

# The Dam That Harnessed the Colorado River To Do 'Man's Will and Man's Work'

by Glenn Mesaros

## Colossus: Hoover Dam and the Making of the American Century

by Michael Hiltzik

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Seventy-five years ago, on Sept. 30, 1935, President Franklin D. Roosevelt dedicated the great Hoover Dam, speaking to millions of Americans via a radio broadcast, and thousands on site:

"This morning I came, I saw, and I was conquered as everyone would be who sees for the first time this great feat of mankind.

"Ten years ago the place where we are gathered was an unpeopled, forbidding desert.... We are here to celebrate the completion of the greatest dam in the world, rising 726 feet ... and altering the geography of a whole region; to see the creation of the largest artificial lake in the world ... with enough water to cover the State of Connecticut to a depth of ten feet, and to see nearing completion a power house ... which can continuously supply 1,835,000 horsepower of electric energy. All these dimensions are superlative.

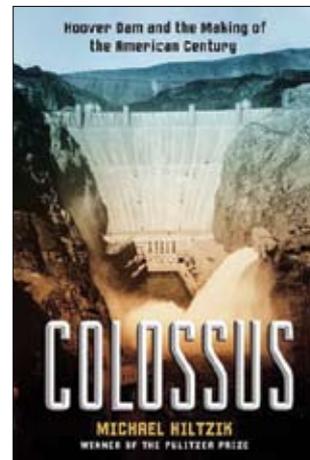
"While we do all this, we give actual work to the unemployed and at the same time we add to the wealth and assets of the Nation. These efforts meet with the approval of the people of the Nation.

"Labor makes wealth. The use of material makes wealth. To employ workers and materials, when private employment has failed, is to translate into great national possessions the energy that otherwise would be wasted. Boulder Dam is a splendid symbol. The mighty waters of the Colorado were running unused to the sea. Today we translate them into a great national pos-

session."

Author Michael Hiltzik tells us much about the great dam, initially known as Boulder Dam, in *Colossus*, but there is too much that he leaves out, most egregiously, the cultural optimism and revival of the human spirit that Roosevelt's New Deal projects had on the American population. Hiltzik's one attempt to show the social impact on Americans of the FDR explosion of infrastructural development, was to cite the inaugural issue of *Life* magazine, in November 1936, which depicted the huge spillway gates of the Montana Fort Peck Dam as "a celebration of mass ... and grandeur were seen as counterbalancing the meanness and constraints of the Great Depression."

Fortunately, the history of the great



dam can speak for itself to convey to today's generation the scope and importance of the project.

### An Historic Appropriation

On Dec. 28, 1928, the tight-fisted, and outgoing President, Calvin Coolidge, signed the largest single appropriation in the history of the U.S. Congress: \$165 million for construction of a 726-foot-high arch gravity dam and power plant, at Black Canyon, on the Colorado River border between Nevada and Arizona.

Located about 30 miles from a nondescript town called Las Vegas, the site had been repeatedly surveyed by the U.S. Reclamation Service as far back as 1900. Not officially called the Hoover Dam until 1947, the location just fit the then farthest extent of transmission power lines to the energy-hungry city of Los Angeles, which signed up for most of the power to be consumed.

President Herbert Hoover received the honor of the Dam's namesake because he toiled for years in bringing seven southwestern states



U.S. Bureau of Reclamation

*Hoover Dam at work.*



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*Franklin D. Roosevelt dedicating the Hoover Dam, Sept. 30, 1935: "This morning I came, I saw, and I was conquered as everyone would be who sees for the first time this great feat of mankind."*

into a Colorado River Compact, signed in November 1922, which distributed the water and power rights. Congress then dallied another six years before appropriating the monies, at the behest of Republican Senator Hiram Johnson (R-Cal.) and Congressman Phil Swing (R-Cal.), mostly because "Silent Cal" Coolidge did not like to spend money.

Congress finally pushed Coolidge to do it after the 1927 Mississippi Flood devastated New Orleans, and a bipartisan coalition demanded flood control projects on a nationwide basis, which became the Flood Control Act of 1928. Engineer Hoover, at the time, did not even promote a high dam on the Colorado, but just asked for 13 smaller dams, and irrigation canals.

The political obstacles were many. President Coolidge had demanded that various utilities sign up for power consumption totalling \$327 million over 50 years to pay for the Great Dam. The Wall

## Roosevelt and Hoover Dam

One of the stories *not* included in *Colossus* is the Sept. 11, 1936, event at Constitution Hall in Washington, D.C., where President Roosevelt addressed 3,000 delegates at the 3rd World Power Conference, and 2nd Congress of the International Commission on Large Dams. The full story can be found in the government journal *Reclamation Era*, published by the Bureau of Reclamation.

Roosevelt told the audience: "Boulder Dam, in the name of the people of the United States, to whom you are a symbol of greater things in the future, in the honored presence of guests from many nations, I call you to life!"

Dramatically, FDR pressed a telegraph key next to his podium, and the signal from Washington, D.C. energized the master relay on the generator control cubicle in the Hoover Dam power house, thus starting a 3,500-horsepower station service unit.

Millions heard the FDR speech, and listened to a dramatic NBC radio hookup at the Dam, where the electricity opened 12 "pin needle" valves to allow a torrent of Colorado River water to tumble 177 feet from the top of the power house down to the ancient river

bed, a waterfall larger than Niagara Falls.

FDR continued, "We are going to see, I believe, with our own eyes electricity and power made so cheap that they will become a standard article of use, not only for agriculture and manufacturing, but also for every home within reach of an electric light line.

"The experience of those sections of the world that have cheap power proves very conclusively that the cheaper the power, the more of it is used."

NBC reporter Laurence Keating followed FDR's speech, and turnkey of power, with this narrative:

"It will take 20 minutes for all 12 to be opened fully—with only the four partially turned on now—there is a definite murmuring roar of falling water—hear it?" [Five seconds or so of light roar].

"... [T]he power house, in height from foundation, is equivalent to that of a 20-story building. Yet from the top of the dam, which is 560 feet above where we are standing, this power house looks like a bungalow!"

Keating then turned the broadcast over to Cliff Eagle, who was flying over the dam in a United Airline transport

plane: "Take it, Cliff Eagle!"

"Boulder Dam is too big to comprehend, all of it at once; and Lake Mead, the largest man-made lake in the world, is of such immense size that we had to come up here to see all of its turquoise waters. . . .

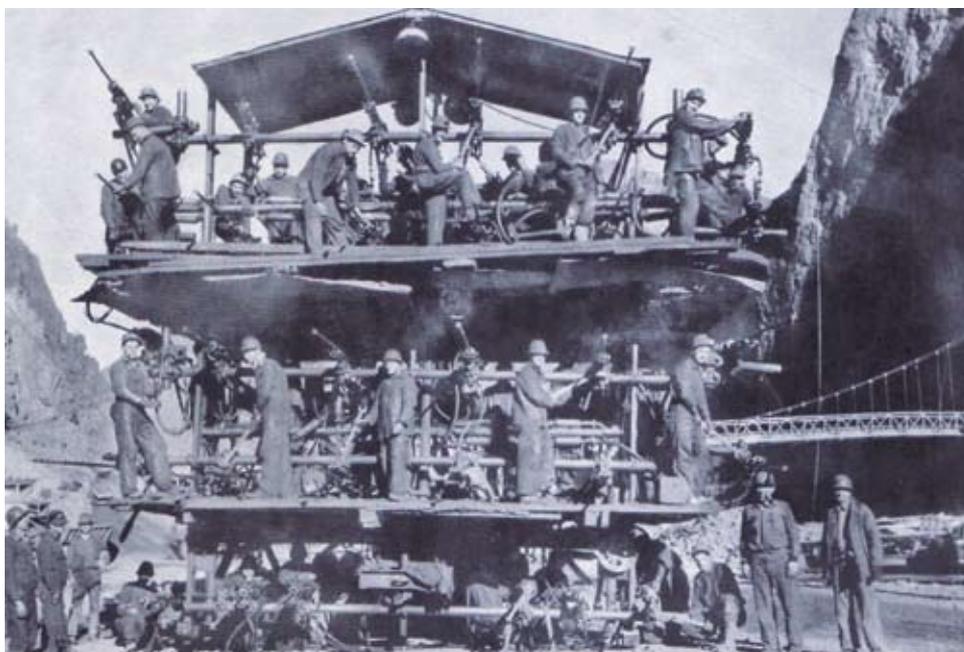
"This is the very heart of what the old maps marked as the 'Great American Desert.' Everywhere we look . . . we can see what countless centuries of devastating floods have done to this country in the way of erosion . . . plainly visible, is the mighty Grand Canyon of the Colorado. . . ."

"Right now the basin is one third full . . . there are 9,500,000 acre-feet of water below me in what was once a land as parched as the Sahara. . . ."

"Boulder Dam looks as though it belonged in this country . . . seems to blend in with all, as though Nature had put it there."

The broadcast then went back to NBC reporter Keating, on the ground.

"The Boulder Dam project is a fact! The Colorado River flows through man-made tunnels, confined by man-made pipe, harnessed to do man's will and man's work."



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The wheeled drilling jumbo, invented by construction foreman Bernard "Woody" Williams, allowed as many as 30 drillers to attack the tunnel face simultaneously.



U.S. Bureau of Reclamation

The Dam in an early stage of terraforming.

Street-run utilities located in California initially opposed it, producing pamphlets in the 1920s titled "Shall California be Sovietized," when that state proposed a hydroelectric system.

and away from Mexico.

### The Great Depression

However, by the time the U.S. Reclamation Bureau appointed Francis Trenholm Crowe to superintend the Dam

Construction in 1930, the Great Depression had settled over America, and between 1930 and 1932, hordes of hungry, desperate workers descended on Las Vegas looking for work. They established "living quarters" near the actual dam site called "Rag Town," where only scorpions and black widow spiders were able to survive the 120 degree heat in the summer-time.

As Hiltzik tells it, Tom Godbey, a former Arizona silver miner, showed up at the Ragtown with his wife Erma, and four children, one only five months old, in the ancient touring car of Erma's parents. No job? "Then you'll have to go down to the river bottom," where no air circulated in the stifling desert heat.

Erma's mother noticed a sign among the raggamuffins labeled "Hell Hole," and shuddered to her daughter, "I am never going to see you again," as they left the destitute family with a mattress, baby crib, and cooking utensils. "Residents" had to sleep in water soaked sheets at night to survive the furnace of the Southwest Desert.

Children would become dehydrated over night, and drink huge amounts of water in the morning. The river water had to be gathered in buckets and left for 24 hours to settle the red silt of the river, before

the water became potable.

(I have driven the area in July, in an air conditioned car, and the 110 degree heat hits you like a blast furnace when you get out of your car. These people lived in that desert without recourse to any modern conveniences.)

Tom eventually got a job. The book depicts him at his "tent," a skinny, malnourished worker. (The 4,000 Dam workers were well-fed later on.) Tom's family was



U.S. Bureau of Reclamation

The Dam was an engineering challenge: There were 5,000 men jammed into a 4,000-foot canyon, and each task had to be carried out in the right sequence.

fortunate enough to buy a tent from the widow of a worker for \$6. Her husband had died when he prematurely entered a blast tunnel zone, and dynamite blew him and his shovel to bits.

#### The 'Big Six Companies'

The Reclamation Bureau correctly determined that the Boulder Dam project represented such grand terraforming of the American continent that it required a unified command. Therefore, the government bidding process required companies to bid on the entire project, as opposed to piecemeal elements. Since the job was so huge, six companies, including the then small unknowns Kaiser and Bechtel, banded together to form the "Big Six Companies," which won the bid.

The Wall Street bonding agencies reacted with horror at insuring the winning bid. One bonding agent wrote his East Coast banking clients, "I consider it almost impossible to build. The hazard is much greater than in any construction contract I have ever known."

New England-born Frank Crowe, the building superintendent, had been building dams for the Reclamation Bureau all his professional life, and he was getting good at it. Boulder Dam, however, was twice as large as any project yet attempted in America. Crowe later recalled for *Fortune* magazine, a great promoter of the TVA and Western projects: "We had 5,000 men jammed into a 4,000-foot canyon. The problem, which was a problem in material flow, was to set up the right sequence of jobs so they wouldn't kill each other off."

The right sequence meant that they had to first build four 4,000-foot "diversion" tunnels, two on each side of the river, to divert the river with "coffer dams," so that construction on the actual dam could begin. The two interior tunnels would later feed the turbulent river water into the power turbines, while the outer tunnels served merely to divert the river, and to prevent future floods from overtopping the dam.

The tunnels had to be 56 feet in diameter, and therefore, drilling cylindrical holes in the mountain face with diamond studded drill bits on conventional scaffolding presented a time-delay problem. The apparatus had to be assembled and disassembled before each dynamite blast. Since each blast tore only about 10



Central Federal Lands Highway Division

*The Hoover Dam Bypass, known as Mike O'Callaghan-Pat Tillman Memorial Bridge, was completed in October 2010, replacing a winding two-lane road. The bridge is 1,700 feet downstream and 280 feet above the Dam, and is an impressive engineering feat in itself. The first arch bridge of its kind in the U.S., it is the longest single-span concrete arch bridge in the Western Hemisphere.*

feet out of the mountain, a quicker way had to be found.

Crowe's engineers used Yankee ingenuity to create "permanent" two-tier scaffolding on the back of large trucks. Eventually, set-up time for all the cables for the electric drills and lights was reduced to 20 minutes, enabling several blasts per tunnel per day.

By the dawn of 1932, there was spectacular progress on the four tunnels. Plans called for diverting the river into the two Arizona tunnels, leaving the Nevada side for reserve in case of Spring floods.

On Nov., 13, 1932, just after Franklin Roosevelt defeated President Hoover in a landslide election, another landslide in the Colorado River Cofferdam diverted the mighty river for the first time since the cofferdam's creation. Shortly thereafter, President Hoover arrived to visit the Dam site. A local reporter said that "I never in my life saw a man look so worn out and completely defeated."

#### Boulder Dam 'University'

The Reclamation Bureau tested 15,000 samples of concrete in building the dam in 94 different formulations, which were tested in three universities, and two spe-

cialized government labs, one of which featured a four-million-ton pressure hydraulic press. They published their findings in a 1938 report which served to advance the "science of concrete manufacture by a quantum leap and would be mined assiduously by dam builders ... for years to come."

The Big Six Companies built an entirely new city near the dam site, Boulder City, which exists to this day and has 15,000 residents. (I stayed there at the same hotel as President Roosevelt.) Big Six constructed nearly 1,000 cottages for families, and eight 172-man dormitories for single workers, all featuring air conditioning, a rare commodity at the time. A Big Six subcontract to Anderson Bros. Supply Co. stipulated that they "shall furnish the buildings, water, and light, and required equipment, supplies, and labor ... shall be absolutely first class in all respects and of such character and quality as to keep all those employed and using the service satisfied and contented."

In addition, Big Six constructed a cafeteria for 1,200 men, and provided fresh meat, fruit, and vegetables at every meal.

Since there were no dairies in Nevada, they bought an alfalfa ranch, and created a 50-cow dairy to provide milk, cream, and butter, which were shipped daily in refrigerated trucks.

Big Six also commissioned Ford Motor company to build special A-6 International trucks with a 210-inch wheelbase to transport workers to the dam. Ford had to develop a four-blade heavy duty fan and radiator for the truck, which became standard issue for the desert regions of the United States.

Altogether, the government spent \$1,135,000 to develop Boulder City from scratch, including the town layout, streets, sidewalks, and installation of sewage and electrical systems.

Several years after Lake Mead filled up, a 5.0 earthquake rumbled through the desert floor from Las Vegas to the newly created Boulder City, felt all the way to Los Angeles, in an area that had previously no seismic activity, in modern times. More quakes followed in the next 10 years.

Later scientists determined that the rapid changes in water levels in Lake Mead during the flood season, and not the actual weight of the Lake, had

caused the quakes.

What was the solution? All the seismic activity stopped when the Bureau of Reclamation built another huge dam, 300 miles up river, the Glen Canyon Dam, in the 1960s, and better regulated the flow of the river floods along the entire Colorado River.

#### Ahead of Schedule

By the time Frank Crowe implemented his ingenious system of cable ways that coordinated the concrete pouring into the dam sections, he was one year ahead of schedule. He had built several concrete plants on location to feed the monster, which devoured 500,000 buckets of concrete, each weighing 16 tons, and comprising 3,500,000 cubic yards of concrete.

The cable ways hoisted each 16-ton load 800 feet in the air over the river, and plunked it down into a designated 50-foot section, where a seven-man crew stomped and shoveled the wet mix into a slowly cooling mass of concrete. Each section contained copper tubing (662 miles in total) which ran refrigerated water to set the concrete in a quickened fashion.

The workers poured the last bucket of

concrete on February 21, 1935. By this time, Babcock and Wilcox had constructed an on-site foundry five stories tall, and 670 feet long, to construct the steel "penstocks," which would funnel the raging river into the power house turbines. A photo shows a large inspection delegation being ferried to the dam base in one such penstock, as a crane slowly descended it into place, from 800 feet over the canyon.

Big Six formally handed over the Dam to the Reclamation Bureau, representing the United States Government, on March 1, 1936. In typical New England Yankee style, Frank Crowe told Reclamation engineer Ralph Lowry:

"Take it Ralph, it's yours now. It's a great dam, Ralph."

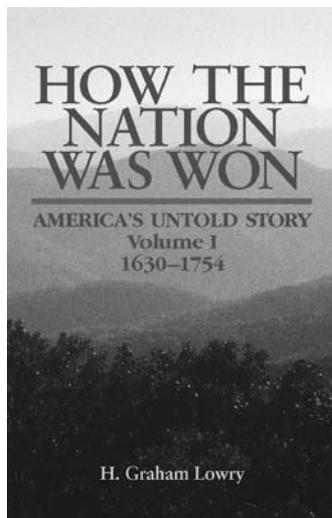
"Well, Frank," Lowry responded, "you oughta know."

Years after he built the Hoover Dam, Frank Crowe told a reporter from *Time* Magazine about the pending completion of the Shasta Dam in California:

"If you want to see the fellow who really built this dam, go over to the mess hall. He wears a tin hat, his average age is thirty-one, and he can do things."

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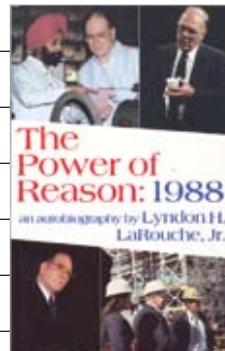
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