DATA SHEET CA 0143 '61

Form 10-300 (Rev. 6-72)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY – NOMINATION FORM

(Type all entries - complete applicable sections)

STATE: California
COUNTY: Amador
FOR NPS USE ONLY
ENTRY DATE: JUL 1 1975

1. NAME

COMMON: Knight's Foundry and- Shops
AND/OR HISTORIC:

2. LOCATION

STREET AND NUMBER: 13 Eureka Street
CITY OR TOWN: Sutter Creek
CONGRESSIONAL DISTRICT: 14
STATE: California — CODE: 06
COUNTY: Amador — CODE: 005

3. CLASSIFICATION

CATEGORY (Check One)	OWNERSHIP		STATUS	ACCESSIBLE TO THE PUBLIC
☐ District ☒ Building S	☐ Public	Public Acquisition:	☒ Occupied	Yes: X
☐ Site ☐ Structure	☒ Private	☐ In Process	☐ Unoccupied	☒ Restricted
☐ Object	☐ Both	☐ Being Considered	☐ Preservation work in progress	☐ Unrestricted
				☐ No

PRESENT USE *(Check One or More as Appropriate)*

☐ Agricultural	☐ Government	☐ Park	☐ Transportation	☐ Comments
☐ Commercial	☒ Industrial	☐ Private Residence	☐ Other (Specify)	
☐ Educational	☐ Military	☐ Religious		
☐ Entertainment	☐ Museum	☐ Scientific		

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4. OWNER OF PROPERTY

OWNER'S NAME: Carl W. Borgh & Wife
STREET AND NUMBER: 26 Hanford Street
CITY OR TOWN: Sutter Creek
STATE: California — CODE: 06

5. LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC: Amador County Court House (Deed Book 203, page 531)
STREET AND NUMBER: 108 Court Street
CITY OR TOWN: Jackson
STATE: California — CODE: 06

6. REPRESENTATION IN EXISTING SURVEYS

TITLE OF SURVEY: Assessor's Map Bk. 18, Pg. 16, County of Amador, California
DATE OF SURVEY: Never surveyed ☐ Federal ☐ State ☒ County ☐ Local
DEPOSITORY FOR SURVEY RECORDS: Engineering & Surveying Dept., Amador County
STREET AND NUMBER: 42 Summit Street
CITY OR TOWN: Jackson,
STATE: California — CODE: 06

STATE: California
COUNTY: Amador
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7. DESCRIPTION

CONDITION	(Check One)				
	☐ Excellent	☒ Good to ☒ Fair	☐ Deteriorated	☐ Ruins	☐ Unexposed
	(Check One)		(Check One)		
	☒ Altered	☐ Unaltered	☐ Moved	☒ Original Site	

DESCRIBE THE PRESENT AND ORIGINAL *(if known)* PHYSICAL APPEARANCE

Knight's Foundry and Shops were established 1873 by Samuel Newman Knight (1838-1913),[1] Sutter Creek, California, and his partner, George Horne, Sutter Creek, California. The buildings that house the foundry and shops have occupied the original site to present (July, 1974); in continous operation during this period of time.

The foundry and shops are simple, wood frame, gable and some shed-like construction. Their exterior walls were originally covered by vertical, 1" x 12" wood boards and battens; replaced by corrugated iron sheeting, after the 1936 fire.[2]

Plant layout includes:[3] a foundry having two cupola furnances both for iron, one of which was used originally for brass; a pattern shop for making molds; a shop for riveting metal pipe; a complete blacksmith shop;[4] a machine shop equipped with lathes and other machine tools, for shaping and cutting metal.[5]

The Knight foundry and machine apparatus were and are operated by water power delivered by seven Knight turbines of various horse power ratings; lathes and other shop machines were and are driven by overhead line shafts, belts and pulleys. The crane boom was and is moved manually by turning a set of reduction gears. The ladle is suspended from the crane by a chain fall and hook. A turbine driven blower supplies air to the brass boundry located on Eureka Street, opposite the iron foundry.

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[1]Appendix 1: Register of Deaths.
[2]Ed Arata, 1972: 9.
[3]Appendix 3, 3A & 3B.
[4]Ed Arata, 1972: 1. Originally two forges; now one forge.
[5]Appendix 4: Listing: Some equipment & machine tools, June, 1974.

SEE INSTRUCTIONS

8. SIGNIFICANCE

PERIOD *(Check One or More as Appropriate)*

- ☐ Pre-Columbian
- ☐ 15th Century
- ☐ 16th Century
- ☐ 17th Century
- ☐ 18th Century
- ☒ 19th Century
- ☒ 20th Century

SPECIFIC DATE(S) *(If Applicable and Known)*

AREAS OF SIGNIFICANCE *(Check One or More as Appropriate)*

- ☐ Aboriginal
- ☐ Prehistoric
- ☐ Historic
- ☐ Agriculture
- ☐ Architecture
- ☐ Art
- ☒ Commerce
- ☐ Communications
- ☐ Conservation
- ☐ Education
- ☒ Engineering
- ☒ Industry
- ☒ Invention
- ☐ Landscape Architecture
- ☐ Literature
- ☐ Military
- ☐ Music
- ☐ Political
- ☐ Religion/Philosophy
- ☐ Science
- ☐ Sculpture
- ☐ Social/Humanitarian
- ☐ Theater
- ☐ Transportation
- ☐ Urban Planning
- ☐ Other *(Specify)* _____

STATEMENT OF SIGNIFICANCE

8. SIGNIFICANCE-- Knight's Foundry and Shops, Sutter Creek, California were founded in 1873 by Samuel Newman Knight. He was born in Maine, 1838 and came to California in the 1860's.[1] The foundry and shops from their beginnings have been closely associated with the gold mining industry of the Mother Lode of California. The Knight water turbines, stamp mills, and other power and mining machinery designed and built here, were an essential part of this industry, which provided the means by which California influenced and accelerated the westward growth of the nation.[2] It is still in operation today and remains perhaps the only shop of its kind in the world still run by water power ". . . still obtained from the old Amador Canal, now part of the P. G. & E. system* (Wagner, 1970: 132)."

The development of gold mining in California was to a considerable extent dependent on the parallel development of water systems, for the recovery of gold. By the middle 1880's nearly all of the principal quartz mines were using Knight,

Continued to Continuation Sheet: 8 Page 1

SEE INSTRUCTIONS

MAJOR BIBLIOGRAPHICAL REFERENCES

See continuation sheet Form 10-300a: 9. Major Bibliographical References

0. GEOGRAPHICAL DATA

LATITUDE AND LONGITUDE COORDINATES DEFINING A RECTANGLE LOCATING THE PROPERTY

CORNER	LATITUDE Degrees	Minutes	Seconds	LONGITUDE Degrees	Minutes	Seconds
NW	°	'	"	°	'	"
NE	°	'	"	°	'	"
SE	°	'	"	°	'	"
SW	°	'	"	°	'	"

OR 1

LATITUDE AND LONGITUDE COORDINATES DEFINING THE CENTER POINT OF A PROPERTY OF LESS THAN TEN ACRES

LATITUDE Degrees	Minutes	Seconds	LONGITUDE Degrees	Minutes	Seconds
38°	23'	37"	120°	47'	56"

APPROXIMATE ACREAGE OF NOMINATED PROPERTY: 1.5

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE:	CODE	COUNTY	CODE
STATE:	CODE	COUNTY:	CODE
STATE:	CODE	COUNTY:	CODE
STATE:	CODE	COUNTY:	CODE

1. FORM PREPARED BY

NAME AND TITLE: Clyde R. Berriman, Chairman, Amador County Historical/ Landmarks Committee

ORGANIZATION: Amador County Board of Supervisors

DATE: July 25, 1974

STREET AND NUMBER: 108 Court Street

CITY OR TOWN: Jackson

STATE: California 95642

CODE: 06

2. STATE LIAISON OFFICER CERTIFICATION

As the designated State Liaison Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service. The recommended level of significance of this nomination is:

National ☐ State ☒ Local ☐

Name _____

Title State Historic Preservation Officer

Date JAN 2 1975

NATIONAL REGISTER VERIFICATION

I hereby certify that this property is included in the National Register.

_____

Director, Office of Archeology and Historic Preservation

Date 7/1/75

ATTEST:

_____

Keeper of The National Register

Date JUN 27 1975

SEE INSTRUCTIONS

☆ U.S. GOVERNMENT PRINTING OFFICE : 1973—729-147/1442 3-1

Form 10-300a
(July 1969)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY - NOMINATION FORM

(Continuation Sheet)

STATE	
California	
COUNTY	
Amador	
FOR NPS USE ONLY	
ENTRY NUMBER	DATE
	JUL 1 1975

(Number all entries)

8. Significance

Pelton or Donnelly water wheels of the impulse type to supply their power needs.[3]

Water, under pressure, was the most available source of power located in the foothills and mountainous areas of the Mother Lode region of California: a high head with a ~~relat-~~ RELA- tively small volume of water. This kind of potential water, POWER called for a water wheel entirely distinct from the more familar overshot and undershot types: low head with a relatively large volume of water. The use of some form of free-jet or impulse water wheel was inevitable (Durand, 1939: 448).

The precursor to the impulse wheel seems to have been the crude and inefficient hurdy-gurdy water wheel. It was used in the Mother Lode region on the 1850's; it became obsolete, when power demand increased due to greater sizes and capacities of mining machinery (Durand, 1939: 448).

Inventors and m&chines ANICS were at work to develop a wheel to meet these requirements. Apparently the first significant advance in California itself, affecting the development of water wheels of this type (impulse), was a form of bucket invented by Samuel N. Knight, Sutter Creek, California, who, in 1870, brought out the cup-shaped bucket, acted on by a jet of rectangular cross section (Durand, 1939: 449/450).

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NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY - NOMINATION FORM

(Continuation Sheet)

STATE California
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(Number all entries)

8. Significance

Thus, the Knight wheel designed, invented and built by Samuel N. Knight marked an important engineering achievement that resulted in a significant advance over previous practice, both in efficiency of operation and cost, which made the use of foothill and mountainous water power practical. Knight's business was expanded to accomdate the quartz mines of the Mother Lode region: turbine wheels and casings, stamps mills and their dies, shoes and mortars, hoisting and pumping machinery.

At a later date, Knight manufactured heavier equipment, including the scarifiers and dredgers. The scarifiers were used in ripping dirt roads and used state-wide. Dredgers (20 inch) were made in 1898 for harbor use in San Francisco Bay; then, in 1902, Knight developed and manufactured the 30 inch dredger for use in the port of Portland, Oregon.[4, 5]

The Knight Foundry and Shops continued to be owned and operated by Knight until his death in 1913. The original plant system, including the water turbines for power, has continued unchanged to the present (1974) time; thus, giving employment to residents of Sutter Creek and nearby communities[7] and a service to the gold mining industry, which enabled this activity to produce immense quantities of gold.

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UNITED STATES DEPARTMENT OF THE INTERIOR
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INVENTORY - NOMINATION FORM

(Continuation Sheet)

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(Number all entries)

8. Significance

FOOTNOTE PAGE

[1]Appendix 1: Death Register.

[2]". . . there are tangible proofs that gold was the touchstone that set California in motion on the course that made her what she is today, and that her gold did things for the West at large and the Pacific basin that otherwise would not have been done for a generation or perhaps at all."-- Caughey, 1948: 293.

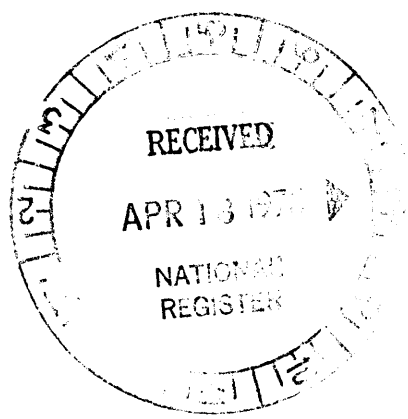
[3]Logan, 1948: 34.

[4]Knight's Catalogue No. 3, 1896: pp. 1-49.

[5]Sargent, 1927: 80/81.

[6]Sunset Magazine, Menlo Park, California. February, 1974: "A Friday Visit to a 101-Year Old Foundry", p. 30.

[7]The home-owned nature of the operation, as carried on by Mr. Knight during his life time, has been continued by employee and others. For example, in 1957, 7 of the men had been employed a total of 301 years, an average of 43 years. (Sacramento Bee, August 15, 1957, Sacramento, California).



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UNITED STATES DEPARTMENT OF THE INTERIOR
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INVENTORY - NOMINATION FORM

(Continuation Sheet)

STATE	
California	
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Amador	
FOR NPS USE ONLY	
ENTRY NUMBER	DATE
JUL 1 1975	

(Number all entries)

Form 10-300
Section 9. BIBLIOGRAPHICAL REFERENCES

9. Major Bibliographical References--

Amador Record. Special Mining Edition: "Knight & Company's Shops". California: Sutter Creek, April, 1897.

American Men of Science: A Biographical Directory. 6th ed. "Durand, Prof. W(illiam) F(rederick)." New York: The Science Press, 1938, page 390.

Arata, Ed. Knight's Foundry, Sutter Creek, California. A reprint. Sutter Creek, California, June, 1972.

Catalogue No. Three. Water Wheels, Hydraulic Appliances, and Mining Machinery, manufactured by Knight & Co., Risdon Iron & Locomotive Works, Sole Agents, S. E. Cor. Howard and Beals Streets, San Francisco, Cal;, June 1, 1896. (Amador Record Publishing Co. Water Power Printing and Bookbinding. Sutter Creek, Cal.).

Catalogue No. Six. Water Wheels, Hydraulic Applicance and Mining Machinery, manufactured by Knight & Co., Sutter Creek, Amador County, California, U.S.A., October, 1912. (Press of Hicks-Judd Co., 51-65 First Street, San Francisco).

Caughey, John Walton. Gold is the Cornerstone. Berkeley and Los Angeles: University of California Press, 1948.

Durand, W. F. "The Pelton Water Wheel." Mechanical Engineering: Part I - Developments by Pelton and Others Prior to 1880. A reprint: June 1939, pages 447-454.
(Despite the title, this publication treats in detail with Sam Knight and his impulse wheel, shows his patent drawing, and quotes Knight's own statement concerning the early history of his invention. See also Mechanical Engineering: July 1939, pages 511-518: Part II - Developments by Doble and others 1880 to Date.

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STATE	
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(Numbering Entries)

Logan, C. A. "History of Mining and Milling Methods in California." Geologic Guidebook Along Highway 49 - Sierran Gold Belt. Centennial edition. California Division of Mines Bulletin 141: San Francisco, September, 1948, p.34.

Mason, J.D. History of Amador County, California. Reprint by California Traveler. Oakland, California: Thompson & West, 1881.

Mead, Daniel W. Water Power Engineering. 2d ed. rev. New York: McGraw Hill Book Co., 1920. Reproduced copy: pages 15 to 18, 23 to 25.

Mechanics' Institute Library. Pacific Coast Business Directory for 1876-78. San Francisco: Mechanics' Institute Library, (Cat. No. 917.9 L 28.) pages 269, 426 & 464.

Mechanic' Institute Library. Pacific Coast Business Directory for 1867. San Francisco: Mechanics' Institute Library, (Cat. No. 917.9 L 28.) page 240 (Knight was not Listed).

Pacific Telephone & Telegraph Company. "Knight Foundry, 13 Eureka Street, Sutter Creek", Telephone Directory: Amador, El Dorado and Placer Counties. October, 1973, pages 123 (Sutter Creek) and 81 (Yellow pages).

"A Picture Story of Mother Lode Foundry," Sacramento Bee (Sacramento, California), August 15, 1957.

Sargent, Mrs. J. L. ed. et al. Amador County History. Jackson, California: Published by the Amador County Federation of Women's Clubs, April 1927, pages 80 and 81.

"Knight Foundry at Sutter Creek Marked by Historical Plaque," Stockton Daily Record (Stockton, California), November 14, 1967.

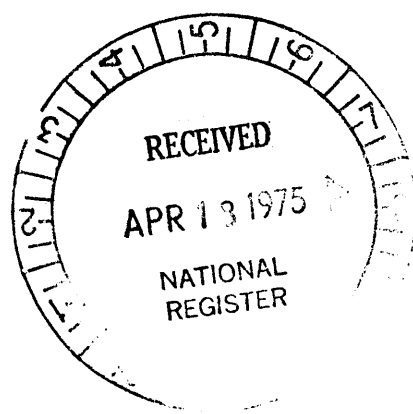
"A Friday visit to a 101-year-old foundry." Sunset Magazine, Menlo Park, California: February 1974, page 30.

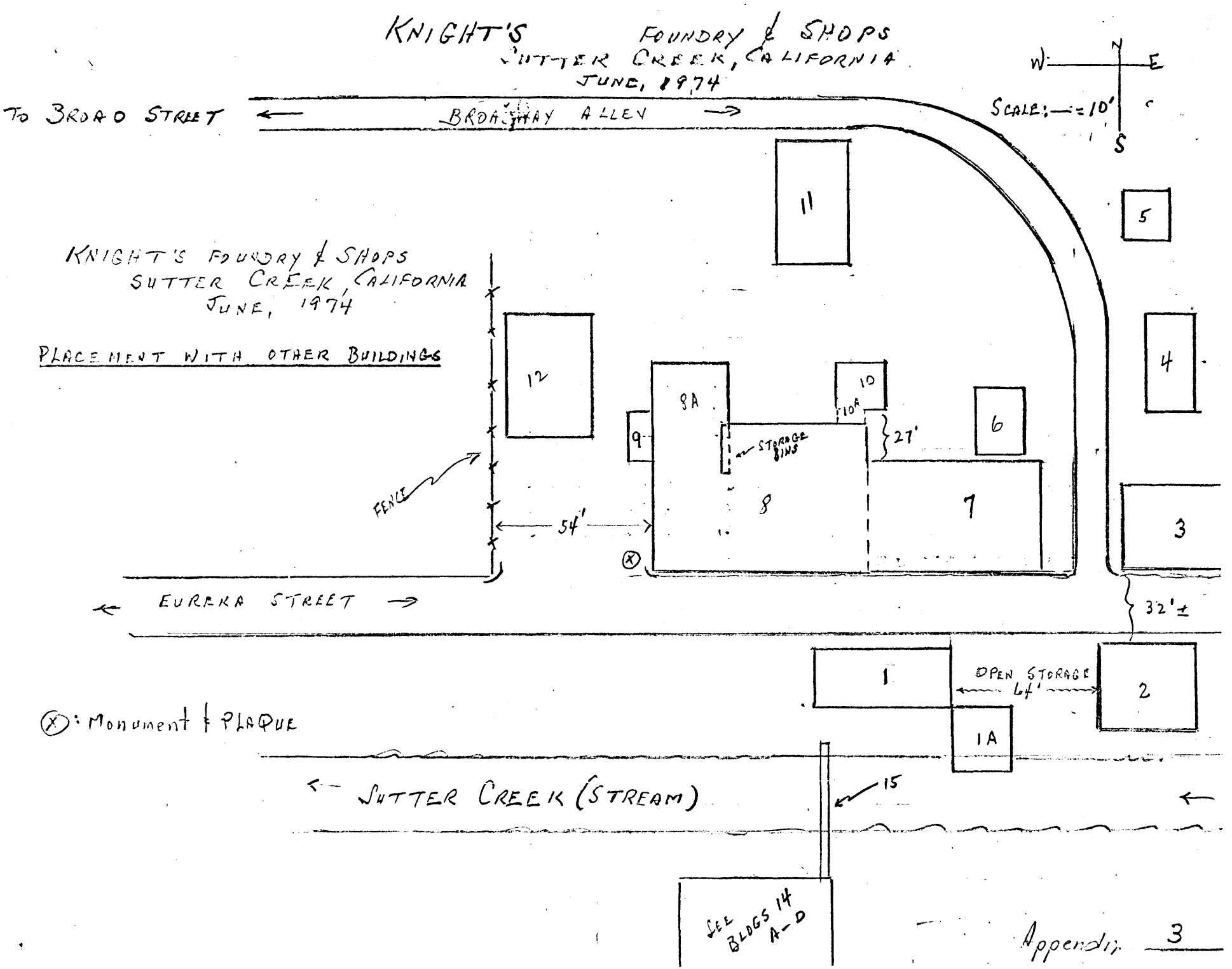
"Water-powered iron foundry." Sunset Magazine. Menlo Park, California: October, 1970, page 50 (?).

Wagner, Jack R. Gold Mines of California. Berkeley, ~~Calif-~~ CALI-fornia: Howell-North Books, 1970, pages, inside front cover, 118, 132, 134, 147, 149, 179.

"Durand, William Frederick (~~1858~~ 1859 - ~~1959~~ 1958)",** Webster's Biographical Dictionary. 1st ed. Springfield, Mass.: G. & C. Merriam Co., Publishers, 1963, page 455.
**Note: According to Robert D. Spear, 425 Yale Dr., San Mateo, Calif. 94402, in his letter dated March 19, 1974: "Durand died, at Stanford, in 1952, aged 93, in retirement...."

"Durand, William Frederick (1859-). Who's Who in America, 1950/1951. page 664.



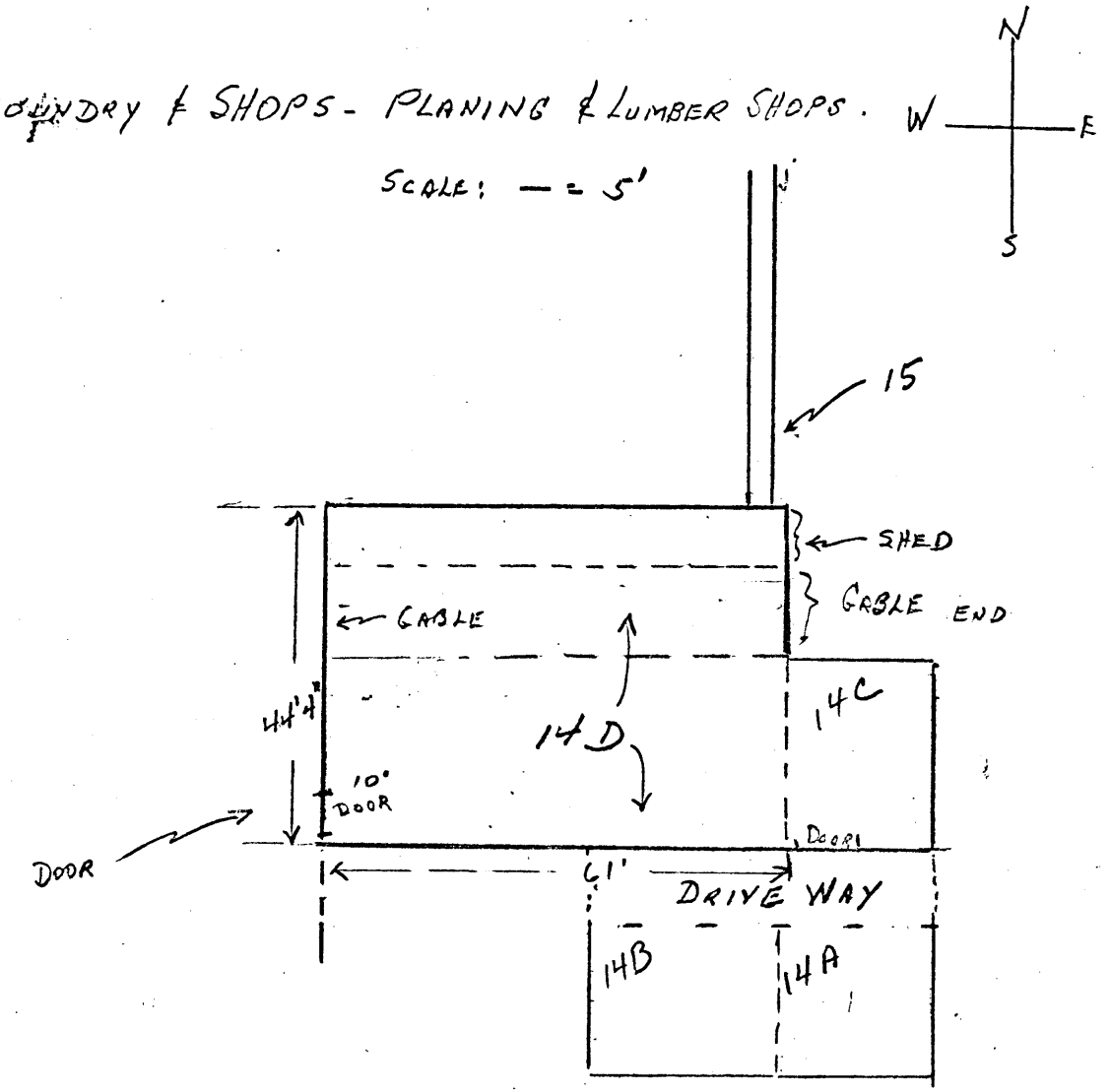


KNIGHT'S FOUNDRY & SHOPS
SUTTER CREEK, CALIFORNIA
JUNE, 1974

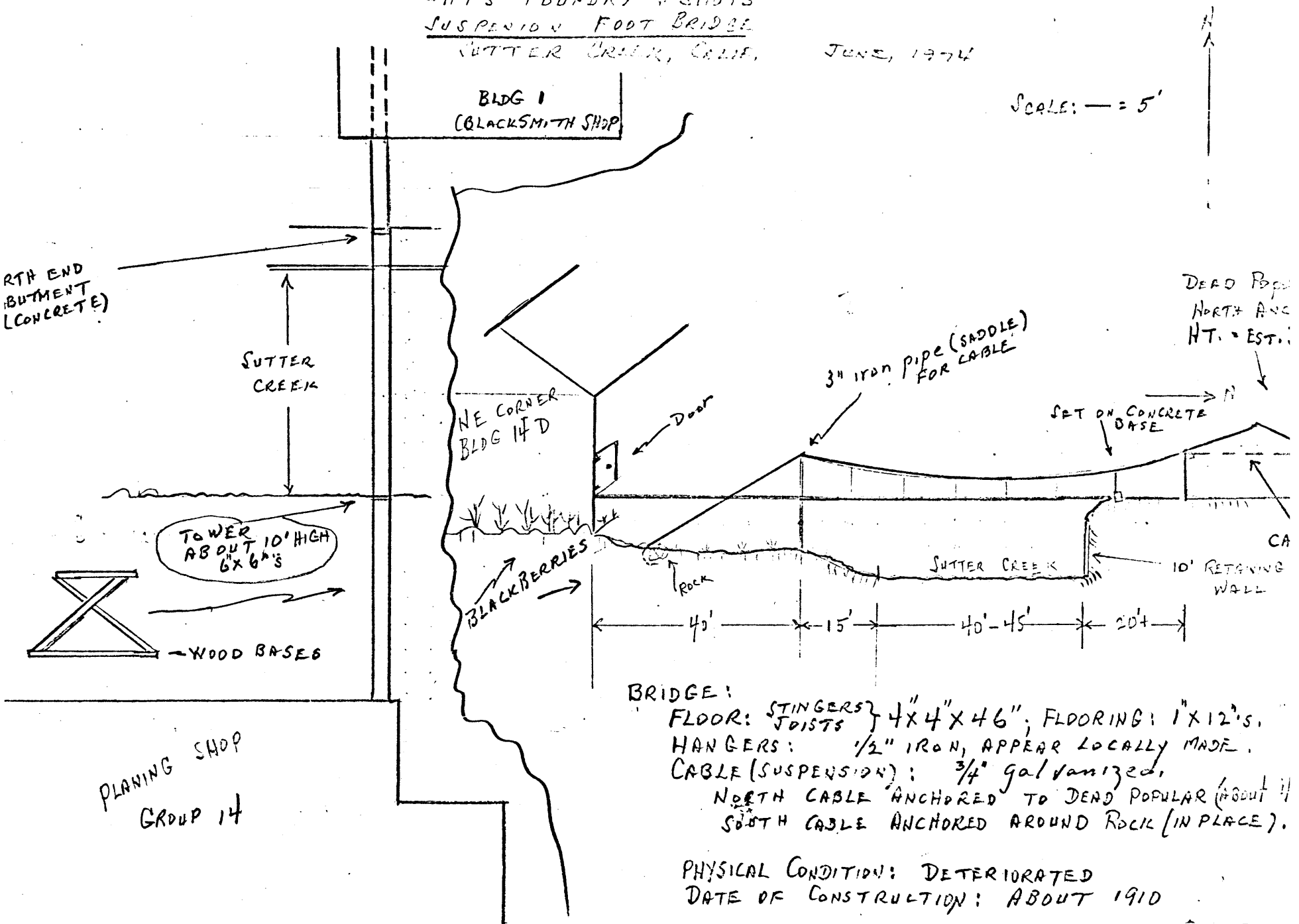
PLACEMENT WITH OTHER BUILDINGS

Appendix 3

KNIGHT'S FOUNDRY & SHOPS - PLANING & LUMBER SHOPS.



KNIGHT'S FOUNDRY & SHOPS
SUSPENSION FOOT BRIDGE
SUTTER CREEK, CALIF. JUNE, 1974



BRIDGE:
FLOOR: STINGERS } 4"X4"X46"; FLOORING: 1"X12"'S.
JOISTS }
HANGERS: 1/2" IRON, APPEAR LOCALLY MADE.
CABLE (SUSPENSION): 3/4" Galvanized.
NORTH CABLE ANCHORED TO DEAD POPULAR (ABOUT 1'
SOUTH CABLE ANCHORED AROUND ROCK (IN PLACE).

PHYSICAL CONDITION: DETERIORATED
DATE OF CONSTRUCTION: ABOUT 1910

KNIGHT'S FOUNDRY & SHOPS, SUTTER CREEK, CALIFORNIA

Listing: Buildings & Other Structures, June 1974

Building	Number[1]	Dimensions	Other
Blacksmith shop	1	25' x 57'	Operated two forges when mines were running: now (1974) in use: one forge and trip hammer.
Brass shop	1A	24' x 25'	In use at present.
Storage building	2	37' x 39'	Storage: patterns, molding sand.
Pipe shop	3	30' x 54'	Original use: mfg rivetted pipe used in mining operations; some original pipe tools remain in shop; now used for storage: patterns, ~~ect.~~ ETC.
Storage building	4	21' x 39'	Storage: patterns; now a horse shelter.
Storage building	5	18' x 21'	Storage: patterns.
Tumbling shed	6	20' x 24'	Houses cinder barrel, for cleaning castings.
Molding shop	7	53' x 66'	Molding operations.
~~Molding~~ MACHINE shop	8	53' x 84'	Machine operations.
Pattern shop	8A	30' x 30'	Pattern making.
Office	9	8' x 20'	Plant hq.
Coke shed	10	17' x 20'	Storage: coke.
Mixing shed	10A	10' x 14'	Mixing: limestone, fire clay & storage including patterns (stamp mill).

[1]Corresponds to number shown on sketch of plant layout. (Appendix 3)

Building	Number	Dimensions	Other
Wood building	11	30' x 50'	Storage: fire wood, furnace.
"New shop"	12	36' x 50'	Machine work; storage.
Knight plaque & monument	13		See ~~photograph~~ attached sheet.
~~Planting~~ PLANING mill group	14		Lumber processing & storage.
Bridge, foot suspension	15		

KNIGHT'S FOUNDRY & SHOPS, SUTTER CREEK, CALIFORNIA

Listing: Buildings & Other Structures, June 1974.

Planning mill group-

Building number	Dimensions	Roof shape	Other
14A	20' x 20'	Gable, N-S	Exterior walls: N. open w/divided sections for storage of lumber. S & E: 1" x 12" boards W : Open
14B	20' x 20'	Shed (slopes S)	N. side open with divided sections for lumber storage. S. corrugated iron sheeting. E. open end. W. 1" x 12" vert. boards; no battens.
14C	20' x 25'	Shed (slopes N)	N. 1" x 12" vert. boards no battens. S. a masonite; 4, 32" joined doors. E. 1" x 12" vert. boards W. end joined to 14 D.
14D	45' x 61'	Gable, E-W; N side shed	Four sides: Vert. 1" x 1[illegible] board & batten. Has equivalent to a basement.

Roof covering: corrugated iron sheeting.
Foundations: wood piers; rock bases.
Windows: 2-sash (6 panes each). Deteriorated.
Conditions of buildings: Deteriorated to fair.

KNIGHT'S FOUNDRY & SHOPS, SUTTER CREEK, CALIFORNIA

Listing: Some equipment & machine tools, June 1974

Quan.	Location	Item
		Knight's water wheels & motors:
1	Machine shop	4½ foot, approx. HP = 25; similary to water wheel, page 10, knight's Cat. No. 3, 1896. This wheel operates all overhead pulleys, belts.
1	Tumbler shed	12" water motor. Use: turns cinder barrel.
1	Molding shop	12" water motor. Use: drives emery wheel, for grinding castings. (Page 19, Knight's Cat. No. 3, 1896).
1	Patter shop	12" water motor. Use: drives wood lathe. (Page 19, Knight's Cat. No. 3, 1896).
1	"New shop"	12" water motor. Use: drives "bull" lathe. (Page 19, Knight's Cat. No. 3, 1896).
1	Brass shop	12" water motor. Use: drives 24" (OS diam.) Anderton blower.
1	Blacksmith shop	18" water motor. Use: drives trip hammer. (Page 19, Knight's Cat. No. 3, 1896).
1	"New shop"	Pelton water wheel, No. 3 (OS diam. =22"); a 12" water motor: "Pelton Water Wheel Co. Patented: Oct., 1880, Feb. '87, Aug. '89. Pelton Water Wheel Co., San Francisco, California. Use: None, probably inoperable.
2	Pipe shop	Knight water motors, 12". Use: None, inoperable.

KNIGHT'S FOUNDRY & SHOPS, SUTTER CREEK, CALIFORNIA

Listing: Some equipment & machine tools, June 1974

Quantity	Location	Item
1	Machine shop	Blower, cupola, est. 36" OS diam. Powered by: electricity. and water turbine, as alternate power
1	Machine shop	Compressor, Gardiner, Quincy, Ill., made in U.S.A. ~~Power by:~~ Cranes, overhead, 1½ ton
1	Machine shop	Lathe, gap ("Bull"), 110" diam., with variable pulleys. mfg'd by Knight Foundry. No dates or identification.
1	Machine shop	Lathe, gap ("Bull"), 69" diam., with variable pulleys. Mfg'd by Knight Foundry. No dates or identification.
1	Machine shop	Lathe, Donnelly[1], 24"-26" x 24' long turning shaft.
1	Machine shop	Lathe, Donnelly[1], 36' x 24' long. Head stock mfg'd by Knight Co; tail stock 18 feet long.
1	Machine shop	Lathe, 24", P. Blaisdell & Co., Worcester. n.d.
1	Machine shop	Planer, mfg'd in Knight molding shop. Plate: Knight & Co., S. C. Cal. 1882.
1	Machine shop	Press, drill, mfg'd by K & Co. (no other identification; probably mfg'd about 1882. Press in machine shop prior to 1910.

[1]It is said that the Donnelly lathes came from the Donnelly Foundry, Sutter Creek, California.

Register of Deaths, Amador County, California
Book 3, page 129. Local register number: 6.
Amador County Court House, Jackson, California
Place of death: Sutter Creek, County of Amador, California.

Date of death: January 13, 1913. Cause of death: Bronchial pneumonia. Contributory: Exhaustion.

Other information:

Male white divorced

Date of birth: November 14, 1838

Occupation: Machinist

Birthplace: Maine

Father's name: William Knight

Birthplace of father: England

Birthplace of mother: England

Samuel's lenght of residence at place of death: 45 years; in California: 53 years.

Certification for above information by: C. H. Norton

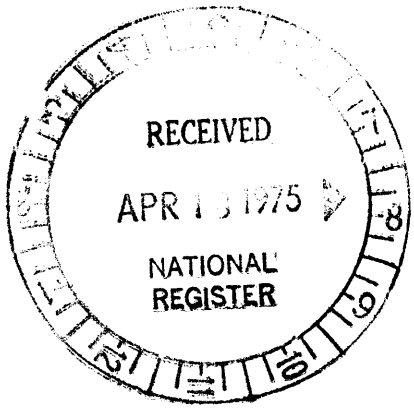
Filed: January 21, 1913, Sutter Creek; T. M. Ryan, Deputy

Signed by attending physician: J. W. McLaughlin, M. D., January 13, 1913, Sutter Creek, California.

Copied by:
Clyde R. Berriman,
Plymouth, Calif.
July 3, 1974

KNIGHT'S FOUNDRY, SUTTER CREEK, CALIFORNIA

By
Ed Arata



Sutter Creek, California
June, 1972

Appendix 2

This paper on Knight's Foundry is as complete and factual as I could possibly make it in the short time I had available for research. It is hoped this paper will serve as a more complete history of Knight's Foundry than is presently available.

I would like to thank the following persons for their help with information and photographs from which this paper was written.

Mr. Dan Boitano
Mr. Carl Borgh
Mr. Babe Gabarini
Mrs. Esther Manassere
Mr. John Norton
Mr. Walter Norton
Mr. Robert Post
Mrs. Audrey Sheppard

Ed Arata
June, 1972

KNIGHT'S FOUNDRY
Sutter Creek, California

The Knight Foundry was established in 1873 by Samuel H. Knight and his partner, George Horne. Located in Sutter Creek, Amador County, California, this foundry came into existence to supply the mining industry of this area with machinery and mining appliances and as a local repair facility for all types of equipment. Knight's Foundry was not the first foundry in Sutter Creek; but it was the first of sufficient size to meet the demands of the area. The first foundry was the Donley Foundry started by Frank Tibbits in the 1850's mainly as a repair facility for the mines. This foundry was located near the present site of the Amador Steam Laundry and was destroyed by fire in the 1860's.

The Knight operation included at one time the largest machine shop in the West (outside of San Francisco), a foundry having two cupola furnaces, a pipe shop that produced riveted pipe, and a complete blacksmith shop.

Samuel Knight came to California from Maine where he was born in 1839. Knight worked as a ship's carpenter to get to California, and in the 1860's he settled in Calaveras County to work as a carpenter at the mines in that area. The best early history of Samuel Knight and his development of the Knight water wheel is recorded in the Knight Foundry catalog of 1896. It reads as follows:

> About 30 years ago (1866) Mr. Knight, in common with others, made water wheels entirely out of wood. The buckets were shaped like saw teeth, and wooden flanges covered the sides of the buckets to confine the water; a round nozzle was used and the general results were considered at that time highly satisfactory.
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> The next step about two years later (1868) was to make a wooden water wheel with iron buckets, giving them a curve and discharging the water toward the center of the wheel, still using the round nozzle.
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> Two years later than this (1870) a man named Coleman patented a wheel which had a bucket shaped very much like that of the present Pelton Bucket, the stream splitting and curving off to each side. He for lack of means did not develop it.
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> After two or three years (1872) passed, Mr. Knight made several improvements by using a curved iron bucket and having the discharge towards the center and to one side, still using the round nozzle.

> Knight found that the round nozzle did not fill general requirements; he could not cover enough bucket space along the periphery of the wheel, without covering an equal space in the width of the bucket. This induced him to try an elliptical or oblong nozzle, and the first wheel of this character was placed in the Lamphear Mine at Mokelumne Hill. It was quickly followed by others.
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> From these wheels sprang the present Knight wheel. Knight finally abandoned any modification of the round nozzle and made the opening a narrow slit (or rectangle). The round nozzle worked with with small quantities of water but wasn't suitable with larger amounts because as the nozzle became bigger it had to be set back further from the wheel to clear it and considerable power was lost.
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> In 1875 the first wheel of present design was placed in the Lincoln Mine at Sutter Creek, and from that time various improvements have been made in the size and arrangement of the slits in the nozzle and shape of the buckets, until at the present time (1896) Mr. Knight is manufacturing a wheel that for general utility and economy challenges competition.

As shown by this early history (1873-1896) the Knight Foundry in its early days was involved primarily with production of water wheels. Sam Knight is credited with the perfection of the bucket water wheel to be used with a small head of water at high pressure. In connection with the water wheel, Knight and Company developed appliances to be used with their wheels to improve their performance and utility. These included: The slit nozzle, a reversible water wheel unit, a hydraulically controlled gate, an automatic control gate and wheel governors. The slit nozzle was designed to fit the curve of the wheel so that all water entered the buckets with the same force and the slit nozzle could easily be connected to the governor to regulate the wheel speed. To regulate the speed, the slot only needed be made bigger or smaller through the means of a sliding plate. The reversible wheel unit consisted of two wheels that were run in opposite directions.

This unit was used primarily with mine hoisting works. The hydraulically controlled gate gave instantaneous control of the wheel rather than the slower process of shutting the gate valve by hand. The automatic gate valve was designed for use with air compressors. This device would automatically start the wheel when pressure in the system dropped below a set level and then shut off when pressure was restored. The water wheel governors were the first of their kind and were developed primarily for use with electric generators. The governors were attached to the wheel casings and held the wheel speed within desired limits.

Knight water wheels and appliances were used widely in the Mother Lode area to power stamp mills, hoisting works and other mining operations. At this time over 300 Knight wheels were in operation in California. In addition, many were in use all along the Pacific Coast and as far away as Alaska. One Knight wheel was seen in a hydroelectric plant in Italy in 1918.

In addition to the water wheels and related appliances, the Knight Catalog of 1896 shows a wide range of other products. Included in this catalog were: (1) the Knight Dynamo Motor having a 17-inch wheel that developed 500 HP at 1100 rpm's, first used at the Amador Electric Railway and Light Company, Sutter Creek; (2) water motors for small applications in 4 sizes; 6 inch, 12 inch, 18 inch, and 24 inch; (3) hoisting works of all sizes, designed to meet the needs of each operation; (4) Knight and Company's Rock Breaker, 2 sizes, 10" x 12" weighing 7,400 pounds and 12" x 16" weighing 12, 600 pounds with a capacity of 20 tons per hour. This bigger unit was in use at the Kennedy Mine in Jackson; (5) Knight's Eureka Mine in Plumas County and the Wildman Mine, Sutter Creek; (6) Tractor Engine with Rock Breaker and Gasoline Engine, designed as a mobile unit to crush rock for road paving. The unit was powered by a 20 HP single cylinder gasoline engine and was estimated to crush and spread 60 to 80 tons per ten-hour day. There was only one built and it was used in Amador County; (7) Centrifugal pumps ranging in size from 3" to 8" with capacities rated at 225 gallons per minute to 1600 gallons per minute; (8) Knight's Patented Mining and Marina Dredging Buckets, these were clam shovel type dredging buckets operated by steam and compressed air. The steam bucket model (shown in use at a mining operation at Camp Seco, California) had a capacity of 1-1/2 cubic yards and weighed 6,000 pounds. The air bucket model (shown in operation at the Port of Seattle) weighed 14,000 pounds and was operated by a 30-inch cylinder with a 30-inch stroke under 80 pounds of pressure.

Knight's Foundry was a busy place just before the turn of the century and the work going on at this time is best recorded by the Amador Record, then printed in Sutter Creek. In April 1897, the Amador Record printed a Special Mining Edition, including most of the mines and industries of Amador County. This edition gave a short history of each mine or establishment, its present development and the prospects for the future. The following is the article concerning the Knight Foundry written by G. A. Carpenter, Mining Editor.

> The mines in the surrounding districts are favored with one of the largest and best-equipped foundry and machine shops in the state outside of San Francisco. The shop, located in Sutter Creek, is supplied with all the modern improvements and appliances for handling heavy work such as is used in the mines. They have lathes that swing 10 feet in diameter, a planer that takes in 4 feet square and 16 feet long. Their rolls for sheet iron take in pieces 10 feet long and are strong enough to roll any thickness of steel plates, having hydraulic appliances for handling them.
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> The works were started in 1873 on a small scale, and have been gradually growing in size until the ground space which the works occupy covers 16,658 square feet. The owners intend to erect, this year, another building, for the purpose of manufacturing water wheel governors in connection with their water wheel, which has done so much to build up the works. They have turned out this year next to the largest water-powered plant in the United States. The first half of the plant is now setting up in Ogden, Utah. The water wheels are made of bronze and are 58 inches in diameter, and will be coupled direct to 5 of the General Electric Company 750 kilowatt generators, and will develop, when in operation, 6,000 horsepower. The whole

plant, when completed, is equal to 12,000 horsepower. The Pioneer Electric Company of Ogden, Utah, intends to transmit their electricity to Salt Lake City for lighting and power purposes.

Each water wheel is provided with two 6 foot fly wheels which weigh 8,000 pounds, and are encased in a steel casing with the wheel. The casing is secured to a concrete foundation. All the gates are worked by hydraulic appliances as well as the nozzles, at the switchboard. The speed is regulated by the Knight and Company mechanical and electric governors which keep the speed at all times 2-1/2 percent of normal.

The Knight and Co. Works, of Sutter Creek, have been running day and night for the past four months on principally water wheel work, and have employed 44 hands during the summer months.

S. N. Knight, the senior member of the firm, is an acknowledged authority on water wheel power upon the Pacific Coast. It was he who first perfected and made practicable the bucket wheel, and the other manufactures, such as the Pelton and Dodd wheels, were a modification and copy of the general plan of the Knight wheel. Today this wonderful power obtained from these wheels has made possible cheap motive power on the lode, and the owners of the many hoisting works and mills owe to his genius a debt of gratitude, Mr. Knight has perceptive powers and is quick to see an advantage for the improvement of all mechanisms. Consequently, his inventive turn of mind has brought about great changes in the utility of mining machinery, mill, and hoisting plants. His latest product, the electrical governor, which controls the speed and regulates the supply of water on the immense Knight wheels, is a stride far in advance of all competitors. The Pioneer Electric Power Co. at Ogden, Utah, have introduced this late invention, and it is to Knight and Co. of Sutter Creek, that the industrial world will now turn for a new lesson in the science of motive as obtained from the agent, water.

L. Oettinger, a progressive young man, is the other member of the firm, a valuable help mate in the management of the large enterprise.

Although this article paints a very bright picture for the future, this was not the case. Knight met stiff competition for the Pelton Water Wheel Company of San Francisco and electric power was beginning to replace the water wheel in many areas as a new commercial and dependable source of power. The competition between Pelton and Knight was so keen that in 1896 when a contract put out by the North Star Mine of Grass Valley, California called for either a Knight or Pelton water wheel, each company set up a wheel at the site and tests were conducted to determine the best one. The Pelton wheel proved to be the best for that application and was awarded the contract. Due to this test the Knight wheel showed a drop in popularity and thus Knight and Company began to direct its efforts into other areas. While still producing some water wheels and water motors, the foundry began designing and producing heavy mining equipment. In 1898 they produced several 20 inch dredgers for harbor use in

San Francisco and Seattle Bays, each weighing 42,500 pounds. Later, in 1902, the foundry developed and manufactured a 30 inch dredger developing 2,000 horsepower for use in the port of Portland, Oregon, weighing 101,000 pounds. These seem like large jobs to us today, but at this time it was even a larger task when it is considered that all of these large castings had to be moved by horse and wagon from Sutter Creek to Ione, a distance of 12 miles, and then loaded on to train cars for shipment.

A look at the Knight Catalog for the year 1912 again shows that the company had moved into new areas of production. Water wheels and water motors are still a major product and have been improved and are rated at from 50 to 3600 horsepower. Also provided in the catalog to help the customer determine the proper water wheel for his operation were several pages of charts and illustrations. The illustration showed how the wheels were to be framed when installed so as to be firmly held during operation. There were charts that listed the probable horsepower that the customer could expect from a given wheel at a given head of water. Also included were methods of measuring water supplies so that the customer could accurately determine the amount of water he had to work with. Another chart showed loss of head due to friction in pipe used to transmit water to the wheel.

Again many of the products that were covered in the 1896 catalog were covered in this year's catalog. It contains many engravings showing the Knight water wheel and wheel governor in use at various early day electric plants; among these were: White River Electric Plant, Oregon and Pioneer Electric Plant, Ogden, Utah. For applications where only a very low head of water was available, Knight developed a Double Discharge Water Wheel to be used in the turbines.

Centrifugal Pumps are listed in this catalog but this time they are much larger. One engraving shows the 30 inch pump that had been developed for the dredger used at Portland, Oregon. The other large pump shown is a 20 inch pump used for dredging.

Among the new products seen in this catalog is a three plunger pump driven by an electric motor. This pump was designed for mine pumping and was first used at the Bunker Hill Mine, Bunker Hill, California.

Knight's was now producing hoisting engines and one engraving shows an 18" x 16" single reel unit for use in single compartment shafts. This single reel unit was also produced as a double reel hoist when the mine had a two compartment shaft. Pit head sheaves up to 4 feet in diameter were available to be used with these hoists. A second cut shows a double reel 12" x 20" hoist suitable for hoisting 6,000 pounds at 700 feet per minute. Sheaves 6 feet in diameter were supplied with this hoist. This unit was in use at the Mutual Mine, Sutter Creek and the Baliol Mine, Sutter Creek, and weighed 30,000 pounds. A third engraving displays a double reel 16" x 32" hoist, rated at 8,000 at 1,500 feet per minute. Sheaves 8 feet in diameter were recommended and the unit weight was 80,000 pounds. This hoist was used at the Central Eureka and South Eureka Mines, Sutter Creek.

The final item shown in the 1912 catalog was the patented Knight Timber Framing Machine. This machine was developed to square the ends of unfinished

logs to be used as the mine framing. It could accomodate logs up to 4 feet 4 inches by 16 feet long.

Knight's Foundry was a busy place in the early 1900's. They were developing new types of hard rock mining equipment and carrying out most of the repair work needed by the local mines in their blacksmith shop and machine shop.

In 1913 Samuel Knight died after 40 years of operating one of the most prosperous foundries in the Mother Lode. At the time of his death, Knight owned 5/8 of the stock in the foundry. Of his stock, he left parts of it to two long-time employees. One eighth of the stock went to Dan Ramazotti and 3/8 went to Charles H. Norton, bookkeeper and assistant manager of the foundry. The remaining 1/8 of Mr. Knight's stock went to his sister living in Maine. At this time the remaining 3/8 of the stock was owned by Louis Oettinger, another employee. Mr. Ramazotti bought Knight's sister's interest and later in 1920 bought Oettinger's shares to become the principal owner.

The period 1914-1920 was a slack time at Knight's Foundry due mostly to the entry of the United States into World War I. The mines in the area slowed in production due to shortages in manpower, machinery, and mostly explosives that they needed to blast the hard rock of the mines. The foundry slowed due to lack of work from the mines and shortages of raw materials and scrap iron to feed the furnaces.

After the war, the work picked up again as men and materials became available and as many of the mines in the area began to refit their plants so that they could explore deeper and process more rock and ore. The Knight Foundry was a major supplier for much of the machinery needed. It produced: primary rock crushers, hoisting works, stamp mills, pumps and other equipment. Knight's supplied the hoisting works and milling plant for the Argonaut Mine which reached a depth of 5,570 feet and the underground hoist and 100 stamp milling plant for the Kennedy Mine, the deepest gold mine in North America at 5,912 feet (at that time). Knight had also supplied many other castings for the Kennedy Mine. Among these were the hubs for the famous Kennedy Tailing Wheels constructed in 1914.

In 1928 Knight's Foundry patented a new piece of equipment that would again be used statewide and even exported for use in Mexico and Africa. This was the Scarifier. Advertised as "The scarifier that will scarify", this machine was an early road ripper weighing about 7,100 pounds. The Scarifier was produced in two models, one unit having 7 teeth and the other having 13 teeth. The teeth were mounted on an adjustable bar to determine the depth of cut to be taken. The unit was towed by a tractor or truck and ripped at the dirt roads that had become rutted due to heavy use or bad weather. It was followed by a grader that then smoothed the surface back flat. Several Scarifiers can still be seen on display in Amador County.

During the 1930's Knight's continued to supply the mines with equipment and local repair facilities. The foundry had several fires during its history but the worst occurred in 1936. The fire destroyed the office, pattern shop, and part of the machine shop. The machine shop was shut down for several weeks at this time and some work that was in progress was finished at the machine shop at the Kennedy Mine by Knight machinists. Up to this time the machine shop and foundry had been constructed with board and bat walls, after the fire this was replaced with corrugated sheet to cut down on the fire danger.

Again with the outbreak of war, business at the foundry dropped off greatly. During World War II, all gold mines were closed by government order as nonessential industries. The foundry did some government work during the war but not to a great extent because the machine shop was not geared to the high production rates needed and the management at this time was unwilling to refit the shop. During the 1940's, the foundry again changed hands. With the death of Charles H. Norton, his interest went to his family and in 1949, Dan Ramazotti retired leaving his shares to the men then employed at the foundry.

Since 1950, the foundry has been kept busy mostly with orders from outside of Amador County and some repair work. The foundry was bought in 1956 by Herman Nelson and he managed it until his death in 1970. At this time the operation was purchased by Mr. Carl W. Borgh and is still operated daily, engaging mostly in specialty work and some repairs.

Knight's Foundry has a long history and has played a major role in the development of the West Coast. It has the distinction of being the last water powered machine shop in the United States. Water drives a 42 inch water wheel after falling nearly 400 feet from the Amador Canal. The power is then transmitted to the machines through a system of belts and overhead pulleys and shafts. Some of the machines in the machine shop were built at Knight's Foundry. One is a sixteen foot planer that will accept work 4 feet square. It was built in 1882. Another is a seven foot radial drill, one of the largest in northern California. The oldest operating metal lathe in the United States was manufactured here also. The foundry is equipped with two cupola furnaces fired with coke. Castings, today, are made in standard size flasks, but in the past when the job required the mold was made by digging into the foundry room floor and making a pit casting.

The foundry complex was made up of several different buildings and the work force encompassed many jobs. At its peak period, Knight's had its main foundry and machine shop, a pipe shop making riveted pipe and a tar pit to coat the pipe, a blacksmith shop doing repair and general smelting, and a small planing mill for finishing the lumber used for patterns and flasks. Men worked as foundry men, pattern makers, chippers, machinists, pipe fitters, blacksmiths, and helpers (approximately 40 men employed). Today, after nearly 100 years of operation, the foundry employs only about six men. Only one man works as a machinist, while the rest work in the foundry area.

Knight's continues to work daily and visitors are welcome to view the plant. The foundry pours on Fridays and this operation is done much as it has been in the past. This foundry would be of interest to anyone interested in foundry-machine processes or just early California history.