

An Inventory of the Papers of

Clifford Allen Betts  
(1889-1982)

Collection No. 59

A holding of  
The Library of the Colorado Historical Society  
Denver, Colorado

Processed by  
Tracie L. Etheredge  
December 1990

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## INTRODUCTION TO THE COLLECTION

Clifford Allen Betts was born on September 12, 1889 in Norwalk, Connecticut. By the age of twenty-four, he had received his physics degree from Sheffield University, and his Ph.D. in civil engineering from the University of Wisconsin in 1913. He married Edna E. Cantril of Denver, Colorado two years later. Betts worked as a surveyor in 1916 for Scofield & Ford in Bridgeport, Connecticut, and again in 1917 for the Methow Valley Railroad, Washington. Known for meticulousness and his eye for detail, he brought these qualities to work next as the chief engineer of the Cummings-Moberly Lumber Company in Portland, Oregon, working with the government on the production of spruce for airplanes.

In 1919, Betts began his career of working with water, starting with the U.S. Forest Service and the Municipal Water Works in Denver, and continuing with various dam and tunnel projects. From 1923-1928, Betts worked as the office engineer for the Moffat Tunnel Commission. He then moved to Oregon, where he worked for the Bureau of Reclamation on the Owyhee Dam. His water expertise was again needed in his next job, with the Mississippi Valley Committee. He returned to the Forest Service in 1935, this time working in Washington, D.C.

Betts was an avid photographer, taking many photographs of his projects. Some of these photos are the only known surviving pictures of the actual work in progress on the Moffat Tunnel. An enthusiastic outdoorsman, Betts faithfully walked seven miles every day until his death in 1982.

The collection includes a gathering of material from projects that Clifford Betts was involved in during 35 years of his life as a civil engineer (1919-1954). Most of the collection is related to the construction of the Moffat Tunnel through

James Peak in Colorado; it consists primarily of blueprints from all areas of the work. There is also a small collection of items from Bett's involvement in the Bureau of Reclamation project on the Owyhee Dam, Oregon (1928-1943), the Mississippi Valley Committee (1934), and the U.S. Forest Service, in Washington, D.C. (1935-1954).

This collection is probably most useful to researchers looking for information on the technical, engineering aspects of the projects. The blueprints seem to be fairly complete and would be invaluable to researchers on the engineering and structural aspects of the Moffat Tunnel.

All photographs previously found within this collection have been transferred to the Department of Photography of the Colorado Historical Society.

Other sources on Clifford Betts and his career with the Moffat Tunnel Commission can be found in the Denver Public Library, the University of Wyoming, the Colorado State archives and the Smithsonian Institution in Washington, D.C.

## CHRONOLOGY

Clifford A. Betts (1889-1982)

- 1889      September 12: Born, Norwalk, Connecticut
- 1909-1910    Surveying and map work during summer vacations, for the city engineer, So. Norwalk, Connecticut.
- 1911      Received physics degree, Yale University, Sheffield Science School.
- 1912      Draftsman on water works and sewage disposal plans, with James H. Fuertes, So. Norwalk, Connecticut.
- 1913      Received Ph.D. in Civil Engineering, University of Wisconsin.
- 1915      Married Edna E. Cantril, San Francisco, California.  
Children: Allen Walker, Edith and Marjorie.  
Engineer for the city of Norwalk, Connecticut.
- 1916      Assistant City Engineer, Norwalk, Connecticut  
Surveyor for Scofield & Ford, Bridgeport, Connecticut
- 1917      Surveyed for complete preliminary survey, Methow Valley R.R., Washington.
- 1918      Moved to Portland, Oregon.  
Chief Engineer, Cummings-Moberly Lumber Co., cooperating with U.S. government in aircraft spruce production.  
March-June: Mapped Columbia River for Portland Port Authority.
- 1919-1923    Denver Municipal Water Works: Resident Engineer on Fraser River, Williams Fork and Blue River diversion.
- 1923-1928    Office Engineer, Moffat Tunnel Commission.
- 1928-1943    U.S. Bureau of Reclamation on Owyhee Dam, Oregon.

- 1934 February-December: Mississippi Valley Committee engineer.
- 1935-1954 Engineer, U.S. Forest Service, Washington, D.C.
- 1954-1956 Consultant to City of Chicago Water Works.
- 1982 February 5: Died, Denver, Colorado  
February 9: Buried, Fairmount Cemetery, Denver.

CLIFFORD A BETTS COLLECTION

## Collection Contents

Box No. 1**Moffat Tunnel Commission Materials  
(1923-1928)**

## FF DESCRIPTION

## A. C.A. Betts biographical material

- 1 Water Commission  
Reports, maps, news clipping  
Water use of Moffat Tunnel & Denver Municipal Water Works
- 2 Contracts (copies)  
Water tunnel contract, Jan 1929, 1927  
R.R. tunnel contract, Jan 1926  
Information for bidders, 1923
- 3 Monthly Progress Reports  
Dec 5 1925 – May 1 1927 and Feb 2 1928
- 4 Monthly Progress Reports  
Jul 1922, Sept 14 1923, Aug 9 1923 and Feb 1 1924 – Nov 9 1925
- 5 Statement of Cash Receipts and Disbursements  
May 12 1922 – Jul 7 1925  
May 12 1922 – Jan 7 1926
- 6 Electrification  
Reports, memos and notes  
Electrification vs. Steam Power of Moffat Tunnel
- 7 Clearing and Grading Spec.  
Contract, proposal, specifications, statement of work and bidding info.
- 8 R.R. Approaches  
Exhibits, notes, reports



- 9 Lewis Cantilever Girder  
Drawings and patent
- 10 Concrete Field Tests  
Test reports from Pierce Testing Labs, Feb 1928 – Jul 1927
- 11 Barometer Reports  
Tunnel barometer readings
- 12 Budgets  
Estimates, cost reports
- 13 Reports, C.A. Betts  
Misc. reports
- 14 Inventory of the Moffat Tunnel  
Report
- 15 Correspondence and Misc. (1922-1928)

**Owyhee Dam, Oregon and Bureau of Reclamation (1928-1933)**

- 16 Owyhee Dam  
Notes and reports on Owyhee and Vail Tunnels, steel liner plates, joints, etc.
- 17 U.S. Bureau of Reclamation  
Press releases, reports, news clippings, published booklets:  
  - “Thought for the Morrow,” by Harold Ickes, Colliers, 12-8-34
  - “Spare that Desert,” by Owen P. White, Colliers, 6-16-34
  - Federal Reclamation in a Nutshell, 1934
  - Reclamation under the New Deal, by Elwood Mead
- 18 Correspondence and Misc. (1930-1933)

**Mississippi Valley Committee (1934)**

- 19 Mississippi Valley Committee  
Interstate Flood Control reports, charts, notes and news clippings
- 20 Mississippi Valley Committee  
Flood Control Work Progress Reports—Mississippi River and Tributaries,  
Jan 1929 – Feb 1934

**U.S. Forest Service, Washington, D.C. (1935-1954)**

- 21 1935 – 1939  
Notes, technical reports, etc.
- 22 1940 – 1949  
Notes, technical reports, etc.
- 23 1950 – 1954  
Notes, technical reports, etc.
- 24 Misc. diagrams and drawings

Box No. 2Published Materials

Folder No. 1: Misc. Published Materials:

Kluge, Ralph. "Lightweight-Aggregate Concrete." Journal of the American Concrete Inst. 20 (May 1949).

General Electric Review. April 1925 (reprint).

The K & W Gas-Electric Rail Layer. Chicago, Ill: K & W Equipment Co.

A Plan for the Development of Hydro-Electric Power at Low Cost on the South Platte River. 3-19-26.

Water Service Bulletin—Board of Water Commissioners. Denver, Colo. 5-1-23.

Water Service Bulletin—Board of Water Commissioners. Denver, Colo. 8-1-22.

Water Service Bulletin—Board of Water Commissioners. Denver, Colo. 11-1-22.

Coal Age. March 1928 (reprint).

"Driving the Claremont Tunnel." Engineering and Mining Journal. 5-25-29 (reprint).

Congressional Record. Proceedings of the 85<sup>th</sup> Congress.

Soil Cement News. 5(Oct 1941). "Ventilation Experiments in the Moffat Tunnel."  
Denver Water News. Vol. 15, May 1947.

Official Bulletin of the Colorado Society of Engineers. No. 34, March 1921.

The Engineers Bulletin. Vol. 11, No. 7, July 1927.

Engineering News-Record. 3-14-35, pp. 373-378.

"Amberson Dams." Engineering News-Record. 5-18-33.

Engineering News-Record. 2-9-28, pp. 227-228.

Engineering News-Record. 11-25-20, pp. 1034-1040.

Engineering News-Record. 2-3-27, pp. 189-192.

Engineering News-Record. 11-19-31, pp. 27-28.

Engineering News-Record. 9-21-27, pp. 457-462.

Engineering News-Record. 10-20-27, pp. 629-634.

Engineering News-Record. 3-10-27, pp. 405-510.

Engineering News. 3-26-31, pp. 509-514.

Engineering News. (12-15-27), reprint.

Engineering Record. 8-23-13, pp. 205-208.

Engineering News-Record. 4-26-28, pp. 663-668.

Western Construction News. 5-10-28, pp. 284-296.

Western Construction News. 2-25-29, pp. 119-120.

Western Construction News. 4-10-32, pp. 187-194.

Western Construction News. 5-10-29, pp. 249-250.

Western Construction News. April 1935, pp. 91-98.

New Reclamation Era. 1-28, pp. 189-190.

Boise Capital News. 1-16-28.

Construction Methods. Feb 1928.

Construction Methods. Aug 1929, pp. 59-62.

Western Pipe and Steel News. Jan 1930.

Folder No. 2: Sacramento Union. Jan 2 1949, centennial ed.

Folder No. 3: Truscon Steel. Reports and promotional material.

Folder No. 4: Portland Cement. Reports and promotional material.

Folder No. 5: News clippings (1), 1922.

Folder No. 6: News clippings (2), Feb 26 1925: Opening of Rail Road Tunnel.

Folder No. 7: News clippings (3), 1927-1928.

Folder No. 8: News clippings (4), 1928.

Folder No. 9: News clippings (5), 1929

Folder No. 10: News clippings (6), 1931-1932.

Folder No. 11: News clippings (7), 1932—Owyhee.

Loose Materials:

“Right of Way over Public Lands.” General Land Office. 5-21-09.

“Right of Way over Public Lands.” General Land Office. 6-6-08.

“Engineering Features of the Moffat Tunnel,” by P.W. Brunton. Oct 1923.

Engineering Short Course on Soil Testing and Construction for Corps of Engineers, U.S. Army. Portland Cement Co., Chicago, Ill. 1941.

Seventeenth Biennial Report of the Dept. of Reclamation. State of Idaho. 1952

U.S. Geological Survey-Water Supply Paper #309-Surface Water Supply of the U.S. Washington, D.C.: Government Printing Office. 1911.

U.S. Geological Survey-Bulletin #565-Results of Spirit Leveling in Colorado, by R.B. Marshall, Washington, D.C.: Government Printing Office. 1915.

U.S. Dept. of Agriculture-The Hydraulic Design of Spillways, by Albert N. Huff. Minneapolis, Minn. St Anthony Falls Hydraulic Lab. 1944.

Vertical Waterwheel Driven Generators. Schenectady, NY. General Electric Co. 1930.

Your Denver Municipal Water System. Denver, Colo. 1934.

Pocket Abstract of the J-M Sales Manual. New York. Johns-Manville. 1934.

Report of the Board of Water Supply of the City of New York. July 27 1927.

“The Hydraulic Jump & Critical Depth in the Design of Hydraulic Structures.”

“Tunnel Liners and Mine Arch Plates.” Commercial Shearing & Stamping Co.

“Pneumatic Concrete Placer.” Ransome Concrete Machinery Co. Bulletin #105A.

“Selected Bibliography on Soil Mechanics.” 12-4-39.

“Maximum 24-Hour Precipitation in the U.S.” Technical Paper #16, U.S. Dept. of Commerce. Weather Bureau. Jan 1952.

The Contractor’s Story of the Moffat Tunnel. Hitchcock & Tinkler. 1927.

The Moffat Tunnel Water Tunnel Project. Walter Ena. June 10 1936.

Denver Trans-Mountain Fraser River Diversion Project. 1938.

Municipal Facts. Aug – Sept 1923. Vol. 6.

“Contract for the Construction of the Shandaken Tunnel.” Board of Water Supply. New York, NY. 1917.

“Under the Great Divide.” Texaco Star. Vol. 16. 10-29, pp. 7-10.

Silcox. F.A. U.S. Dept. of Agriculture-Fish Stream Improvement Handbook. Washington, D.C.: Government Printing Office. 1936.

Code Governing Design & Construction of Dams in Arizona. State of Arizona. 10-10-32.

Niel Meadowcraft. U.S. Dept of Agriculture-Debris Dam Survey of the South Slope of the San Gabriel Mountains. 6-6-35.

ASTM Methods of Testing Soil-Cement Mixtures. American Society for Testing Materials. 1949.

Catalog of Johns Manville Building Materials. 1934.

Industrial Asphalt Products for Maintenance. New York. Flintcote Co.

Shank, H.M. Flood Flows from Certain Mountain Land in the West as Related to Economy of Bridge and Structure Design. 1950.

Log Book. Misc. notes.

Hetch Hetchy Aqueduct: Report on construction. 1926. San Francisco, CA.

Box NO. 3                      MOFFAT TUNNEL COMMISION BLUEPRINTS

No.	Title	Draw- ing #	Acc. #	File #	Date
1	Moffat Tunnel & Vicinity (map)				
2	Exhibit A				
3	Exhibit A-1				
4	Exhibit A-2				
5	Exhibit A-3				
6	Special Reinforced Timber	B-12			
7	Separate Sets	B-12			
8	Rachet Wrench for Lewis Girder	B-53			
9	West Portal Camp	C-3			
10	East Portal Camp Layout	208	7-E-6		
11	Rail & Splice		3-T-20		
12	7 x 10 ½ Tie Plate		3-T-24		
13	Concrete Portal	204	7-T-1		
14	Map of the Moffat Tunnel Diversion Project, Grand County, CO				
15	Proposed Refuge Bay				
16	Station 2717-86				



17	Special Reinforcing Timber				
18	Separate Sets for 2 Types of Construction				
19	Moffat Water Tunnel				
20	Filing Map of Moffat R.R. Tunnel				
21	Filing Map of Moffat Water Tunnel				
22	Gunite Tunnel Car				
23	Resident Engineer's Cottage				8-19-23
24	Moffat Tunnel Locality Map				8-1-23
25	Topography at West Portal—Nos. 4 & 5				8-1-23
26	Water Tunnel Profile				8-1-23
27	Ties on New Line of Tunnel		16		8-15-23
28	Bunkhouse for 26 Men		17		9-23-23
29	Resident Engineer's House		25		8-24-23
30	Roof Ventilator Detail		26		3-29-23
31	Shop St.—East Portal		30	2-E-4	8-29-23
32	Laundry & Bathhouse		32		9-1-23
33	Protection for Water Service		35		9-8-23
34	A-Frame Support for Crane		37		9-12-23

35	Basement for Bunkhouse		36		9-12-23
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66	Permanent Auxiliary Timber		147	6-T-39	2-5-25
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71	Separate Sets—3 types of construction				4-9-25
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143	ESO 26-89				
144	Middlefield Dam				
145	D. & R.G. R.R.—Standard Road Bed Sections				5/1903
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