

Using Wagon Odometer Data in Trail Research

BY GERALD T. AHNERT

ODOMETERS HAVE A LONG HISTORY. About 25 B.C.E., Vitruvius described an odometer to measure distances mounted on a chariot, but the actual inventor may have been Archimedes.¹

Benjamin Franklin had been serving as postmaster for Philadelphia until 1753 when he was promoted to postmaster general of Britain's American colonies. While inspecting the post offices between Philadelphia, Pennsylvania; and Boston, Massachusetts, Franklin wanted to determine the distances between postal stations. An odometer, probably designed by Franklin, was mounted on his carriage to measure the distances.²

Surveying parties and the military, as well as others, have used wagon odometers on trails throughout the West, providing historians with important information to aid them in locating historic sites. Beers Wagon Odometer, or similar, was used for this purpose.

In 1872 W.H. Holmes was the artist with the Yellowstone surveying party. His report included a photo of a two-wheeled cart with mounted odometer to record the distances.³

In 1869 Maj. Henry M. Robert compiled the itineraries of

trails in Arizona and southern California. In his report was the *Reliability of Odometer Measurements*:

The distances passed over by a wagon, during a single evolution of the wheel, is always greater than the circumference of the wheel and this difference varies on different kinds of road and probably with different kinds of wagons. Several experiments were made on different kinds of road, including the heaviest sand on the Colorado desert with the following results:

The wheel of the Ambulance used had a circumference of 12' 7"; while the distance passed over during each revolution of the Wheel on hard level ground was 12' 10.5"; in the heaviest sand, (the axle freshly greased,) 13' 2"; and in the heaviest sand the axle not having been greased for 3 days, 13' 4.5". Thus, the slip of the wheel was 3.5", 7" and 9.5" respectively in the three; or 2.3 per cent, on all the roads excepting over the Colorado Desert between Fort Yuma and the Sea Coast where the slip has been taken at 5 per cent. These amounts are certainly large enough, but I think will not exceed the true slip in any case more than one per cent.

The slip of the wheel however is a very variable quantity when road is rocky and especially under the combined influence of rocks, hills and rapid driving.

Measurements up hill are always more reliable than the down hill measurements, but I think it a mistaken notion that the Odometer cannot be relied upon excepting when the animals are driven at a walk. On all ordinary roads at speed not exceeding five miles per hour, the Odometer *seems reliable*. As an evidence of this; the road from Maricopa Wells to Fort Yuma early in the year 1868, was measured by two parties

1 André Wegener Sleswyk, "Vitruvius Odometer," *Scientific American* (October 1981), 245.
2 Displayed as part of the Frankliniana Collection, "Benjamin Franklin: In Search of a Better World," The Benjamin Franklin Tercentenary, 1706–2006, *Franklin Institute of Philadelphia*, Benjamin Franklin Museum, Philadelphia, Penn.
3 W. H. Holmes, "Survey of the Yellowstone, Artist to the Survey," in *Random Records of a Lifetime Devoted to Science and Art, 1846–1931*, 20 volumes (n.p., n.d.) 3: Part 1, 42.

On the Southern Overland Trail, studies of distances with wagon odometers were made in 1858 by Butterfield's Overland Mail Company for the California section and in 1862 by the California Volunteers from California to New Mexico. These studies that document the physical route of the Southern Overland Trail and specific historic locations such as Butterfield's Overland Mail Company stage stations have greatly aided historians.

In June 1858 Overland Mail Company director and superintendent Marquis L. Kenyon was selecting the route of the Butterfield Trail and stage station sites from Fort Tejon to Los Angeles, California. By using a viameter (odometer), he determined that the distance between the two locations was 93 miles, 493 yards.⁵

USING INFORMATION OBTAINED FROM AN ODOMETER TO LOCATE A HISTORIC TRAIL SITE

One example of finding a historic trail site by using the information given in reports from the time of the Southern Overland Trails use (1846–1880) is my finding Montezuma Head Tank in Arizona's Forty Mile Desert. The tank is located about forty miles southwest of Phoenix. In his itinerary, California Volunteers lieutenant-colonel West calls the site "The Tanks." Similar tables from the itinerary state that an odometer was used.

Along with other data, the "itinerary of the marches from Fort Yuma to Pima Villages, made by Lieutenant-Colonel West"⁶ was used to find the location of a historic tank. In James B. Leach's 1858 report, he describes how to provide water along the trail: "Where permanent water was not found at suitable points, reservoirs were constructed, either by damming the arroyos or sinking large tanks [cisterns] to collect and retain a

supply of rain water."⁷ A reservoir utilizing an arroyo was made by building a berm across an arroyo. The ruins of "The Tanks," mentioned in West's report, were dammed arroyos originally constructed in January 1858 by James B. Leach's engineer, H. P. Hume.⁸ The locations of Butterfield's Overland Mail Company

Desert Stage Station and Maricopa Wells Stage Station are known. The trail ruts are still well preserved between



Beers odometer mounted on the rear axle of a wagon. SMITHSONIAN SPECIAL COLLECTIONS.

these two stations. On my map table, by using the distances from West's itinerary, I plotted 7.42 miles along the trail to "The Tanks" east of Desert Station and noted the position. I then plotted 11.15 miles along the trail, west of Maricopa Wells Stage Station and noted the point. The two points were within a "stone's throw" of each other. Using Google Earth, I obtained a Global Positioning System location of 33.0797, -112.2303.

According to the Maricopa County assessor, the tanks are located on land now owned by Bernard and Alice O'Neal. I contacted them, and they agreed to allow me to spend the day at the site with them and members of the Hudson family. Bernard O'Neal is a Hudson family friend whose brother, now deceased, was married to Mary Hudson.

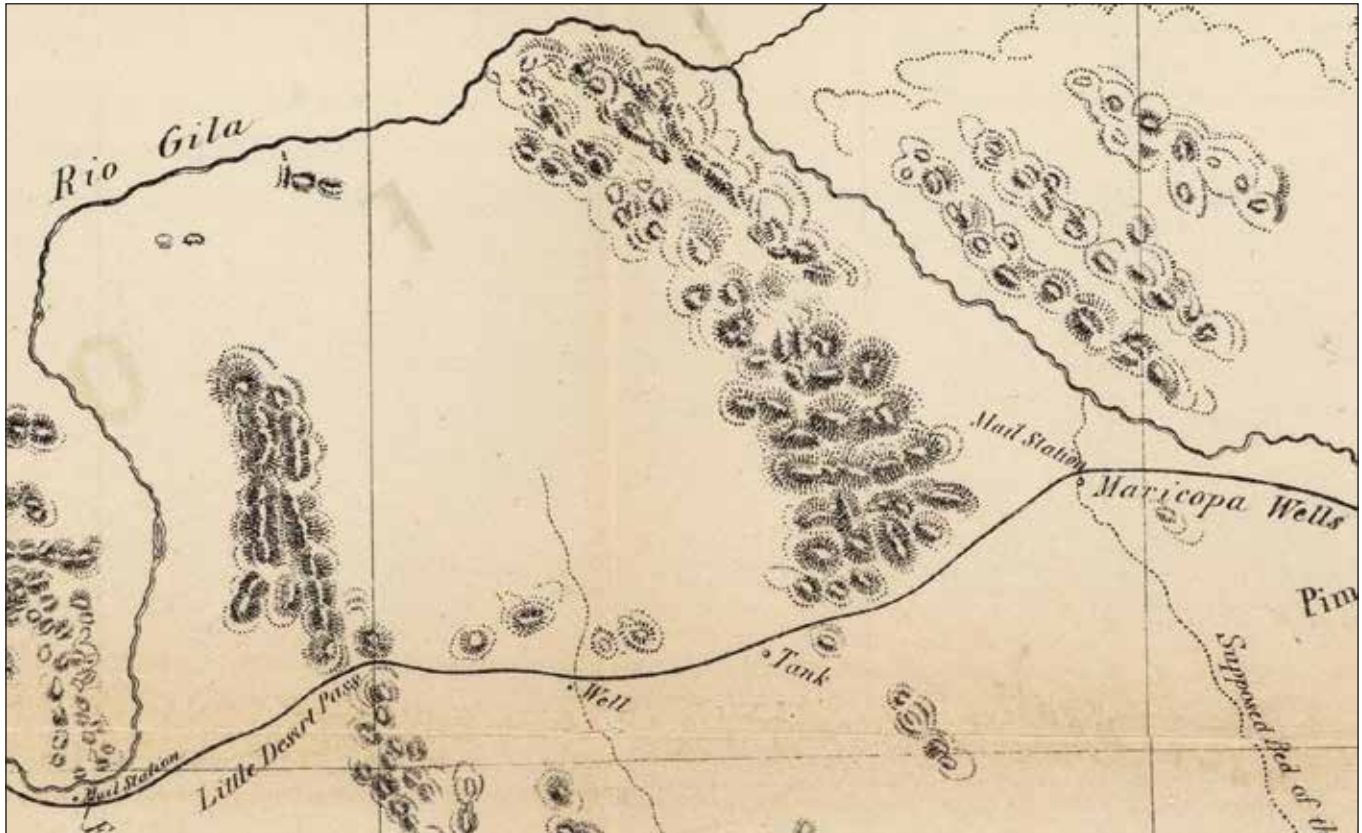
Naomi (Hudson) Skinner is the family historian and is Mary Hudson's sister. Naomi is the daughter of James and Diamond Hudson. The Hudson family lived on the

5 Marquis L. Kenyon, *Los Angeles Star*, Los Angeles, Calif., June 26, 1858.

6 *The War of the Rebellion, a Compilation of the Official Records of the Union and Confederate Armies*, Series I, 50, Pt. I (Washington, D.C.: Government Printing Office, 1897), 1056.

7 James B. Leach, "Report Upon the Pacific Wagon Roads, El Paso and Fort Yuma Road," in *The Executive Documents, printed by order of the Senate of the United States, Second Session, Thirty-Fifth Congress, 1858-'59* (Washington, D.C.: William A. Harris, Printer, 1859), 11.

8 "Letters Received to the El Paso-Fort Yuma Wagon Road, 1857-1861," *Records of the Office of the Secretary of the Interior Relating to Wagon Roads, 1857-1881*, File Microcopies of Records in the National Archives: No. 95, Roll 3, The Washington Archives, Washington, D.C., 1947.



**GENERAL ORDERS, } HDQRS. DIST. OF SOUTHERN CALIFORNIA,
No. 6. } Fort Yuma, Cal., May 7, 1862.**

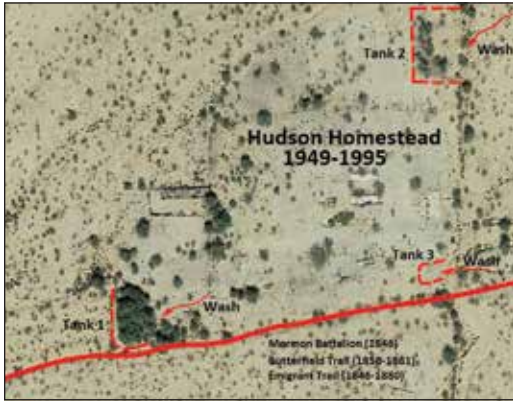
The following itinerary of the marches from Fort Yuma to Pima Villages, made by Lieutenant-Colonel West, is published for the information of all concerned:

To—	Distance.	Marches recommended.	Remarks.
Gila City.....	Miles. 17.56	1	No grass, wood; camp on the river.
Mission Camp....	11.49	2	Wood, water, and a little grass at Mission Camp. Wood and water at Filibuster Camp; grass four miles further on.
Filibuster Camp ..	6	3	Grass within three-quarters of a mile of Antelope Peak. The camp is at the station; no grass. Camp on the river, at Mohawk Station.
Antelope Peak....	9.14	4	A little grass on the hill. Station half a mile back from the river. Lagoon Camp, fine water, wood, shade, and grass.
Mohawk Station ..	12.83	5	Very dusty and disagreeable at Grinnel's. Men or animals cannot recruit much. At Grassy Camp they do much better.
Texas Hill.....	10.98	6	A very poor camp at Burke's, and little better at Outman Flat; no grass at either.
Lagoon Camp.....	5	7	Poor camp at Kenyon Station; no grass. At Shady Camp all good.
Grinnel's ranch ..	11.13	8	At Gila Bend, wood and water, but no grass; thence to Maricopa Wells good road, but destitute of water and grass.
Grassy Camp.....	3	9	At the wells abundance of water, but brackish. Some salt grass.
Burke's Station ..	6.43		Road fair, with some sloughs.
Outman Flat.....	11.22		
Kenyon Station ..	13.48		
Shady Camp.....	10.10		
Gila Bend.....	4		
Desert Station....	21.82		
The Tanks.....	7.42		
Maricopa Wells ..	11.15		
Pima Villages....	11.35		
Total.....	184.10		

By order of Colonel Carleton:
BEN. C. OUTLER,
First Lieut., First Infy. California Vols., Actg. Asst. Adj. Gen.

TOP A section of James B. Leach's 1858 Map No. 2 accompanying his report. "Tank" represents the approximate location of "The Tanks" listed in the California Volunteer's table. The "Well" is at the West Prong of Waterman Wash and directly across from the location of the later established Butterfield Desert Stage Station. This was an unsuccessful well drilled by Leach's engineers.

LEFT In 1862, for reconnaissance, the California Volunteers made a comprehensive study of distances on the Butterfield Trail.



CLOCKWISE FROM TOP LEFT These historic tanks were used by the Hudson family as a water supply for their small farm-homestead. They are “The Tanks” that Lieutenant-



Colonel West lists in his table of measurements made with an odometer. GOOGLE EARTH. Looking east at the west bank of Tank 1. The trail is to the immediate right. PHOTO G. AHNERT. A military button found near The Tanks and in possession of land owner Bernard O’Neal. Possibly lost by the California Volunteers? PHOTO G. AHNERT.

homestead from 1949 to 1995, where the Montezuma Head Tank and a well-preserved section of trail are located.


As we were standing near Tank 1, Mary, the oldest sister, stated that it was already there when they built the homestead and that they improved it by digging it deeper.

Naomi mentioned that there was a second and third tank a short distance east and northeast of the first tank. This would account for the use of the plural, “The Tanks,” listed in the California Volunteer’s General Orders No. 6. The family would like to preserve this historic site.

These historic tanks are only the third known structures in present-day Arizona that existed during Butterfield’s service.⁹

CONCLUSION

Montezuma Head Tank—“The Tanks”—was located on the Southern Overland Trail by the California Volunteers’ use of an odometer measuring distances from known sites.

The 1869 information for the accuracy of odometers came from a study of distances from the Colorado River to Maricopa Wells. This study adds an important factor for our using data obtained by odometers. 

⁹ The other two are a tank approximately fourteen miles west at the west entrance of Butterfield (Pima) Pass and the ruins of Dagoon Springs Stage Station in Cochise County.

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