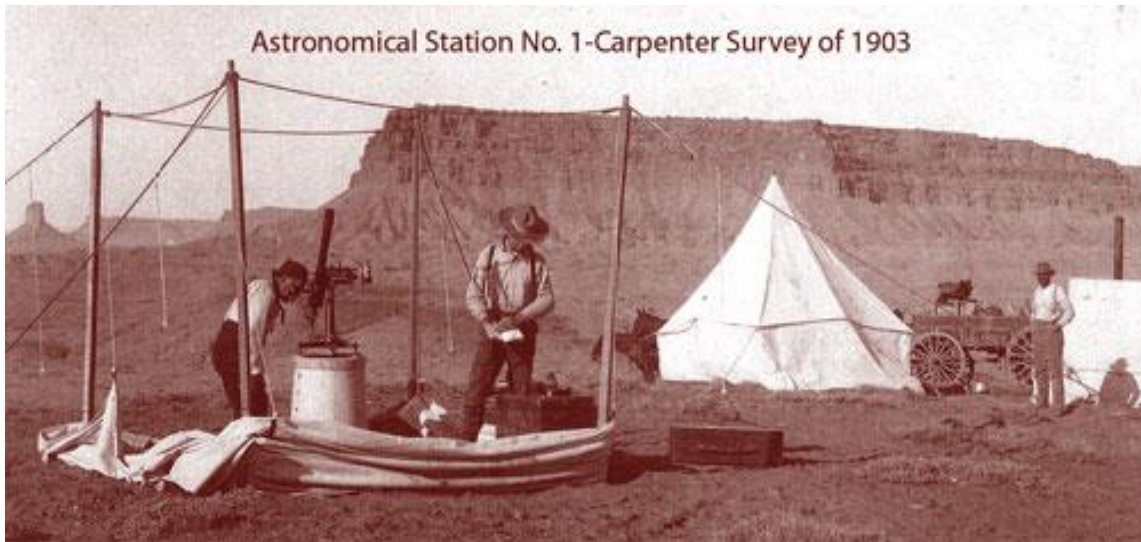
Astronomical Monument No. 7, he “corrected the line back East to the 191st mile corner a distance of 23(+) miles.” The only problem is that his correction notes don’t go that far eastward.

Furthermore, future investigations seem to have shown that he didn’t correct any farther eastward than the west side of the Ewell Canyon, only two miles or so eastward from Astronomical Monument No. 7. He set a monument there that would become known as the “North Angle Point.” The line between the two angle point monuments became known as the Ewell Canyon Connection and was an unsurveyed line bearing approximately N38°W for a distance of just over 55 chains in the original survey. This created a major kink in the arc that was to be the south line of the State of Colorado. Darling then proceeded westward to his endpoint without any additional major problems. Darling surveyed to a point west of the present location of the Four Corners Monument by about 1 mile and 45 chains; however Darling’s survey was solely to establish the 37th parallel, so his endpoint was not a critical aspect.

The Four Corners

In 1875, Chandler Robbins was contracted to survey the west line of New Mexico. Interestingly, on the title page of his notes, Robbins describes himself as “US surveyor and astronomer.” He was directed to set an initial monument at 32° west longitude and “on the Darling line.” As surveyors we know the difference between 37° north latitude and “on the Darling line.” Darling’s survey was the original survey of the south line of Colorado, after all, even though it wasn’t exactly on the 37° north latitude line.

The difference between 109° west longitude and 32° west longitude isn't as immediately apparent as just the numbers would indicate.



Prime Meridian

Any fan of Dan Brown's *The Da Vinci Code* remembers Robert Langdon following "The Rose Line" monumented through the center of Paris at the end of the story. These monuments mark France's prime meridian. The Greenwich meridian was chosen as the Prime Meridian (at the International Meridian Conference held in Washington, D.C. in 1884) because of the superiority of the British shipping and navigational charts, which most countries had been using for decades and which were all based on the Greenwich meridian. So, Robbins' monument predated the use of the Greenwich meridian as the Prime Meridian and was in fact based on the Washington, D.C. prime meridian.

However, there have been four prime meridians in D.C. The first prime meridian of the United States was proposed by Charles Pierre L'Enfant, the designer of D.C., to go through "Congress' House." This meridian was never implemented.

The second U.S. prime meridian, and the first to be put to use, was defined by Thomas Jefferson and established at the right angle point of the triangle with its hypotenuse drawn between the White House and the Capitol Building. This point is currently marked by the "Jefferson Stone" just northwest from the Washington Monument. (The Jefferson Stone has a unique and interesting history that was fully described by Silvio Bedini in his wonderful book *The Jefferson Stone*, that you can buy through PSM's website.)

This U.S. prime meridian was used until 1850. At that time the U.S. Naval Observatory (now called the Old U.S. Naval Observatory and located near the west end of the mall in D.C.) was being used for making longitudinal measurements, and apparently the U.S. prime meridian was moved to the dome of the Old U.S. Naval Observatory building for simplicity in reducing measurements.



That U.S. prime meridian was used until the Greenwich meridian was adopted by the United States as the prime meridian in 1912. Sometime later the current U.S. Naval Observatory was built, and the U.S. prime meridian was moved to there for measurement purposes even though all measurements were converted to Greenwich.

In an attempt to thwart future misunderstandings, Chandler Robbins published an article in the Santa Fe Daily New Mexican on November 1, 1875, just a few months after he set the monument, saying this: “It seems to have been the general impression that the line was the 109° of longitude west from Greenwich. Such is not the case, as the law makes it the 32° of longitude west from Washington, which corresponds to 109°2’59.25” west from Greenwich, and which places the line as a small fraction less than three miles farther west than would have been the case if it had been run as the 109° of longitude west from Greenwich.”

Measuring longitude in 1875 was often based on a time measurement using the telegraphic services. But out in the wilds of the west there were no telegraph lines. Chandler’s notes say: “In the absence of available telegraphic facilities for the determination of the longitude I was directed by the Hon. Commissioner of the General Land Office to adopt the Southwestern needle point or crestone, otherwise named Wilson’s Peak, situated in Township 11 North, Range 3 West of the Navajo Special Meridian.”

The location of Wilson’s Peak had been established under the U.S. Geographical Surveys West of the 100th Meridian, led by first lieutenant George Wheeler (one of the “Great Surveys of the American West” that includes King’s survey of the fortieth parallel, Powell’s survey of the Grand Canyon region, and Hayden’s geological and geographical survey of Colorado and adjacent territories). Wilson’s Peak has since been renamed Ship Rock.

Robbins then describes the geographical position he was given for this point and how he ran a line due west after triangulating on that point to establish 32°W. Then he ran due north and intersected Darling’s line and established his initial point. He monumented his initial point with “a shaft of hard sand stone 7 feet long 12 inches wide and 6 inches thick; set 3 feet in the ground and marked on the N.E “Col, 37° N.L,” on the S.E “N. Mex 32° W.L”; on the SW “Arizona,” on the N.W “Utah 1875.” This is the monument that would eventually become the Four Corners Monument.

As surveyors we know that the Four Corners Monument isn't exactly where it was intended to be. No one can measure exactly, not even now. But given the instrumentation available at the time, the terrain, and the many other challenges to survey well in that area and era, the level of precision and accuracy they were able to achieve is remarkable.

Re-surveying the 37th Parallel

In 1876 Colorado was admitted into the Union as the Centennial State (100 years after 1776) with "Darling's line" as the south boundary. Apparently Darling's line had more errors than just the Ewell Canyon connection, because in 1902, 34 years after the original survey and 26 years after Colorado joined the United States, the GLO decided to re-survey the 37th parallel to establish it more accurately. Note that this was not a re-survey of Darling's line.

Howard Carpenter was contracted for this work. He started at the Four Corners Monument and surveyed west to east, the reverse direction of Darling. One of the more unusual aspects of his instructions was that he was to "obliterate" Darling's monuments along the way.

Fortunately he took careful notes as to their locations prior to completing that task. Upon completion, the GLO ceased to recognize Darling's line as the correct line and began to recognize Carpenter's line as the correct line, thereby "correcting" the poorly done but original survey. In fact, in 1908 Congress passed a joint resolution accepting Carpenter's line as the correct boundary between the states. And in 1912 New Mexico was admitted as a state defined by Carpenter's line on the north side.

As can be imagined, disputes about this line between the states of Colorado and New Mexico grew to the point where, in 1919, New Mexico decided to sue Colorado over the definition of their mutual boundary line. In 1925 the Supreme Court ruled on the case (the Supreme Court is the only place two states can sue each other) determining that the original survey, even if it is done poorly, is the defining survey and cannot be changed; regardless of the fact that the Carpenter line had been temporarily used, the Darling line had originally been accepted by both Colorado and the federal government.

Furthermore, Darling's line had been "recognized and acquiesced in" for more than 30 years prior to Carpenter's survey, is the original line, and is therefore the correct line.

The Supreme Court noted that for more than 30 years whole communities had considered themselves a part of the state of Colorado but were subsequently told that they were now a part of New Mexico. In some cases, collection was attempted on past property taxes that had been already paid to Colorado. So, the first moral of the story could be that, even if the original survey was done poorly or even incorrectly, it is still right and cannot be corrected. Right or wrong, original is right.

But our story doesn't end there. Arthur D. Kidder was tasked in 1925 by the GLO to re-survey and re-monument Darling's line from his original notes and those of Carpenter. Carpenter, you remember, had noted the locations of Darling's monuments. Unfortunately, upon completion of the Kidder survey, the GLO didn't have the budget to pay off the contract so Kidder refused to release the survey, plats, and notes. Kidder died years later having never released any surveys to the government.



Typical monument cap from Kidder's survey plat

It wasn't until 1959 after Kidder's widow was finally paid in full and all his data was released that the line between Colorado and New Mexico could be officially finalized. I don't know if any of Darling's original monuments have been found, but Kidder was able to re-survey the locations based on the evidence he had available: Darling's and Carpenter's notes and Carpenter's monuments.

At the Core: Original Monumentation

We as surveyors understand the concept of original monumentation better than the layman. Monumentation of land is so important that laws against moving or removing monumentation have been instituted since prior to the writing of the Bible and are included in the Bible. The removal of survey monumentation continues to be a criminal offence today. Retracement surveying, in which most of us participate, is by definition the re-establishment of monumentation in its original location, not where it was intended to be.

As Thomas Cooley, chief justice of the supreme court of Michigan from 1864-1888, wrote, "We all know that when purchasers (in this case states) take lands from the general government, they ascertain the boundaries by going upon the land and tracing out the lines and stakes. No one supposes that if an error shall chance to have occurred in the survey, he is liable to have the corner post removed, and perhaps the portion of his purchase, which he regarded as most valuable, taken from him by a resurvey."

Note: Since the Four Corners Monument was set it has gone through several upgrades, described in the circular Field Notes of the Remonumentation of the Corner Common to the States of Colorado, New Mexico, Arizona, and Utah, of the New Mexico Principal Meridian, Gila and Salt River Meridian, and Salt Lake Meridian, executed by Darryl A. Wilson, Supervisory Cadastral Surveyor for the BLM and dated October 17, 1992 (R-573). At the time of this writing it has been closed for construction since February 2010 and is scheduled to reopen for visitors in late June 2010.

Additional information about the history of this monument and its location can be found at <http://www.ngs.noaa.gov/INFO/fourcorners.shtml> and <http://www.navajonationparks.org/htm/fourcorners.htm>

About the Author



Earl F. Henderson, PLS

Earl is owner of Zenith Land Surveying, Inc. in Boulder, Colorado. He has been surveying in various states since 1989.