

Redeeming the West: A History of the Scientific Approach

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April 1st, 2013

Dixie State University Colleagues Presentation

Albert Bierstadt, *On the Oregon Trail*, 1867



Albert Bierstadt, *Surveyors Wagon in the Rockies*, 1859

The pioneers of science in the American West were more often than not those trained in the “art” of surveying. Exploration surveys were funded by Congress, led by military officers (King, Hayden, Wheeler, Ives, Powell), and necessarily included surveyors, photographers and artists many of whom achieved fame in their own right.

1870

William Hooper before Congress opposing Anti-Mormon bill

[DEBATE ON THE CULLOM BILL]

Shelby M. Cullom [Ill.] Introduces Bill in the House to Punish Polygamists in Utah—Debate: in Favor, Mr. Cullom; Opposed, William H. Hooper [Utah]; Bill Passed by House, but Not Acted upon by Senate—President Grant on Polygamy—Enactment of the Poland Anti-Polygamy Bill; It Is Upheld by the Supreme Court Decision That Religious Belief Is not a Valid Plea against an Act Made Criminal by Law; the Act Is Ineffectual.

IT was not until five years after the war that the Republican party attempted to execute its pledge of 1856.

On February 17, 1870, Shelby M. Cullom [Ill.] brought forward in the House of Representatives from the Committee on Territories a bill "in aid of the execution of laws in Utah," which, among other provisions, excluded from grand and petit juries all believers in polygamy; made the lawful wife in prosecutions for this offense a competent witness to prove her husband's first and second marriages; made cohabitation and kindred acts a proof of the original and subsequent marriages, there being no public official Mormon marriage ceremony or record; and declared plural marriage to be concubinage, punishable by fine and imprisonment, the concubines to be competent witnesses; authorized the use of United States troops to enforce the act; excluded alien polygamists from citizenship, and native polygamists from voting or holding office or preëmpting homesteads; prescribed that an office-holder qualify by swearing he is not a polygamist or will become one; prescribed that marriages be solemnized as in other parts of the country; debarred marriage within specified degrees of consanguinity; required divorce from former spouse in case of a marriage of a person whose former spouse was living, etc.

GREAT DEBATES IN AMERICAN HISTORY

From the Debates in the British Parliament on the Colonial Stamp Act (1764-1765) to the Debates in Congress at the Close of the Taft Administration (1912-1913)

EDITED BY

MARION MILLS MILLER, LITT.D. (PRINCETON)
Editor of "The Life and Works of Abraham Lincoln," etc.

IN FOURTEEN VOLUMES

EACH DEALING WITH A SPECIFIC SUBJECT, AND CONTAINING A SPECIAL INTRODUCTION BY A DISTINGUISHED AMERICAN STATESMAN OR PUBLICIST

VOLUME EIGHT

CIVIL RIGHTS: PART TWO

With an Introduction by WALTER HINES PAGE, LL.D.
American Ambassador to the Court of St. James

On March 22 and 23 William H. Hooper, Delegate from Utah, opposed the bill.

Mr. Speaker, I wish to make a few remarks concerning the extraordinary bill now under consideration. While so doing I crave the attention of the House; for I am here not alone as one of the people sought to be cruelly oppressed, not only as the delegate representing Utah, but as an American citizen, to utter my solemn protest against the passage of a bill that aims to violate our dearest rights and is fraught with evil to the Republic itself.

I do not propose to occupy the time of the House by dwelling at length upon the vast contributions of the people of Utah to the wealth of the nation. There is no member of this House who does not recollect in his schoolboy days the vast regions west of the Rocky Mountains characterized in the geographies as the "great American desert." There, said those voracious textbooks, was a vast arid region wherein no man could live, around the borders of which roamed the painted savages, only less cruel and remorseless than the desert itself.

In the midst of this inhospitable waste to-day dwell an agricultural, pastoral, and self-sustaining people, numbering one hundred and twenty thousand souls. Everywhere can be seen the fruits of energetic and persistent industry. The surrounding mining Territories of Colorado, Idaho, Montana, Arizona, and Nevada in their infancy were fed and fostered from the surplus stores of the Mormon people. The development of the resources of these mining Territories was alone rendered possible by the existence at their very doors of an agricultural people who supplied them with the chief necessities of life at a price scarcely above that demanded in the old and populous States. The early emigrants to California paused on their weary journey in the redeemed wastes of Utah to recruit their strength and that of their animals, and California is to-day richer by thousands of lives and millions of treasure for the existence of this halfway house to El Dorado.

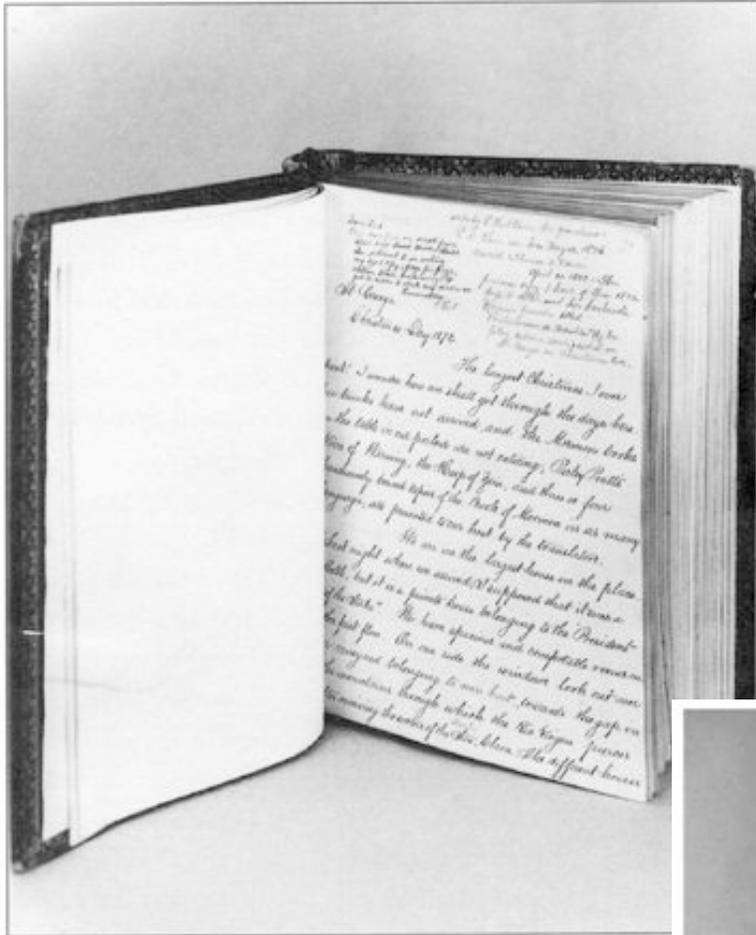
This, however, is but a tithe of our contributions to the nation's wealth. By actual experiment we have demonstrated the practicability of redeeming these desert wastes. When the Pacific slope and its boundless resources shall have been developed; when beyond the Rocky Mountains forty million people shall do homage to our flag, the millions of dwellers in Arizona, Nevada, Idaho, Colorado, and Montana, enriched by the products of their redeemed and fertilized deserts, shall point to the valley of Great Salt Lake as their exemplar, and accord to the sturdy toilers of that land due honor, in that they inaugurated the system and demonstrated its possible results. These results are the offering of Utah to the nation.

For the first time in the history of the United States, by the introduction of the bill under consideration, a well-defined and positive effort is made to turn the great law-making power of the nation into a moral channel, and to legislate for the consciences of the people.

Here, for the first time, is a proposition to punish a citizen for his religious belief or unbelief. To restrain criminal acts,

1873

Elizabeth Wood Kane's Journal



Elizabeth Kane's Journal.

I wonder whether just such scenes were not familiar to David! The Mormons have redeemed these little fertile oases from the desert of a country resembling Palestine geologically, chemically one might say, and topographically. And if these industrious thrifty settlers should be driven off by the shiftless lazy horde who generally settle first on the rich soil of the West, men who expect to reap harvests without labor, these places will soon fall back into desert again. "Blessed are they that sow beside all waters, and send forth thither the feet of the ox and the ass."⁶⁶ I begin to realise now why it is that Palestine seems so barren a country now, and why the Jews deemed it so fertile. With irrigation trees grew and they had magnificent crops. When the enemy overran the land, and the heart of the people failed them, they neglected the water channels, and the hot sun and the strong salts in the soil burnt up the vegetation. So it will be here. I do not suppose now, as I used to do at home, that Palestine was once a country wooded and green as Pennsylvania. It must have been like this land, with timber of poor quality growing in the cañons, and here and there spots like Lebanon, of whose mighty trees they talked as the Mormons do of the forest on the San Francisco Mountain in Arizona.

Elizabeth Wood Kane kept a journal during her stay in St. George, Utah during the winter of 1872 - 1873.

"She noted that she often felt she was living in an old Syrian world among pastoral folk fulfilling Isaiah's promise of making a fertile land of the desert plains."



FIG. 1. Elizabeth W. Kane in Salt Lake City, winter 1872-73. Photo by C. R. Savage. L. Tom Perry Special Collections, Harold B. Lee Library, Brigham Young University.

1879 Report on the Lands of the Arid Region, JW Powell

Thirty years of data concerning climate change were analyzed by the J. W. Powell Survey in 1877. Powell and other government scientists were aware of claims by Mormon settlers that the increased precipitation was a result of their prayerful requests to the Almighty.

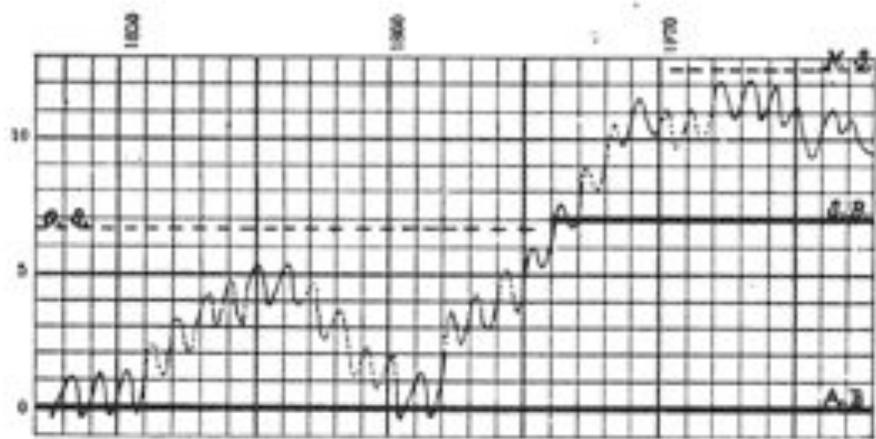


Diagram showing the rise and fall of Great Salt Lake from 1847 to 1877.

- N. S. = Level of new storm line.
- O. S. = Level of old storm line.
- S. B. = Level of Stansbury Island bar.
- A. B. = Level of Antelope Island bar.

It is proper to add that, so far as I entertain the idea of a change of climate, I do so without referring the change to any local cause. It is frequently asserted that the cultivated lands of Utah "draw the rain"; or that the prayers of the religious community inhabiting the territory have brought water to their growing crops; or that the telegraph wires and iron rails which gird the country have in some way caused electricity to induce precipitation; but none of these agencies seem to be competent. The weather of the globe is a complex whole, each part of which reacts on every other, and each part of which depends on every other. The weather of Utah is an interdependent part of the whole, and cannot be referred to its

G. K. Gilbert provided this explanation of the rise of the level of Great Salt Lake over the thirty year period following the Mormon's arrival.

The only remaining theory of value is the one advocated by Professor Powell: that the phenomena are to be ascribed to the modification of the surface of the earth by the agency of man. The rise of the lake and the increase of streams have been observed since the settlement of the country by the white man, and the sage brush on the old storm line shows that they had not been carried to the same extent at any previous period in the century. They have coincided in time with the extension of the operations of civilization; and the settlers attach this idea to the facts in detail as well as in general. They have frequently told me that wherever and whenever a settlement was established, there followed in a few years an increase of the water supply, and these statements have been supported by such enumerations of details that they seem worthy of consideration. If they are well founded, the secret of the change will surely be found among the modifications incident to the operations of the settler.

John W. Powell believed that the phenomena was a result of the actions of man. This was termed the *Theory of Human Agency*.

Similar testimony was gathered by Prof. Cyrus Thomas in 1869 in regard to the increase of water supply at the western edge of the plains,

Southern Illinois Normal School Professor, Cyrus Thomas, was the leading proponent of the theory that "*Rain Follows the Plow*".

1891

First Irrigation Congress held in Salt Lake City, Utah

MEMORIAL
 TO THE
 CONGRESS OF THE UNITED STATES
 FROM THE
 NATIONAL IRRIGATION CONGRESS
 HELD AT

Salt Lake City, September 15, 16 and 17, 1891.

To the Honorable, the Senate and House of Representatives in Congress Assembled—Your memorialists represent that in pursuance of a call issued by the Hon. Arthur L. Thomas, Governor of Utah, for a convention "to consider matters pertaining to the reclamation of the arid public lands of the West," the Irrigation Congress met at Salt Lake City on September 15, 1891, and remained in session for three days. There were delegates in attendance from the States of California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Texas and Wyoming, and the Territories of Utah and New Mexico, and the body was in a notable degree representative of that large section of the Union to which the rainfall is inadequate for the purposes of agriculture.

A convention "to consider matters pertaining to the reclamation of the arid public lands of the West,"

I joined my neighbors in placing a dam in a stream from the mountains (then called Mill Creek, now Canyon Creek), and in opening up an irrigating ditch of sufficient size to bring water to their land and mine. This water I have used, and this land I have cultivated, from that time to the present. The products of my farm have been wheat, oats, barley, corn and potatoes. I made

From this twenty-acre farm has come the main support of my family during nearly forty-four years. Only once in that time have I had less than forty bushels of wheat to the acre. Four years ago

As to the amount of water needed, I give again my own experience: I irrigate my crops not more than twice in a season, and the wheat generally but once. As to fertilizers, I have used nothing but barn-yard manure.

"Here are a thousand miles, I might say, through these mountains, filled with cities, towns, villages, gardens, and orchards, and the produce of the earth that sustains the people. Without this water, this irrigation for which you have met here today, this country would be as barren as it was in 1847, when we found it."



"My Twenty Acre Farm", Wilford Woodruff

"The Mormon Land System", George Q. Cannon

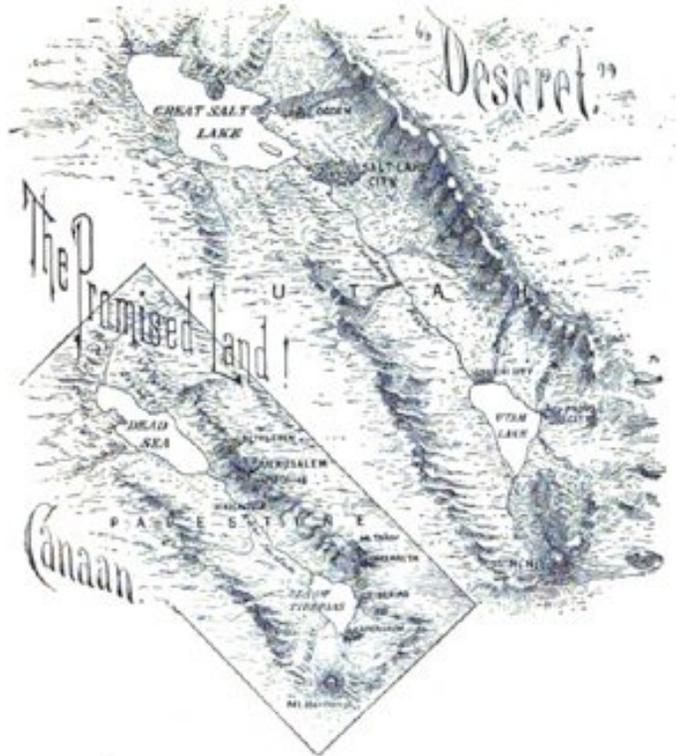


HON. GEORGE Q. CANNON,
 Of Utah, Temporary Chairman Irrigation Congress.

We in Utah have proved that the small holdings are the best for the people. Our pioneers, when they went into that country, arranged in the first place that men at the head of a household should receive a city lot. The city was divided into blocks of ten acres, containing eight lots of one and a quarter acres each. I remember applying for a lot and was told that I was not a married man and could not have the land. Outside the city the first lots were five-acre lots, later ten-acre lots, and later twenty-acre lots. Mechanics were expected to have ten acres. Those who were engaged in business drew ten acres if their families were large enough. It was not a law, but was suggested. Laws were then made that no man should manipulate land, so that every man in the community should have a sufficient quantity to supply his wants and to enable him to raise what he wanted, but could have nothing for manipulation. We had to set our faces against the manipulation of land and the manipulation of water. We dread above everything large companies coming in and making canals and taxing our people for the water. We do not think that is necessary. We have proved that water can be taken out and that it can be used by the poor man by a proper combination of efforts by being united. We have proved this and also that large tracts of land are not necessary for the public

1891 Rio Grande Western Railroad Pamphlet

The accompanying map of Canaan and the Salt Lake valley strikingly exhibits the topographical similarity between the Promised Land to which Brigham Young led the Mormon pioneers of 1847. In both localities a River Jordan connects a body of fresh water with a Dead sea, and the surrounding mountain landscape is almost the same in both cases.



A STRIKING COMPARISON BETWEEN THE PROMISED LAND OF CANAAN AND THE SALT LAKE VALLEY, ON THE LINE OF THE RIO GRANDE WESTERN RAILWAY.

The railroad pamphlet advised "Follow prairie dogs and Mormons, and you will find good land."

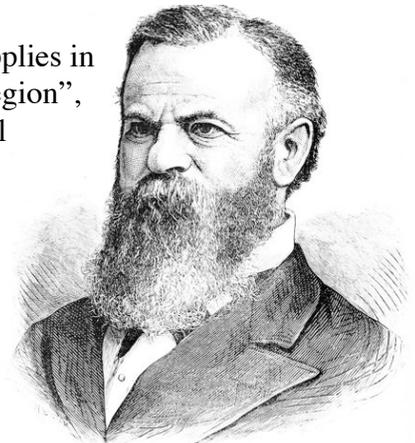
The *National Irrigation Congress* was held annually from 1891 until 1916, by which time the organization had changed its name to the *International Irrigation Congress*.

Mr. PICKLER. How do you account for the multiplicity of schemes in the last eighteen months?

Major POWELL. It is because of the large increment of value given to land by reason of irrigation. It is so enormous that there is no difficulty in obtaining hundreds of millions of dollars for the land's redemption. Hardly a week passes that some foreign or American investment company does not write to me asking for information. Capital is offering everywhere. You must appreciate what it means to take desert land that has little or no value and make it worth anywhere from \$30 to \$200 an acre, and after these lands have been increased thus in value, to obtain permanent right to water and make a permanent investment. The opportunities for investment and for making grand fortunes are so great that money pours into the country for the purpose.

Mr. HERBERT. You have estimated that it will take several hundred million dollars to buy out the rights that will be vested if existing plans are carried out. What is your estimate of the amount that would be

"Water Supplies in the Arid Region", J.W. Powell



"An Unresolved Western Problem: The Division of Interstate Streams" Elwood Mead



ELWOOD MEAD. STATE IRRIGATION ENGINEER OF WYOMING.

TWO reasons influenced the selection of this topic. The first was the belief that the opinion of the irrigator at the head of the stream is always of interest to the user of water below. The second was the conviction that the division of water across State lines is destined to be a live question in the near future. As population increases and the area of land reclaimed is extended, the demands on some streams will exceed the supply, and parties living below the invisible barrier which the boundaries of a commonwealth interposes will seek some method of setting it aside. Already parties having investments on the lower levels of inter-state streams look with extreme and anxious disfavor on continued diversions across the border above them. A few controversies have already arisen in which the aid of the courts has been

1902

Washington County Lands, *Irrigation Investigations in Utah*, Elwood Mead



INFLUENCE OF IRRIGATION UPON PEOPLE AND COUNTRY.

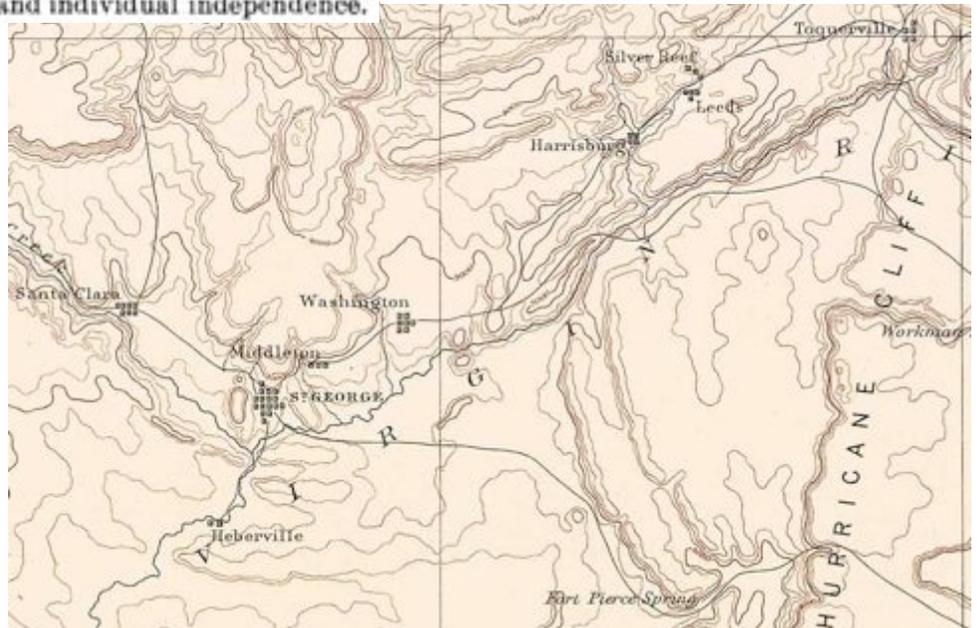
While a description of existing conditions in the far West necessarily includes references to many evils and disappointments, there is a brighter side to the picture, and the future is luminous with new hopes for humanity. A vast population will make its homes in valleys now vacant and voiceless, yet potentially the best part of our national heritage. They will create institutions which will realize higher ideals of society than the world has yet seen. Irrigation is much more than an affair of ditches and acres. It not only makes civilization possible where men could not live without it, but it shapes that civilization after its own peculiar design. Its underlying influence is that which makes for democracy and individual independence.



Figure 55.—An Anticlinal Valley, with section.

Powell's Colorado River expeditions 1869 -1873 were for the Smithsonian, He became head of the USGS in 1876.

Elwood Mead completed his *Irrigation Investigations in Utah* in 1902, the same year the Reclamation Act was passed by Congress.



1903 Movement of Water in Irrigated Soils, John A. Widtsoe

In 1900, John A. Widtsoe, a Norwegian immigrant, became the director of the Experiment Station at the Utah Agricultural College (USU) which had a branch location in Washington County.

For a short time after 1905, he established the Biology/Agriculture program at BYU in Provo. In 1907, he became the president of the Agricultural College. In 1916, he was



appointed president of the University of Utah. In 1921, Widtsoe was ordained an Apostle in the LDS Church.

Days since Irrigation	Number of Trials	Crop	Per Cent of Water at Different Depths of Soil. (Foot Sections.)						Av.
			1	2	3	4	5	6	
In 1903.									
1	2	Lucern	19.99	18.11	15.32	10.52	7.71	9.84	....
8	2	"	17.66	17.10	14.01	10.35	7.69	9.20	....
16	2	"	15.72	14.42	14.13	10.95	8.03	9.53	....
28	2	"	13.01	12.92	12.16	9.88	8.13	9.03	....
1	2	Sugar Beets	25.29	18.66	17.19	16.55	....	....	....
8	2	"	18.77	17.14	19.41	17.60	....	....	....
16	2	"	14.16	15.71	17.20	17.00	....	....	....
19	2	"	11.18	13.30	15.86	14.26	....	....	....
1	5	Corn	24.46	22.88	20.02	16.89	14.89	14.68	....
6	5	"	17.63	16.85	15.60	14.76	14.91	13.08	....
13	5	"	13.36	13.98	15.10	15.51	14.03	13.04	....
19	5	"	11.10	11.13	12.21	12.74	11.21	10.79	....
1	3	Oats	15.94	15.82	15.12	14.96	....	....	....
7	3	"	12.48	12.40	14.41	11.37	....	....	....
13	3	"	9.44	10.96	10.93	12.76	....	....	....
1	2	Wheat	27.65	16.64	18.00	16.28	17.83	12.65	....
8	2	"	16.73	13.31	14.55	16.01	15.61	13.01	....
13	2	"	11.27	10.88	14.42	14.01	14.19	12.42	....
Month BARK SOIL.									
1	3	July	24.81	21.53	21.17	19.83	16.41	13.23	19.46
9	3	"	16.12	17.83	16.97	17.57	13.68	10.32	15.42
16	3	"	16.42	18.30	18.17	19.56	16.56	13.26	17.05
20	3	"	15.36	14.80	17.93	16.90	13.59	13.40	15.33
1	3	August	23.62	21.43	23.34	22.09	17.65	15.33	20.58
8	3	"	17.40	18.65	19.45	18.91	17.42	15.41	17.87
15	3	"	17.22	17.97	20.35	19.37	16.06	15.01	17.66
22	2	"	15.86	18.78	19.38	19.70	17.43	15.57	17.79

However, the year 1870 was almost reached before the American people began to give serious attention to the irrigable West, so strange and forbidding did irrigation seem to the rainfall farmers. With the opening of the '70's came a slight change of heart. Many colonies were established, and with every year the emigration increased. In 1878, Major J. W. Powell's report on the arid lands was published by the government. The public interest became aroused. The westward movement was already covering the Great Plains, and overflowing steadily into the region where irrigation was at that time generally held to be indispensable. All classes of people discussed the Great West as a great hope of the Republic.

From 1870 to 1880, the population of the mountain states doubled; from 1880 to 1890, it almost doubled again. The future of irrigation was safe. Then, the cautious men of money thought their opportunity had come. Great sums were spent in building splendid canals above fertile lands, with the thought that the farmers who settled below the canal would pay a royal annual tribute for the water delivered to the land. But the process of settling a new country is slow; irrigation succeeds best under a close social and economic organization in which canal-owner and water-user must be equal members, and the West is large; so, in face of the slow adjusting of difficulties and the slower settlement of the projects, capital often became discouraged and surrendered its property at a loss rather than to await the sure harvest that the years would bring. Occasionally, also, as in all enterprises, the careless or dishonest or ignorant speculator appeared and for a time misled both capital and farmer.

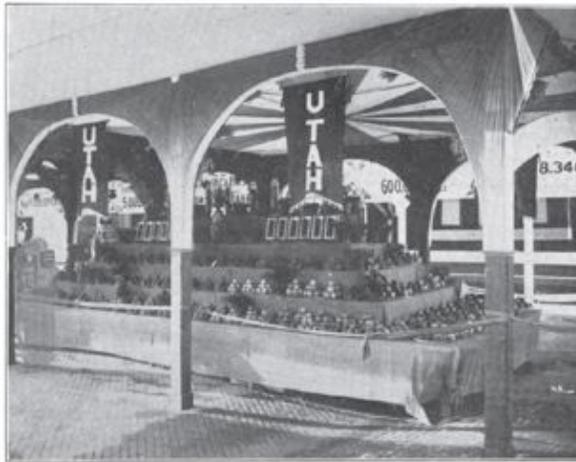
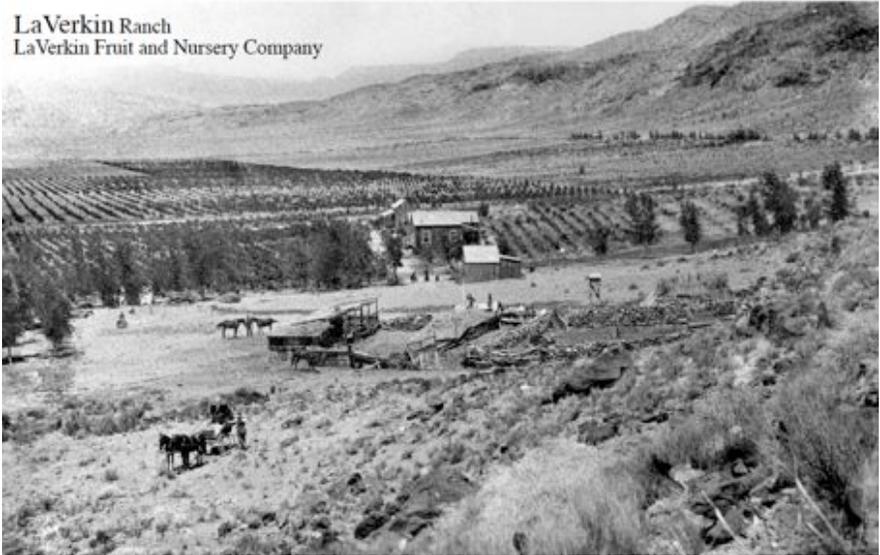
Widtsoe went to Washington DC to serve as Secretary of a Fact Finding Commission which reformed the *Reclamation Service* beginning in 1923 and ending in 1924 with the appointment of Elwood Mead as Director of the *Bureau of Reclamation*.



SUPERINTENDENT'S DWELLING, SOUTHERN UTAH EXPERIMENT FARM, ST. GEORGE, UTAH.

1904 Southern Utah Experiment Farm, Thomas Judd

St. George tithing clerk, Thomas Judd, became a founding partner in the cooperative mercantile firm Woolley, Lund and Judd in 1874. In 1889, he organized the La Verkin Fruit and Nursery Company and built the five mile long La Verkin Canal and 900 foot long tunnel that brought Virgin River water to the La Verkin Ranch. In 1890, Thomas leased the Washington Cotton Factory and operated it at a profit until 1898. He was appointed president of Utah's Horticultural Board when it was first organized in 1897 and remained in that position until 1914.



Another Section of the Utah Fruit Exhibit at Boise, September, 1906.

As a part of his duties he supervised the Southern Utah Experimental Farm (later Experimental Station) in cooperation with the Agricultural College in Logan. Scientific methods were introduced and promoted transforming family farms into an expanding and competitive horticultural industry during his tenure.

EXPERIMENT STATION
OF THE
AGRICULTURAL COLLEGE
OF UTAH
Bulletin No. 97



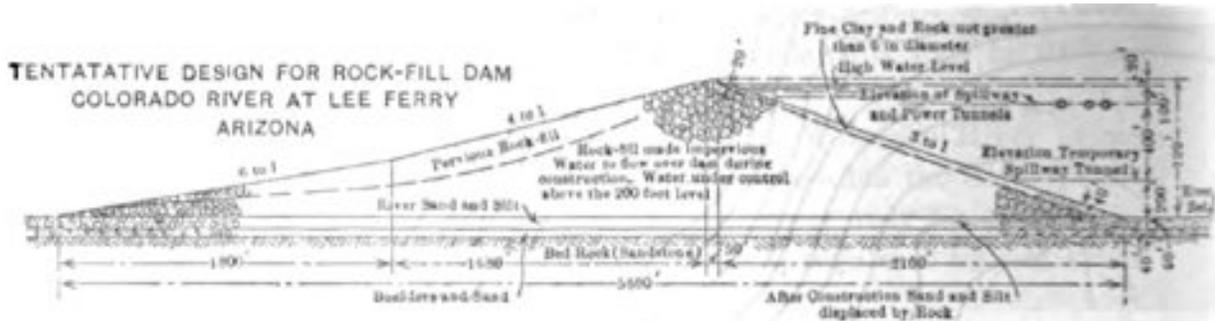
Fig. 1.—Prune Orchard on the Southern Experiment Farm.

REPORT ON THE SOUTHERN UTAH
EXPERIMENT STATION

DECEMBER, 1906

1922 Lee's Ferry Rock-Fill Dam, American Society of Civil Engineers

The tentative plan for the construction of a rock-fill dam at Lee's Ferry by the American Society of Civil Engineers in 1922 would have had a maximum storage capacity of 50,000,000 acre-feet of water, more than twice the capacity of Lake Powell. At 780 feet high it would have been taller than the 710 feet concrete gravity arch dam built at Glen Canyon, fifteen miles upstream from Lee's Ferry in the early 1960's. The 1922 ASCE proposal was motivated by the California's growing electrical power needs and the funds that could be spent on hydro-electric projects. It was anticipated that the rock-fill dam type could be built by blasting the upper portions of the canyon walls away and allowing the loose debris to fall and be maneuvered into place below.



AMERICAN SOCIETY OF CIVIL ENGINEERS
INSTITUTED 1852

PAPERS AND DISCUSSIONS

This Society is not responsible for any statement made or opinion expressed in its publications.

TENTATIVE PLAN FOR THE CONSTRUCTION OF A 780-FOOT ROCK-FILL DAM, ON THE COLORADO RIVER, AT LEE FERRY, ARIZONA.

By E. C. LA RUE,* M. Am. Soc. C. E.

SYNOPSIS

It is proposed to build a rock-fill dam in a narrow canyon of the Colorado River by blasting in the canyon walls. The dam described in this paper was designed to raise the water 700 ft. above the bed of the river. Both the height of the dam and the plan suggested for its construction are unique features. The walls of the canyon rise 1300 ft. above the river, and the width of the canyon at the water surface is 450 ft.

INTRODUCTION

In the southwestern part of the United States, the demand for power is increasing rapidly. In California alone, construction plans which call for the expenditure of several hundred million dollars, have been adopted for the development of hydro-electric power. As a result of these plans, the ultimate development of the power resources of the Sierra Nevada and Coast Range Mountains, in the southern part of California, is in sight.

Paper.] TENTATIVE PLAN FOR ROCK-FILL DAM, LEE FERRY, ARIZ. 83'



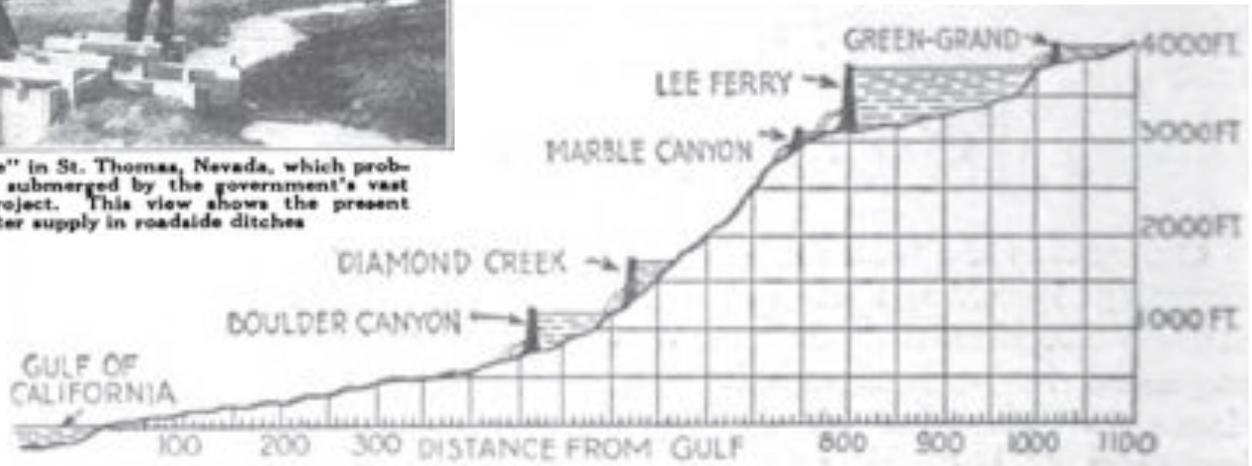
1922 The Great Boulder Canyon Project, Popular Science Monthly

"The incentive for harnessing the mighty Colorado is threefold:

First, flood control.
Second, irrigation of 4,000,000 acres of arid land.
Third, the increase of hydroelectric power to 5,000,000 horsepower -- or one half the total hydroelectric power now (then) generated in the entire United States."



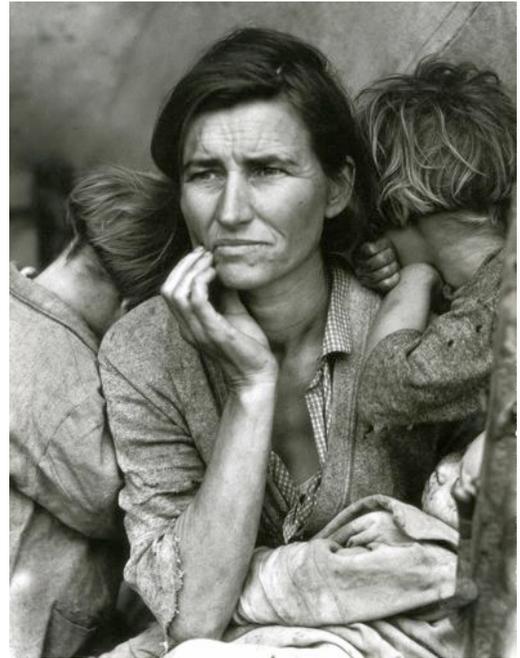
"Street scene" in St. Thomas, Nevada, which probably will be submerged by the government's vast irrigation project. This view shows the present water supply in roadside ditches



Between the 1200-foot walls of Boulder Canyon, Nevada, Uncle Sam will build the greatest dam in history—735 feet high. In charge of preliminary work is Ray Gossett, in the foreground

1938 Springdale Peach Harvest, Dorothea Lange

Between 1935 and 1940 respected and influential documentary photographer Dorothea Lange worked for the *Resettlement Administration* and the *Farm Security Administration* largely bringing the plight of displaced families and migrant workers to the attention of the public.



Dorothea Lange, *Migrant Mother*, 1935



Yet, her photograph of the peach harvest taken in Springdale, Utah in 1938 tells a different story of bounty, togetherness and being prepared for tough times.

Dorothea Lange,
Peach Harvest,
Springdale, Utah, 1938