State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary # ______
HRI # ______

Page of ***NRHP Status Code** a7

***Resource Name or #** (Assigned by recorder) _ Mountain Quarries Railroad Bridge

P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** X **Unrestricted** ***a. County** _El Dorado and Placer

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** ______ **Date** ______ **T** ___; **R** ___; ___ ¼ **of Sec** ___; ______ **B.M.**

c. Address _No Street address, downstream from the State Highway 49 Bridge over the NF American River, El Dorado/Pacer County Line City Auburn Zip_ 95603

d. UTM: (give more than one for large and/or linear resources) Zone 10 ;672099.7595939488 mE/ 4309480.83139016 mN/ Zone 10 667182.0625280924 mE/ 4306004.903229949 mN/

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The Mountain Quarries Railroad Bridge was a very early use of reinforced concrete in railroad bridge construction and the largest such railroad bridge in California and the largest of its type owned by a private concern in the nation, at the time it was built in 1912.

The bridge was designed by John B. Leonard, who would become one of California's most renowned pioneers in the design, engineering and promotion of the use of reinforced concrete in California and the nation. Leonard would eventually design over forty-five reinforced concrete bridges and another twenty-five or more reinforced concrete buildings. This was Leonard's first design of a reinforced concrete railroad bridge. It is the only remaining example of a reinforced concrete railroad bridge designed by Leonard.

The bridge design of the Mountain Quarries Railroad Bridge was the earliest form of concrete bridge construction known as the closed spandrel arch bridge. In this form, the closed spandrel arch portion of the bridge includes a solid barrel of concrete reinforced with 1.5 inch twisted steel bars for the arch itself and the vertical sidewalls or spandrel walls. The abutments and piers were formed in a similar manner with the thickness of the concrete box being 18". The cavities created by the spandrel, abutment and pier walls were filled with material, which in the case of the Mountain Quarries Railroad Bridge was sand and gravel. Finally, the top portion of the bridge roadbed was poured with more reinforced concrete. This portion was also hollow on top and filled with sand topped by limestone.

The significance of the Mountain Quarries Railroad Bridge was recognized at the time it was built. Shortly after it was completed, two different engineering articles were published detailing and emphasizing the design and construction of the bridge.

The Mountain Quarries Railroad Bridge listed on the National Register of Historic Places on February 11, 2004 (National Register #04000014).
http://www.nationalregisterofhistoricplaces.com/CA/Placer/state.html

It was designated as an American Society of Civil Engineers (ASCE) Local Landmark in 1976 and is currently under review to be designated an ASCE State Landmark.

Continued on DPR 523L Continuation Sheet, Section P3a

***P3b. Resource Attributes:** (List attributes and codes) HP 19 Bridge, AH 7 Roads/trails/railroad grades

✓ ***P4. Resources Present:** Building X☐ Structure ☐ Object Site District ☐ Element of District ☐ Other (Isolates, etc.)

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Primary # ______
HRI # ______

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***Resource Name or #** (Assigned by recorder) _ Mountain Quarries Railroad Bridge

See 523L Attachment #3 - Photos

P5b. Description of Photo: (View, date, accession #)
See Attached 523L - #3

***P6. Date Constructed/Age and Sources:**
☐X Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
US Bureau of Reclamation
Attn: Dan Holsapple
7794 Folsom Dam Road
Folsom, CA 95630

***P8. Recorded by:** (Name, affiliation, address)
Hal Hall, President
Placer County Historical Foundation
P.O.Box 3193
Bowman, CA 95604-3193

***P9. Date Recorded:** October 24, 2012

***P10. Survey Type:** (Describe) California Historical Landmark Nomination

B1. Historic Name: Mountain Quarries Railroad Bridge
B2. Common Name: No Hands Bridge B3. Original Use: Railroad Bridge B4. Present Use: Pedestrian, equestrian, hiking trail ***B5. Architectural Style:** Closed spandrel arch reinforced concrete railroad bridge.
***B6. Construction History:** (Construction date, alterations, and date of alterations) Constructed 1912, repairs to East pier in 1996

***B7. Moved?** X **No Yes Unknown Date:** ______ **Original Location:**
***B8. Related Features:**
B9a. Architect: John B. Leonard, architect and engineer b. Builder: Duncanson & Harrelson
***B10. Significance: Theme** Railroad transportation **Area** North American River and Highway 49
Period of Significance Railroad 1910 to 1942 **Property Type** Railroad Bridge **Applicable Criteria**

Landmark – Largest reinforced concrete railroad bridge in California at the time it was completed in 1912, designed by a renowned master concrete engineer and designer John B. Leonard.

._____(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Mountain Quarries Railroad (MQRR) Bridge

- MQRR Bridge was designed by a renowned master concrete engineer and designer John B. Leonard. It is the only existing example of a railroad bridge designed by Leonard. (*Building Bridges for the 20th Century*, *California History Magazine*, Fall, 1984.)
- The MQRR Bridge was "A relatively rare early use of the material [concrete] in railroading, the bridge was designed to carry the largest locomotive of the day, as well as cars laden with limestone…" (*Building Bridges for the 20th Century*, *California History Magazine*, Fall, 1984.)
- MQRR Bridge was the largest reinforced concrete railroad bridge in California at the time it was built.
- MQRR Bridge was the "Longest span concrete arch bridge for railroad traffic owned by private capitol" at the time it was constructed. (*Railway Engineering and Maintenance of Way Magazine*, Dec. 1913).
- MQRR Bridge was listed on the National Register of Historic Places on February, 11, 2004.

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Primary # ____
HRI # ____

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*NRHP Status Code ____ a7 ____

*Resource Name or # (Assigned by recorder) _ Mountain Quarries Railroad Bridge

B11. Additional Resource Attributes: (List attributes and codes) **HP 19 Bridge**

***B12. References:** See DPR 523L Continuation Sheet for References **See Continuation Sheet #2**

B13. Remarks:

***B14. Evaluator:**

***Date of Evaluation:**

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

See sketch map on DPR 523 K

CONTINUATION SHEET #1 - Section P3a

John Buck Leonard

(Condensed from the Historic American Engineering Record - Chili Bar Bridge, 1993)

John Buck Leonard was the youngest of three children, born to Joseph C. and Martha (Haynes) Leonard in Union City, Michigan in 1864. After an education in Union City schools, Leonard studied engineering at Michigan State, Illinois University and the University of Michigan. In 1888, he travelled to Los Angeles where he gained a position in that city's Engineering Department. In 1889, he moved north to San Francisco, the city that was to be his home for the rest of his life.

During the early 1890s, Leonard worked for several engineering firms as a civil engineer. In 1897 to 1899, Leonard opened his own business in concrete and artificial stone contracting. In 1904, he opened his own office as a consulting civil engineer.

In May 1905, Leonard's letterhead proclaimed his work to be "Reinforced Concrete and Structural Steel". In 1905, Leonard won a competition for his first reinforced concrete bridge. He was retained to execute the engineering design for what was billed as the largest reinforced concrete building in the world. Perhaps most important was the beginning of publication in May 1905 of Architect and Engineer of California. From 1905 to 1912, Leonard was the magazine's Associate Editor for Reinforced Concrete. Thus, simultaneous events found Leonard achieving recognition of his design skills as evidenced by his commissions, acquiring a lucrative marketing agency, and gaining a vehicle in which to expound his views as a proponent of reinforced concrete, on building code revision, on building inspection and in which to illustrate his own designs.

Leonard gained his first reinforced concrete bridge commission to design a new bridge across the Truckee River in Reno. The bridge, virtually unmodified today, was erected in 1905 as a two-span, filled-spandrel arch, originally carrying two traffic lanes, two sidewalks, and a center streetcar track. Illustrative of Leonard's subsequent bridges, even in this first example the gracefully proportioned arch rings spring to a remarkably thin section at the crown. Moreover, in keeping with the bridge's urban setting, Leonard chose Beaux-Arts detailing in the form of decorative railing and lighting elements.

Shortly thereafter, Leonard had three commissions: the San Joaquin River Bridge at Pollasky near Fresno, the Dry Creek Bridge at Modesto and the Stanislaus River Bridge at Ripon. These San Joaquin Valley bridges demonstrated well Leonard's competence of design and his daring use of a technology and material in which he so strongly believed. The Pollasky Bridge incorporated ten 75-foot spans in a stately march across the bed of the San Joaquin River; and while individual span length was less than at Reno, its composite length made Pollasky the longest reinforced concrete bridge in the United States at that time. At Dry Creek and Ripon, Leonard's designs were noteworthy for their individual span lengths, 112 and 110 feet respectively, with the Ripon Bridge employing two spans.

At this same time, Los Angeles architect Charles Whittlesey engaged Leonard to prepare the engineering design for his Temple Auditorium in Los Angeles. Whittlesey, never overly modest with regard to his own work, termed the structure "...in some respects, the most remarkable building ever erected of this material." Reinforced concrete is used throughout the nine-story building. Leonard's engineering provided reinforced concrete girders up to 42 feet in length, carrying a concentrated center load of 100 tons each. However, it was in the design of the auditorium itself that Leonard excelled. This space then the largest theater west of Chicago measured 165 by 110 feet and seated 3,500 with provision for seating an additional 1,500 for special events. In order to provide the best possible sight lines, Leonard carried the auditorium's enormous balcony on huge reinforced concrete cantilevers, so that there were no supporting columns to obstruct from seats on the main floor below. Moreover, to cover the auditorium Leonard designed a reinforced concrete roof carried on reinforced concrete trusses having a clear span of 110 feet.

On May 11, 1906, they published a notice in Bay Area newspapers calling a meeting of engineers to "...intelligently observe and analyze the structural effects (of) the recent earthquake and fire...for exchange of

Resource Name or # (Assigned by recorder) Mountain Quarries Mine, Bridge and Railroad Grade

***Recorded by** *Date ☐ Continuation ☐ Update

data...to lead to, a concert of opinion as to future practice." The group, 100 strong, met on May 17, 1906 to form the influential Structural Association of San Francisco. This organization eventually included most engineers, architects, builders and contractors in the Bay Area. The stated purpose of the Association was "...investigation and discussion of earthquake and fire phenomena in San Francisco, and the formulation of conclusions as to the manner in which the best types of building construction should be modified to conform to these observations." Subsequently, Leonard was appointed to head the Subcommittee on Reinforced Concrete, and to membership on the Executive Committee. These appointments were proof of Leonardo personal and professional standing with his peers.

In addition to his role with the Structural Association, the Board of Trustees of Stanford University retained Leonard, along with engineer John D. Galloway and architect Henry A. Schulze to inspect earthquake damage to the University and to recommend the best means of reconstruction to provide an earthquake and fire proof campus. This was yet another tribute to Leonard's professional status, as Stanford's engineering faculty and school were second only to the University of California within the state.

The post-earthquake period in San Francisco produced a hiatus in Leonard's bridgework as the engineer found his services in great demand for building design. By September 1907, Leonard had undertaken the reinforced concrete design for more than a score of San Francisco buildings. In the design of at least two of these buildings, Leonard found himself in association with leading architects. In 1906, he executed the design of the Sheldon Building, one of San Francisco's first large reinforced concrete buildings. The structure, with a terra cotta exterior, was built in 1907 and was the produce of architect Benjamin G. McDougall, himself an important early user of reinforced concrete. Also in 1906, Leonard handled the engineering of the MacDonough Estate Building for architect William Curlett. This seven-story structure, whose facade was finished in a stucco mixture of marble dust, cement and sand, was completed in less than six months, attesting to Leonard's claims of the ability of reinforced concrete to provide the investor a completed structure more quickly than any other material

Leonard's building designs in 1906 also appeared outside San Francisco. In Oakland, he again teamed with McDougall in the design of the Hotel St. Mark. This nine-story building of eclectic design provided the engineer with yet another chance to highlight the design and construction possibilities of reinforced concrete. Leonard chose flat slab design with supporting beams between columns in order to facilitate rapid construction. Careful placement of reinforcing provided all-important monolithic continuity to the structure. Leonard also successfully handled such design difficulties as a spiral stairway to the basement and a circular stairway to the orchestra balcony, both executed in reinforced concrete. The building, whose reinforced concrete construction was selected as a result of the earthquake and fire in San Francisco, was hailed as combining "...aesthetic appearance and excellence of design with stability of construction."

In Salinas, the owners of the Ford and Sanborn Department Store chose Leonard to design a building to replace their earthquake-damaged store. The building was designed by Leonard, and its straightforward, unornamented use of reinforced concrete exterior and unobstructed, spacious interior marks an early awareness of the potential of the material to express its own characteristics. The unadorned, planar surfaced, broken only by the broad display windows marks a design well ahead of its time, presaging the International Style.

Around 1905, Leonard was at the forefront of his profession in the field of reinforced concrete in California. A foreword to one of his articles termed him "...the coast's foremost authority on reinforced concrete construction."

Leonard embarked upon another facet of his consulting career, this time as engineer for the Western Inspection Bureau. This role brought Leonard into contact with still more major architects, making them aware of the engineer's skills and versatility, and reinforcing Leonard's belief of the need for close interaction and cooperation between architect, engineer and contractor.

At this same time, Leonard took advantage of opportunities to speak to architects and other audiences apart from his San Francisco colleagues. Attending the 15th Annual Irrigation Congress in Sacramento in 1907, Leonard was interviewed by the staff of the Sacramento Union, who introduced him to readers as "...one of the best known authorities on the Pacific Coast in reinforced concrete..."

The hiatus in Leonard's bridgework ended in late 1907 as the engineer, his reputation boosted by his building design and publication work, found time to return to the structures that remained his prime interest. He quickly undertook a number of commissions, designing a pair of bridges that were built in San Luis Obispo in 1909. The same period saw him win a competition for a group of five bridges in Ross, Marin County, and for another bridge in nearby San Anselmo. As at Reno, he used Beaux-Arts detailing to produce bridges quite in keeping with the architecture of what was, even then, an exclusive suburb of San Francisco. It was at this time that he designed the Gianella Bridge, one of only two steel bridges that can be credited to him.

The year 1911 climaxed Leonard's design work with the filled spandrel arch bridge. Fernbridge crosses the Eel River south of Eureka in northwestern California with seven 200-foot spans. Monolithic abutments aid it in withstanding heavy winter runoff and the battering-ram effects of large logs washed away from upstream mills. Similarly, each of the bridge's massive piers is founded on 250 piles and pier cutwaters shaped like ships' prows reduce stream restriction and deflect debris. Since its construction, Fernbridge has met the river on its own terms. In 1955 and 1964, when the Eel and its tributaries destroyed many newer bridges upstream and obliterated entire towns, Fernbridge stood as if an extension of the bedrock itself. Indeed, during the 1964 floods, water level was almost up to the deck and a large jam of debris lodged against the upstream side of the structure. With the bridge vibrating from the current and from repeated blows of debris, workers resorted to dynamiting the jam. Fernbridge survived both debris and dynamite, and continues to carry traffic today* It has been designated a National Historic Civil Engineering Landmark by the American Society of Civil Engineers.

In 1911, he completed a reinforced concrete railroad bridge design across the American River near Auburn for the Mountain Quarries Company. The structure, designed to carry the largest locomotives of the day as well as cars laden with limestone, is composed of three 140-foot spans towering above the river. Due to the engineering difficulties inherent in the restricted canyon site, the bridge had to be skewed rather than crossing the stream at the preferred right angle. Leonard met the requirement with a bridge that proved to be fully twenty percent cheaper than a steel structure designed for the same site. Like Fernbridge, the Mountain Quarries Bridge was designed for permanence. With its tracks removed during World War II, the bridge has stood unmaintained in quiet abandonment. Yet, in the 1960s, it was pressed into emergency service as a vehicular bridge when floods washed out the highway bridge a few hundred yards upstream.

Also in 1911, Leonard met the requirements of civic officials of the Oakland suburb of Piedmont, who wanted a bridge out of the ordinary. For the second time Leonard retained a consulting architect, this time Oakland architect Albert A. Farr. The collaborative result was a bridge far more architectonic than any other Leonard designed. To the graceful 130-foot arch of Leonard's design, Farr added details to give the town a bridge in the Mission Revival style, then at its height. Tile-roofed pylons at each end of the structure featured ornamental lights, while intermediate kiosks, supported by concrete columns and capped "...in the regulation manner with Spanish S tile...," provided shelter for pedestrians. Corbelled arches carried sidewalks along the bridge's flanks.

In 1913, Leonard and junior partner W.P. Day published *The Concrete Bridge*. In it, they reiterated all of Leonard's arguments for concrete bridges and invited inquiries from their readers. In addition to economy and strength, the book stressed other qualities that served to make the reinforced concrete bridge desirable. Aesthetically, it offered "...conformity with environment...pleasing outline and appropriate use of ornament..." And beautiful bridges," Leonard wrote, "...are a sure indication of a progressive community." The use of California products—cement, sand, gravel and reinforcing steel— negated the often-lengthy wait for Eastern materials associated with steel bridges. Of course, Leonard also addressed the need for careful and competent design. Profusely illustrating Leonard's bridges, and in the tradition of a builder's catalog, the book represented a unique step for a consulting engineer to have taken and underscores Leonard's drive and salesmanship for his products and services.

Leonard at this time began designing "Canticrete" bridges. Essentially, the "Canticrete" bridge utilized a cantilever steel truss to provide sidewall and floor substructure. Steel reinforcing bars were placed following erection of the truss and the entire structure was then encased in concrete. The cantilever was self-supporting during construction, keeping falsework and its attendant costs to a minimum. Due to the strength of the truss, less reinforcing steel was required, and sidewalls and floor could be thinner in section, using less concrete.

Records indicate that Leonard designed at least eleven "Canticrete" bridges between 1914 and 1921. Of this number, only three remain, one each in Monterey, Yuba and Stanislaus counties. After 1921, Leonard returned to more conventional reinforced concrete bridge designs.

In 1921, Leonard undertook yet another project that was to have great impact on California transportation. Aware of tests proposed in Illinois and Virginia by the U.S. Bureau of Public Roads, Leonard approached W.E. Creed, President of Columbia Steel Company at Pittsburg, California. Leonard proposed to build a concrete test highway to study types and thicknesses of concrete surfaces, reinforcement and adobe soil subgrades peculiar to California. The result was a 1,371-foot oval, 18 feet wide, utilizing 13 sections of various types of concrete pavements. Initially the only direct government involvement was the supplying, by the State, of 40 surplus trucks. Four tunnels under the track contained instrumentation devised by Leonard to record slab flexure. By the time the tests ended in 1922 after two seasons, the trucks had rolled the equivalent of 80 continuous days, subjecting the highway to an accumulated load of 7.36 million tons. The results of the test were provided to the California Department of Public Works in an exhaustive illustrated report. The agency put the data to immediate use, and Leonard's project is credited with giving California's highway program its first great impetus on its way to becoming, by the 1960s, the acknowledged finest such system in the world.

Between 1921 and 1926, Leonard prepared designs for at least nine bridges, of which six were built between 1922 and 1925. In 1921, he designed a three-span open spandrel arch bridge to cross the Russian River at Healdsburg, marking his first use of the fully open spandrel type. Leonard designed a three-span open spandrel bridge at Chili Bar on the American River near Placerville the same year. With its longest span measuring only 114 feet, the Chili Bar Bridge was not noteworthy in terms of scale. Yet the open spandrel design, lighter in feeling than that of the earlier bridges, represented a refinement of the aesthetics long espoused by Leonard.

Humboldt County turned to Leonard for a series of five bridges in the rugged Van Duzen River canyon. The first two were built in 1922 at Upper and Lower Blue Slide. Two-span open spandrel arches, they had span lengths of 207 feet. Like the Chili Bar Bridge, these structures traversed their setting gracefully, respecting it without overwhelming it, recalling Leonard*s notion of "conformity with environment," The fine proportions seen in all of Leonard's designs reached maturity here. Leonard built the remaining bridges over the Van Duzen in 1925. Two of these bridges were totally unique among all of Leonard's designs. These were the bridges erected at the Upper and Lower Blackburn Grade Cutoff. With the road virtually at river level at these points of crossing, the use of a deck arch was not practicable. Such a design would have meant arching the deck to allow sufficient stream clearance and flow beneath the bridge. This in turn would have produced an unacceptable vertical curve in the deck resulting in lack of sight distance for the motorist—a hazardous situation. Leonard thus chose a design that carried the roadway between gracefully soaring arch ribs. Instead of being supported from below, the deck was suspended from the arch above. Again, the engineer provided a suitable engineering solution while meeting his principles of bridge aesthetics.

The mid-1920s were a busy period in Leonard's career. In addition to marking the culmination of his bridgework, the period also saw him return to the position of Associate Editor for Reinforced Concrete for Architect and Engineer in 1924. Now the main thrust of his attention was given over to inspection.

Leonard's continuing efforts to improve codes and inspection, as well as his high professional standing, did not go unnoticed. In February 1928, San Francisco City Engineer M.M. O'Shaughnessy sent a letter to Mayor James ("Sunny Jim") Rolph recommending Leonard's is appointment as the city's chief building inspector. O'Shaughnessy stated, "He ranks highly as a structural engineer." On May 17, 1928, the Board of Public Works appointed Leonard to the position of Chief Building Inspector. When he retired in August 1934 at age 70, Architect and Engineer noted he had served the city well.

While his retirement years found Leonard generally removed from an active design role, he remained active in an advocacy role, continuing to pursue and support code and inspection improvements and improved interdisciplinary relations. In 1928, he had become involved in a movement to establish a California Uniform Building Code. This was undertaken by the California Development Association (later the California Chamber of Commerce).The aim was to standardize materials and construction and to foster sound building statewide, and to eliminate the plethora of divergent municipal laws. When the draft was ready in mid-1933, Leonard had become Vice-Chairman of the Executive Committee on Building Code Revision. The following year he was appointed Chairman of the Building Code Committee of the Structural Engineers Association of Northern California, a group he had helped to found in 1930 to establish high standards for the profession and to seek professional licensing for engineers in California. He continued to hold the Association's post until the Code was ready for adoption in 1937.

Finally, Leonard's last known work was in 1942 when, probably due to a wartime shortage of engineers, he designed buildings for United Engineering Company in Alameda.

John Buck Leonard died in San Francisco on February 16, 1945 at 81 years of age. His legacy includes 47 known bridges designed throughout California (and Nevada), all but three of which were of reinforced concrete, as well as more than a score of reinforced concrete buildings. His aesthetic precepts, set forth in The Concrete Bridge and in his other writings, had influenced State bridge design, while his test highway work had formed the basis for the development of the state highway system. His was a legacy also of improved building codes and regulations, design principles and interdisciplinary cooperation. He had helped lead California from the traditional building practices and casual regulations of the 19th century into the innovative technology and codified practices of the 20th century.

CONTINUATION SHEET #2

Section B12 -References

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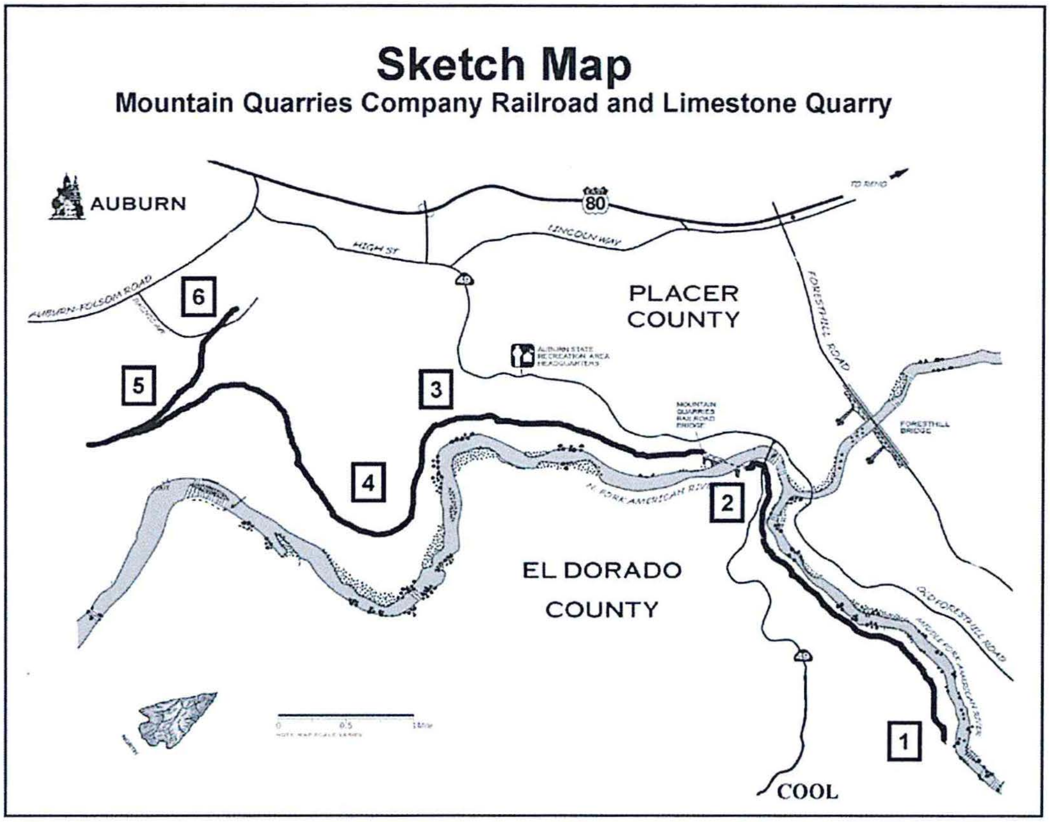
Other Sources – Miscellaneous
- Articles of Incorporation of Mountain Quarries Company, dated August 8, 1910, Secretary of State, Sacramento, California.

State of California X The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI#
Trinomial

Page 1 **of** 1 **Resource Name or #** (Assigned by recorder) Mountain Quarries Railroad Bridge
***Drawn by:** Mike Lynch ***Date of map:** July 9, 2012

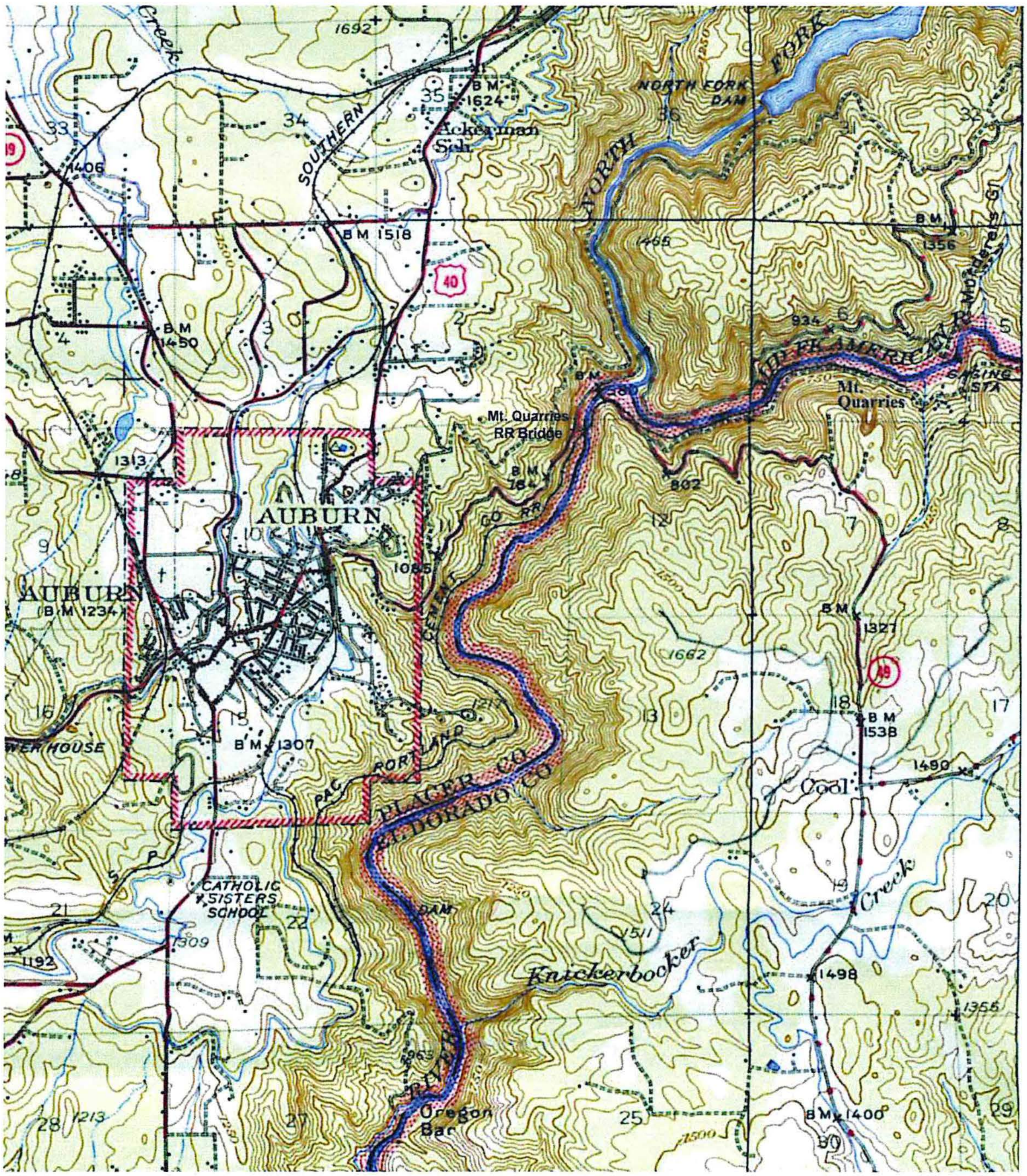


Route of MQRR

1 Mine, quarry and crushing plant
2 Concrete RR Bridge
3 Eagle Rock Water Station on RR
4 Trestles along RR
5 Twin Trestles on RR
6 Flint Station on SP Main Line

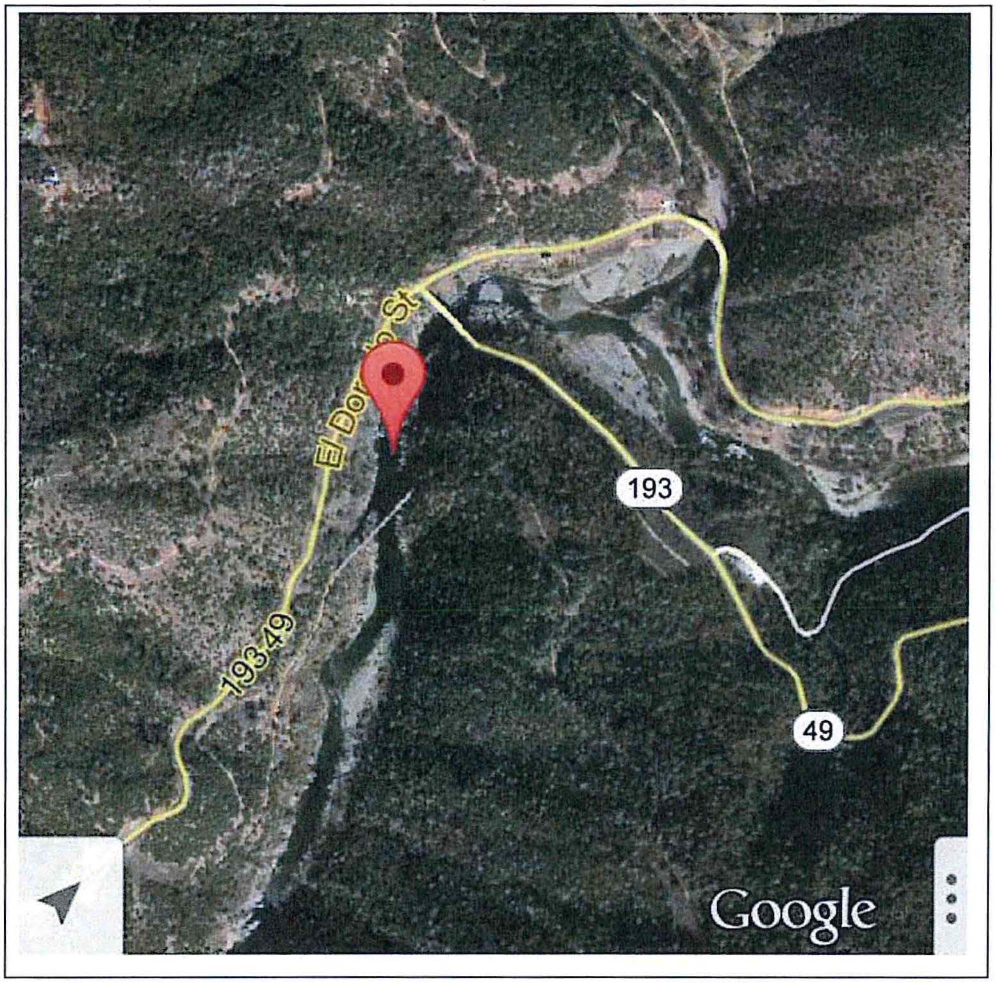
NOTE: Include bar scale and north arrow.

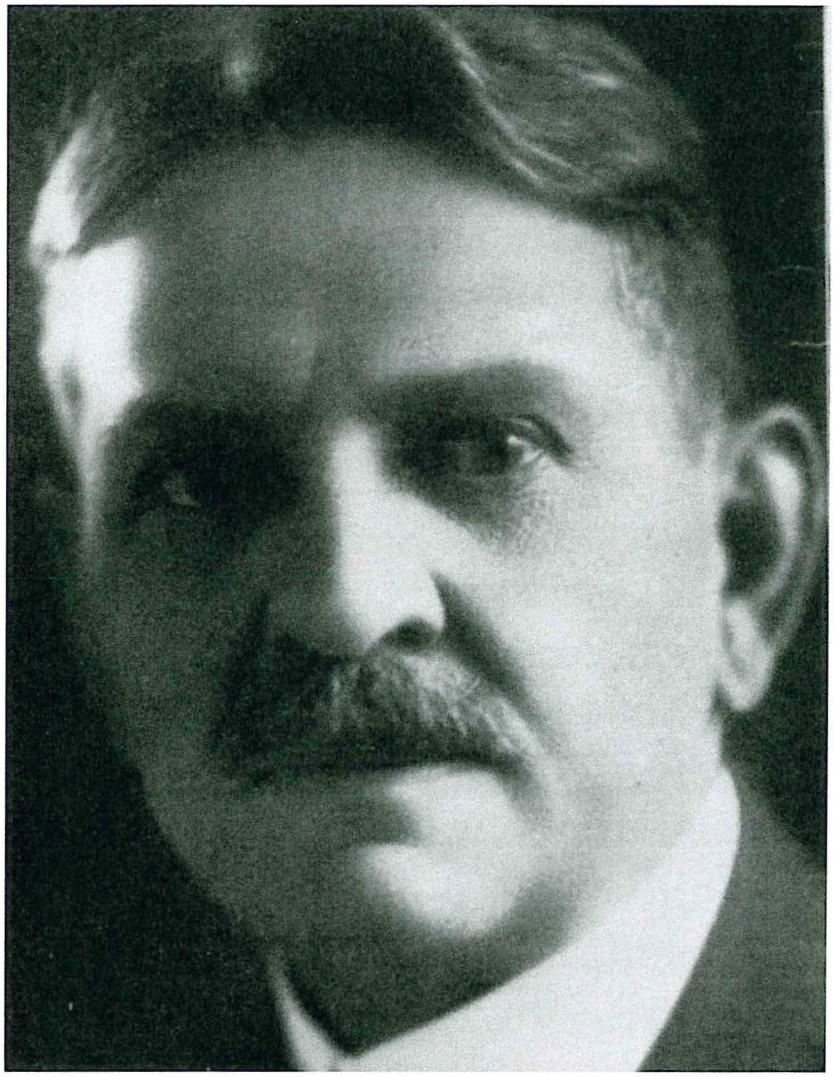
Mountain Quarries Railroad & Bridge



1944 Topo Map - Mt. Quarries RR is marked Pacific Portland Cement RR

Satellite View of Location of Mt. Quarries RR Bridge





John B. Leonard

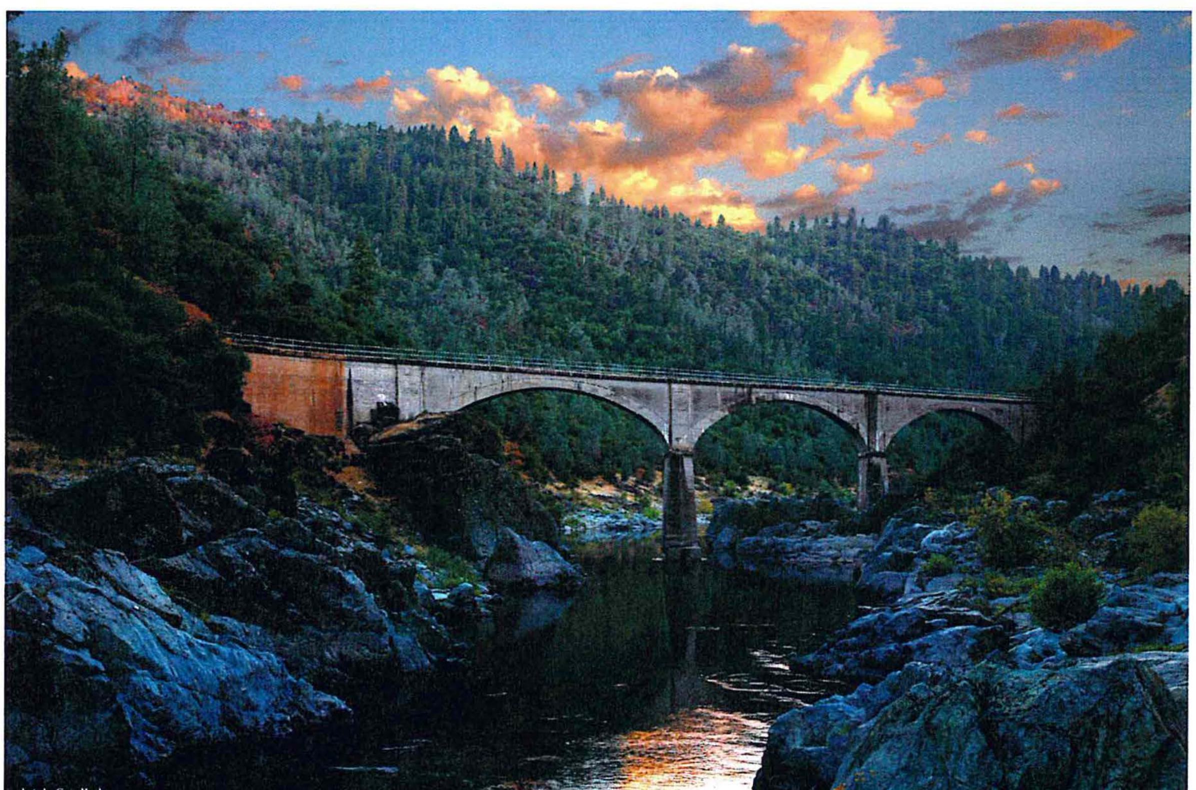
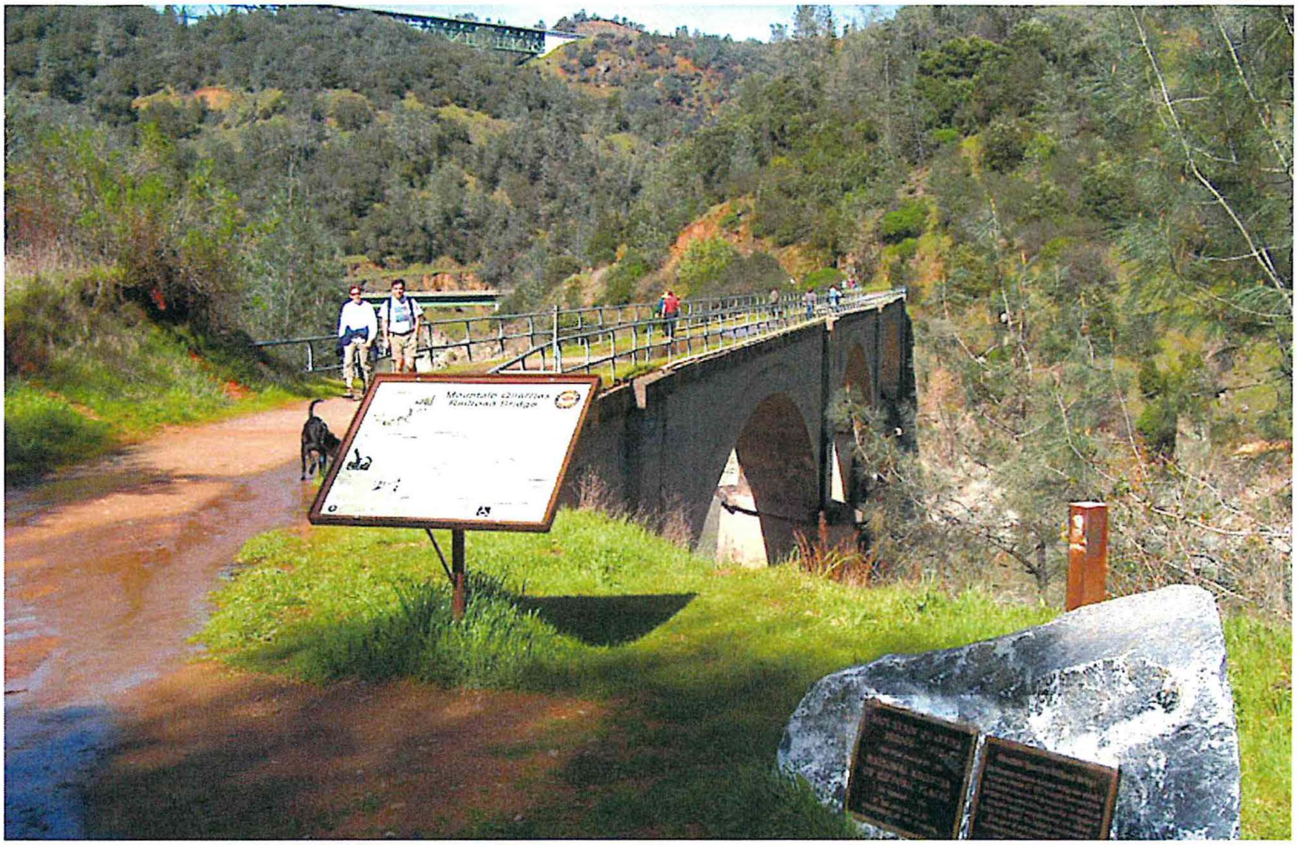
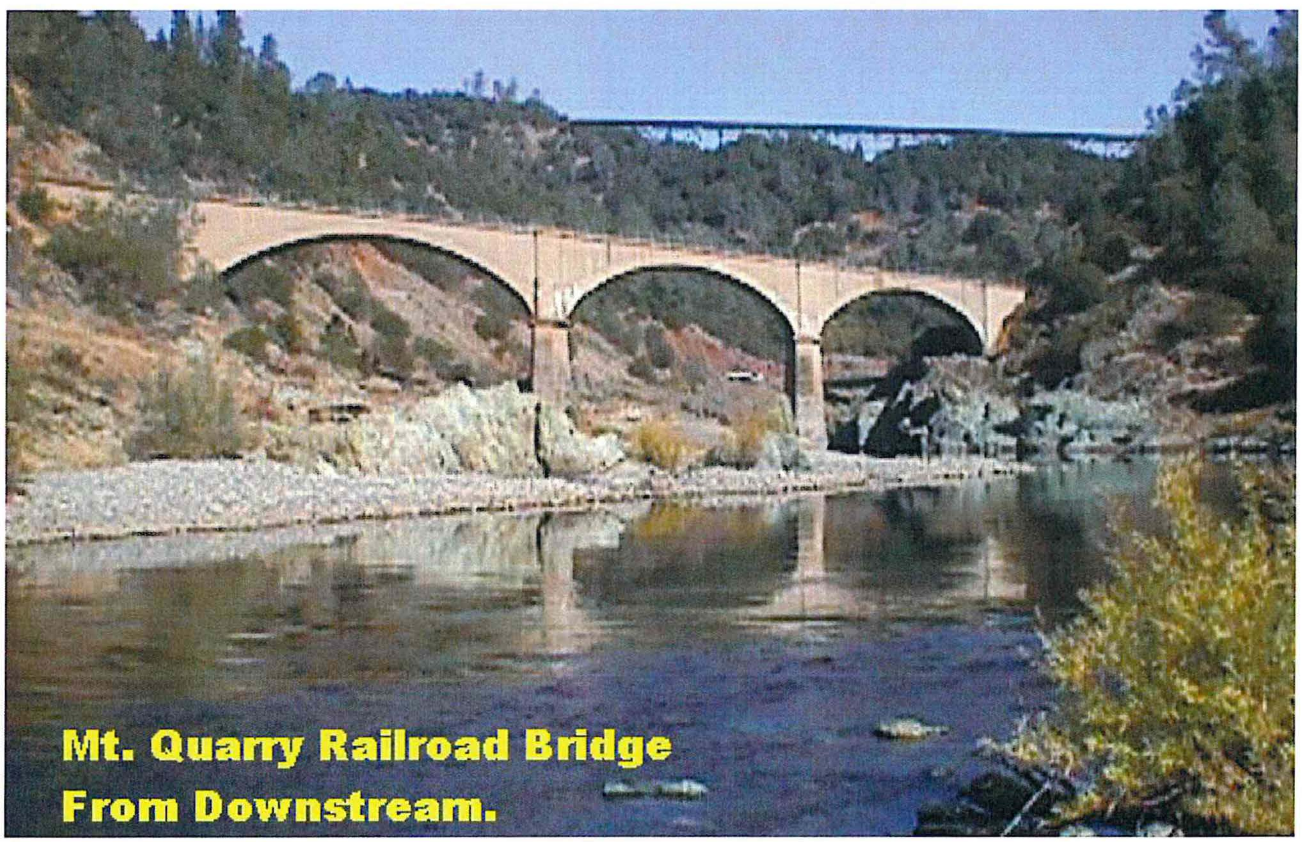
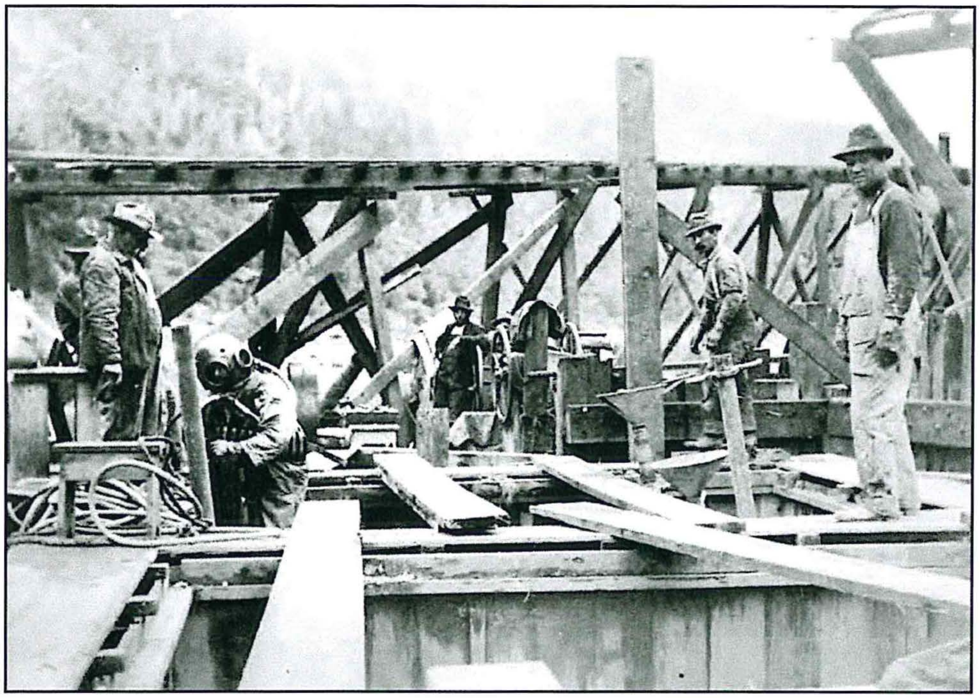


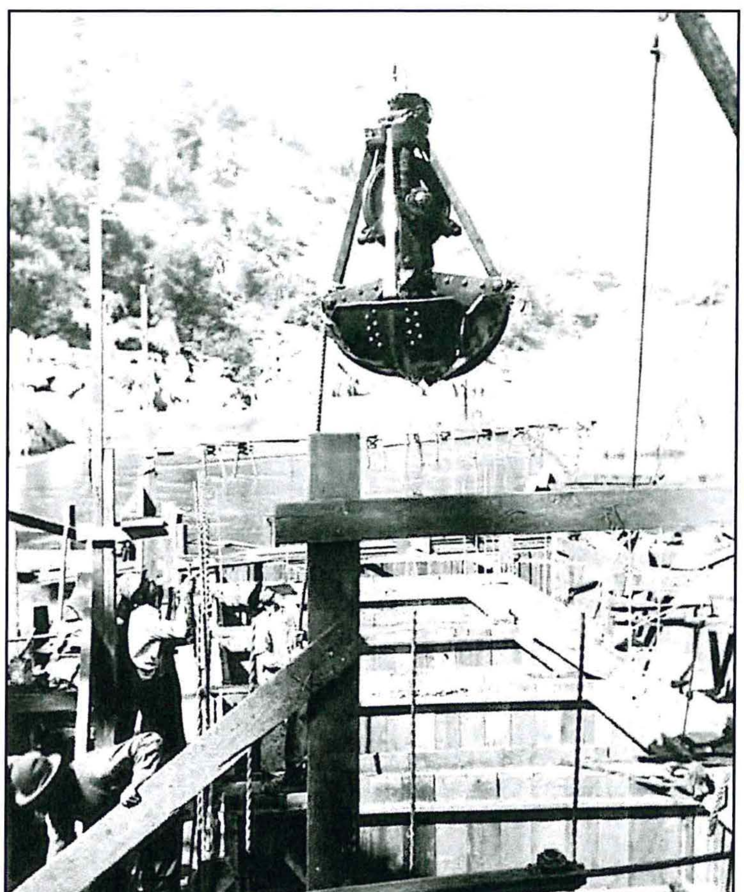
photo by Gary Hughes



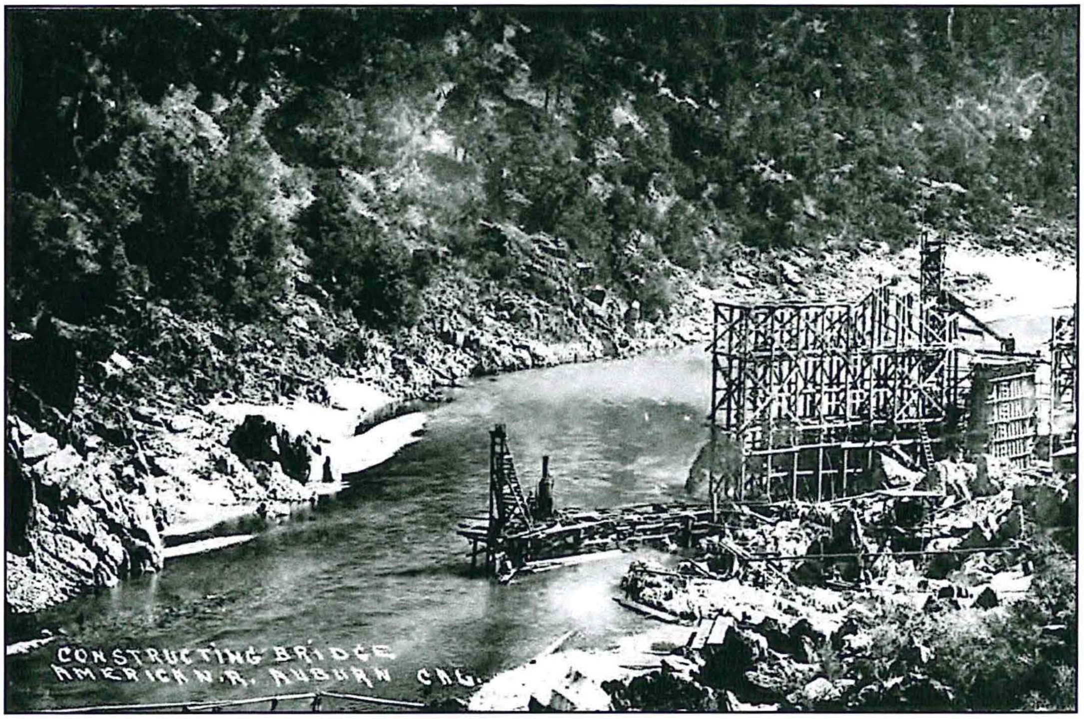

Mt. Quarry Railroad Bridge
From Downstream.



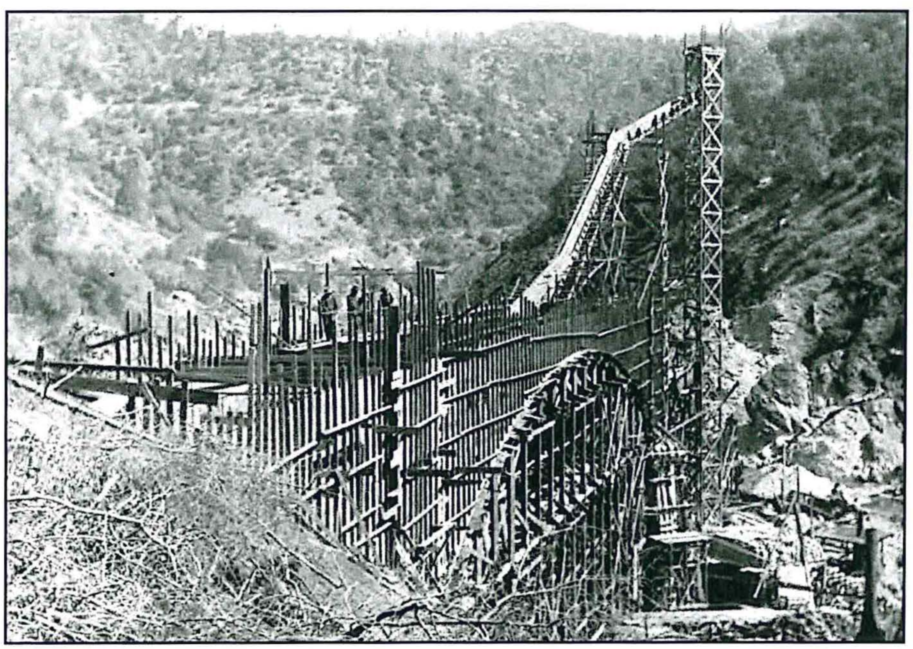
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_016
A hard-hat diver was used in the construction of the Mountain Quarries Railroad Bridge. After reaching bedrock, the diver went down and cleaned the rock. Concrete was then poured to create a solid base for the pier. The bridge piers were not solid but built of hollow concrete boxes formed 18" thick and then filled with 1/8" to 3" uncrushed rock. The forms were poured with concrete in 3-4 foot layers. (Courtesy of the California State Railroad Museum.)



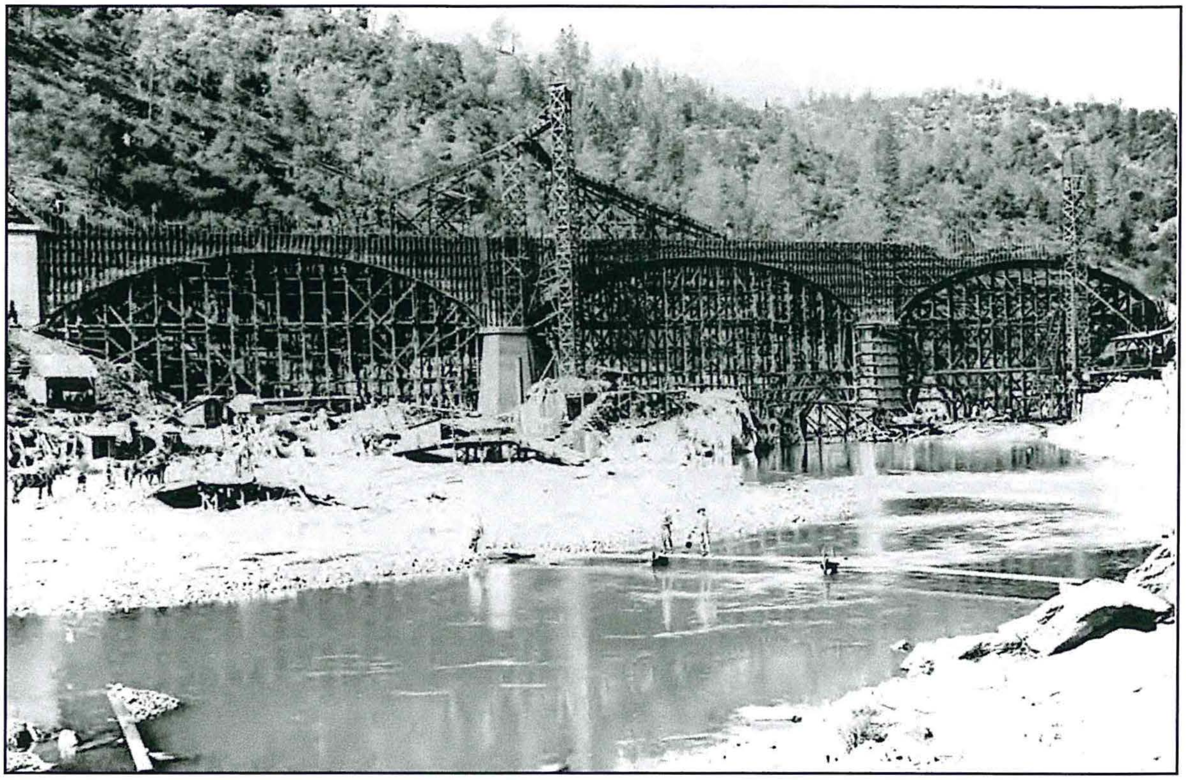
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_017
A clam shell bucket was used to clean out the 18" thick concrete form. After the concrete base was completed, the bucket was used to fill the form with gravel and rock from the river. You can see workers are installing the 1.5" twisted steel bars used to strengthen the concrete. (Courtesy of the California Railroad Museum.)



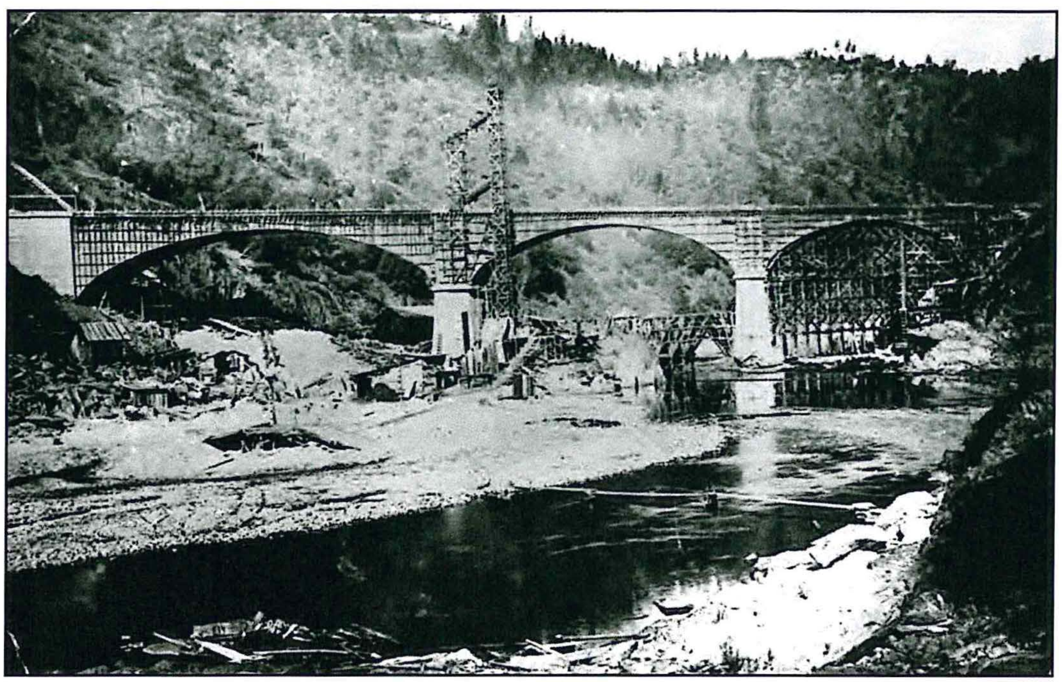
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_018
Work on the Mountain Quarries Railroad Bridge began in 1910. It was constructed by Duncanson & Harrelson Company. The bridge was designed by bridge engineer John "Buck" Leonard. Leonard designed not only this bridge but also many others including the Fern Bridge on the Eel River, which was the largest concrete bridge in the US in 1911. Leonard left a legacy of having designed and engineered more than 40 concrete bridges. (Courtesy of Arthur Sommers.)



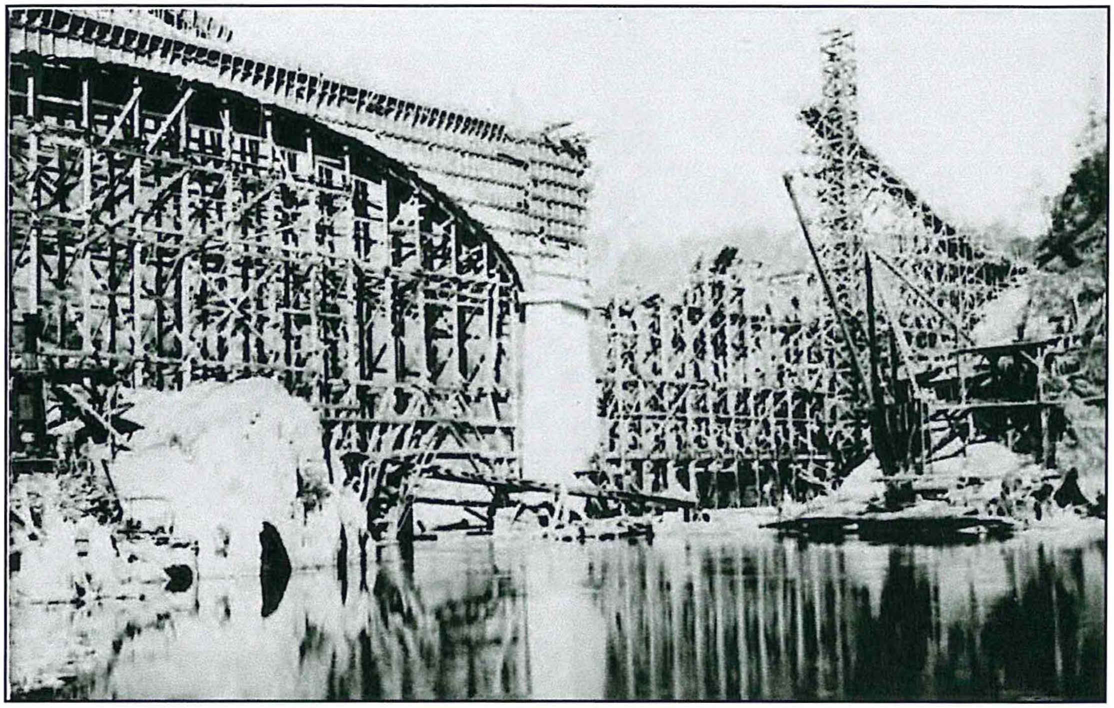
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_019
The construction of the Mountain Quarries Railroad Bridge began on the Placer County side working across the river to El Dorado County. Temporary buildings were constructed along the riverbank to house workers and supplies. At the height of construction, a reported 300 men were working on the bridge. The ramp and the tall tower in the photograph were for the delivery of concrete to the site. (Courtesy of J.L. Johnson Photography.)



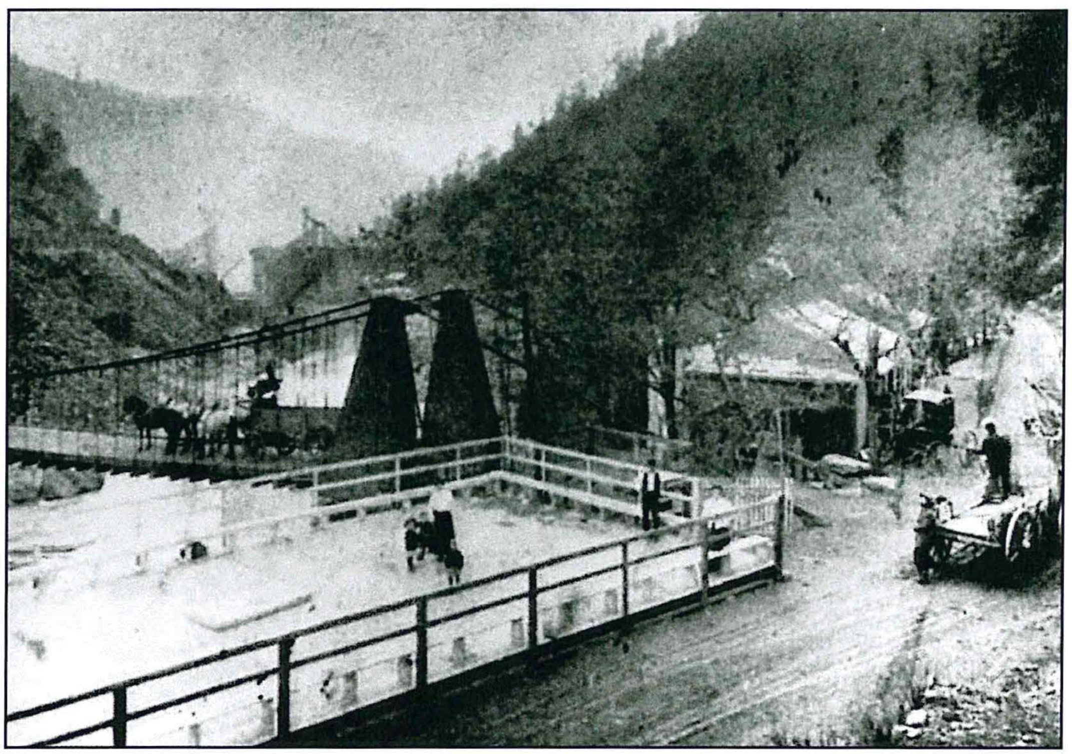
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_024
The bridge under construction in 1911 shows the extensive 8" by 8" wood posts needed to support the forms. The large tower in the middle of the bridge was for delivery of the mixed concrete. The 140 foot arches were hollow and later filled with crushed limestone. The railroad bed on the bridge was filled with sand and topped with limestone then ties and track were laid down. (Courtesy of Donna Howell.)



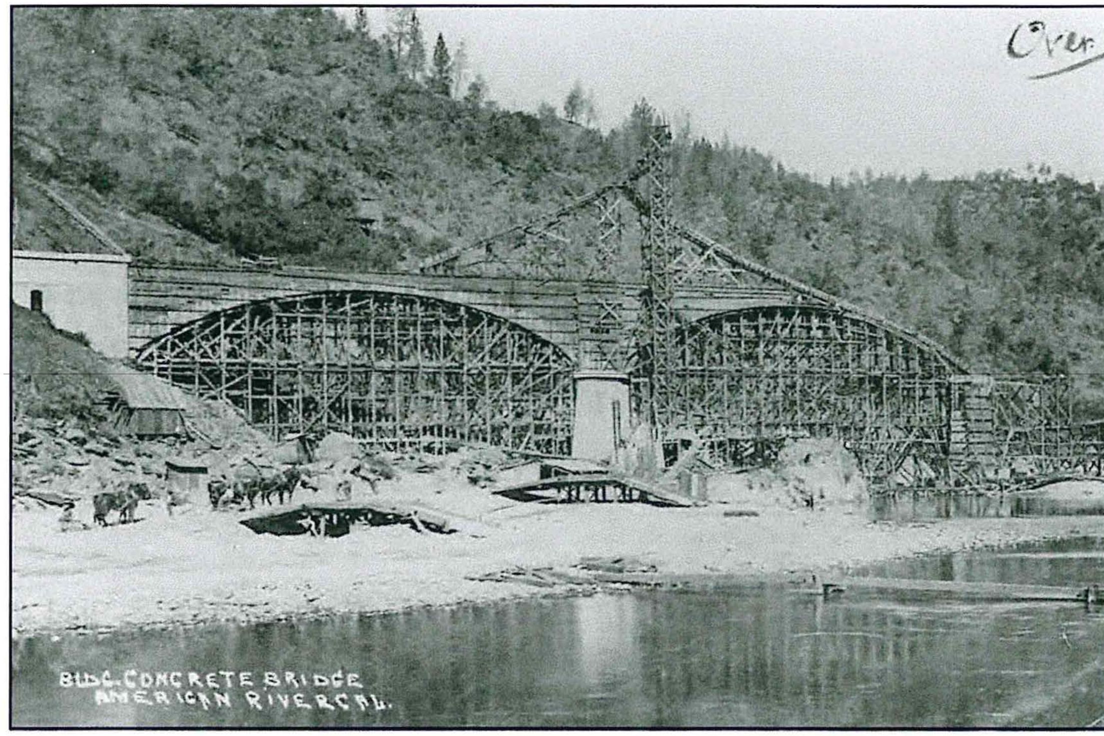
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_025
This is the nearly completed Mountain Quarries Railroad Bridge in early 1912. The bridge was part of the seven-mile standard-gauge railroad that started at the Mountain Quarries in El Dorado County and ended at Flint Station near Auburn. The rail line was built to haul limestone from the quarry. The temporary construction buildings in this photograph were removed shortly after the bridge was completed. (Courtesy of J.L. Johnson Photography.)



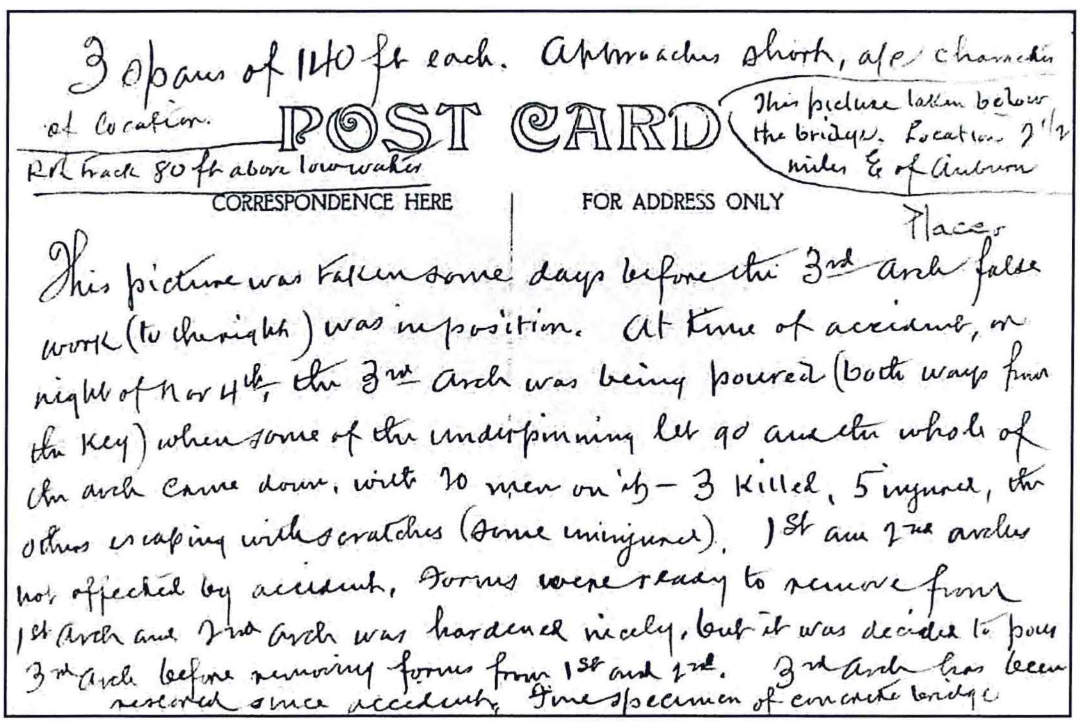
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_020
The Mountain Quarries Bridge under construction on the North Fork American River between Placer and El Dorado counties in 1911. (Photograph courtesy of Don McDermott and Karri Samson.)



CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_021
Downstream of Lyons' Bridge, the Mountain Quarries Bridge can be seen under construction in 1911. The Lyons' Bridge area was a very busy location during the construction of the railroad. This photograph gives a good view of the large outdoor dance floor. Louis Foscalina's North Fork Saloon sits across the road from the dance floor. (Courtesy of the Placer County Archives.)



CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_022
On November 4, 1911, as concrete was being poured, part of the frame work collapsed on the El Dorado side of the Mountain Quarries Railroad Bridge. Three men were killed and five were injured. Those killed were John Kern, Gust Johnson, and Casaco Angelo. A coroner's inquest found no one at fault in their deaths. The image on this postcard was taken some days before the collapse. (Courtesy of J.L. Johnson Photography.)


3 spans of 140 ft each. Approaches short, a/c character of location.

POST CARD

This picture taken below the bridge. Location 2 1/2 miles E of Auburn

R R track 80 ft above low water

CORRESPONDENCE HERE | FOR ADDRESS ONLY

Placer

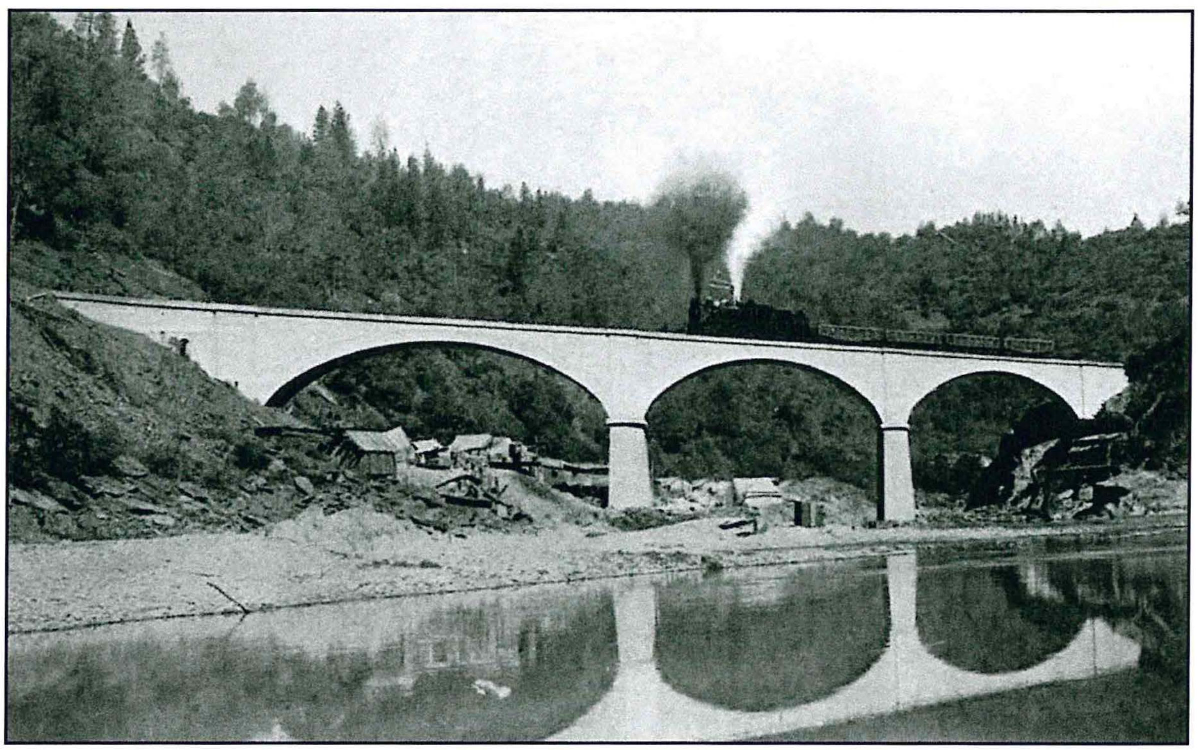
This picture was taken some days before the 3rd arch false work (to the right) was in position. At time of accident, on night of Nov 4th, the 3rd arch was being poured (both ways from the key) when some of the underpinning let go and the whole of the arch came down, with 20 men on it – 3 killed, 5 injured, the others escaping with scratches (some uninjured). 1st and 2nd arches not affected by accident, forms were ready to remove from 1st arch and 2nd arch was hardened nicely, but it was decided to pour 3rd arch before removing forms from 1st and 2nd. 3rd arch has been restored since accident. Fine specimen of concrete bridge

CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_023
This is the back of the postcard image of the Mountain Quarries Railroad Bridge above. It gives a contemporary account of how "the third arch was being poured . . . when some of the underpinning let go and the whole of the arch came down with 20 men on it—3 were killed, 5 injured, the others escaping with scratches (some uninjured)." (Courtesy of J.L. Johnson Photography.)

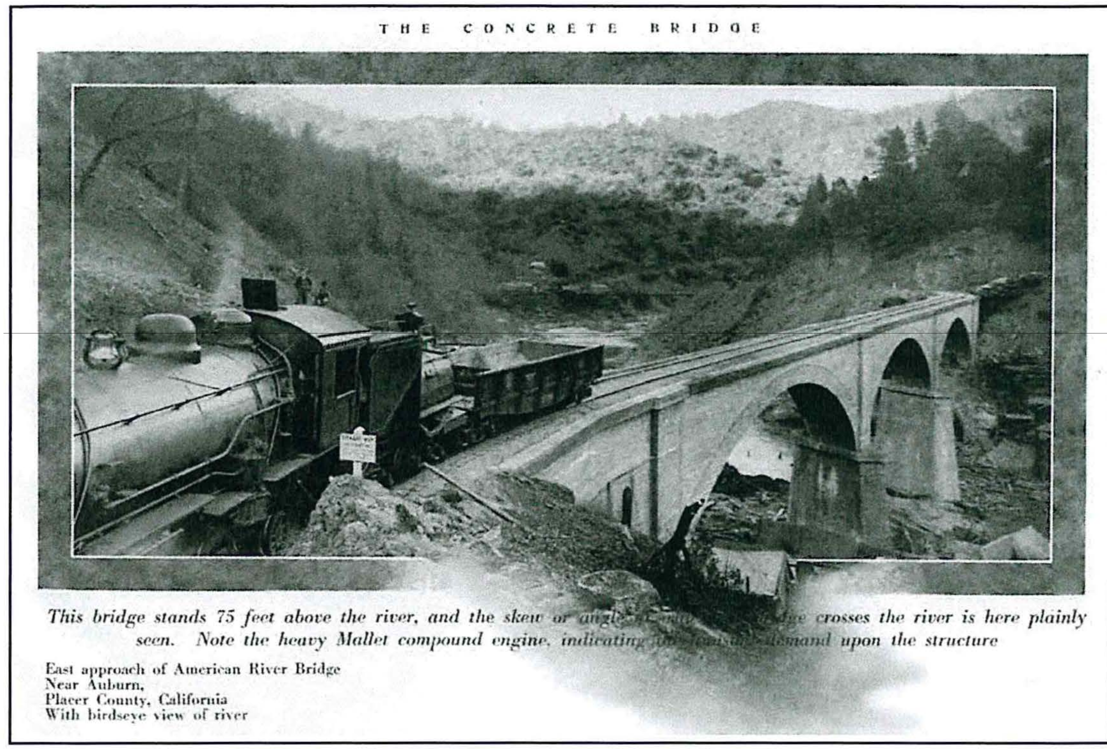
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_026
The newly completed Mountain Quarries Bridge in 1912 has men working from scaffolding that is hanging on the side of the bridge. (Courtesy of Arthur Sommers.)

CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_027
The Mountain Quarries Bridge is completed and is ready for use. Lyon's Bridge can be seen in the background. Lyon's Bridge is now the location of today's Highway 49 Bridge. (Courtesy of Michael Lynch.)

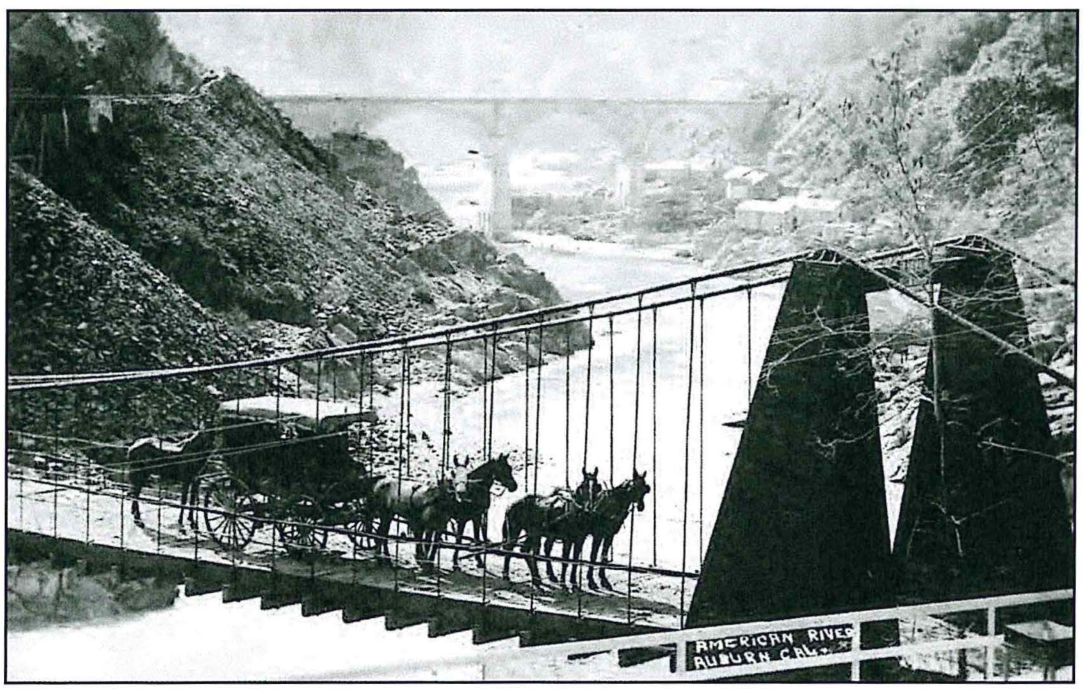
CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_028
The completed Mountain Quarries Bridge and railroad is ready for use. Lyon's Bridge (now Highway 49) can be seen in the background. (Courtesy of Donna Howell.)



CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_029
Completed on March 23, 1912, the Mountain Quarries Railroad Bridge was considered "a marvel of engineering." It was reported to be the "longest span concrete arched bridge for railroad traffic owned by private capitol" in the world at the time of its completion as reported by Railway Engineering and Maintenance of Way Magazine, December 1913. The $300,000 cost of the bridge would equal nearly $7 million today. (Courtesy of Michael Lynch.)



CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_030
A heavy Mallet compound locomotive, Engine 101 sits on the recently completed Mountain Quarries Railroad Bridge. The bridge is 15 feet wide at the top, 482 feet long, 75 feet high, and has three arches, each with a 140-foot span. This photograph comes from a 1913 publication *The Concrete Bridge* by John Leonard and W.P. Day. Leonard was the designer of the Mountain Quarries Railroad Bridge. (Courtesy of Michael Lynch.)



CA_El_Dorado_Placer_counties_Mountain_Quarries_Company_031
Downstream of the Lyons' suspension bridge is the completed Mountain Quarries Railroad Bridge. The temporary construction buildings date this photograph to 1912 or 1913. At the top left can be seen one of the 17 trestles on the line and the only one in El Dorado County. On the suspension bridge is the Auburn-Georgetown Stage. (Courtesy of Michael Lynch.)