The Co-Operative Electric Company
Santa Cruz, California
1904-1908

By Mike Dalbey

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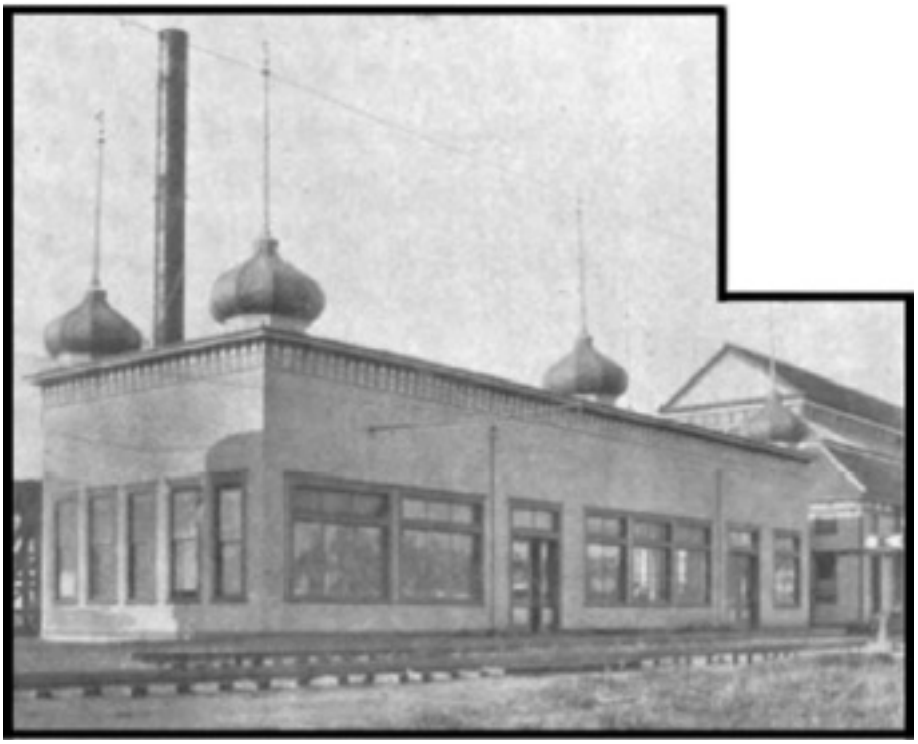

I. Introduction

This paper describes key aspects of the brief history of the Co-operative Electric Company[1].

The COEC illustrates several trends in electric power development that were occurring nationally at the beginning of the 20th Century. Foremost among these was the progressive absorption of small local utility companies by, and consolidation with, ever-larger regional utilities; a trend that culminated in the integrated electrical power "grid" we have today.

The most unique feature of the COEC, which might be particularly interesting to Santa Cruz historians, was its close association with the Santa Cruz Beach, Cottage, and Tent City Company[2]. This was sufficiently intimate to blur the distinction between what was referred to as an "isolated plant", and an electric utility company "central station". (See below for further discussion of this distinction.)

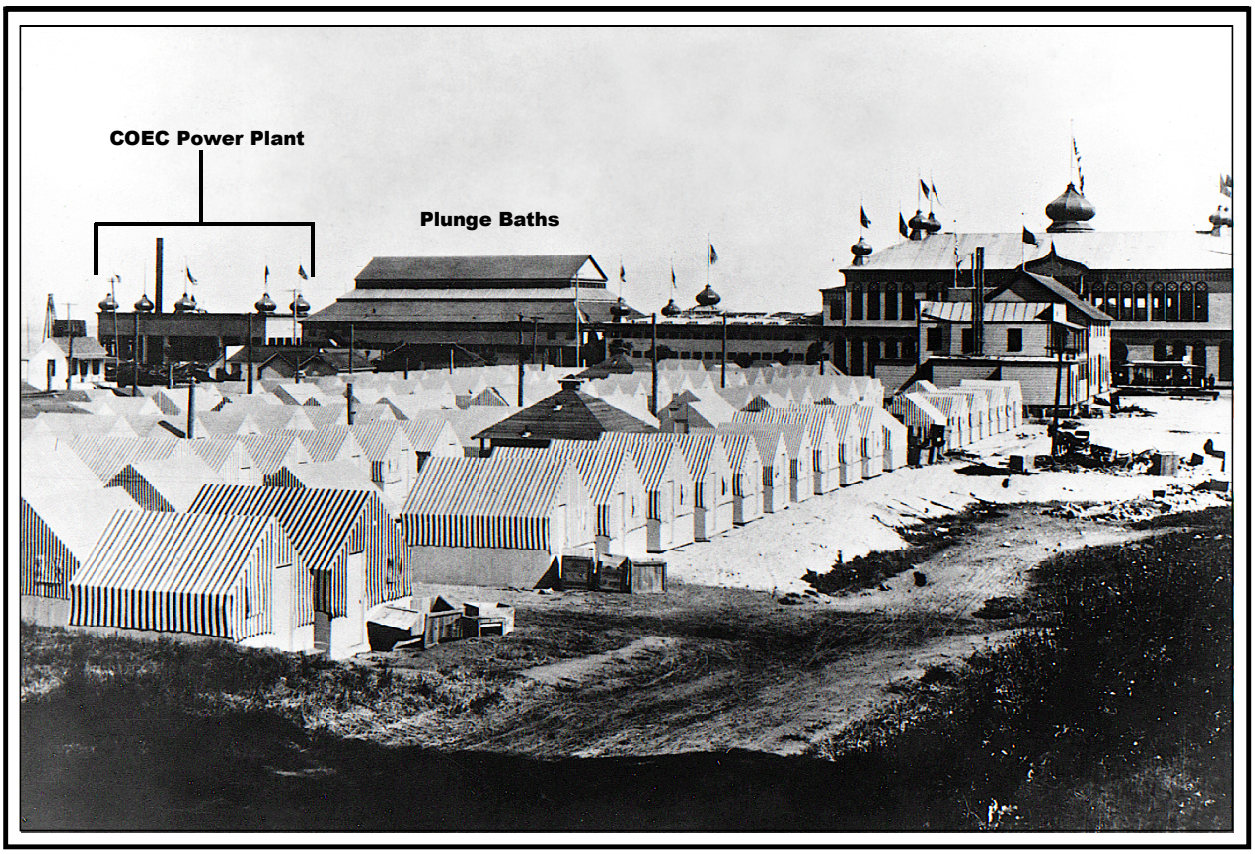

Figure 1. The Santa Cruz Beach, Cottage, and Tent City immediately after its construction in 1904. Note the smokestack and domes of the COEC power plant. Courtesy of Santa Cruz Public Library[3].

Several circumstances attest to the intimate connection with the Beach Company. The two companies were incorporated in the same year, and shared several major stockholders (see Section III, below). The

[1] Referred to hereafter as "COEC".

[2] Referred to hereafter as the "Beach Company".

[3] "The tourist accommodations known as 'Tent ...," *SCPL Local History*, accessed June 20, 2017, http://history.santacruzpl.org/omeka/items/show/9790.
Identifier LH-0588

COEC power plant was constructed immediately adjacent to the Beach Company's plunge baths, and shared its building with the "Hammam" or Turkish baths[4]. The Beach Company was a major COEC customer, both of electricity and of heat generated by the COEC plant. Moreover, the power plant building was architecturally integrated with the Beach Company buildings by its "onion domes", similar to those decorating the original casino building and presenting an odd contrast to the visually dominant smokestack (Fig.1). Surely it was the only electric power plant anywhere that ever had such oriental embellishments.

The questions I find most intriguing about the foundation of the COEC are these:

1. Why didn't the Beach Company buy power from an *existing* local utility?
2. Why was a *separate* electric utility company incorporated, rather than just building a plant dedicated solely to supplying the needs of the Beach Company?
3. Did the COEC plan to develop hydroelectric power?
4. How was the COEC affected by the public utility regulatory environment existing at the time?

The reader will find that a lack of definite answers to these questions does not deter me from unburdening myself of my favorite speculations.

1. Why didn't the Beach Company buy power from one of the three local electric utilities that existed at the time?

Three electrical plants were supplying electric power to Santa Cruz in 1904. It seems that the Beach Company should have been able to buy power at a favorable rate in a competitive market. However, the reality of the electric power market in Santa Cruz was much different than it would first appear. One of the existing plants, the Santa Cruz municipal lighting plant, was dedicated to running the DC arc lighting system did not have excess capacity. Furthermore, its generating equipment was not compatible with supplying power for incandescent lighting. The Santa Cruz Electric Light and Power Company at this time functioned only as a distribution company. They were no longer producing power, but instead purchased it from the Big Creek Power Company. In practical terms, then, the power market was a virtual monopoly by the Big Creek Power Company, and the Beach Company could probably not have secured the favorable rates that a truly competitive market might have offered. Moreover, if the Beach Company had purchased their electric power from a utility company, they would still have needed their own boilers for heating. The requirement for heating, together with the desire to avoid buying electric power in an un-competitive market, are the two factors I can identify which would justify the decision to generate their own power. Therefore, the COEC can be partially construed as an example of corporate "upstream vertical integration".

2. Given that the Beach Company would generate, rather than buy electric power, why incorporate a separate utility company to sell power to outside customers rather than simply build a dedicated "in-house" electric plant?

Discussions of the early electric power industry widely characterized generating plants as belonging either to the class of "central stations", or to a class referred to as "isolated plants" (or "private plants"). Central stations are corporate or municipal entities generating electricity for distribution to the general public, and during the 20th Century came progressively to dominate electric power generation. Isolated

[4] The building, which had been edited beyond recognition in form and function, was demolished in November, 2016 to make way for construction of a new main entrance to the Boardwalk. (Santa Cruz Beach Boardwalk press release dated 8/30/2016).

plants usually generated electricity for the exclusive use of their owners, and were typically located within or adjacent to the building or group of buildings they supplied, such as manufacturing plants, hotels, municipal buildings, or large department stores[5]. A cogent summary of this topic is found in Census Bureau studies dating from that time.[6]

One reason for establishing the COEC as a separate corporate entity may have been that the COEC directors believed that production capacity of hydroelectric power by the Big Creek Power Company was insufficient to satisfy rapidly growing demand. (Who would be in a better position to appreciate this than Fred Swanton?) Indeed, in 1905 the Big Creek Power Company constructed a steam-powered electric plant (in Watsonville) to augment their hydropower capacity[7]. Not long thereafter, they began to purchase some of their power from the newly founded P.G.&E Company. It may be, then, that the COEC founders intended to eventually develop the COEC into a viable electric power company.

Another, more obscure motive to incorporate a separate company that could sell power to domestic and commercial customers throughout Santa Cruz may have been the perceived need to utilize their capacity uniformly throughout the year. A major problem confronting the management of early electric utilities grew from the idiosyncratic nature of their product, which unlike any other industrial commodity, must be transmitted and used instantaneously by the customer. Additionally, customer demand, particularly for lighting, is highly variable. This leads to the disagreeable situation of a utility burdened with the investment and fixed cost of a plant that operates at full load for only several hours a day, or at only certain times of year. The load imposed on the COEC by Beach Company would have been particularly variable, with high demand on summer evenings. The load for domestic lighting, peaking in the winter months, would complement the demand by the Beach Company. Combining the loads imposed by the two customers would have mitigated demand variation and improved the overall financial position of the COEC.[8]

3. Did the COEC plan to develop hydroelectric power?

There is circumstantial evidence that the COEC planned to build a hydroelectric plant on the San Lorenzo River. This would be consistent with the surprising emphasis placed on water rights, etc. in its Articles of Incorporation (see Section III, below). The Sentinel briefly described a "plan" floated by Fred Swanton on behalf of the COEC, to dam the San Lorenzo River and build a power plant at Rincon Flats[9, 10]. This reportedly advanced to the stage where "water rights and property had been secured"[11]. I have found no further mention of this plan within the lifetime of the COEC, nor any explanation why it was not

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[5] I remember that my elementary school (Lyman Trumbull School, Chicago, built 1908) had an isolated plant with boilers, a steam engine, and dynamos; though only the boilers were in use when I was a student there in the 1950s.

[6] U. S. Bureau of the Census, Central Electric Light and Power Stations, 1902 (Washington, 1905)
https://ia801406.us.archive.org/34/items/centralelectric00goog/centralelectric00goog.pdf
U. S. Bureau of the Census, Central Electric Light and Power Stations, 1907 (Washington, 1910)
https://babel.hathitrust.org/cgi/pt?id=mdp.39015028113432;view=1up;seq=7

[7] Electricity in the City of the "Holy Cross".
Journal of Electricity, Power and Gas, San Francisco.
Vol. 15, No. 5; May, 1905; p. 167.

[8] For further discussion of this topic (under the heading of "load factor") see:
Louis C. Hunter and Lynwood Bryant
A History of Industrial Power in the United States, 1780-1930. Vol. 3: The Transmission of Power
MIT Press, Cambridge Mass, 1991.

[9] Santa Cruz Sentinel, 6/28/1904, p.1.

[10] Santa Cruz Sentinel, 6/29/1904.

[11] Apparently from the H. Cowell estate.

pursued further. The most probable explanation is that the rebuilding of the Beach Company properties after the catastrophic fire in 1906 (See Section V., below) consumed all the available capital.

4. What public utility regulatory environment existed at the time?

The COEC needed a franchise from the City to erect poles and to run wires on city streets to supply their external customers. This would not have been required if the COEC were to have provided power exclusively to the Beach Company buildings.

Apparently this was overlooked by the COEC and the City alike until June, 1904, when the COEC was stringing wire on Pacific Ave. in fulfillment of their contract to provide incandescent streetlights for the summer. An employee of "a rival company"[12] stopped them from using the utility pole at Pacific and Cooper streets. Fred Swanton, on behalf of the COEC, objected to the City Council that this company had "taken advantage of a technicality"; an argument that prevailed, as the Council allowed the COEC to string wires "on all poles along Pacific Ave. belonging to the City".

I have not located documentation that a wider franchise was ever formally granted. I suspect that it would have been readily obtained amidst the climate of civic enthusiasm that propelled the development of the Beach Company.

On the other hand, the COEC did not need a state-sanctioned license to operate a public utility. The California State Railroad Commission[13], which had been established by the State Constitution of 1879, did not assume responsibility for regulating electric utilities until after 1910. Incidentally, this meant that the 2 existing private utility companies could not apply to the Commission for relief from competition by COEC, as they would have been able to do later. This situation fostered the growth of numerous competing small local utilities throughout California before 1910.

[12] Santa Cruz Electric Light and Power or Big Creek.

[13] Eventually to become the California State Public Utilities Commission.

II. The Company Name

Searching for information on the COEC in databases, or on the internet, is problematic because of the bewildering variety of names used in print media:

Co-operative Electric Company[14]
Cooperative Electric Company[15]
Co-operative Light Company[16]
Co-operative Electric Light Company[17]
Co-operative Light and Power Company[18]
Co-operative Electric Light and Power Company[19]
Tent City Co-operative Electric Light Company[20]

The first name listed above is the correct "legal" name of the COEC as bestowed in its articles of incorporation[21].

Similarly, I have found the power generating facility of the COEC referred to variously as:

"the power house at the casino"[22]
"the power house at the beach"[23]
"the old beach power house"[24]
"the old co-operative powerhouse"[25]
"the Co-operative power house"[26]
"the Electric light sub-station on the beach"[27]

These designations contribute to confusion between the COEC power plant (est. 1904), and the power plant of the Coast Counties Electric Light and Power Co. that was built directly across the street from it in 1908.

Electric utility co-operatives were a significant development of the New Deal, and played an important part in the electrification of rural areas of the country in the 1930's; so an electric utility co-operative in Santa Cruz in 1904 would have been several decades ahead of its time, and unusual for being an urban enterprise rather than rural. However, my conclusion is that the COEC was a co-operative in name only. It was a privately held, for profit enterprise that did not adhere in any way to the definition of a co-

[14] Santa Cruz Sentinel, 9/17/1904.
[15] Santa Cruz Sentinel, 1/26/1907, p.9.
[16] Santa Cruz Sentinel, 6/28/1904, p.1.
[17] Santa Cruz Sentinel, 6/26/1904, p.3.
[18] Santa Cruz Sentinel, 6/11/1904, p.1.
[19] Santa Cruz Sentinel, 5/25/1904, p.1.
[20] Santa Cruz Sentinel, 1/6/1905, p.3.
[21] Articles of Incorporation filed May 2, 1904; County Clerk's Index No. 369. MAH Archives, courtesy of Marla Novo
[22] Santa Cruz Sentinel, 4/27/1906, p.13.
[23] Santa Cruz Sentinel, 4/27/1904, p.3.
[24] Santa Cruz Sentinel, 10/27/1908, p..
[25] Santa Cruz Sentinel, 6/11/1906, p.6.
[26] Santa Cruz Sentinel, 6/2/1904, p.3.
[27] Santa Cruz Surf, 3/12/1908, p.4 : 4.

operative applicable at the time[28], nor to the definition used today[29]. The only sense in which the COEC could be construed as "co-operative" is that it was constructed and operated in alliance with the Beach Company.

In the early 20th Century, public sentiment became increasingly disenchanted with the growing power of "electric trusts" in much the same way it had with railroad corporations several decades earlier. Adopting the designation "co-operative" may have been an attempt to deflect a growing public distrust of private electric power utilities.

[28] So-called co-operatives appeared in the late 18th Century in Great Britain, and the principles of co-operative organizations were formally enshrined by the Rochdale Principles of 1844.

[29] "A co-operative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise." http://ica.coop/en/whats-co-op/co-operative-identity-values-principles

III. Corporate Structure and Financing

Articles of Incorporation for the COEC were filed May 2, 1904 in Santa Cruz County[21].

The purposes and intended activities of the company are described by the 6 paragraphs of article II. The first paragraph, quite curiously, is a broad and thorough description of activities that essentially constitute a "water company"[30] rather than an electric utility. It's all about owning water rights, and constructing water infrastructure (dams, flumes, etc.) and selling water for agricultural, domestic and industrial purposes. Paragraph 4 expands this with the addition of "acquisition of water rights by eminent domain".

Not until paragraph 4 do the Articles describe the business actually conducted by the COEC, electric power generation for sale (essentially an electric utility company).

5,000 shares of capital stock at a par value of $10 per share were offered. Just over 20% was subscribed at the time of incorporation (Fig. 2)[31].

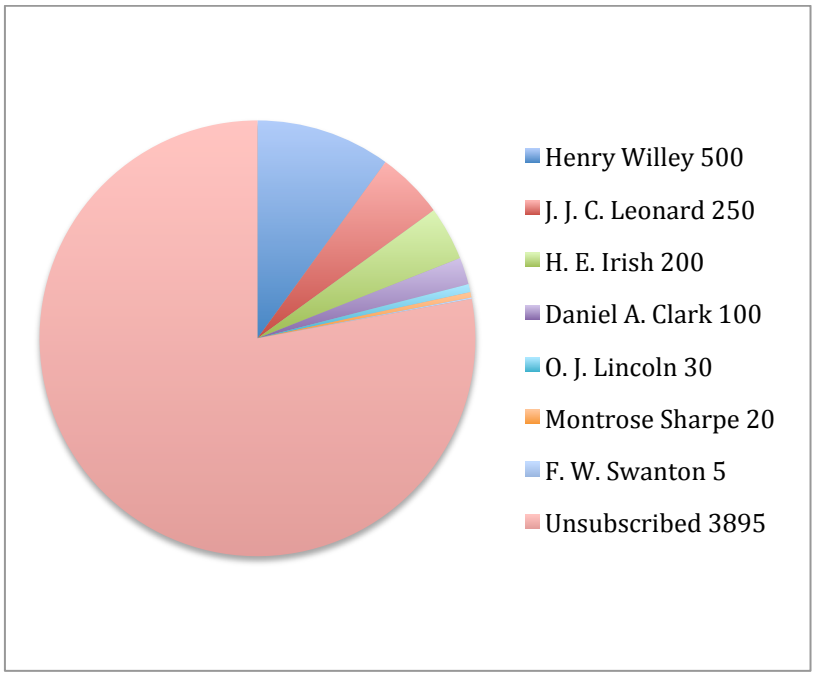

Figure 2. Initial stock subscriptions as recorded in the Articles. The numbers are the number of shares subscribed at $10 each.

[30] *"That the purpose for which said corporation is framed and formed is to appropriate, buy, lease and acquire water and water rights; to construct and maintain dams, reservoirs, ditches, acqueducts [sic], tunnels, pipes, flumes and laterals; to purchase, lease erect, construct, acquire and hold any and all structures and machinery for accumulating and storing water; to accumulate, store, use and sell water and water rights for agricultural, domestic, manufacturing, irrigation, mining, transportation and other purposes, and to sell and deliver to, and supply cities, towns and villages, and the inhabitants thereof, with water, and to use, sell and rent water rights for any and all purposes whatsoever, in the County of Santa Cruz, said State of California."*

[31] Santa Cruz Sentinel (Santa Cruz, California) · Wed, Sep 26, 1906 · Page 1.

Note that the 2 largest shareholders controlled more than 50% of the subscribed stock. The founding officers and directors of the COEC were drawn directly from the group of investors (Table 1.).

Incorporators listed in the "Articles"	Company officers elected at first meeting[32]
Henry Willey*	President
Daniel A. Clark*	Vice President
O. J. Lincoln*	Secretary
H. E. Irish*	Treasurer
Montrose Sharpe*	Director
J. J. C. Leonard	Director
F. W. Swanton	Director

Table 1. Original stockholders and officers of the COEC. *Also a stockholder in the Beach Company.[33], [34]

All of the COEC founders were local residents, businessmen, and/or city officials, making it clear that the COEC was funded by local capital rather than outside capital. Several COEC founders were also important backers of the Beach Co. Willey, Swanton, and Leonard, had been associated previously as managers and directors of the Santa Cruz Oil Co. (Incorporated Dec., 1900.)

In 1905[35] the following individuals were cited as "owners" of the COEC: Henry Willey, H. E. Irish, J. J. C. Leonard, and George Staffler. There is also a reference to a Mr. Moore as having been "one of the promoters of the Co-operative Electric Light Company" and subsequently a director of the Ocean Shore Railroad[36].

Dramatis Personae, Brief Comments

Fred W. Swanton — The notorious Fred Swanton needs no further biographical sketch from me. The COEC is the 3rd electric utility he was instrumental in founding. Probably, Swanton's influence in the company is not fully reflected by his small share holding.

Henry Willey — A local hardware dealer of long standing. Also associated with the People's Bank, and the Santa Cruz Oil Co.[37]

Daniel A. Clark — The only founding shareholder who was not a long-time Santa Cruz resident. Daniel A. Clark came to California in 1850 from Rhode Island by way of Panama,

[32] Santa Cruz Sentinel Wed, May 25, 1904 · Page 1
[33] Santa Cruz Sentinel 10/18/1903, p.3.
[34] Santa Cruz Sentinel, 11/8/1903, p.3.
[35] Electricity in the "City of the Holy Cross"
The Journal of Electricity, Power and Gas (San Francisco)
Vol. 15 No.5
May, 1905 pp. 167-179.
[36] Santa Cruz Sentinel, 9/26/1906, p.1.
[37] Daily Surf10/15/1903p. 7 : 1

	but after a few years he returned to RI where he became an undertaker. After retiring, he moved to Santa Cruz in 1903 and purchased the Coope House on Beach Hill[38]. He remained in Santa Cruz 5 years, investing in several residential properties as well as the COEC and the Beach Co. In 1908 he moved to Berkeley where he died in 1913.[39]
O. J. Lincoln	Lincoln was the City Clerk, and Clerk of the Santa Cruz School District. He was elected a Santa Cruz County School Trustee, and later, Postmaster. After retiring from public service he founded a bulb growing business in at Twin Lakes
H. E. Irish	Stationery store owner.
Montrose Sharpe	Owner of the Sea Beach Hotel, a COEC customer.
J. J. C. Leonard	Manager and/or owner of the Hotel Ben Lomond, the St. George Hotel, and the Pacific Ocean House. Secretary of the Santa Cruz Oil Co.

I have not found any information on those who actually designed and built the power plant. Information on the superintendents/engineers who operated the plant appears below in Section V.

[38] Santa Cruz Sentinel, 7/16/1903, p.3.

[39] See a biography by Stanley Stevens in: Santa Cruz County History Journal Issue 4 (1998).

IV. Power Plant Infrastructure

Unless noted otherwise, technical information and images in this section, as well as the architectural floor plans in Appendix B, are from a description of the COEC power plant that was published within a year of its construction in a technical journal intended for industry professionals[40].

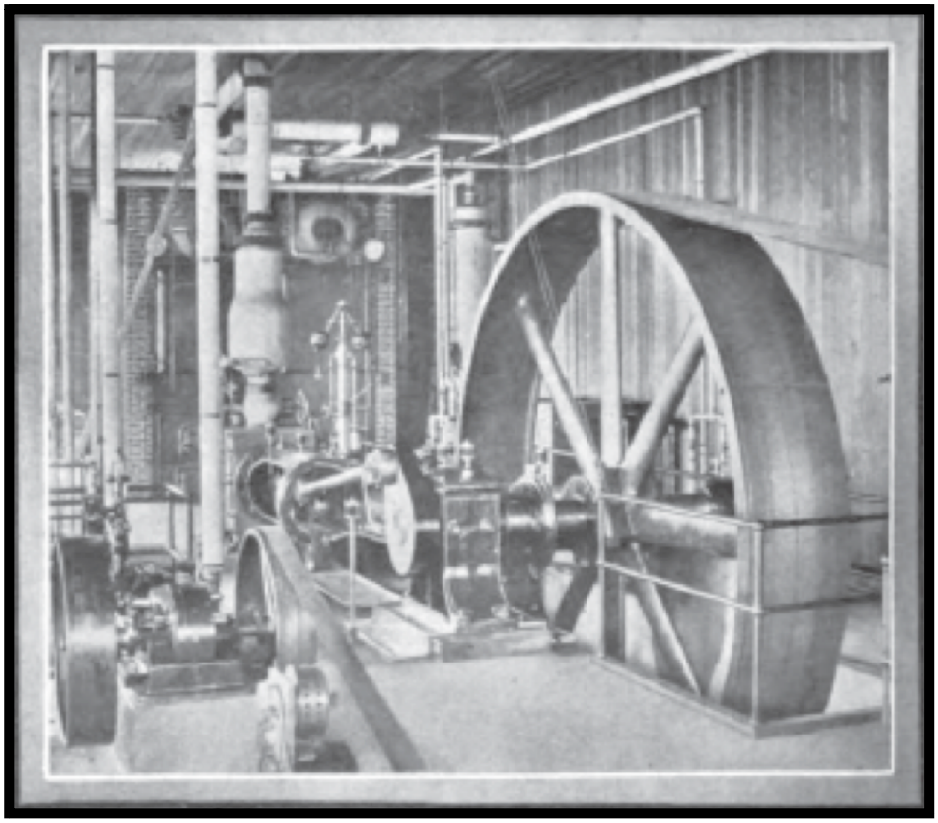

Fig. 3 One of only three known photographs of the COEC power plant interior. Probably taken between June 1904 and June 1905.

I found the following general considerations to be helpful guides in studying the details of the power plant infrastructure:

1. The COEC plant represents the culmination of the 200-year development of reciprocating steam engine design and practice. Although there had been some relative success in adapting steam engines to the special demands of electric power stations, they would be rapidly and aggressively displaced by steam turbines as the 20th Century progressed. That is, we have a window through which to view the swan song of the prime mover most responsible for the industrial revolution.

2. Much of the technical development of the steam engine took place without the benefit of scientific understanding of its principles or even of precise measures of its operation. Yet, by 1900 the theoretical advances by Carnot, and by Rankine, had been thoroughly assimilated into the thinking of professional

[40] Electricity in the "City of the Holy Cross"
Journal of Electricity, Power, and Gas, San Francisco
Vol.15, No.5.
May, 1905, pp. 167-179.

steam power engineers. This, along with increasingly sophisticated analyses of engine performance, forced acknowledgement that steam engines were very inefficient[41], and that substantial improvements in efficiency were not even theoretically possible according to thermodynamic principles. In response, attention was re-directed to finding ways to increasing power plant efficiency as a whole. Several features of COEC plant reflect this.

3. The COEC plant was designed as dual-purpose, producing electric power and hot water/steam for heating.

(2) Babcock and Wilcox Boilers	vertical header type each with 1,175 ft. sq. heating surface 25 PSI
22" X 36" Series "B" Hamilton-Corliss Engine	built by the Hooven, Owens, Rentschler Co. 84 RPM 300 HP 16 foot band wheel with 29 inch face
Westinghouse Alternator	180 kW 2,300 V 3-phase AC
("Exciter") Dynamo	5 HP 125 V DC
Single Phase Westinghouse Switchboard	
Wheeler Admiralty Surface Condenser	
Goubert Feed Water Heater	Vertical Water Tube Type A
Snow Feed water Pumps	
Stratton Separator	
Hot Well	
Blake Vertical Exhaust Relief Valve	
Moore Fuel Oil Pumping System	

Table 2: Power plant components are mentioned in the published technical description.

Regrettably, the technical article presents little more than a "laundry list" of components, and does not convey an understanding of how they all worked together to create a practical power generation facility. No doubt this was appropriate for an article intended for power system engineers who would be able to supply that understanding from their experience and training. I found it unsatisfying, by itself, as a vehicle for understanding the COEC plant as a dynamic entity. This section struggles to contrive a more satisfying *holistic* description, however imperfect, of the COEC power plant machinery and infrastructure. In so doing it necessarily encompasses a good deal of contextual background material and technical information that should be avoided by readers who are interested in only in the "local history" of the COEC.

[41] i.e. A large fraction of the energy embodied in the working fluid (high pressure steam) could not be converted to mechanical work.

I'll begin the discussion with the INPUTS to the plant, namely:

fuel
boiler feed water
steam condenser water
oxygen (atmospheric)

A. Fuel

The COEC power plant was designed to burn crude petroleum (fuel oil) rather than coal or wood, as had been the case with earlier steam powered electric utilities in Santa Cruz. In 1904 the development of the California oil industry was well underway, with a number of oil fields in active production throughout the state[42], including at least one near Watsonville. The Santa Cruz County Board of Trade enumerated the advantages of fuel oil use in local industry[43]. (Lime production in the region was also converting to crude oil at this time[44], and the Santa Cruz and Portland Cement Co. plant in Davenport also burned crude oil delivered by rail, rather than coal, when it opened in 1906.)

Among the advantages to electric power plants specifically was that oil was comparatively clean[45]. In the COEC plant, boilers, engine and alternator were all in the same enclosed space (See Appendix B). Coal-fired boilers would have had to be segregated into a separate space to keep coal dust away from engines and electrical equipment. Also, oil fired burners produced less noxious smoke, no doubt a huge benefit to a plant located in a tourist-centered business area.

Accordingly, we find that the COEC signed a 5-year contract with "a Watsonville Oil company" for 750 barrels a month[46]. Oil delivery was facilitated by the COEC plant's proximity to the railroad.

There is ample evidence that the COEC sold oil on a retail basis to other local users. For example, at their November, 1904 meeting the City Council approved a payment of $202.30 from the Electric Lighting Fund to the COEC for fuel oil.[47] Incidentally, this also documents that the boilers at the municipal street lighting plant had been modified to burn oil rather than wood.

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[42] For a thorough discussion of early fuel oil use in California see:
James C. Williams (1997)
Energy and the Making of Modern California
University of Akron Press, Akron, OH p. 120-126.
[43] *The County of Santa Cruz and Vicinity, California*
Published by the Santa Cruz Board of Trade
The Sunset Press, SF
1905
[S C Cty LIBRARY 0402888 1]
[44] Frank A. Perry and Robert W. Piwarzyk (2007)
Steps in Making Lime
Lime Kiln Legacies: The History of the Lime Industry in Santa Cruz County
The Museum of Art and History at the McPherson Center, Santa Cruz
[45] Summarized in:
Journal of Electricity, Power and Gas, SF
Vol. 24, No. 7. p. 148.
2/12/1910
[46] Santa Cruz Sentinel, 1/10/1905, p.3.
[47] Santa Cruz Sentinel 11/8/1904, p. 1.

Oil Storage

It seems that the original plan for oil storage at the COEC plant was to re-purpose several water storage tanks from the old Neptune Bath House by moving them to the eastern side of the powerhouse building and burying them underground. This plan was applauded because it would allow replacement and removal of an existing oil storage tank that was considered unsightly[48]. I have no information regarding the purpose of this pre-existing oil tank. It may have been used by the Neptune Baths, or by the Dolphin Baths, both of which had boilers, but no oil storage tank is shown at either location in Sanborn Fire Insurance maps for 1886, 1888, or 1892.

The old oil tank was removed some time between June and September 1904, but by this time the plan to use the Neptune water tanks had apparently been abandoned in favor of constructing a new "up to date vat"[49]. This new tank is undoubtedly the one shown on the Sanborn Fire Insurance map of 1905 (Appendix A.). The tank had a capacity of 32,000 gallons and was described as a " fine cement oil tank" constructed "near the track", and "flush with the street"[50].

Further details were given as follows:

> *"The concrete oil tank, which is being built east of the Casino, will cost $1,200 when finished and is 50 feet long by 16 feet wide, and holds five carloads or 900 barrels of oil .It is made of cement, interwoven with steel rods, and all covered with corrugated iron, which is perfectly waterproof. The whole tank is built together, so it cannot come apart, and if the foundation gives away it will sink as if it was just one complete piece."*[51]

Indeed, although the power plant was damaged in the 1906 earthquake, there is no evidence of damage to the oil storage tank[52]. Also, the oil tank, being located well to the east of the powerhouse, was not involved in the fire that destroyed the original casino and baths.

An unfortunate consequence of the location of the oil storage tank in the open was its susceptibility to sabotage and vandalism. There was an incident in which someone shut off a valve for the oil supply to the boilers, leading to a brief blackout of the casino, bathing pavilion, and tent city. The COEC considered this sufficiently serious to offer a $250 reward for apprehension of the perpetrators.[53]

When the new Coast Counties powerhouse was built in 1906 (see Section V. below) it had a new circular, above ground oil tank[54] with a capacity of 65,000 gallons[55]. Use of the COEC underground tank probably was discontinued at this time. A new building, housing a "human roulette wheel" and "nickelodeon" was built partially over the rectangular tank and the 1917 Sanborn map (Appendix A.) shows the tank with the annotation "to be removed". Even so, the rectangular underground tank is still shown in the Sanborn map of 1928. It is possible that the tank was still in use, if only as a backup oil supply for the Coast Counties powerhouse. Or possibility it was just too robustly constructed to be easily removed.

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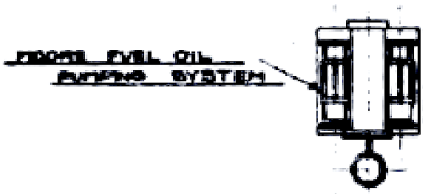
[48] Santa Cruz Sentinel, 5/27/1904, p.3.
[49] Santa Cruz Surf, 6/18/1904, p.1.
[50] Santa Cruz Sentinel 9/17/1904 p.1
[51] Santa Cruz Sentinel, 11/12/1904, p.1.
[52] Santa Cruz Sentinel, 4/27/1906, p.13.
[53] Santa Cruz Sentinel Jul 28, 1904 p. 1
[54] Sanborn Fire Insurance Map, Santa Cruz; 1917 p. 28.
[55] Sanborn Fire Insurance Map, Santa Cruz; 1928 p. 136.

Moore Fuel Oil Pumps



California crude oil was more viscous than eastern crudes and required special equipment to handle, transport, and burn[56]. Much of this equipment was developed in California.

The floor plan of the COEC powerhouse (Appendix B) shows a Moore fuel oil pumping system. This was manufactured by the Charles C. Moore Company of San Francisco and is evidently an example of equipment tailored to handle viscous California crude oil.

The only technical information I have found on this system is in an article describing the powerhouse at the University of California, Berkeley[57], which was built by the Moore Company in 1905 and also used Moore fuel oil pumps. The oil pumps were steam-driven, and were mounted directly above coils carrying the exhaust steam away from the pumps. This was intended to pre-heat the oil, reducing its viscosity so that it would flow more easily and be more easily atomized for combustion (see below).

Charles C. Moore was a highly regarded engineer and businessman in San Francisco, best remembered today as the president of the Panama-Pacific International Exposition Company. His engineering firm designed and constructed power plants, and was "to be reckoned with in all big electric power plants installed in the western States."[58] Moore was also locally connected through ownership of "a beautiful country place at Santa Cruz"[59],[60]. This naturally invites the speculation that his firm designed and built the COEC plant.

B. Boiler Feed Water

Steam plants require water as the starting point for producing the working fluid (steam) used by the engines or turbines, and successful design of a plant entails careful consideration of the *quantity*, the *purity*, and the *cost* of water resources available at its location.

Feed water impurities bring vexing problems, mostly experienced by the boiler in the form of scale deposits and corrosion. These increase maintenance costs and reduce overall thermal efficiency. Steam plants therefore often included ancillary components for chemical or physical pre-processing of raw feed water. There is no evidence that the COEC plant included such a system.

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[56] James C. Williams (1997)
Energy and the Making of Modern California
University of Akron Press Akron, OH p. 120-126.
[57] G. C. Noble (1905)
The Central Light, Heat And Power Plant At The University of California.
The Engineer, Chicago, April 15, 1905 vol. 42. No. 8; p. 263
[58] The Spectator, NY
vol. 94, No. 10, p. 126.
3/11/1915
[59] The Spectator
vol. 94, No. 22 SUPPLEMENT, p. 51.
6/10/1915.
[60] 660 High Street see Companion

The best quality, and most expensive, water available to the COEC plant would have been available from the domestic water supply. Even this, however, would still have presented the potentially serious and costly problem of boiler scaling resulting from the notoriously high levels of calcium and magnesium in our water supply.[61]

The water quality issue was largely mitigated by designing the COEC plant for condensing operation (see below). The water of condensed steam is re-circulated back to the boiler in a closed system. In non-condensing plants the low-pressure steam leaving the engine is exhausted directly to the atmosphere and must be continually replaced.

Additionally, Ca and Mg cations are held in solution by carbonate and bicarbonate counter ions. Heating the water drives out CO_2, so precipitation of the insoluble scale occurs even without evaporation. Therefore, in the COEC plant, what precipitation there was occurred mostly in the feed water heater (see below) and not in the boiler tubes.[62]

My tentative conclusion is therefore that the COEC plant used the municipal water supply as boiler feed water, rather than the San Lorenzo River, or seawater.

C. Condenser Cooling Water

The water saving advantage of a condensing steam plant comes at the cost of introducing a very large demand for cooling water. But in this case water quality is much less of an issue; so the trade off is that using a large volume of low quality cooling water allows the saving of high quality boiler feed water. The sources of cooling water available to the COEC would have been the San Lorenzo River and the Pacific Ocean. My working speculation is that seawater was used. The cold seawater would have been warmed by the heat given up by the steam in the condenser, and so it could have been used directly to supply the plunge baths, and perhaps for general heating as well. There is no direct evidence for or against this idea, but it would explain why there is no mention of a *separate* seawater heating system for the plunge.

D. Oxygen

There is no evidence for the use of any kind of blower or compressor to supply atmospheric oxygen to the combustion chamber. The oil burners were designed to atomize the oil to increase the overall surface area exposed to oxidation.

STEAM GENERATION

"A battery consisting of two Babcock &Wilcox boilers of the vertical header type and each having 1175 square feet of heating surface, develops steam at a boiler pressure of 125 pounds per square inch[63]."

[61] The "hardness" vale of our domestic water currently averages 180 ppm or more, in the "very hard" category according to the City of Santa Cruz Water Department Consumer Confidence Report, 2015.
[62] Gebhardt, G. F. (1912)
Steam Power Plant Engineering, 1st ed.
John Wiley and Sons, NY
[63] 350 degrees F

The Babcock and Wilcox Company was founded 1867 and still operating. They were the foremost boiler manufacturer in the US[64].

The oil burners in the boilers are not described. The earliest oil burning boilers were simple retrofits of coal-fired boilers[65]. Engineers found that each boiler installation, and each crude oil had its own characteristics, so that by 1910 a technical journal noticed that "hundreds of oil burners have been devised, each better than the other."[66]

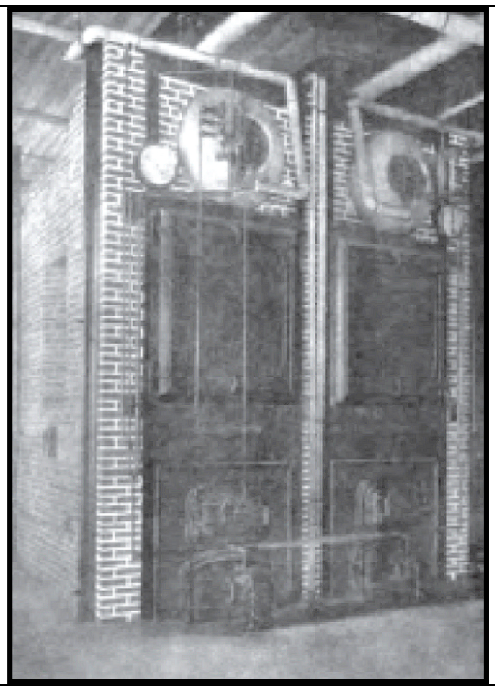

Figure 4. Boilers installed at the east end of the COEC plant. Note the brickwork, done by locals.

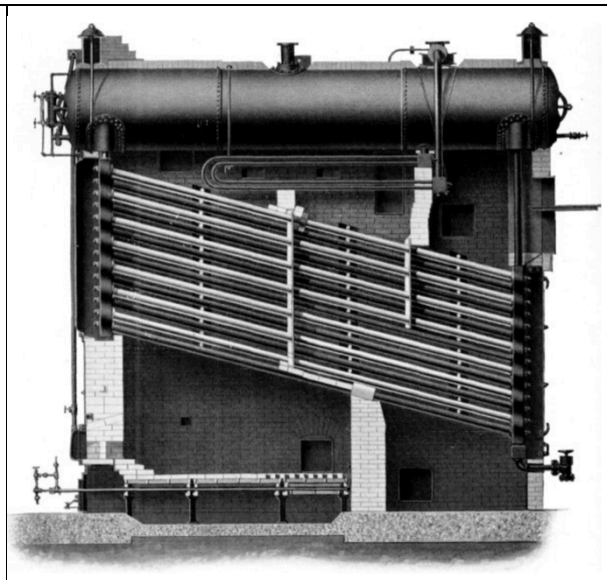

FIG. 29. BABCOCK & WILCOX BOILER, EQUIPPED WITH A PEABODY OIL FURNACE

Figure 5. Side view (Cut away) of a Babcock and Wilcox boiler modified for burning oil. From reference 64.

[64] *Steam-Its Generation And Use*
Thirty-Fifth Edition, 4th Issue
The Babcock & Wilcox Co., NY
1919
Http://Www.Gutenberg.Org/Files/22657/22657-H/Header.Html
[65] Pacific Lumberman and Contractor
Feb. 7, 1889; p. 8
Vol. 5, No. 6
Burning Crude Petroleum
[66] Journal of Electricity, Power and Gas, SF
Vol. 24, No. 7. P.148
2/12/1910

ENGINES

Despite the proposal to develop hydroelectric power from the San Lorenzo River (see above), the only power generation actually realized was from the beach power plant, and this was exclusively by reciprocating steam engines.

The COEC power plant boasted as many as 3 reciprocating steam engines, with an aggregate rating of over 400 HP.

The essential prime mover in the COEC plant is described as follows:

"a 22 by 36 series "B" condensing Hamilton-Corliss engine running at eighty-four revolutions per minute and developing 300 indicated horsepower, and which was built under the specifications of the Hoover-Owens-Reneschler Company* [sic][67]*. It carries a sixteen-foot band wheel having a twenty-nine-inch face[68]"

By 1905, the reciprocating steam engine had been developed nearly to its limits of size and efficiency. A few engines producing as much as 25,000 HP were installed for industrial (mechanical) power generation, but these were not practical for electric power stations, partly because of their low rotational speed. The largest engines installed in central electric stations were less than 10,000 HP. In fact, 92% of steam engines in central electric power stations in 1902 were rated at 500 HP or less[69], meaning that the Corliss engine in the COEC plant was typical of the time, at least in terms of capacity.

[67] The Hooven, Owens, Rentschler Co. was founded in 1882 in Hamilton, Ohio.
https://en.wikipedia.org/wiki/Hooven-Owens-Rentschler
[68] The most visually prominent feature in Fig. 3.
[69] U.S. Bureau of the Census
Central Electric Light and Power Stations, 1902
(The largest electric power stations achieved large outputs by employing multiple smaller engines rather than one large engine, as discussed in Hunter and Bryant p. 329.)

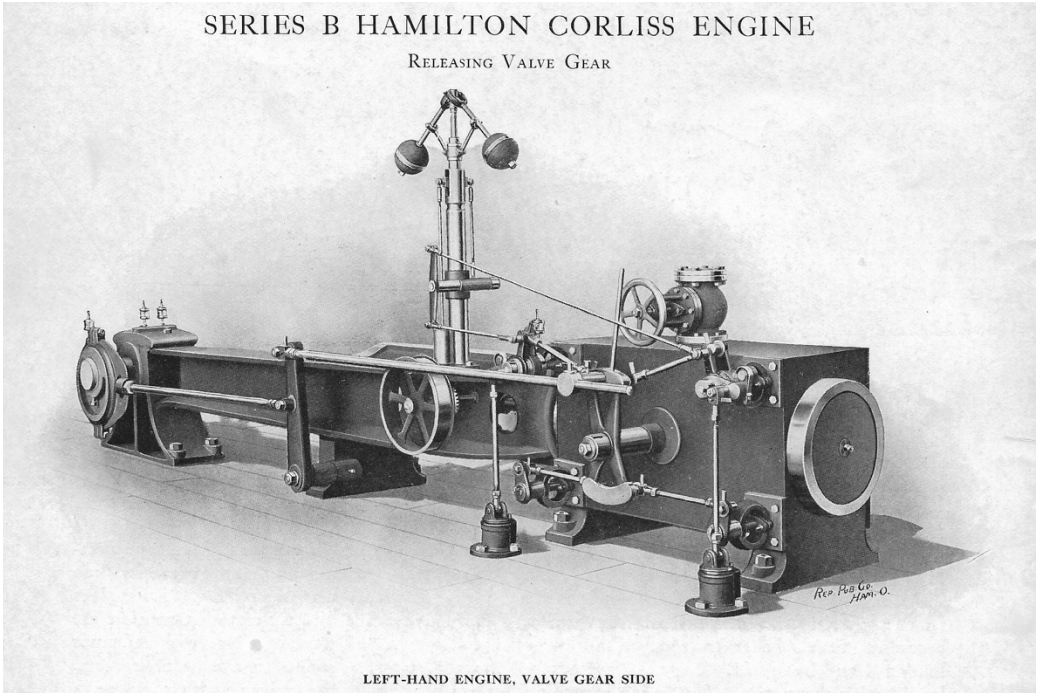

Figure 6. Engraving of a Series B Hamilton Corliss engine from reference 70. Note that the 16-foot diameter wheel is not shown, and that the engine appears in the reverse orientation of that in Fig. 3.

Corliss-type engines were prevalent throughout the latter 19th and early 20th Century. They were characterized by a system of 4 cylindrical valves (Fig. 6) patented by George Henry Corliss in 1849. After the patents expired, many other firms manufactured this type of engine. A thorough appraisal of Corliss-type engines is provided by Hunter[70].

According to the manufacturer's literature, "Series B" engines would be considered the "economy model" of Corliss engine. They were constructed on an "I-Beam" frame, rather than the more robust girder frame" used for the A series. Moreover, they were afforded "less outer finish" than the A series, and could be therefore be offered at "reduced cost"[71]. Series B engines were produced in 20 stock sizes rated from 50 HP to 550 HP, so the COEC engine was mid-range.

"22 by 36" refers the diameter and stroke of the piston in inches[72].

According to a typical classification[73] 84 rpm would have been decidedly low speed, consistent with the need for such a large driving pulley (see below).

---

[70] A History of Industrial Power in the United States, 1780-1930. Vol. 2: Steam Power
Louis C. Hunter
Hagley Museum and Library, University Press og Virginia, Charlottsville, 1985 Chap. 5
[71] Series B Hamilton Corliss Engine
Bulletin No. 22
Hooven, Owens, Rentschler Co., Hamilton. Ohio
Dec. 1, 1915
[Author's collection.]
[72] i.e. The stroke volume is 13,700 in^3.
[73] *Steam Engine Principles and Practice*
Terrell Croft, ed.
McGraw-Hill, NY, 1922; p. 19.

In the left foreground of the photo of the power plant interior (Fig. 3) there appears to be a second, smaller steam engine (note the small fly-ball governor near the left margin) that is not shown in the floor plans (Appendix B) and is not mentioned in the published description of the plant. That such an engine probably did exist is supported by the Sanborn map (Appendix A) that indicates the presence of a second engine by the notation "ENG 12 HP" at the appropriate location. This small engine may have been used to drive the exciter dynamo (see below), or to power the water pumps for the seawater intake, but these are only speculations.

In 1905 a new "100 HP engine" (evidently a steam engine) was purchased to serve as a backup for the Corliss engine when it was offline[74]. This new engine, however, was not fitted out to drive the original Westinghouse alternator. Instead it was connected directly to its own generator. Direct connection of an engine to its generator reduces the loss of mechanical power compared to the more primitive pulley and belt connection, and also reduces maintenance. Furthermore, it is more compact, making it easier to cram the new equipment into the space remaining at power plant. The constraint imposed by direct connection is that the engine and generator must rotate at the same rpm value, so the new engine was probably of the so-called "high-speed" variety pioneered by Charles T. Porter in the 1860s, and which were capable of operation at speeds of 700 rpm and above. Indications are that this engine/generator duo was installed in early in 1906. Building the concrete foundation for this new machinery was an early project of the Granite Rock Co.[75]

One or more of these engines probably was moved to the new Coast Counties power plant when the COEC plant was shut down in 1908 (see Section V. below).

ELECTRICAL

"…a 180-kilowatt, 2,300 volt, three-phase Westinghouse alternator, together with a five-horsepower, 125 volt exciter…"

By way of comparison, the Big Creek hydroelectric plant was capable of 150 kW when installed in 1896, but the total capacity had been increased to 800-900 KW in 1905.

Another interesting point of comparison is the photovoltaic array installed on the roof of the Ecology Action/Cruzio (formerly Sentinel) building in 2010. This is rated at 52 kW maximum output, but averages only about 10 kW[76].

An *exciter* is a small dynamo (DC generator) whose current output energizes the poles (electromagnets) of a larger dynamo or alternator. I am not certain whether this was driven by the 300 HP Corliss engine, or by a smaller dedicated engine.

[74] Santa Cruz Sentinel, 10/20/1905, p.5.
[75] Santa Cruz Sentinel, 2/8/1906, p.1.
[76] City of Santa Cruz Climate Action Program
Go Solar Santa Cruz Commercial Solar Case Study
Ecology Action-Cruzio Building
http://www.cityofsantacruz.com/home/showdocument?id=39494 5/29/2017

The published description does not give the frequency (cycles per second or Hertz) of the AC current output. 60 Hz was introduced as an AC standard by the Westinghouse company in 1890[77] as a compromise between the higher frequencies optimal for lighting, and the lower frequencies optimal for electric motors, but in 1905 60 Hz was yet the universal national standard it is today.

I was able to tease out enough information to estimate the frequency of the COEC alternator output as follows:

E = engine RPM = 84 rpm (=1.4 rps)
R = Ratio of alternator speed to engine speed = 5.1[78]
P = # poles in alternator = 16[79]

Freqency (Hz) = (E) (R) (P) (1/2)[80] = (1.4) (5.1) (16) (1/2) = 57 Hz

This estimate is close enough to 60 Hz to convince me that COEC made 60 cycle 3-phase AC consistent with today's standard in the US.

CONDENSER

The useful work performed by a steam engine is proportional to the difference between the intake steam pressure and the exhaust steam pressure ("back pressure") Ordinarily, the exhaust pressure would be near atmospheric. An engine will develop greater power, if the backpressure is reduced relative to the inlet pressure.

In a condenser, the exhaust steam is cooled below 100 degrees C, and converted to liquid water, creating a partial vacuum. This lowers the back pressure to 10-14 psi <u>below</u> atmospheric. The condensate is then collected in a sump (the "hot well") from whence it is recycled (by pumping) back into the boiler to create a closed cycle. Condensing can improve the thermal efficiency of an engine by as much as 20%, in addition to reducing the requirement for feed water (see above).

The drawbacks to condensing are:

1. An ample supply of cheaply obtained cooling water must be provided. (See above for a discussion of condenser cooling water.)

2. If the exhaust steam is cooled and condensed, it cannot be used for heating. According to one authority:

> "Condensing operation is not economical for any engine when most of the exhaust steam from the engine can be profitably used for heating or industrial purposes. In general, the exhaust from an engine should be condensed only when it cannot be used.[81]"

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[77] Owen, E.L, *The Origins of 60-Hz as a Power Frequency*
Industry Applications Magazine, IEEE, Volume: 3, Issue 6, Nov.-Dec. 1997, Pages 8, 10, 12-14.
[78] Estimated by measuring the engine flywheel and alternator pulley diameters in the diagram in Appendix B.
[79] Counting in the alternator poles (electromagnets) Appendix B.
[80] A full cycle of AC requires that an armature coil pass 1 North and 1 South pole.
[81] *Steam Engine Principles and Practice*

This suggests that heat from the COEC power plant was NOT used to a significant extent for general heating of the casino or other buildings at the beach.

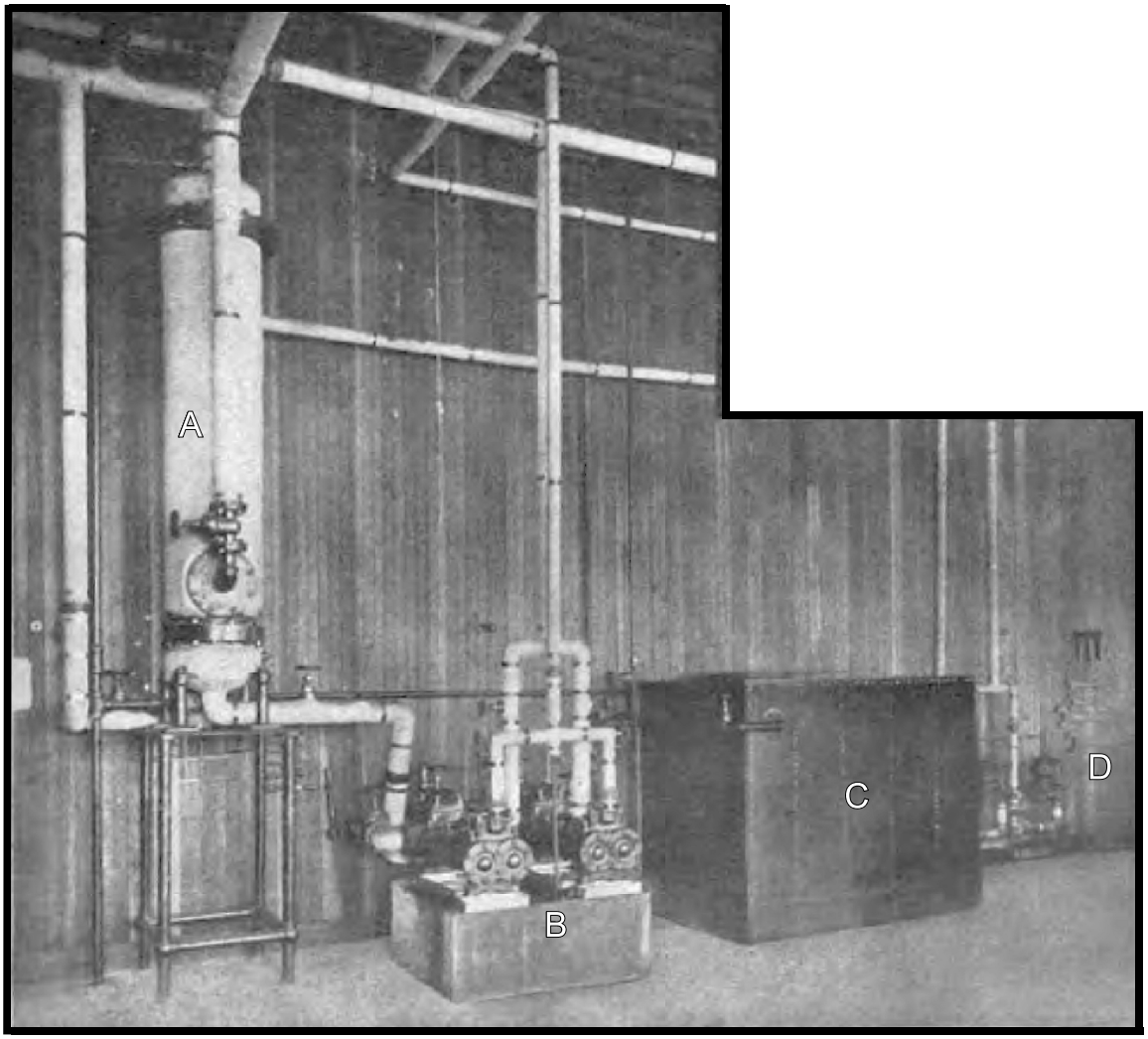

Figure 7. Photograph of the power plant interior showing several pieces of accessory equipment. A. Goubert Feed Water Heater, B. Snow Feed Water pumps, C Hot Well and D. You have to love the crescent wrenches on the wall. The pipe insulation is probably asbestos.

FEED WATER HEATER

A feed water heater increases the overall thermal efficiency of a steam plant by raising the temperature of the water drawn from the hot well (typically at 100 deg. to 140 deg. F) to near boiling before it is injected into the boiler, thereby reducing the amount of combustible fuel consumed per quantity of steam delivered to the engine. The source of heat used to do this is, in the COEC plant, was apparently the exhaust steam from the several types of auxiliary steam-driven pumps[82].

Terrell Croft, ed.
McGraw-Hill, NY, 1922

[82] These include the oil pumps, the condensate pumps, and the feed water pumps. It is interesting to note that these pumps were steam-driven; they did not have electric motors.

The Goubert Type A vertical tube feed water heater was introduced in 1892[83]. As noted in the Goubert literature, the feed water heater acted essentially as a second condenser for the exhausted steam, with its cooling water being the boiler feed water. The estimated saving in fuel was 6%.

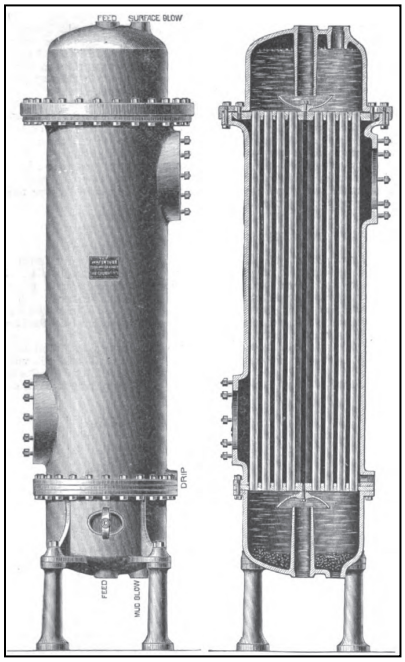

Fig. 8 Goubert Type A vertical tube feed water heater. From reference 82.

HOT WELL

The hot well was simply a receptacle, or tank to collect the hot water drawn from the condenser. This water was returned to the boiler, being drawn from the hot well by the feed pumps and then passed through the feed water heater.

FEED WATER PUMPS

Water leaving the boiler as steam must be continually replaced by injecting "feed water". The feed water, whatever its source, is invariably at atmospheric pressure (14-15 psi), so considerable work is expended to pump it into the boiler at a pressure is 125 psi.

The COEC plant used Snow Feedwater pumps shown in Fig. 7. These were arranged as a tandem pair of reciprocating mini steam engines that drove integral pumps to generate the required pressure to force the water into the boilers.

The other possible source of heat for feed water heating is the hot flue gases leaving the furnace. This was not used in the COEC plant.

[83] Anon. (1892)
The Goubert "Water-Tube" Feed Water Heater
The Electrical Engineer, NY
Vol. 13, No. 196, p.125
2/3/1892

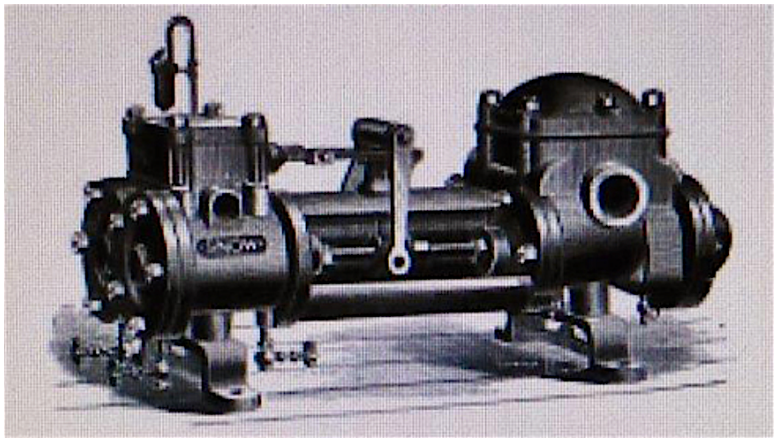

Figure 9. Snow duplex steam pump[84]. Several sizes, 8-120 gpm were offered

[84] A Book of Tools, Being a Catalog of Tools, Supplies, Machinery, and Similar Goods
Chas. A. Strelinger and Co. Detriot
1895

V. Business History Chronology

1904

The first public notice of a new electric plant appeared in local papers in February[85] and described "A subsidiary corporation … to put up an electric light plant to supply the Tented City, the casino, the pleasure pier, the esplanade, and also to engage in competitive lighting of business houses, etc." Later the same month another article reported a conversation between Fred Swanton and H. E. Irish concerning an "independent electric lighting system for the tent city"[86] Beginning in April, and extending into September, papers carried occasional brief updates on construction activity at the COEC power plant[87, 88, 89, 90, 91, 92, 93]. It seems astonishing that within 4 months of these reports the COEC had been incorporated and its power plant built and brought into operation.

Articles of incorporation were filed, and company officers elected in May. (See Sec. III, above.)

In early June, H. E. Irish offered to have the COEC wire and light the streets of Santa Cruz from 6/11 – 9/15 "practically at the cost of wiring", ostensibly as a "donation … to the New Santa Cruz fund". The wiring infrastructure was to be done in a "permanent manner" and left available (after Sept. 15) for "any future occasions". Several rate options, from $325 to $485, were proposed, based on the number of incandescent bulbs to be provided, and their illuminating power. The Council accepted the least expensive among the options offered, which envisioned 332 bulbs of 10 candle-power each.[94] It seems that the arc lights on the city streets, powered by the municipal plant, were being augmented during the summer tourism season by incandescent lighting downtown, and at the esplanade, and that this was contracted out.

The work of putting up lights on Pacific Ave. proceeded under direction of Harvey Meade, presumably an employee of COEC. The strings were on pulleys so they could be easily lowered to replace burned out bulbs[95]. Lights extended all the way to the beach, unlike the previous year when they stopped at Hotel Hagemann.

In anticipation of the opening of the new Beach Company attractions, the Sentinel reported that "the electric light fixtures for the pillars of the inside of the casino are very swell" and that "the tents are to be lighted up" on opening night[96].

The Sentinel's report of opening night at the casino featured the following description of lighting[97]:

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[85] Santa Cruz Surf, 2/9/1904, p.8:4.
[86] Santa Cruz Sentinel, 2/14/1904, p.2.
[87] Santa Cruz Sentinel, 4/27/1904, p.3.
[88] Santa Cruz Sentinel, 5/13/1904, p.3.
[89] Santa Cruz Sentinel, 5/27/1904, p.3.
[90] Santa Cruz Sentinel, 6/2/1904, p.3.
[91] Santa Cruz Surf, 6/18/1904, p.1:1.
[92] Santa Cruz Sentinel, 6/26/1904, p.3.
[93] Santa Cruz Sentinel, 9/17/1904, p..
[94] Santa Cruz Sentinel, 6/2/1904, p.1.
[95] Santa Cruz Surf, 6/9/1904, p.5.
[96] Santa Cruz Surf, 6/9/1904, p.1:4.
[97] Santa Cruz Sentinel, 6/11/1904, p.1.

> *"The Co-Operative Light and Power Company [sic] turned on a portion of their power Friday afternoon and night and tested for the first time the thousands of electric light globes that will illuminate the streets of Santa Cruz, the Neptune Casino and the Tented City during the coming summer.*
>
> *The big engines at the power house were running at full speed Friday afternoon, the bright yellow belts flashing as they whirled around the big wheels to the time of a hundred revolutions a minute."*

The COEC began to actively extended service to other parts of the city by placing wires to East Santa Cruz, and up Lincoln St. and along Mission to Walnut.[98]

They also proposed to provide incandescent lights for the County court house for $35 per month[99]. This was at first accepted; but was soon rescinded following a complaint by the SCELP Company that no other bids had been solicited or considered.[100] I could not locate information on the outcome of this, but it suggests that the COEC had indeed created competition in the local electric power market.

Overall, the COEC enjoyed a successful first year in business.

One sour note was struck by a minor act of vandalism when someone shut off a valve for the oil supply to the boilers, leading to a 10-minute blackout of the Neptune Casino, Bathing Pavilion, and tent city. The COEC offered a $250 reward for apprehension of the perpetrator/s.[101]

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[98] Santa Cruz Sentinel, 11/12/1904, p.1.
[99] Santa Cruz Sentinel (Santa Cruz, California) · Tue, Dec 6, 1904 · Page 1
[100] Santa Cruz Sentinel, 12/7/1904, p.4.
[101] Santa Cruz Sentinel, 7/28/1904, p.1.

1905

Local papers carried a number of notices documenting the extension of the COEC distribution system and the sale of power to "outside" customers beyond the casino and immediate vicinity of the beach. In January, they were erecting poles for a transmission line on North Branciforte Av. as far as "the G. H. Normand residence at the junction of Glen Canyon and Blackburn drives"[102], as well as installing transmission lines in Chinatown[103].

The COEC again bid on the yearly contract with the City to provide incandescent lights for the esplanade but was underbid by the Santa Cruz Electric Light and Power Co.[104]

In February, City Trustees Leask and Parker were delegated to arrange with the COEC to install incandescent lighting on Church Street between the library and Pacific Ave[105].

There was also news that the COEC was awarded a contract for lighting Pacific Ave. from 5/20 to 9/20 at $80 per month, "$20 less than the old company last year[106]. This is at odds with the fact that newspaper accounts indicate that COEC held the contract the previous year (see above). In any case, the April expenses of the City street lighting plant included $126.06 for "oil and street lights" paid to the COEC.[107]

The streets of Santa Cruz were now bestrewn with transmission lines of 4 electric utilities, in addition to electric streetcar and telephone lines. This must have reached a level of chaos and disorganization that precipitated the erection of new poles on Pacific Ave. that would carry "the combined lines of the various companies", suggesting some degree of (possibly forced) cooperation between them[108]. Local contractor George Pratchner was awarded the contract to erect 18 Oregon cedar poles[109].

A merry-go-round driven by an electric motor was installed by the Beach Co. This is the earliest known example of the use of COEC electricity for power rather than lighting[110].

In May, Ralph Morris resigned as "superintendent" of the COEC plant. He was replaced by R. L. Cardiff, who in turn resigned his position as the "City Electrician and Inspector of Wiring"[111,112].

Fred Swanton announced a plan to build an ice plant at the beach to be run "in connection with COEC", i.e. using waste steam from the COEC power plant[113]. I do not know if this ice plant was ever built.

The COEC opened an office on Pacific Ave. (#155 or #164, opposite the Pacific Ocean House) in "a room occupied by A. J. Hinds"[114]. Presumably this was for the purpose of transacting business with customers other than the Beach Co.

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[102] Evening Sentinel (Santa Cruz, California) · Fri, Jan 6, 1905 · Page 3
[103] Santa Cruz Surf, 1/27/1905, p.8:3.
[104] Santa Cruz Sentinel (Santa Cruz, California) · Tue, Apr 4, 1905 · Page 1
[105] Santa Cruz Sentinel, 2/8/1905, p.1.
[106] Santa Cruz Sentinel, 5/16/1905, p..
[107] Santa Cruz Sentinel, 4/5/1905, p.1.
[108] Santa Cruz Sentinel, 2/9/1905, p.1.
[109] Santa Cruz Surf, 2/10/1905, p.8.
[110] Santa Cruz Surf, 2/7/1905, p.1:4.
[111] Santa Cruz Sentinel, 4/20/1905, p.6.
[112] Santa Cruz Sentinel, 4/16/1905, p.3.
[113] Santa Cruz Sentinel, 8/1/1905, p.3.

1906

1906 proved to be a tumultuous year for the COEC from beginning to end.

Sale and Consolidation

In January, news leaked that the COEC had been sold to John Martin and Eugene DeSabla[115,116,117]. The reported price was $100,000[118], which would apparently represent a substantial return on the original investment. Martin and DeSabla had recently purchased the Santa Cruz Electric Light and Power Co. and the Watsonville Light and Power Co., so this could not have been a surprise. They were known to be also negotiating to buy the Union Traction Co. and the Big Creek Power Co. and these further acquisitions were completed by September, thereby removing all major electric utilities in the County from local ownership. All the local companies became wholly-owned subsidiaries of a new corporate entity, the Coast Counties Light and Power Company[119][120]. The COEC power plant remained in operation until 1908, and in following its history I continue to refer to it as the "COEC power plant".

R. L. Cardiff, superintendent of COEC is named superintendant of SCELP as well[121] and his office moved from 49 Pacific to "headquarters of new companmy".[122] This obviously was a step in the direction of integrating the previously independent power companies.

In November, the COEC filed a certificate changing the principal place of business from Santa Cruz to San Francisco under the names of John Martin, president, and Henry Malloch, Secretary.[123]

Earthquake

The COEC powerhouse was "partly wrecked" in the great earthquake of April 18th.[124] Particulars on the nature and extent of the wreckage are not forthcoming in the local papers. The lack of further news coverage, plus the fact that the tourist attractions at the beach apparently continued operating during the early summer tourist season, suggest that the wreckage was not extensive and was rapidly repaired. The new owners of the COEC could take little comfort in this, given the tremendous damage suffered by the properties of the newly incorporated P.G.and E. Co. in San Francisco. The next year, P.G.and E. Co barely weathered a financial crisis precipitated by the expense of rebuilding facilities in the city.[125]

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[114] Santa Cruz Sentinel, 12/7/1905, p.5. (The A. J. Hinds real estate, loan, and insurance office.)
[115] 'Santa Cruz Electric Plant Sold' Los Angeles Herald, 1/12/1906.
[116] Santa Cruz Sentinel, 1/13/1906, p.15.
[117] Santa Cruz Sentinel, 1/12/1906, p.1.
[118] 'Electric Light and Power' Santa Cruz Surf, 1/11/1906, p.1:1.
[119] Referred to below as the "CCLPC".
[120] Incorporated March, 1906.
San Francisco Call, 3/4/1906.
[121] Santa Cruz Sentinel, 1/25/1906.
[122] Santa Cruz Sentinel, 1/25/1906.
[123] Co-Operative Electric Company: Certificate of Change of Principal Place of Business filed Nov. 21, 1906; County Clerk's Index No. 369. MAH Archives, courtesy of Marla Novo
[124] Santa Cruz Sentinel, 4/27/1906, p.13.
[125] Charles M. Coleman
P.G.and E. of California
McGraw-Hill,1952.

Fire

The fire that destroyed the casino and plunge baths in June seared the collective psyche of Santa Cruz to an even greater extent than the earthquake. However, the passageway at the eastern side of the plunge bath building leading from the Tent City to the pleasure pier acted as a "firebreak" that allowed firefighters to save the COEC power plant from going up in flames. (See the 1905 Sanborn Map in Appendix. A) The Coast Counties Company rewarded each of the 3 firemen responsible with $25 cash[126].

An interesting sidelight on this aspect of the fire is that there was at the time a proposal to expand the courthouse building on Pacific Avenue by eliminating a public walkway between it and the IOOF building. Opponents pointed out that eliminating the walkway would pose greater fire risk, citing as evidence the experience at the COEC plant[127, 128]. This opposing argument apparently prevailed, and the remnant of this legacy is preserved even today as the so-called "Cooper House Mall".

The survival of the power plant, along with most of the tent city and "electric pier" enabled the Beach Company to cobble together a semblance of a tourist attraction for the summer.[129] Furthermore, COEC power was available to support the rapid re-building and expansion of the Beach Co. facilities[130].

Storm

Just before the close of the year, 1906 delivered a final wallop to the COEC power plant. The "worst storm in memory" damaged many of the properties at the beach that had survived the earthquake and fire, or that were already under re-construction. The bandstand was torn from its foundations on the pier and hurled all the way across the railroad tracks. A large crew of men narrowly saved the smoke stack of the power plant from being toppled[131], but electrical lines throughout the city went down[132].

[126] Santa Cruz Sentinel, 6/11/1906, p.6.
[127] Santa Cruz Sentinel, 6/29/1906, p.4.
[128] Santa Cruz Sentinel, 6/30/1906, p.4.
[129] Santa Cruz Sentinel, 6/23/1906, p.1.; Santa Cruz Sentinel, 6/23/1906, p.8.
[130] Santa Cruz Surf, 9/15/1906, p.1.
[131] Santa Cruz Sentinel, 12/15/1906, p.9.
[132] Santa Cruz Sentinel, 12/15/1906, p.9.

1907


NOTICE!
ON MONDAY JAN. 28
WE WILL OCCUPY OUR
NEW OFFICES
AT
277 PACIFIC AV.
OPPOSITE ELM ST.
Santa Cruz
Electric Light & Power Co.
Cooperative Electric Co.

In January, a notice appeared in local papers that the COEC business office was moving a few doors up Pacific to #277, where it would share space with the SCELP Company[133]. This was another step in the integration of the previously independent utility companies by their new owners, though the original company names were still being used locally.

In March, John Martin announced plans to construct a new, modern, larger power plant to be located adjacent to the Cottage City[134]. Construction began later in March, with the view of having the new plant operational for the summer season. [135] Remember that this construction was undertaken in concert with re-building the casino and plunge baths after the fire. The COEC power plant would be de-commissioned after the new plant came online.

In May the COEC plant was still being run at maximum capacity[136] and the CCLPC contemplated starting up their new plant even before the roof was constructed, so great was demand.

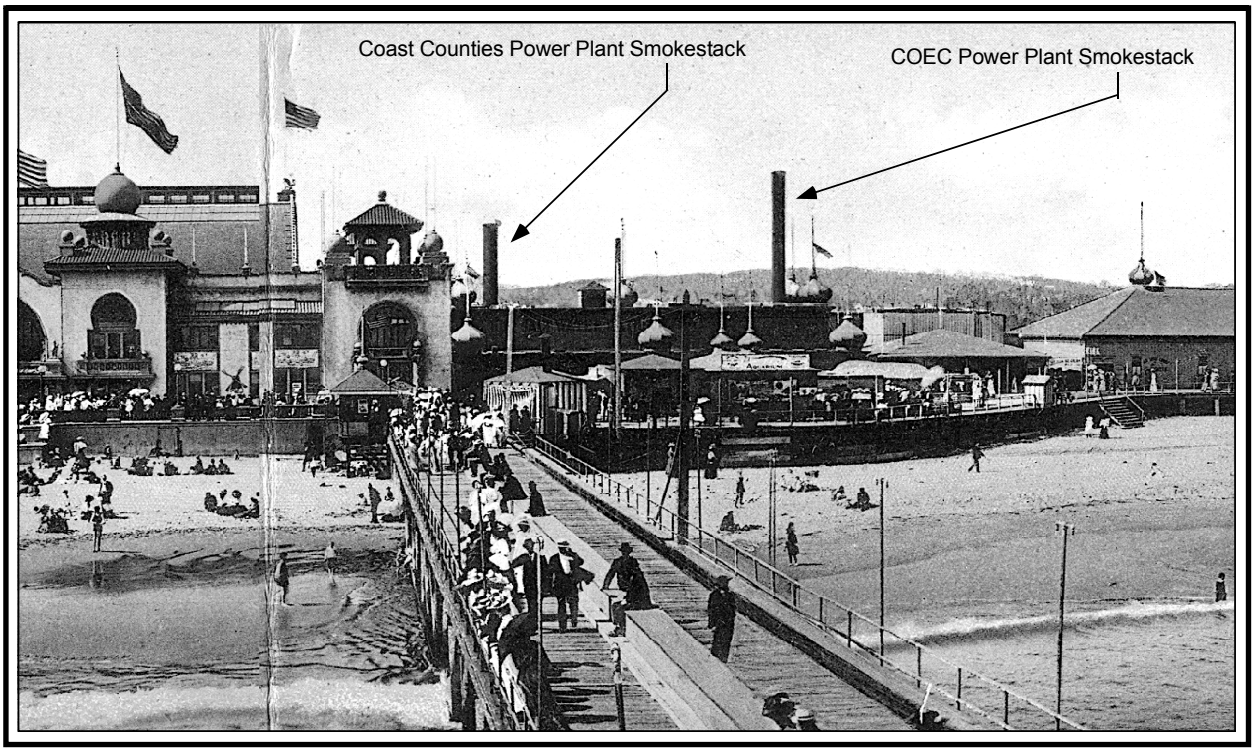


Figure 10. Section of a 1907 panoramic photo showing the COEC power plant (center) next to the recently re-built Plunge Bath (left). The smokestack of the "new" CCLPC power plant is visible behind the "old" COEC plant. The incandescent lighting fixtures on the "electric pier" are also evident. Courtesy of the Santa Cruz Beach Boardwalk Archives.

[133] Santa Cruz Sentinel, 1/26/1907, p.9.
[134] Santa Cruz Sentinel, 3/2/1907, p.15.
[135] Santa Cruz Sentinel, 3/23/1907, p.1.
[136] Santa Cruz Sentinel, 5/28/1907, p.1.

The new casino opened in mid June to great fanfare[137]. According to the Sentinel's correspondent, the opening was a triumphant success, and her description featured a detailed and laudatory description of the "dazzling" electrical illumination of the new buildings on opening night (See Fig. 11.).[138] Regrettably, my information is not clear as to whether electricity on opening night was generated in the "old" or the "new" power plant, or both.

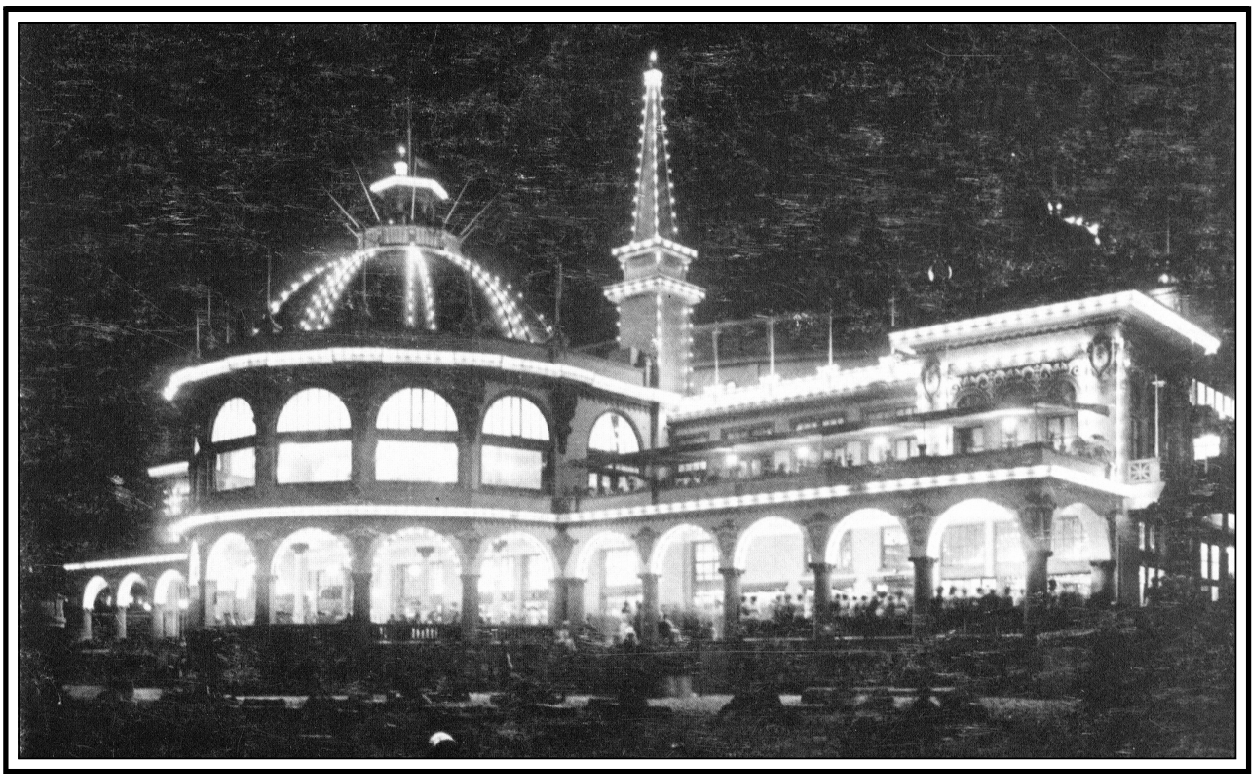


Figure 11. Newly re-built casino on opening night. Santa Cruz Public Library [139]

[137] Santa Cruz Surf, 6/17/1907, p.3:3.
[138] "First Night at the Casino" by Josephine Clifford McCracklin
Santa Cruz Sentinel, 6/22/1907, p.13.
[139] "Second Casino at Night," *SCPL Local History*, accessed June 23, 2017, http://history.santacruzpl.org/omeka/items/show/11162.
Identifier: LH-scpl-459

1908 and after

Power generating equipment was moved from the COEC power plant to the new Coast Counties power plant across the street. The equipment moved to the new powerhouse included either "all"[140], "two boilers and engines", or just "the boilers"[141]. I may be able to clarify this in an ensuing study of the Coast Counties power plant.

The COEC power plant building was re-purposed[142] and eluded the wrecking ball until November, 2016, by which time its early history had been largely forgotten.

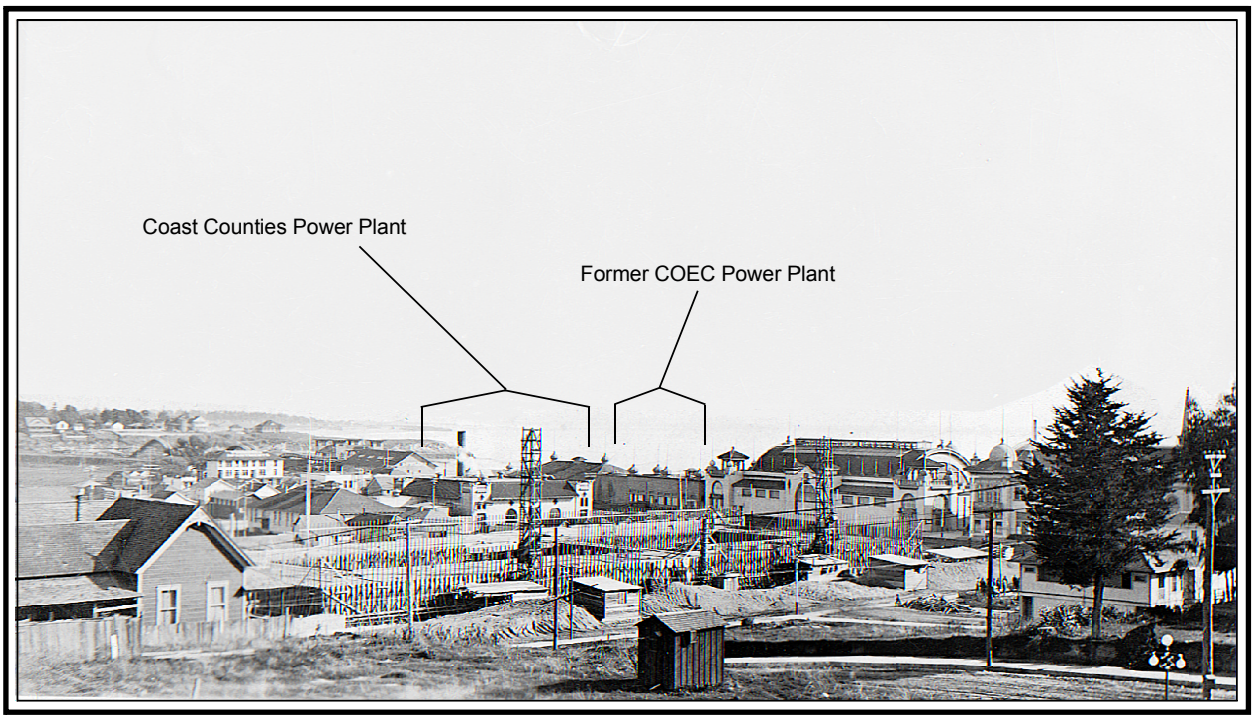


Figure 12. This 1911 photo shows an early phase of construction of the Del Rey Hotel. The COEC power plant building retains its original onion domes, but the smokestack has been removed, reflecting its disuse as a power generating facility. The Coast Counties power plant building is seen to the left. Photo is courtesy of Santa Cruz Public Libraries[143].

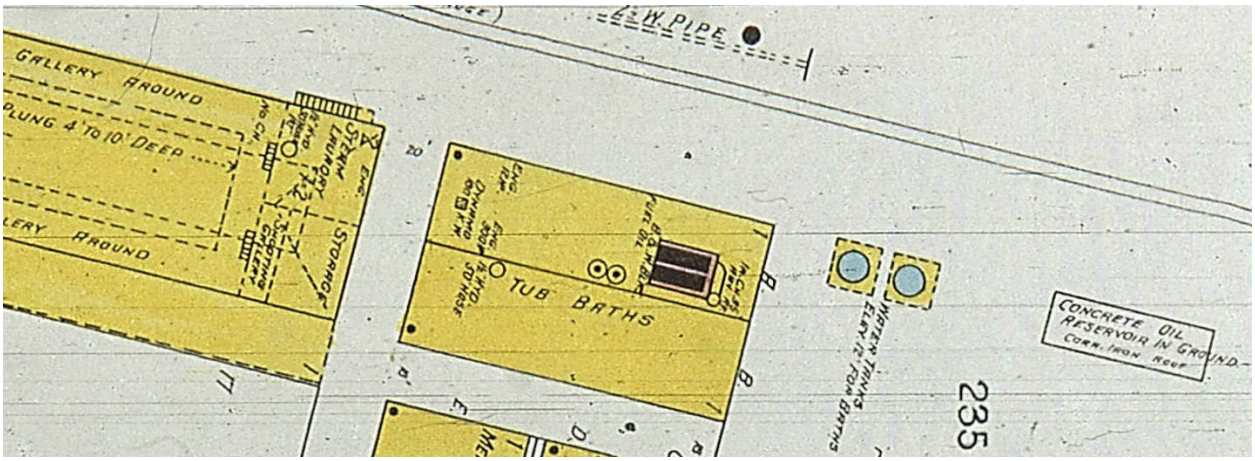
[140] Santa Cruz Surf, 3/12/1908, p.4 : 4.
[141] Journal of Electricity, Power, and Gas, S. F. Vol. 21 No. 1; p. 15; 7/4/1908
[142] The Sanborn Fire Insurance Map for Santa Cruz, CA, 1917, p. 28 indicates the use of the building with the notation "Stge". I assume this means *storage*.
[143] "Laying the foundation for the Casa ...," *SCPL Local History*, accessed June 20, 2017, http://history.santacruzpl.org/omeka/items/show/9408. Identifier LH-0143

VI. APPENDIX

A. SANBORN MAPS

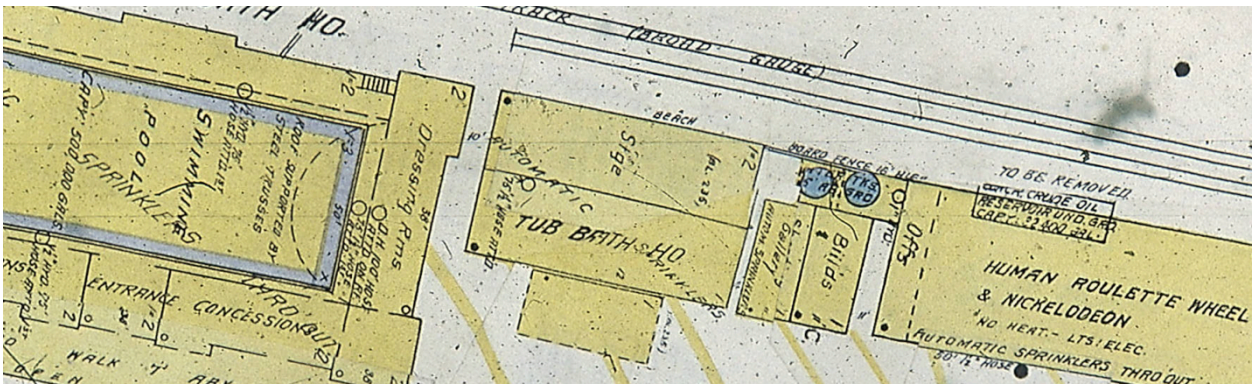
Several Sanborn Fire Insurance maps depict the COEC power plant and related infrastructure.

1905 p. 28:



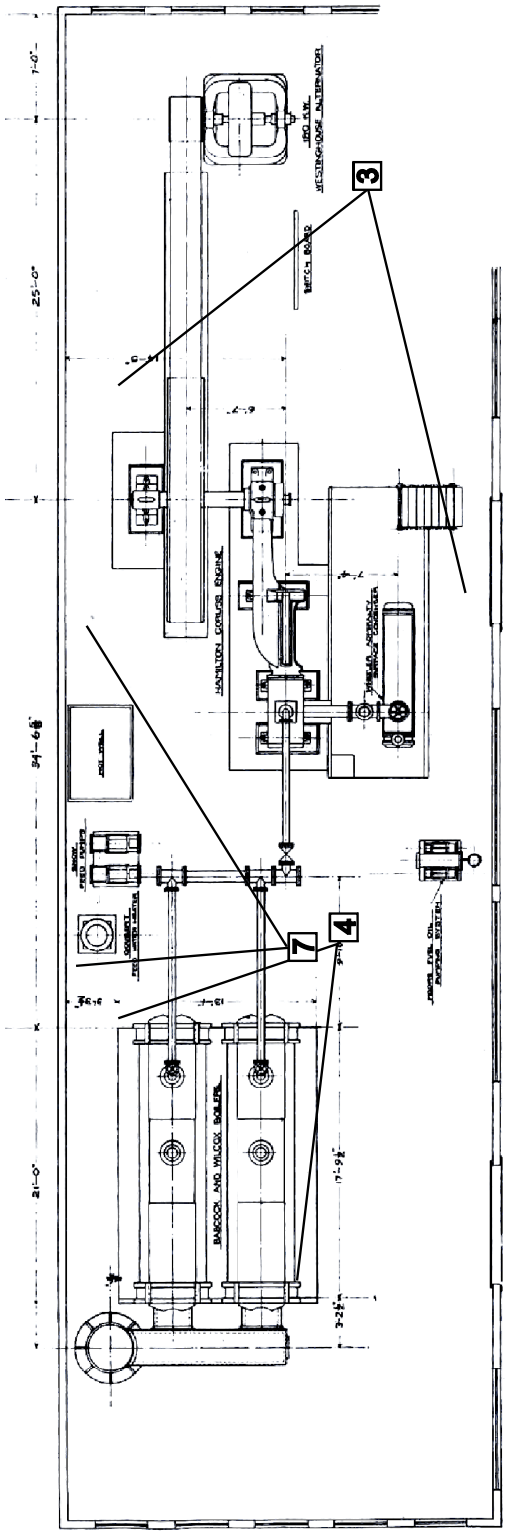
This probably shows the power plant as constructed. The boilers, the dynamo, and two steam engines are indicated. The new oil storage tank is shown on the right.

1917 p. 28:

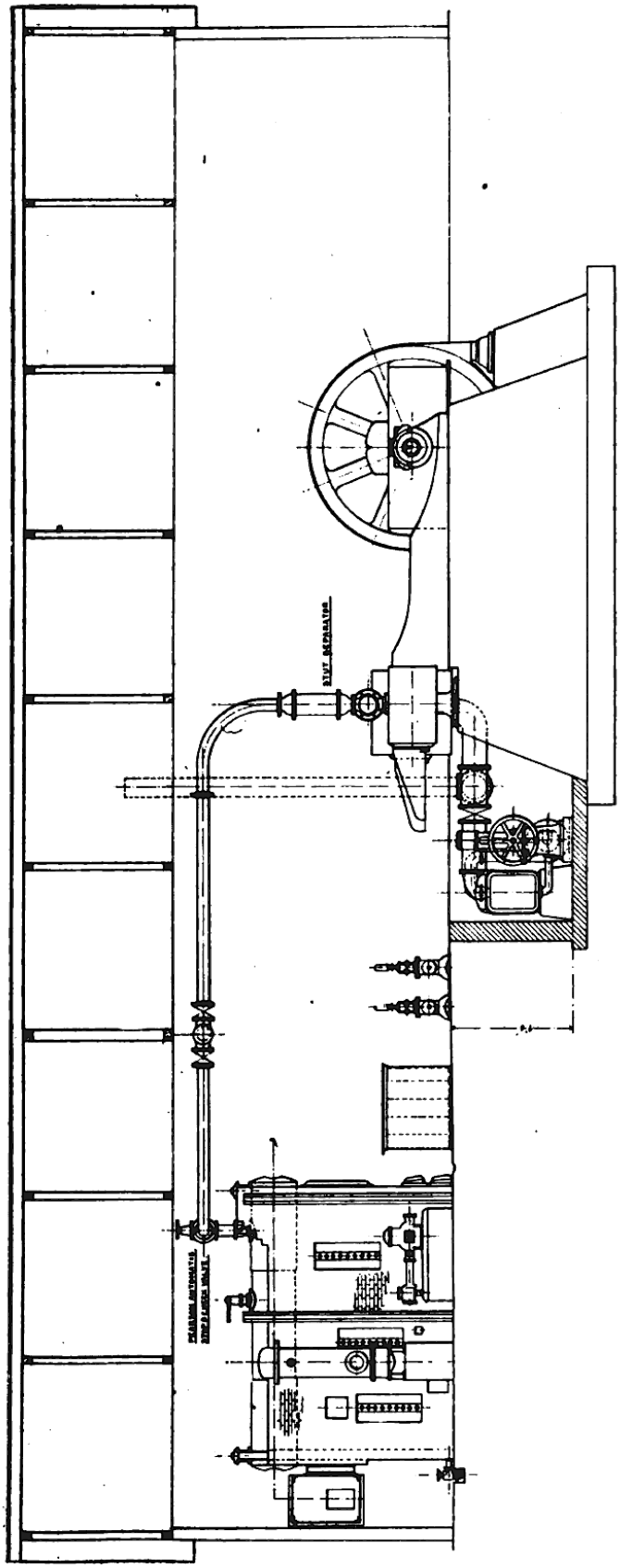


The note indicates the power plant is now serving as a storage facility and that a new building has been constructed partly over the oil tank..

B. Floor Plan and Elevation



The boxes and lines represent the probable locations of the camera when the photographs shown in the Figures with corresponding numbers were taken.


STUFF SEPARATOR
CLEANING AUTOMATICS
STUFF FEEDER SHAFT