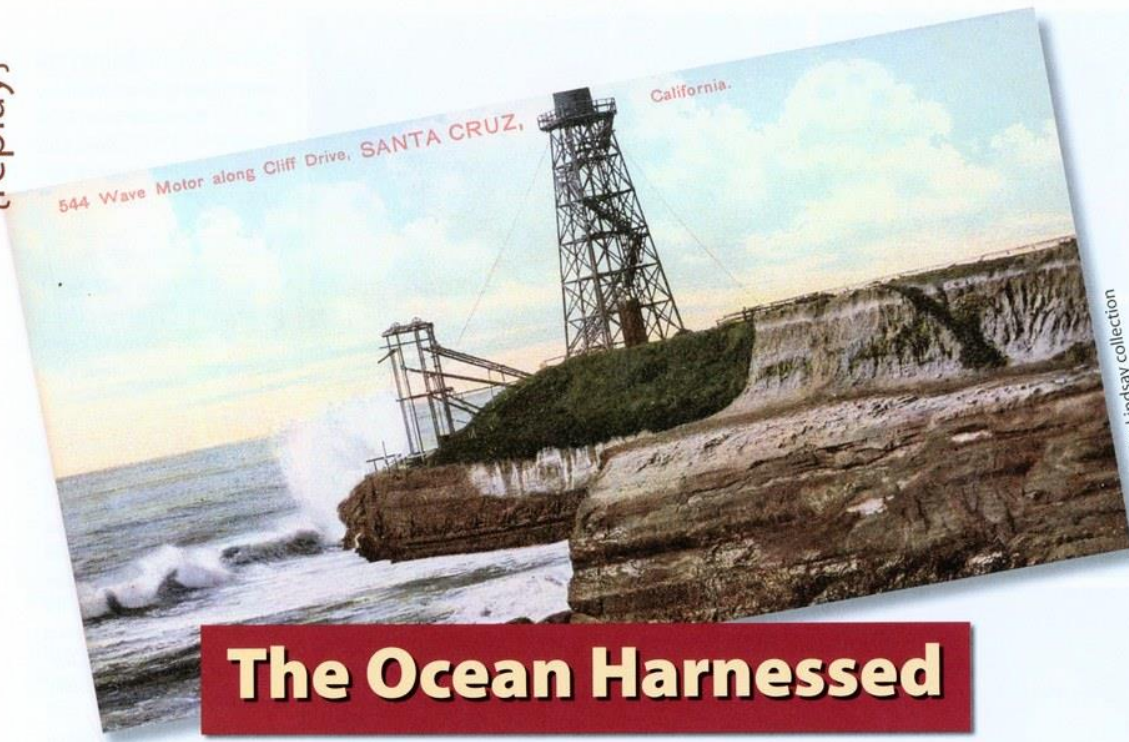


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Postcard: John Lindsay collection

The Ocean Harnessed

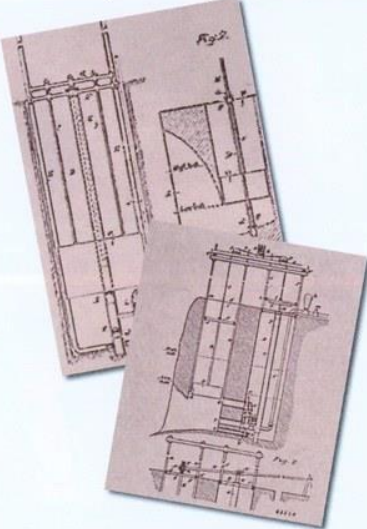
Santa Cruz's experiment in capturing the powers of the Pacific Ocean was successful—if only for a decade

By Geoffrey Dunn

During the late 1890s and early 1900s, the scenic west side cliffs of Santa Cruz hosted a device that was both a signature visual landmark as well as a testament to the entrepreneurial spirit of the community.

Located on a West Cliff Drive promontory overlooking Moore's Beach (today's Natural Bridges State Park), the so-called Santa Cruz "Wave Motor" harkened a new era in Santa Cruz history. The brainchild of brothers William and John Edward Armstrong, the imposing device was heralded by the Santa Cruz Sentinel in front-page headlines on June 25, 1898: "The Ocean Harnessed — A Wave Motor Has Finally Proved A Success."

And indeed it had — for what was its limited purpose. Other contraptions built along the coast promised to turn the ocean's energies into electricity for home and industrial use, but the local Wave Motor was employed simply as a means



(Above) The original patent drawings filed by the Armstrong brothers in 1898.

of procuring large amounts of ocean brine to water down dusty Santa Cruz streets in the midst of a prolonged drought.

While each generation of Santa Cruz historians has paid homage to the Wave Motor — beginning with the Sentinel's own Preston Sawyer, who remembered the device and the accompanying water wagons from his childhood — two important elements of the story largely have been overlooked.

First, the Santa Cruz contraption was part of a worldwide phenomenon involving wave motors during the end of the 19th and beginning of the 20th centuries. Second, the Wave Motor earned Santa Cruz national recognition as the subject of a *Scientific American* profile appearing in January of 1902 by Harry W.H. Penni-

(Top) A vintage picture postcard displays a deserted West Cliff and the wave motor that quickly became a local highlight.



Photo: © Kenneth & Gabrielle Adelman, California Coastal Records

man, founder of the successful Penniman Title Company.

“Ever since man first sought to render useful the various forces of nature, the wonderful power in the mighty waves of the ocean has excited his awe and exercised his ingenuity,” Penniman observed in his article. “Fortune after fortune has been expended to carry out the carefully calculated plans of the mechanical engineer or the fancy of the sanguine theorist.”

The West Cliff Drive wave motor was not the first attempt at procuring the powers of the ocean in the region. The inaugural endeavor took place on the western shores of San Francisco in the 1880s, near the present site of the Cliff House Restaurant. Several others ensued, not only on the Pacific Coast, but globally — from Sausalito and Berkeley to Redondo Beach and San Diego; from Texas, the Great Lakes and along the Atlantic seaboard to Great Britain and even Italy. Promises of cheap electricity were rendered; money was raised and spent; stocks were issued. None was successful. There was a stench of swindle and scandal mixed in with the salt-sea air.

One such effort closer to home — on the Capitola Pier — was constructed in 1895 by Emil Gerlach of San Francisco, who had first attempted to raise money in Santa Monica (where his name appeared

on delinquent tax lists). Gerlach called his invention “the nearest thing to perpetual motion the world will ever know.” He talked about raising an additional \$5 million for a plant in San Francisco. He also assuredly declared, “I do not think there is any chance of a failure.”



A view of the wave motor structure, looking south toward Stockton Avenue.

But fail it did. Following months of construction — replete with a 30-ton flywheel — and expenditures upward of \$23,000, the *Sentinel* noted wryly: “The Gerlach Wave Motor does not allow itself to be disturbed by the waves.” Gerlach blamed the problem on the location in Capitola and later went into the fruit jar business. A year later, Francis M. Graham

Aerial photo shows the intersection of Chico Avenue and West Cliff Drive where the holes drilled for wave motor still remain.

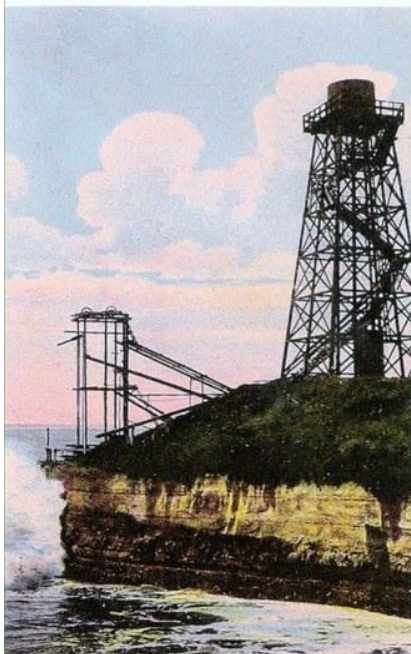
of San Jose, following experiments at Lighthouse Point, received a patent for a wave motor, but it, too, went nowhere.

The Armstrong Brothers had a better idea. The genius of their design was to keep things simple. They had built a prototype reportedly near Black Point (I believe it was actually located further east, on the sandstone bluffs closer to Sunny Cove) and soon realized that it was unlikely to generate much electricity. But as the City of Santa Cruz was in desperate need of salt water for its expanding street system, they were soon contracted by city officials to commence with their invention on what was then the far western edge of the city.

The Armstrongs were actually half-brothers. William, born in 1847, first came to Santa Cruz in 1872 and appears in the 1880 Santa Cruz census, living with his mother, wife, two sisters, a brother and two children on Pacific Avenue. His occupation is listed as a “carpenter,” though, according to local historian Leon Rowland’s file cards at UC Santa Cruz, he also worked in local lumber mills, including F. A. Hihn’s.

John Edward (“Ned”), born in 1852, is listed in the 1880 census as living with his wife’s family in Minnesota. By April

Photos: Geoffrey Dunn collection



The surf pounds against Santa Cruz's west cliff which was home of the Armstrongs' wave motor (left) and the water storage tank (right).

Canada, replete with detailed diagrams of the "Wave Power Pumping Apparatus." In the aftermath of the *Scientific American* article, several other national news outlets picked up on the Wave Motor story. A lengthy piece that first appeared in the *San Francisco Chronicle* was sent out over the wires. While noting that there had been 231 patent applications related to wave motors, the article affirmed that the Santa Cruz variation was "the only machine that has ever proved permanent or of practical value."

The article included an in-depth interview with William Armstrong, who noted that he had been influenced by Gerlach's failed effort along with those of others. "We have always had a knack for contrivance in our family," Armstrong asserted, "and I am never happier than when studying out mechanical difficulties." The unnamed *Chronicle* writer was duly impressed with what he encountered on the west side cliffs. "With the vicious hiss of foam, the waves hurl themselves against the cliff almost beneath [one's] feet," he waxed. "The very earth trembles with the impact, but the beam of the wave motor only rises majestically twenty or perhaps thirty feet, like the piston of some huge steam engine,

while the water sucks and gurgles and groans in the wells below, with the moans of Neptune, the ungovernable, conquered at last."

It was not the failure of ingenuity that doomed the Wave Motor, but the advance of asphalt, cement and concrete. The tank and the landmark tower simply became obsolete and, some time after 1910, were eventually disassembled.

The Armstrong Brothers lived out the remainder of their lives in Santa Cruz. By 1908, Ned would become the city's chief of police. The Armstrongs' mother, Catherine, became one of the first women to vote in Santa Cruz County, at the age of 89.

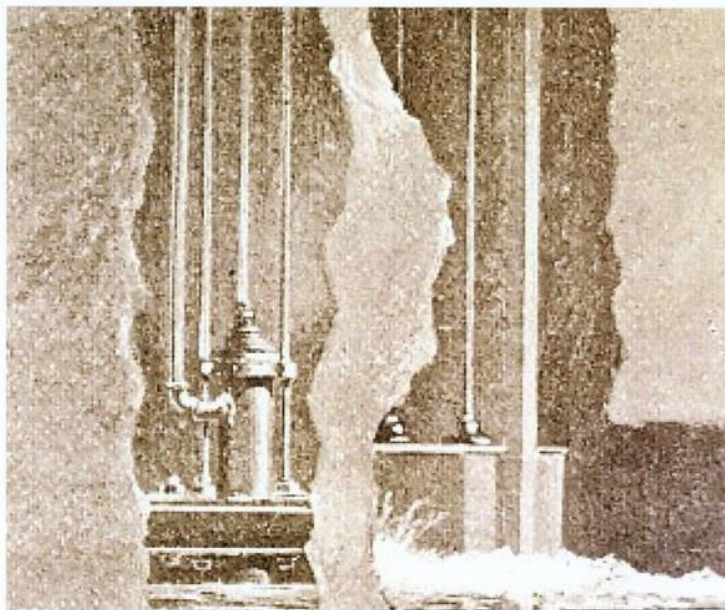
As for the famous Wave Motor, there are still small vestiges of it on West Cliff Drive, between Chico and Auburn avenues. Contrary to various rumors, the six-foot wide hole is still there, though in recent years it has been filled with a large concrete plug that contains a trio of air passages formed by pipe made of polyvinyl chloride. At the right tides, and with a modicum of wave activity, ocean water still shoots up into the air, paying homage to the two brothers who pursued their dreams of oceanic alchemy. ♣

of 1886, he had registered to vote in Santa Cruz County and was identified as a "farmer," though he was to have applied successfully for six federal patents throughout his life.

Preston Sawyer recalled the Armstrongs as being possessed of "inventive minds." They drilled a 35-foot hole, six feet wide, through the edge of the cliff, extending beneath low-tide levels. They then sank a circular shaft through the bore to a horizontal tunnel that connected directly to the ocean.

"A counterbalanced float rises and falls between vertical guides in the foremost well as the swells outside raise or lower the water level," Penniman explained in scientific fashion. "The plunger of a common force pump working in any part of a long pump barrel occupies the second well, forcing on the down stroke the salt water vertically 125 feet to a 5,000-gallon tank raised on a 60-foot derrick on the bank above."

The Armstrongs successfully applied for patents in both the United States and



In 1902, this illustration of the "Wave Power Pumping Apparatus" accompanied Harry W.H. Penniman's article in the *Scientific American* magazine.