



WINTER 2010

LOS ANGELES CORRAL

NUMBER 261

BOTTLE HOUSES

FROM NECESSITY TO ART WORKS

By Mark Hall-Patton



Tom Kelly's famous bottle house in Rhyolite, Nevada, circa 1925
(Courtesy the Author)

In southern Nevada, the desolate desert led to the development of a number of alternatives to standard wooden houses in mining towns. The tent house, easily built and just as easily dismantled and moved to the next great boom, is perhaps the best

known. Tent cities were part and parcel of the boom-and-bust cycle of Western mining communities.

However, enterprising residents often looked for alternatives. Dugouts, where a

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The Branding Iron

Los Angeles Corral of The Westerners

Published Quarterly

Spring – Summer – Fall – Winter

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The Branding Iron is always seeking articles of
2,500 words or less dealing with every phase of the
history of the Old West and California. Contribu-
tions from both members and friends are welcome.

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Editor's Corner . . .

This issue of *The Branding Iron* marks my last as editor. Others may disagree, but I think three years, a dozen issues, and 240 pages is more than enough editorializing for me. Nineteenth century editors sometimes spoke of being perched atop the "editorial tripod" — and it is at times a precarious position.

But I have had lots of support. Abe Hoffman has been a great help to me all along the way. He is one of many Corral members who are devoted to seeing *The Branding Iron* continue to build and grow.

I also appreciate all of the authors who have contributed articles and book reviews over the past three years. One of my goals as editor was to never have to beg for copy. These men and women made that possible.

Now, I look forward to graduating to the role of contributor, and am already working on my next article — are you?

For 2011, *The Branding Iron* will be the work of many hands, with our new Sheriff, Paul Spitzzeri riding herd on the whole crew. Together, we are committed to keeping up our regular, quarterly publication schedule, and by 2012 we expect to see a new editor riding tall in the saddle.

Happy trails!

Phil Brigandi

Bottle Houses . . .

(Continued from Page 1)

November 1979 *Central Nevada's Glorious Past* magazine. She noted:

hole in the ground was covered and used for makeshift housing, or caves in soft cliff faces, were often an alternative. Other houses were made from cans, straw bales, rock or adobe, or any other material which readily came to hand for the enterprising mining camp resident.

One of these alternative forms of construction material has become perhaps best known and certainly most widely imitated through an unlikely series of events. This article looks at the history of that form, the bottle house.

A few years ago, *Branding Iron* editor Phil Brigandi and I were at an E Clampus Vitus "doins" in Beatty, Nevada. We took a short ride over to the site of Bullfrog and Rhyolite, and found ourselves at one point standing by the famous bottle house in Rhyolite. In the course of our conversation we speculated on the history of these houses, and their role in Western landscapes. That speculation led to this article and an interesting tangent in Western popular culture.

The bottle house thrived between 1902 and about 1910 in southern Nevada. It followed the mining booms, with examples found from Tonopah (where it originated), to Goldfield, Rhyolite, Bullfrog, Silver Peak, Round Mountain, and Death Valley itself. After the demise of the southern Nevada mining boom of the early twentieth century, it was revived as a necessary part of mythical Western town amusement parks. From there, bottle houses have been built in many unusual locations that have nothing to do with mining booms.

The first bottle house of which I can find any record was built by William F. Peck in Tonopah, Nevada, about 1902. Tonopah was already known for other unusual houses, including ones made of barrels and empty cans. Peck took the unique a step further, and developed a house made from discarded beer bottles.

Peck's wife, Amanda, wrote about the house in a letter to the *Tonopah Times-Bonanza* in 1966, which was later reprinted in the

At the time we had two children, Mary, seven years, and Wesley, three years of age. We needed a house, and at that time and location lumber was selling at too high a price to make it practical for a working man to use. We were living in a tent on the site of the bottle house. Beer bottles were being dumped out on the desert by saloon keepers, and my husband hired a man with a two-wheeled cart to haul them up to the building site about one-and-a half miles. He paid him a dollar a load.

Water was a real problem. It was \$1.50 a barrel, so we saved water from our washing and also got water from a neighbor who did washing for miners to mix with the soil for mud mortar to put between the bottles for the walls of the house. The bottles were laid with the bottoms out, with the light green ones facing the town and the brown ones facing the hill. The inside of the house was plastered.

We lived in this house, as I remember, approximately nine months.... The house consisted of a bedroom, living room, kitchen, and small back porch. The winter we lived in the house was very cold. Water was delivered to the residents in a tank, and we kept it in a barrel in the kitchen. The water in the neighbors' houses would freeze, but in our bottle house it did not, and we were warm and comfortable.

When we left Tonopah, we did not sell the house. We merely left it....

The house was apparently a success, and it became one of the well-known sites in Tonopah. In a 1904 souvenir album of Tonopah photos, the house is included with the caption "The House that made Tonopah famous." Within a few years of its construction, an addition was added onto the rear of the house.

The fame of Peck's home was such that postcards of the house were widely available, and newspapers and magazines wrote about the wonder. Even *Scientific American* carried an article on the house in 1903. Though

the house was not large, it was big enough to house the small family in much greater comfort than a tent.

An article in *The Sanitarian* magazine from January 1904 gives a good description of the house. Quoting the *Kansas City Star*, it said:

A House of Beer Bottles – Tonopah, Nev., aside from being famed on account of its vast mineral resources, also occupies the unique distinction of numbering among its inhabitants a man who is able to live in a glass house, and throw unlimited quantities of stones at the same time without suffering any of the serious inconveniences popularly supposed to surround such an association. Not a tree grows within sixty miles of the great mining camp, and very naturally building material and fuel bring all sorts of fancy prices, the commonest kind of lumber selling for \$66 per 1,000 feet, while inferior grades of scrub cedar command \$22 a cord. Consequent upon this condition, various subterfuges are resorted to in the architectural makeup of Tonopah. There are houses made of straw; of burlap sacks trimmed with blue jean overalls; of tin from five-gallon oil cans; of dry goods and cracker box lumber; of mud, stone, tents, cloth – in fact almost every sort of contrivance is resorted to as a makeshift for a place of habitation; but it has remained for William F. Peck, a miner, to devise a house in a class by itself. He has constructed of empty beer bottles a house 16 x 20 in the clear, with ceilings 8 feet high, and containing two rooms. It was built in October of last year by Mr. Peck entirely unaided, in such odd moments as he could spare from his regular duties at the mine. Ten thousand empty beer bottles were incorporated in the structure. The inside walls are plastered with mortar, which is spread to a depth sufficient to cover the protruding bottle necks, thus making a smooth surface. Mr. Peck lived all last winter in this peculiar abode with his wife and two children, a girl of seven and a boy of three years, and says, while the temperature in many residences in Tonopah reached the freezing point quite

often, his family found their glass house exceedingly comfortable at all times.

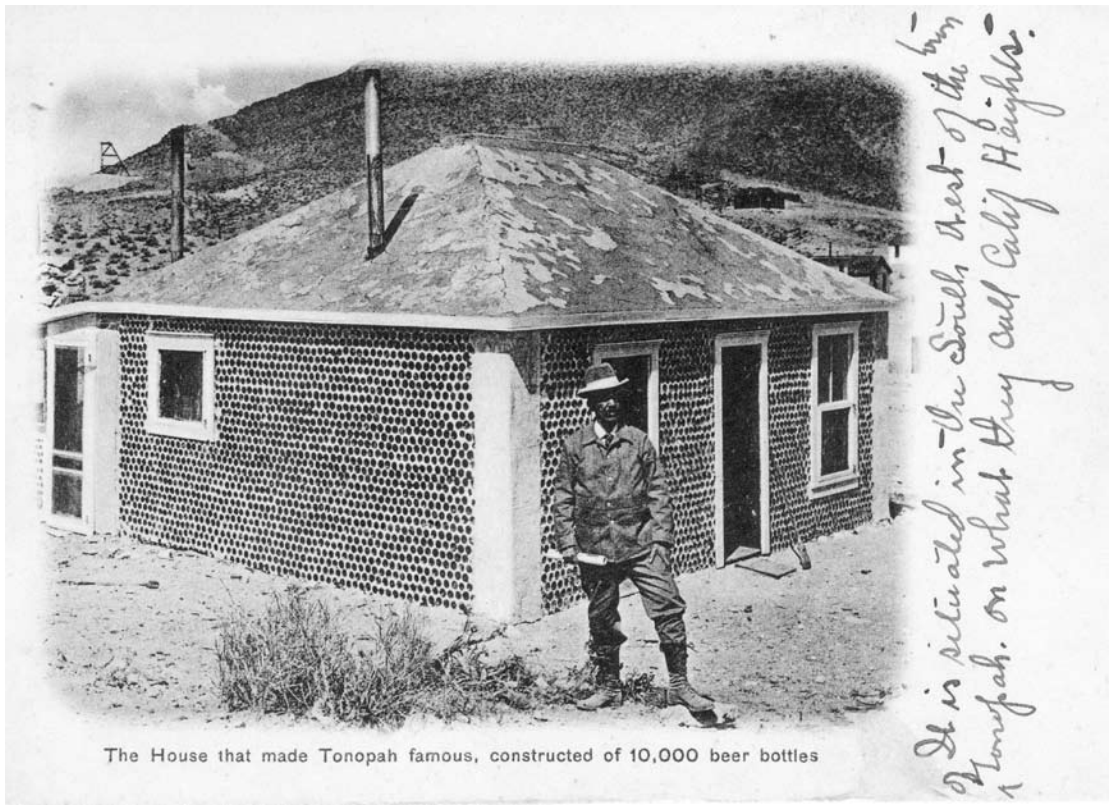
Peck's house was demolished in the early 1980s. Many of the bottles were saved by a local resident I am told, though where they are today is unknown. Bottle house aficionados mourn the loss of the original of this breed.

The fame of Peck's brainchild led to other bottle houses being built in the area. The bottle house provided relative comfort on the desert, with thick walls allowing for warmth in the winter and cool interiors in the summer, not to mention year-round light from the sun through the bottles.

I have found no record of other bottle houses in Tonopah, but in nearby Goldfield the form was tried four times. By 1905, local mining engineer E. A. Byler built a home from the ubiquitous empties provided by local libation establishments. The house still stands across the street and slightly east of the Esmeralda County Courthouse on the main road through Goldfield. Today it is an antique store, and its unique construction materials are readily visible in the exterior walls where the surface plaster has fallen off.

Further to the west on the same road is another bottle house on the other side of the road. In very poor condition, it is also listed in local historical publications as being built in 1905. A third house, now demolished, also existed in Goldfield until relatively recently. Perhaps most interesting, Goldfield also had a bottle foundation for a commercial building near the County Courthouse. This cinderblock building served a few roles, including that of a libations parlor for a time. Who built it and why, I have not been able to discover.

Other bottle structures at this time were built throughout the region. One was a dugout at Stovepipe Wells in Death Valley. This building was an 18' by 12' cellar with bottles used to build up walls on three sides. It was built by James R. Clark, who was working on a road from Bullfrog to Skidoo. The dugout led in later years to the nearby Stovepipe Wells Hotel. The original dugout



A postcard view of the Tonopah bottle house, circa 1908. "How would you like to live in a house like this?" a correspondent has noted on the back. "This town is noted for its different styles for houses."
(Courtesy the Author)

began life as a general store of sorts, and later as a two-bed hotel.

In Silver Peak, Nevada, a building on the main street of town was built from bottles, though its date is uncertain. Most accounts place it, based on the bottles used, at about 1910. At the Berg family ranch at Round Mountain, Nevada, a root cellar was roofed with wood leaving gables on each end. These were filled in with bottles set in mud, providing another dugout bottle house.

Dix Van Dyke, in his reminiscences of Daggett, talks about another bottle house built on the Van Dyke Ranch. Another was built at North Fork, a now abandoned ranching community in Elko County, Nevada. In *The Canadian Magazine* for 1907, there is a reference to a bottle structure on the White Pass Summit near the White Pass & Yukon Railroad tracks. It is described as a house built of empty beer and whiskey bottles, with a canvas roof. This is the most distant example

of the bottle house I have found from the first decade of the twentieth century.

Rhyolite boasted three bottle houses. The first was built by John Wyley, who plastered the exterior of the house. It was a one-room dwelling Wyley occupied with his wife and four children. The Wyley house no longer stands. A second bottle house was another dugout with three-foot tall walls, which has also disappeared. The third, though, lives on.

Of the first wave of bottle houses, the most important after Peck's must be Tom Kelly's Bottle House in Rhyolite. While it was neither the first of its type, nor the only one to be built in Rhyolite, it has probably had the greatest influence on the history and longevity of this particular architectural form. Tom Kelly was a miner in Rhyolite who saw a way to make a dollar. At a time when adobe blocks cost at least \$60 per thousand, and wood 14¢ a running foot, he started building his bottle

house in September 1905, finishing the project in April 1906. He worked with carpenter and shipbuilder David Kennedy. To gather up the bottles, he enlisted local children to bring toy wagons full of bottles to the house site for ten cents a wagonload.

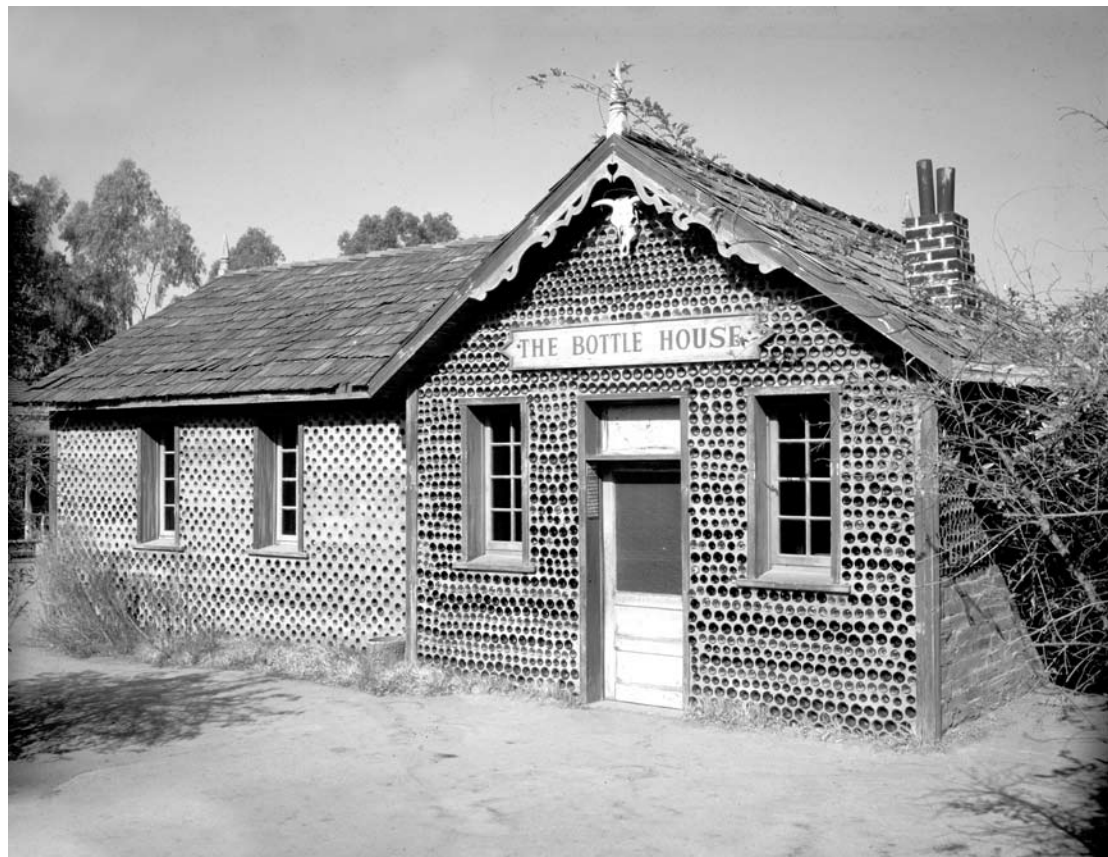
Kelly built his house in order to sell it, but it was not a straight sale. No, Kelly held a raffle. An article in the June 8, 1906 *Bullfrog Miner* described the offering:

Thomas T. Kelly, owner and proprietor of the bottle house, one of the points of local interest, has decided to raffle this unique piece of property in the near future. It has three rooms, is made entirely of bottles, is plastered and papered in the inside, has 10-foot ceilings and is handsomely finished in hard wood. It is valued at \$2,000, and this includes two 30 x 100 foot lots, to which there is a good title.

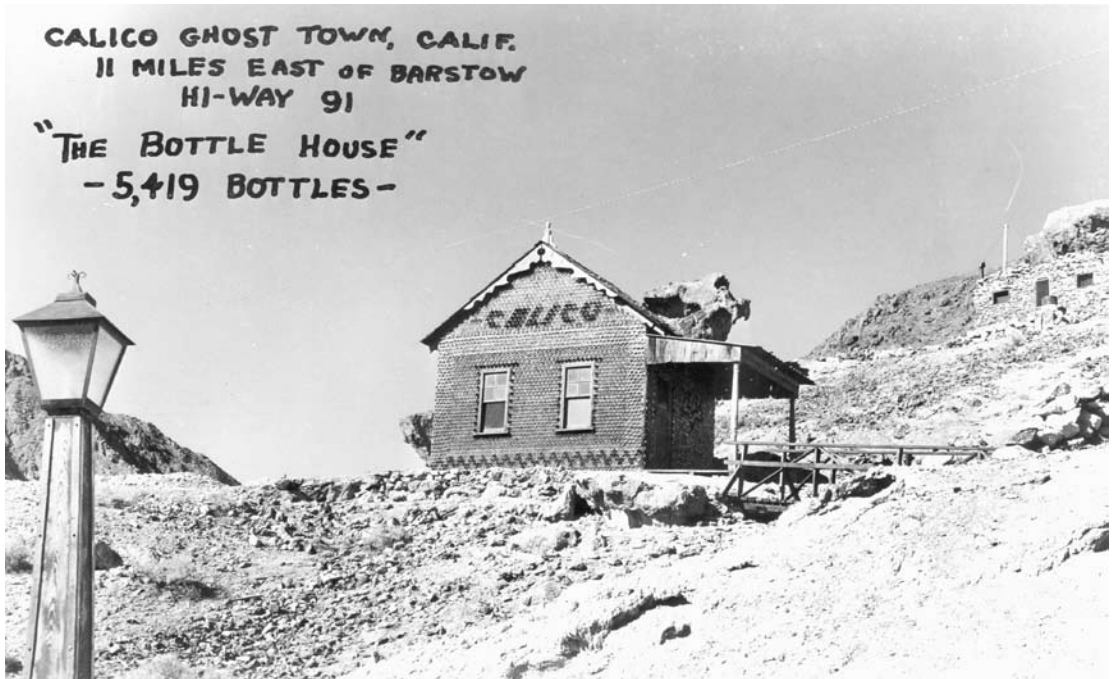
Four hundred tickets will be issued, and they will be dispensed at \$5 each, entitling the purchaser to a chance to a home and a good one for this consideration.

The raffle was successful. Jack and Eva Bennet won the house, and lived there with their first born, Maxine. Jack Bennet was a professional gambler. The family moved on when the boom was over, but the house remained. Kelly also stayed in the area for at least a few years, being noted in a 1910 article in the *Rhyolite Herald* as having three year old producing fruit trees on his property.

The house, in fact, was one of the few still standing in 1925, when a movie company came to the ghost town to film a movie. Sources vary as to which movie was involved, with some saying it was the *Wanderer of the Wasteland* and others claiming it was *The Air Mail*. The latter film starred Douglas



The 1940s bottle house at Knott's Berry Farm was especially inspired by Rhyolite's famed landmark.
(Courtesy the Orange County Archives)



Walter Knott further solidified the fame of the bottle house by adding on to his reconstruction of the old ghost town of Calico in the early 1950s.

(Courtesy the Author)

Fairbanks, Jr., Billie Dove, Mary Brian, and Warner Baxter. Both movies were shot in Rhyolite, but it is more likely the latter which led to the renovation of the Kelly House. Whichever crew it was decided to use the deserted bottle house in the movie, and tore out part of the back wall to film through.

After the end of the filming, the movie company rebuilt the house, filling in the hole in the back wall they had made to film the movie and adding the wood finery to the gables. The house was then deeded by Lewis Murphy, who had been paying taxes on the property, to the Beatty Improvement Association, which then gave Murphy a twenty-year lease for \$1.00 per year. The Murphys lived in the house for a while, and then across the street, selling purpled bottles to tourists brave enough to visit the site. After Murphy's death in 1956, Tommy and Mary Thompson lived in the house. It was Tommy who added the folk art miniature village scene beside the house. After the Thompsons died, their nephew Evan lived in the home.

After Evan's death in 1989, the bottle

house was turned over to the Bureau of Land Management. Spearheaded by interested citizens, the BLM agreed to begin stabilizing the Kelly Bottle House, but announced it did not have the funds to fully restore the building. A group called the Friends of Rhyolite was formed to try to raise funds for the Bottle House. They have successfully raised funds for the building, and overseen restoration efforts.

The Kelly Bottle House became very important as tourism began opening up the desert. For visitors to Death Valley, the ghost town of Rhyolite, and its Bottle House, were on everyone's "must see" list. As its fame was spread by travel guides and newspaper articles, the popular image of the Old West ghost town now required a bottle house to be complete.

This view was solidified when Walter Knott decided to add a bottle house to his Ghost Town in Buena Park, California. Knott's Berry Farm and Ghost Town became the epitome to which all Old West recreated or made up towns aspired. His bottle house

was one of the earliest of the modern wave of bottle houses. The first room was built around 1945. Farm publicity later claimed it was built from 3,082 (mostly champagne) bottles salvaged from Rhyolite, further tying it to the Kelly Bottle House. It still stands as an active part of the park.

The Knott's Ghost Town Bottle house was the most influential after the Kelly house. Many modern bottle house builders modeled their efforts on the Knott's example when building their own. In Wimberley, Texas, an attraction named Pioneer Town had a bottle house built. In Laramie County, Wyoming, J. H. Widholm was inspired by Knott's effort to build a bottle house. Charles Yelten in Forest City, North Carolina, built two based on the Knott's example, starting in 1971.

Knott also had a bottle house built in Calico in 1953, after he began the reconstruction of the desert silver camp. A promotional photo from 1954 claims 5,419 bottles were used. The building never seems to have been occupied, but was only used for decoration. Knott turned the town over to San Bernardino County in 1966, and it is now a county park.

In Pittman, Nevada, a bottle house known by three names – the House of Lost Memories, Parker's Castle, or the Pittman Bottle House – was built sometime in the late 1940s, presumably by someone named Parker. While postcards of the structure exist, I have found no other records of it, and *my* attempts to find the ruins of the site have been, to date, unsuccessful.

Other modern bottle house examples exist throughout the United States, and in surprising locations outside the country. In Kaleva, Michigan, John J. Makinen, Sr. built a bottle house using bottles from his factory, the Northwestern Bottling Works, finishing the building in 1941. He died the next year before he could move into the house. The house is now part of the Kaleva Historical Museum, and is on the National Register of Historic Places.

Another 1941 bottle house was Doc Hope's Bottle House in Hillsville, Virginia. This example was built by Fred Dalton for John "Doc" Hope. It was a three-month project, and is unusual for having the bottlenecks

pointing outward. In inhabited houses, this was never done because of the cacophony the "whistling winds" would cause. Given the number of wine bottles used in its construction, it was nicknamed by locals as the "House of a Thousand Headaches."

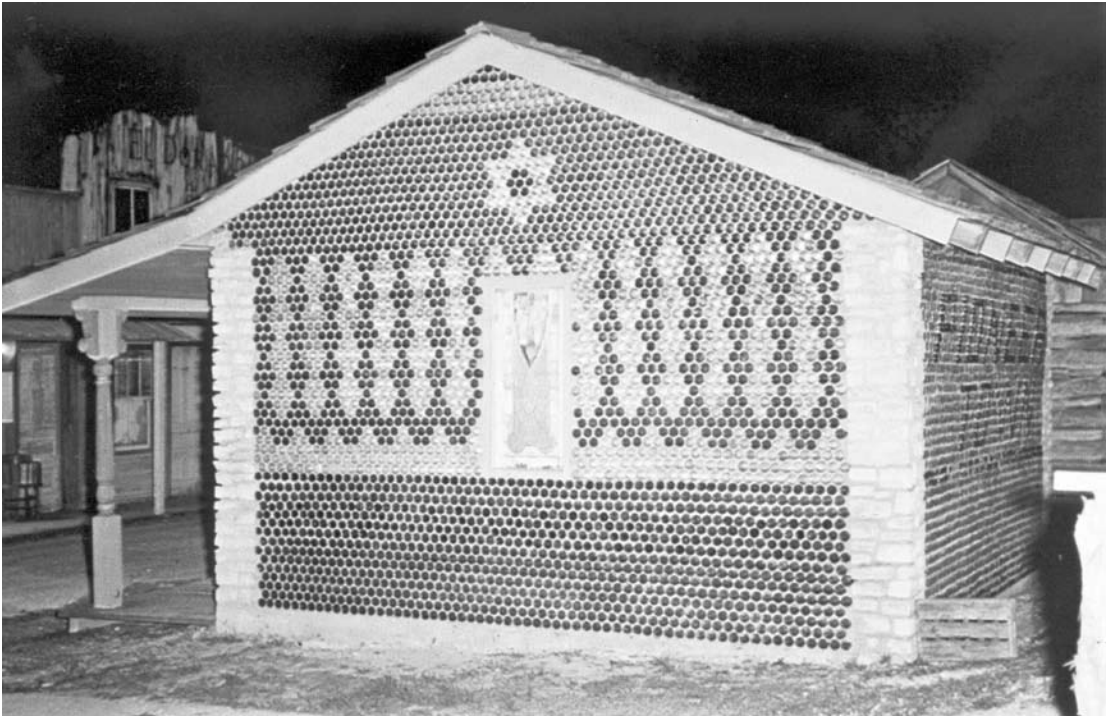
Ohio boasts two bottle constructions. In 1942 a storage shed with a bottle wall was erected at the Boston Hills Pet Memorial Park in Hudson, Ohio. In Washington Court, Ohio, a second bottle house was built as an attraction at a motel named Meyer's Modern Tourist Court. An early postcard notes the builder collected bottles, and used 9,963 in the building of the house.

In Alexandria, Louisiana, the Bottle House Gift Shop was originally a freestanding business. Built by Drew Bridges, who had a pharmacy next door, it included bottles from his business. Built in the 1950s or 1960s, the building still stands in a local home's back yard.

Many others in the United States are individual expressions of art, including Charles Staggs's at Vidor, Texas, Anna's bed and breakfast in Tucson, Arizona, the now-destroyed Rockome in Arcola, Illinois, and Grandma Prisbrey's Bottle Village in the Simi Valley in Los Angeles County.

Grandma Prisbrey's effort, built between 1956 and 1980, was a true folk environment, a personal expression of what she wanted to show off her other collections. Her first glass bottle building was constructed to hold her collection of 17,000 pencils, and she added to her village over the years. This site is in poor condition, because of earthquake damage, though there is a group trying to preserve it. Grandma Prisbrey could also claim to have influenced the building of at least one other bottle village. This is Ross Ward's Tinkertown at Albuquerque, New Mexico.

The bottle house form has also gone international. There are at least three in Canada: one on Prince Edward Island, David Brown's at Boswell, British Columbia (made from embalming bottles), and George Plumb's in Duncan, British Columbia (now destroyed). Two others have been built in Lightning Ridge, Australia. A Buddhist Temple, the Wat Pa Maha Chedi Kaew in



The 1960s bottle house at Pioneer Town in Wimberley, Texas, was clearly inspired by Walter Knott's Calico structure."Built of over 9500 sodawater bottles and lighted from the inside," this postcard view notes, "it glows brilliantly at night."
(Courtesy the Author)

Sisaket Province, Thailand, is completely made of bottles. Queenstown, New Zealand, boasts a bottle house that is a tourist attraction. And the new Market Hall in Altenrhein, Switzerland shows the idea of using bottles in construction continues today.

One company even tried to create a bottle for building. Heineken Beer tried marketing a beer bottle that could be used to build after the contents had been used to advantage. A building on the Heineken Family estate in Noordwijk in Holland was built from the bottles, which according to company lore, were developed based on Alfred Heineken's visit to Curacao in the Caribbean in the 1960s. Seeing many discarded beer bottles, and the need for building materials, he had John Habraken, an architect, come up with a design for a bottle which could double as a brick when empty. Though produced experimentally, they were never issued. The one structure was demolished after Frederick Heineken's death in 2002.

This is not a complete listing of bottle structures. I have found records of at least a dozen more during the course of my research for this article. Early examples all seem to have been based on a lack of building materials, or perhaps an abundance of the particular form of building material used. They are often ignored, with the exception of the few well-known examples such as Rhyolite's or Tonopah's.

The bottle house, as a form, probably originated with Tonopah's William Peck wanting to house his family in 1902, but it has morphed into a great many forms since then. Thanks to a film crew in 1925, one example was rebuilt, leading Walter Knott to conclude he needed one for his Ghost Town. Knott's example led others to conclude they needed a bottle house of their own, and examples began appearing around the world. Artists and architects throughout the world have found the form intriguing, including the great Frederick Hundertwasser, who designed

and gave to the people of Kawakawa, New Zealand, a public restroom which used bottles in its walls for decoration and illumination before his death in 2000.

The bottle house may have been created out of necessity, but it continues to be reinvented into the 21st century. It seems to have been a personal statement from the beginning, and certainly is today. Not bad for a legacy of the mining boom of the southern Nevada desert.

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A bottle house in Goldfield, Nevada, 1907.

(Courtesy the Author)

Mount Wilson, Michelson, and the Fugitive Constant

By Maggie Sharma

The early astronomers on Mount Wilson were cowboys, that is beyond dispute. These mountain men cast their lariats of experimentation into the quiescent atmosphere with the same cunning and skill as their grassland counterparts roped a wayward steer, both eager to capture an elusive quarry. Seekers of lonely places, these unlikely brothers were united by a fierce loyalty to their calling and a knack for subduing the unknown. They both cursed and cherished their harsh environments, defining for all of us the meaning of frontier. Their impact on western history was huge, but with rare exceptions, they wore their distinction lightly.

Chief among the scientists of the early 20th century was Albert Michelson. Originally from Strzelno, Poland, his family immigrated to California in 1855 when Albert was three years old. Albert's father decided to forego the lure of gold and instead bought supplies of picks, shovels, pans, clothing, bedding and stoves that he would sell to the miners at Murphy's Camp.

Albert became a Californian through and through, attending the first public school in Murphy's where he learned the value of a strong body and a disciplined mind. Throughout his life, no matter the honors heaped upon him, he retained a tenaciousness that warded off distractions. Outlaws in Murphy's Camp were publicly hanged; there were no sidewalks, few stores and fewer social pastimes. Albert cherished simplicity and independence but was sometimes misunderstood and disliked when his single-mindedness led him to dismiss others less driven. Michelson joined the U.S. Naval Academy where his interest lay in thermodynamics and optics at which he excelled, but he ranked 25th in seamanship and its practical application. The Superintendent of the Academy reprimanded him. *"If in the future you'd give less attention to*

those scientific things and more to your naval gunnery, there might come a time when you would know enough to be of some service to your country."

Speed of Light Experiment at Annapolis

Michelson developed a life-long fascination with the velocity of light and until he turned his hand to it, there had been only a few attempts to rope in the unruly phenomenon.

Foucault in the 19th century revived a terrestrial system that Galileo had tried in 1667, placing two lanterns on hilltops less than a mile apart. The shutter of one lantern was uncovered and when the operator of the other lantern saw its beam, he uncovered his lantern. Galileo was unable to detect a time lag between flashes and wrote, *"if not instantaneous, it is extraordinarily rapid."*

Michelson decided to replicate the Foucault's method. While the technique was the same – a beam of light shot at a rapidly rotating mirror was reflected back by a more distant mirror – Michelson placed his second mirror at 2,000 feet instead of Foucault's 60 feet. He measured 2,000 feet along the uneven bank of the Severn to within one tenth of an inch. His measurement of light traveling at 186,355 miles per second was printed in the *New York Times* and Michelson became instantly famous for arriving at a figure that was twenty times more accurate than Foucault's. The result was universally accepted and stood for the next forty years, until Michelson decided to redo the experiment on Mount Wilson in California.

Looking For a Medium

Scientists since Aristotle believed that light was propagated via a gaseous medium they named the "luminiferous ether." Michelson was a devout believer that light must be propelled by some means. Water waves had

the medium of water to move across; sound had air; surely if light propagated as a wave, it must have one, too. Michelson decided to observe changes in the speed of light as Earth's direction of travel changed relative to the sun. He designed an interferometer, an ingenious device that projected a narrow beam of light in the direction the earth was traveling. Upon encountering a half-silvered mirror, the beam would split in two, projecting one beam at a right angle to the other. Each beam would travel a different path to a reflecting mirror, and then recombine again at the half-silvered mirror. An observer at a telescope behind the half-silvered mirror would see the beams return and if there were ether, the beams would arrive at slightly different times. To the great surprise and disappointment of Michelson, no such difference occurred. Was it possible that light traveled at the same speed in all directions? Michelson continued to believe that ether would be discovered, even though Einstein had written that the null result of the 1887 Michelson-Morley experiment was one of the foundations of his Theory of Relativity. Eventually Michelson had to yield to the disheartening evidence that ether did not exist. His great friend and founder of the Mount Wilson Observatory, George Ellery Hale, wrote of Michelson: *"He never deviated from an unflinching search for the truth, regardless of personal considerations or life-long convictions."*

In 1907, Michelson was the first American scientist to win a Nobel Prize. It was for his work on optical precision instruments and spectroscopy. From emission and absorption of light from the sun and stars, astronomers were able to understand their makeup and told the world what those distant objects were made of, a seemingly magical feat. Ironically, Michelson had proposed Hale for the Nobel Prize and Hale had put forward Michelson's name. There is continuing debate about who should have won, but as there was and is no prize for astronomy, it went to Michelson the physicist. The probably apocryphal story as to why astronomy was left off the list was said to be due to the glad eye Alfred Nobel's wife cast in the direction of an astronomer!



Albert Michelson acing a billiards game.

The Measure of a Star

Beginning in 1920, Michelson joined the staff of Mount Wilson where he spent three exhilarating months each summer pursuing his interests unimpeded. During that first summer he measured the disk of a large star, Betelgeuse, in Orion, the brightest constellation in the northern sky. His method was brand new. He would use the interference of light waves coming from opposite sides of the star to measure its diameter. Michelson had redesigned his stellar interferometer to be mounted on top of the Hooker 100-inch telescope, giving a greatly enhanced resolving power over the telescope alone. Night after night Michelson toiled painstakingly to move the slits in the apparatus so that the fringes from the incoming beams of light would fade and disappear. That is the moment he would have his diameter. Waiting for dark to fall, the astronomers and Michelson gathered in the billiards room to pass the time. Michelson was a seasoned player prompting astronomer

Alfred Joy to write, *"We all marveled at his superb skill with the cue."*

Hale watched the preliminary observations with interest inducing him to comment that interferometry was the most important astronomical development of the first part of the 20th century. Today on Mount Wilson CHARA, run by Georgia State University, is among the most powerful interferometry systems in the world for studying stars at resolutions not previously available, and the Keck telescopes on Mauna Kea create a formidable array with a resolving power equal to a football field size telescope.

When it came time for Michelson to return to the University of Chicago that fall, he left others at Mount Wilson in charge of taking further readings. On December 13th he got word from Mount Wilson that Betelgeuse's measurement came in at 240 million miles or a distance a little less than the orbit of Mars. Michelson received a cablegram from President Woodward of the Carnegie Institution saying, *"...the result is staggering at first thought. The method you have added to astronomical resources is of the greatest importance..."* Astronomers had expected such a huge diameter but the general public was astounded. Newspapers headlined the finding and the press adulation would have thrilled a rock star. Even other scientists were stunned to learn that Michelson could precisely measure an object 150 light years, or nine hundred trillion miles, from Earth.

Speed of Light Experiment on Mount Wilson

"My greatest inspiration is a challenge to attempt the impossible," wrote Michelson, and at the Mount Wilson Observatory in the summer of 1921 he began preparations to do just that. Einstein first visited the United States that year and the debate was still lively over whether or not the speed of light was constant. Einstein had said so, but was he correct? Sir Oliver Lodge confided to Michelson that he found Einstein's theory *"repugnant to common sense,"* a view that Michelson privately held. Yet when he realized that some of the antipathy to Einstein

came from anti-Semitic views, Michelson was among the first to speak out.

A stone pier to support the rotating mirror was erected on Mount Wilson. The distant reflecting mirror was placed at a site on Mount San Antonio. The route was pock-marked with homes, orange groves, ravines, hills, streams and other immovables, making a precise distance measurement fiendishly difficult. Michelson roped the United States Coast and Geodetic Survey into the tricky task of laying down the baseline, and the resourceful Survey was able to triangulate the deviations to form a theoretically straight line. Fifty meter Invar tapes hung high between portable towers and one obliging homeowner allowed the team to pass the tape through the windows and out the door, maintaining a straight line! When the winds rose and the rains came, work on the line became a nightmare. Often a patch of some length had to be redone but finally the work was completed. When the Survey crew analyzed their results, they announced that Michelson's baseline was 35,385.53 meters long, nearly 22 miles, with an error factor of one seven-millionth of the whole or one quarter of an inch.

Michelson had spent considerable time designing his experiment. For it he wanted a powerful arc lamp, a much too expensive item for him or the Mount Wilson Observatory to provide. Fortunately E.A. Sperry, inventor of the arc lamp, offered an extremely high intensity lamp and Michelson began the painstaking task of preparing the steel or glass rotating mirrors of eight, twelve or sixteen sides. Two years later, he was ready to do preliminary tests of the system.

Just after sunset, before the night wind began, the air between Mount Wilson and Mount San Antonio became still. On the evening of the experiment, tension was palpable as the team started the octagonal mirror spinning aided by an air turbine. They regulated the speed with a tuning fork; the din was frightful and deafening. The scattered light of the strong Sperry arc cast daylight far and wide. While the operators ran the apparatus, Michelson held his breath as the prism picked up speed. He vividly

remembered the first run in his lab when the mirror had exploded. They had thought only the thermometer had burst, but when the team looked at each other, they saw blood trickling down their faces and arms in myriad threadlike streams. They had been sandblasted with glass from the exploding mirror!

By 8 p.m. all eyepieces were focused and the slits adjusted. The tuning fork was warmed up and when the prism began to rotate rapidly, the sides striking the surrounding air sent out a steady shriek into the quiet night. The mountain top was now lit by the eerie violet glow of the Sperry arc. The uncovered prism was only two feet away from the three observers and Michelson felt a tightening in his stomach as he thought of what could happen if the prism exploded. The first observer steadied the prism while Michelson waited, watching for the appearance of the reflected beam. At first the shape was an ill-defined blob, but after about an hour of

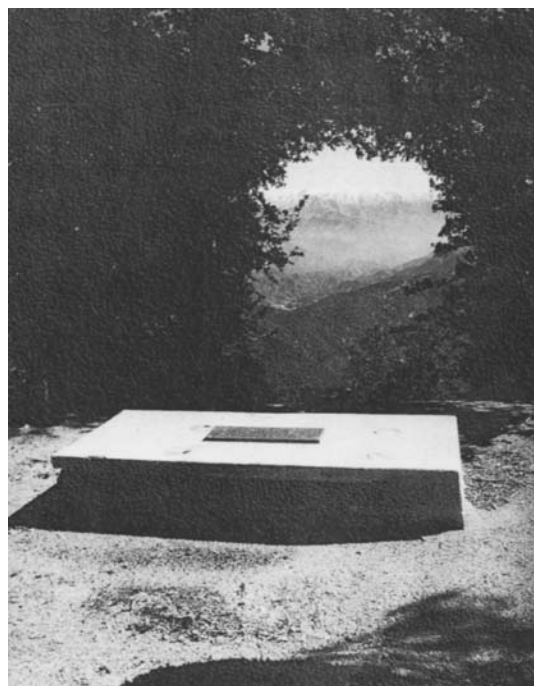
meticulous adjustments, the image became symmetrical.

Over the next two years, Michelson completed five series of measurements including 1,600 separate observations. In 1927 Michelson published his most accurate of these and put the speed of light at 299,796 meters per second, close to the present day speed of 299,792.458 meters per second, a figure that stood the test of time against more modern methods long after his death. It is no wonder that Caltech president Millikan eulogized: *"The whole development of our modern physics is closely related to precision measurements of Albert Abraham Michelson."* Again newspapers catapulted him from his chosen privacy to public hero, but Michelson was not satisfied with the figure and thought he could reduce it further. He turned to Mount San Jacinto, 82 miles away. Once again the Geodetic Survey came to his rescue and took the exacting measurement of the distance, but forest fires raged that year and tests gave poor results. Michelson announced that he would not repeat the experiment in open air but instead would construct a mile long tube from which the air would be evacuated, with no smoke, no weather conditions – a perfectly controlled environment.

The Speed of Light at Irvine Ranch

Michelson had been plagued with recurring bouts of ill health for several years and when Walter Adams, now Director of the Mount Wilson Observatory, urged him to join the staff permanently, he felt relief at the prospect of coming home to California and its fine weather. In June of 1930 the Michelsons moved to Pasadena, eventually settling into a house at 1717 San Pasqual Street. Michelson's wife did not like California life much, declaring it flimsy and without substance. Her husband was thrilled to be back in the state where he grew up and did not miss the seasons or the intellectual climate of the East. The open spaces, the wide skies spoke to him of his childhood where his independence of thought and strength of character first found root.

With Rockefeller and Carnegie money,



"On this pier in 1926 Albert Abraham Michelson measured the velocity of light by means of a beam of light transmitted to Mount San Antonio and reflected back to this station" – plaque on the pier of the rotating mirror.

(Photo courtesy the Mount Wilson Archives)

he was ready to proceed with his *in vacuo* experiment on land that James Irvine Jr. had generously lent to the project. The land was six miles southwest of Santa Ana, with an even terrain varying only a few feet in elevation over the mile. A thirty-six inch steel pipe had been supplied and when everything was in place – the optics, the pump to evacuate the air, the arc light, several rotating mirrors – the experiments began. Light was reflected three times down the length of the pipe giving a distance of six miles. Results were disappointing when fluctuations of up to twelve miles per second occurred. Michelson was too ill to fix the problem, but had he lived, perhaps he would have further refined his Mount Wilson value. Einstein, realizing that the end of Michelson's life was near, paid him a grand compliment at a dinner at Caltech:

"You, my honored Dr. Michelson, began with this work when I was only a little youngster, hardly three feet high. It was you who led the physicists into new paths, and through your marvelous experimental work paved the way for the development of the theory of relativity. You uncovered an insidious defect in the ether theory of light, as it then existed, and stimulated the ideas of H. A. Lorentz and FitzGerald, out of which the special theory of relativity developed. These in turn pointed the way to the general theory of relativity, the theory of gravitation."

Just before Michelson's death, Pease and Pearson of the Mount Wilson staff brought him the latest figure from their continuing experiments at Irvine Ranch. Michelson smiled with pleasure that the work was continuing, but history shows that it was his work on Mount Wilson and Mount San Antonio that produced the most accurate value.

Never let it be said that Southern California's chief fame lies in its amazing sunlit beaches and movies. It was here that one of mankind's most consequential scientific achievements was wrought. Michelson had obtained the one unit of measurement that was the same at the extreme edges of the universe

as on Earth. Knowing the speed of light was crucial to the development of the space program; it is critical for stellar astronomy and interplanetary communication. Harnessing atomic energy sprang directly from Einstein's famous equation which in turn used Michelson's findings. The speed of light connects space and time in the unified structure of spacetime, the crux of our modern understanding of the Universe. It imposes an upper limit to the speed at which energy, matter and information can travel. In astronomy, the fact that more distant objects appear younger than closer ones, due entirely to the finite speed of light, is what allows astronomers to infer the evolution of stars, galaxies and the universe itself. In figuring distances through space, though, light can seem quite slow. Light from the sun takes eight minutes to reach the earth; the astronauts on the moon whose voices are transmitted by radio waves find it takes over a second for their voices to reach Earth; light from Alpha Centauri our nearest star other than the sun takes four and a half years to fall on Earth; starlight from far-flung galaxies can take billions of years to reach us. Michelson in his tireless pursuit of accuracy enabled us to grasp the history, magnificence and possibilities of the universe we inhabit.

Albert Abraham Michelson passed away on May 9, 1931. The hazel-eyed, black-haired, handsome California son had bestowed lasting glory on his state by casting his lariat wide and taming the elusive constant.

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Monthly Roundup . . .



November 2010

Larry Burgess, Director of the A.K. Smiley Public Library in Redlands, shared some of the controversies – past and present – surrounding the Willie Boy Manhunt.

In 1909, a Chemehuevi Indian called Willie Boy shot and killed the father of the girl he loved, touching off one of the last great man-hunts in the West. In the end, the girl was killed (apparently accidentally by the posse) and Willie Boy took his own life.

The story has been told many times over the past century, including in what Burgess terms Harry Lawton's "eminently readable novel," *Willie Boy, A Desert Manhunt* (1960) which was later adapted for the screen as *Tell Them Willie Boy is Here* (1968).

In 1994, Burgess and Dr. James Sandos of the University of Redlands published the results of their own research as *The Hunt for Willie Boy*. Besides contemporary documentation, they spoke with family members, and other Indians, who presented a very different view of the story, including a continuing belief that Willie Boy escaped (despite the fact that the body was photographed, and human bones were later found on the site).

"The mystery still continues," Burgess says, as scholars, descendants of both Willie Boy and the posse members, and others continue to debate the story.



December 2010

Past Sheriff Abe Hoffman returned to the podium to share one of his favorite topics, old time Western films. And for the holiday season, he selected a Christmas story with a Western setting – *The Three Godfathers*.

First published in 1913 by prolific Western writer Peter B. Kyne, the story has been adapted for the screen no less than six times.

In Kyne's book, three outlaws fleeing across the Mojave Desert after a bank robbery, come upon a settler's wife giving birth. She begs them to take care of her child. Two of the robbers die along the way, but the youngest doggedly brings the child to safety, arriving in town on Christmas Day. It is "a story of redemption," according to Hoffman.

The first film version was produced in 1916, and was also the first to take liberties with the plot, tacking on a happy ending. In 1919, it was remade as *Marked Men*, and for the first time a Mexican bandit was added to the gang.

In 1929, it appeared as a talkie, dubbed



Hell's Heroes. "It's my considered opinion that this is the best of the three sound versions," Hoffman said. MGM got a hold of the story in 1936, but made "numerous embellishments" to the story.

The best known film version is 1948's *3 Godfathers*, starring John Wayne. Directed by John Ford (who had directed the 1919 silent version), the film also features Harry Carey, Jr. (whose father had starred in the 1916 film). While the film is "unabashedly sentimental," and "considerably sanitized" from the original novella, it is still "fun to watch," Hoffman admitted.

PASSINGS

John Southworth, a member of our Corral for more than 30 years, passed away in Glendale on November 8, 2010 at the age of 95. A graduate of the Colorado School of Mines, he was especially interested in mines and mining in the Old West. He was active with the Death Valley '49ers for many years, having first visited the valley in 1931. Among his publications are *Death Valley in 1849* (1978), *Spring Break – Desert Style* (1990), and *Pegleg to Date – And Beyond* (1975). He was preceded in death by his wife Helen in 2000, and is survived by his two sons and their families.

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Bill Gold, a 50-year member of our Corral, died last May at age 90. He was a longtime resident of Newport Beach and a lover of the Old West.

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Former Sheriff **Doyce Nunis**, the longtime editor of the Historical Society of Southern California *Quarterly*, passed away on January 22, 2011. His obituary will appear in the next issue of *The Branding Iron*.



FROM OUR FILES

#55 December 1960

"The September meeting of the Los Angeles Corral, following the summer tradition, was held at the home of Dr. Harvey Johnson, in Pasadena. After an afternoon which saw swimming, gabbing, and imbibing the beverages concocted with the medical finesse and precision of Ex-Sheriff Harvey Starr, the gang settled down at twilight to the thick steaks barbecued and served out-of-doors on the spacious grounds of the Johnson home.

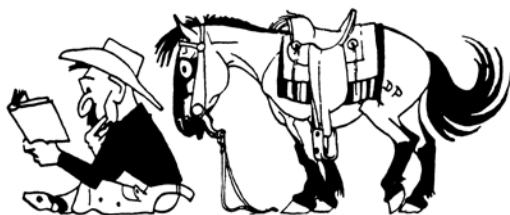
"Ex-Sheriff Carl Dentzel, Director of the Southwest Museum, was speaker of the evening. The long title of his subject, 'The New Decade in the Southwest, Places, Peoples, Problems and Progress,' proved no handicap to the versatile and eloquent Carl."

#162 Winter 1985

"December 1985 Meeting. Corral member Konrad Schrier addressed the Corral on the U.S. Army Field Artillery in the West. Emigrant trains, rail and telegraph lines, and travelers on the trails looked to the Army for protection.... The Field Artillery played a minor role in the Indian Wars, the difficulty of moving the guns presenting an unsolvable problem."

Also in December, "Don Franklin was welcomed as a new Active Member, and Ken Pauley and Joe O'Malley were announced as new Associate Members."

Down the Western Book Trail . . .



A Maritime History of Baja California, by Edward W. Vernon. Santa Barbara: Viejo Press, 2009. 285 pages, maps, illustrations, glossary, bibliography. Cloth, \$49.95. Published in cooperation with the Maritime Museum of San Diego, distribution by University of New Mexico Press. www.bajacaliforniamissions.com.

This is a welcome work on a subject that has had but slight attention in modern times. Aside from publications promoting and emphasizing the spectacular growth of tourist resorts around the cape area of Baja California, not much has been written about the rest of the 2000+ miles of coastline that comprises the physical limits of this unique peninsula. Author Vernon fills in this void by taking the reader back 450 years to the time of the first explorations by Europeans.

Vernon traces the history of the major harbors and anchorages. Weaving a fascinating tale of adventure, risk and danger to rival many a fictional narrative on a similar theme, he rivets the reader's attention to the story. Except his facts are backed up by solid scholarly references and are not fiction. Furthermore, the author's passion for Baja California is apparent to any reader who delves into his narrative carefully. Sad tales of shipwrecks are documented, as well as many more that speak of overcoming challenges and achieving success.

From early attempts to wrest precious pearls and metals from the sea and the land, the author proceeds to describe the struggles to establish the first settlements and first missions. Mainly supported by supplies from the mainland coast of New Spain, these establishments were at the mercy of lengthy and often dangerous Gulf crossings. When the prospect from plunder arose later on, pirates lurked in hidden bays and coves, waiting

for the return of the richly-laden Manila Galleons from the Philippines. Russian, British and American ships exploited the Pacific coast for the "soft gold" of the *nutria marina*, or sea otter. Vernon explains that these creatures were hunted as far south as Bahía Magdalena. Then in mid-19th-century, Boston whalers came and harvested the grey giants in the protected lagoons of the Vizcaino desert. Intricacies of the Mexican-American War as it impacted remote Baja California are detailed, with evacuation of residents whose lives would have been in danger because they liked the idea of being taken over by the United States, but the treaty of Guadalupe Hidalgo declared otherwise.

In this great tome, Vernon has collected archival photographs of many pre-WWI ships, including German and Japanese warships. But the greatest strength of his book are the wonderful illustrations that depict not only the earliest recorded images — whether rough contour maps of coastline, harbor features, etc. — or sketches of Indian families that the first explorers met on these isolated coasts. Often the old images are compared to modern photographs of the same site: the contrast is awesome. The large-size color photos as well as the satellite images add a special dimension to the attractiveness of this work.

A section of the book "Special Ships of Baja California," is of particular interest because Vernon gives details of 19 craft ranging in size from pleasure sail boats to the *SS Sacramento*, a steamer that wrecked itself on a reef south of Bahía del Rosario on 5 December 1872.

A glossary invites the curious reader to note the difference between a *galeón* and a *fragata*, to name just two different categories mentioned. A bibliography includes the author's most frequently used sources. It

provides a foundation to encourage further research on a most engrossing subject.

This reviewer particularly appreciates the author's effort in translating and preserving Spanish nomenclature, even if he comes up short sometimes. The omission of San Felipe in the upper Gulf of California is also puzzling, as it has become an important fishing and tourism center. Perhaps the author's intention was to highlight the lower Colorado River as a gateway to Fort Yuma and the connection from San Francisco in Upper California to the rest of the United States territory. In this context, San Felipe would indeed lose its importance.

— Froy Tiscareño

The Health Seekers of Southern California, 1870-1900, by John E. Baur. San Marino: Huntington Library Press, 1959, 2010. 202 pp. Notes, Bibliography, Index. Paper, \$24.95. Order from Huntington Library Press, 1151 Oxford Road, San Marino, CA 91108; www.huntington.org.

Originally published in 1959, John Baur's *Health Seekers of Southern California* is now available in a paperback edition as the latest entry in the Huntington Library Classic series. Baur's seminal study examined the migration of people with pulmonary diseases, chiefly tuberculosis and asthma, to Southern California in the last third of the 19th century. The cause of tuberculosis was little known at the time, and various remedies remained in vogue well after Robert Koch's identification of the tuberculosis bacillus in 1882. California offered the advantages of temperate climate and lots of sunshine, especially in the southern part of the state. Physicians generally believed that fresh air and sunshine, combined with rest and proper diet, could contribute to a cure from the disease. Tuberculosis was a widespread disease in the 19th century. Until its actual cause was correctly identified, doctors held theories about it that included heredity and environment (miasmatic and fog-bound places).

Southern California boosters, always eager to publicize an image of sunshine and health for the region, initially welcomed people with respiratory illnesses. Baur observes that

while economic factors played their part in the burgeoning invalid industry, Southern California was not necessarily prepared for an influx of patients. Accommodations varied from well-appointed sanitariums to primitive tents and shacks. Quacks did much harm in their claims for nostrums that produced miraculous cures. Baur describes the health resorts, variations on medical treatments (religious faith might help), and the promotions of mineral springs from Napa to Palm Springs. Eventually state and local government took note of the adverse image the invalids created. It was one thing for wealthy clients to come to the Hotel Del Coronado in San Diego, but quite another for paupers who arrived without funds and put a burden on local charities. Baur estimates that as many as 10% of the population in Southern California may have had tuberculosis. Some areas recorded high death rates, the result of people arriving in the last stages of disease, beyond any help that climate might provide. On the other hand, some invalids did find Southern California a rejuvenating place and lived long and prosperous lives, among them Harry Chandler, Charles F. Lummis, Abbot Kinney, and Charlotte Perkins Gilman.

Baur considers the effect of climate on invalids a qualified success, not only for medical reasons but for the economic contribution of thousands of health seekers who came to California hoping to be cured of their ailments. Businesses generally profited from promoting Southern California's climate. "In the case of the pioneer health seekers, willing to adapt to their new western home, it meant more than the mere existence they sought," concludes Baur. "Southern California offered them a freer life and a broader likelihood to build up a promising region as part of the American future" (p. 179).

At age fifty Baur's study, based in large part on resources at the Huntington Library, holds up very well. Professor Robert G. Frank Jr. provides a new introduction to this edition in which he creates a broader context for the problem of tuberculosis and its treatment. He also includes a selected bibliography of books written since Baur's was first published.

— Abraham Hoffman

The Los Angeles International Air Meet, by Kenneth E. Pauley and the Dominguez Rancho Adobe Museum. Charleston, SC: Arcadia Publishing, 2009. 128 pp. Illustrations. Paper, \$21.99. Order from Arcadia Publishing, (800) 313-2665; www.arcadiapublishing.com.

Commemorating the 100th anniversary of the Los Angeles International Air Meet held at Dominguez Field, January 11-20, 1910, Ken Pauley and the Dominguez Rancho Adobe Museum here offer a pictorial account of that pioneering event in aviation history. It may seem unusual to credit a museum with co-authorship, but Pauley is very generous in acknowledging the assistance he received from the museum in producing the book. Pauley takes us back to 1910 and the preparations, events, and side shows that attracted thousands of people to see what Hollywood would later call "those magnificent men in their flying machines."

This book is part of a series put out by Arcadia Publishing on "Images of Aviation." I have reviewed several other Arcadia books and found they generally keep text to an absolute minimum. Pauley is a bit more successful in dealing with this editorial restriction. He has introductory comments at the start of the book's seven chapters, and he makes the most of the opportunity to write detailed captions for the photographs. Pauley also arranged the pictures so that while the book proceeds chronologically, there are also sequential photographs that provide vignettes of the adventures — and misadventures — of the participants and their aeroplanes, dirigibles, and balloons.

The Los Angeles air meet was not the first in the world. That honor went to Rheims, France, where an exhibition was held in 1909. The second meet, at Los Angeles, included veterans of the first one such as Louis Paulhan and Glenn H. Curtiss. Other aviators included Charles Hamilton and Charles F. Willard; dirigible operators Roy Knabenshue and Lincoln Beachey; and Charles B. Harmon and his hydrogen-filled balloon. Conspicuous by their absence were Wilbur and Orville Wright who were so consumed with the possibility of patent infringements that

they relinquished leadership and technological improvements to French manufacturers and aviators. Pauley notes that this explains why so many aeronautical terms such as *aileron* and *fuselage*, in common use today, are French terms.

The events at Dominguez Field made for a ten-day week, with each day given a unique name — Aviation Day, Los Angeles Day, San Diego Day, Ladies Day, etc. Aviators competed for prize money in such categories as speed, endurance and time, shortest distance takeoff, quickest time takeoff, and other competitions. Balloons and dirigibles got no prize money. There were a few crackups, but no one was seriously injured. The aircraft presented an astonishing and imaginative assortment of designs and avionic theories. The pictures well testify to everyone at the meet having a good time, as you will have in enjoying this book.

— Abraham Hoffman