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Iron, Oil, and Emeryville:
Resource Industrialization and Metropolitan Expansion in the San Francisco Bay Area,
1850-1900

By
Seth Roger Lunine

A dissertation submitted in partial satisfaction of the
Requirements for the degree of
Doctor of Philosophy
in
Geography
in the
Graduate Division
of the
University of California, Berkeley

Committee in charge:

Professor Richard Walker, Chair
Professor Michael Johns
Professor Paul Groth
Professor Andrew Shanken

Fall 2013

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in the San Francisco Bay Area, 1850-1900

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Seth Roger Lunine

Abstract

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Professor Richard Walker, Chair

Scholars have largely overlooked the formative role of industry in both California's economic development and the San Francisco Bay Area's metropolitan expansion during the late nineteenth century. Beginning in the early 1880s, leading firms in San Francisco's specialized industries, such as the iron and chemicals sectors, dispersed to the metropolitan periphery. This process of industrial suburbanization created an integrative metropolitan economy, as well as individual suburbs. In this dissertation, I explore the creation of one of the Bay Area's earliest industrial suburbs, Emeryville. I argue that an analysis of industrial dynamism on the regional scale is integral for understanding metropolitan development and industrial suburbanization. Symbiotic relations between resource extraction and industrial dynamism structured California's distinct mode of capitalist development. The expansion and diversification of resource extraction and processing industries fueled metropolitan growth. Within the broader context of regional capitalism, I examine the process of industrial suburbanization and the formation of Emeryville. I show how two processes greatly influenced industrial dispersal and factory relocation: the creation of an industrial property market and the endogenous logic of industrial production. A coalition of land developers, politicians, and transportation entrepreneurs created a new suburban industrial space. High rates of innovation and accumulation, as well as fierce competition, enabled certain firms to eschew the industrial core and locate their factories in early Emeryville. I draw on array of archival material and primary sources to weave together this distinctive story of California landscapes and industries, and cities and suburbs. My examination of the formation of Emeryville also presents a case study of how industry engenders metropolitan transformation. This dissertation provides insights into the necessarily conjoined processes of city development and industrial suburbanization.

To my family: Neva, Oscar, Ben, Michelle, Brij, Kay, and Mike.
And to Debbie.

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Introduction

This dissertation starts and finishes in Emeryville, California, a square-mile municipality wedged between Oakland, Berkeley, and the San Francisco Bay. Between the beginning and the end, however, I wonder far and wide. I travel from San Francisco's corporate boardrooms to Germany's dynamite factories; from Oakland's Mountain View Cemetery to Trinidad's Pitch Lake; from workshops in San Quentin Prison to gushers in Titusville, Pennsylvania; and from silver mines on the Comstock Lode to chemical works in the Newark Meadowlands. I chase a rapid succession of resource rushes throughout California, beginning with gold and followed by mercury and silver, copper and coal, wheat and timber, and oil and iron ore, all before the mid-1880s. I follow these natural resources downstream to Bay Region factories and show how industrial dynamism in the service of resource extraction and processing produced high explosives, mining machinery, and prefabricated roofing. In doing so, I show how California technology created national and global industries *de novo*. An unexpected array of characters appears along the way: Alfred Nobel, the du Pont family, and Thomas Scott of the Pennsylvania Railroad, to name a few. Less fortunate groups are equally prominent in this story, most notably workforces consisting of Chinese immigrants, convicts, and children. Each of these diverse places, products, and peoples is integral to understanding the creation of the first autonomous industrial suburb in the Bay Region. That is, all these meandering paths converge in Emeryville.

This entire dissertation began as only one chapter in a larger project, a chapter looking at Emeryville's two pioneering manufacturers—an ironworks and a paint factory. It quickly became clear that a broader understanding of California's nineteenth century industrial development was required to answer one seemingly straightforward question: Why did corporations based in San Francisco decide to locate their factories on the sparsely settled edge of Metropolitan Oakland in the early 1880s? Beyond the fact that Emeryville's early industries processed natural resources, both were functionally and financially tied to far-flung extraction enterprises. Regional production chains linked Emeryville's first factories directly to Ventura County oil seeps and to Placer County iron ore mines. Imperious capitalists reinvesting resource profits similarly linked these early factories to the regional resource-oriented economy. The directors of Emeryville's first factories financed and managed dynamic and nimble corporations involved in an array of resource rushes and ancillary industries, everything from Contra Costa County coalmines to New Jersey nitrocellulose plants. The creation of Emeryville's early factories marked a moment of industrial diversification fueled by regional capital accumulation.

Thus, my initial research into these early East Bay manufacturers immediately drew Emeryville into wider realms of regional development, economic geography, and metropolitan form. The first lesson I learned was that an understanding of the role of industry in California's regional development was crucial for an analysis of not only economic growth but also metropolitan expansion and industrial suburbanization in the San Francisco Bay Area during the second half of the nineteenth century. Second, my exploration of urban and economic geography emanating from Emeryville made a rigid differentiation of cities and suburbs not necessarily artificial but secondary. That is, undergirding my inquiry into early Emeryville is an understanding of cities and suburbs as mutually constitutive and unified in a single process of metropolitan development—both economic growth and spatial expansion. Specialized resource-intensive sectors and the spatial expansion of agglomerations, particularly metals and chemicals industries, created an integrative metropolitan economy and expanded the contours of the Metropolitan Bay Area. At the same time, Emeryville and other individual suburban nodes acted

as magnets, attracting industrial capital investment and factory location and, in doing so, pulled, stretched, and reconfigured metropolitan space.

Overview of Chapters

Scholarly literature largely overlooks the constituent role of industry in California's nineteenth century regional development and the influence of specialized industries on patterns of metropolitan transformation in the Bay Area. In Part I, "Home Industries," I show how industrial dynamism fueled a resource-intensive mode of capitalism in California and how specialized industries precipitated metropolitan transformation. In Chapter 1, "Prospector Capitalism," I argue that a symbiotic relationship between resource extraction and industrial innovation undergirded economic growth. The imposition of California's property regime and ensuing patterns of land distribution primed the pump for not only resource rushes but also for industrial dynamism through the organization and diversification of nimble California corporations. Discrete categories of "mining," agriculture," and "manufacturing" are insufficient for understanding California's economic development expansion. Instead, mining supply and resource processing industries coevolved with an array of extraction enterprises that collectively fueled California's economic development. In Chapter 2, "Manufacturing Resources," I focus more narrowly on the interworkings of economic development in California and the Bay Region. Largely through an examination of the chemicals sector, I show how resource extraction, capital accumulation, and industrial dynamism reinforced each other. In Chapter 3, "Breakthrough Technology," I discuss mining supplies. Specifically, I depict how Bay Region technological innovations created the incipient U.S. dynamite industry. Localized industrial dynamism in the service of mining created both a novel national industry and new industrial landscapes in Metropolitan Oakland.

Whereas I illustrate how specialized industrial ensembles precipitated both resource riches and metropolitan expansion in Part I, in the second half of this dissertation I narrow my focus on the suburban scene. The grand abstractions of capital, industry, class, and state assumed decidedly Californian characteristics in the first half of this dissertation. Historical contingencies and particularities of place certainly structure Part II, "Industrial Suburbs." Yet I also employ a more general conceptual framework for analyzing industrial suburbanization, focusing primarily on industrial property development and the endogenous logic of industrial production. In Chapter 4, "From Villa Lots to Factory Plots," I demonstrate how a coalition of powerful East Bay suburban landholders and politicians boosted and built Oakland in order to incorporate their peripheral properties into the metropolitan framework, and thereby realize speculative returns. Within this broader framework, I then explore a shift to speculative industrial land development and describe how this coalition created and capitalized industrial space in early Emeryville.

The production of industrial space was a requisite but not a determining factor for factory location. In the remaining two chapters, I shift from the perspectives and practices of property developers to those of industrialists. In Chapter 5, "Iron, Exploitation, and Integration at Judson Manufacturing Company," I examine how attempts to create a vertical monopoly on California iron trades—everything from mining iron ore to milling steel, and from rolling wrought iron to mass-producing nails—led to the implantation of Emeryville's first manufacturer. In Chapter 6, "Oil, Innovation and Expansion at Paraffine Paint Factory," I analyze how industrial innovations in California's early petroleum industry and suburban autonomy in Emeryville created new

products and global markets for asphalt. I also depict how leaders of Bay Region high explosives industries provided capital and an accumulation strategy predicated on industrial suburbanization and rapid national expansion. This exploration of Emeryville's origins and early industries is uniquely a California story. At the same time, this discussion provides insights into broader processes of urbanization and suburbanization, largely concerning the endogenous logic of industrial production. Rather than only the exogenous placement of transportation systems, markets, and labor pools, I argue that high rates of innovation and accumulation, as well as fierce competition, enabled certain firms to eschew the urban industrial core and create new peripheral places while manufacturing innovative products.

Part I

Home Industries

California possessed several reputations by 1886, the *San Francisco Chronicle* claimed.¹ The speculative mania of the Gold Rush created, “a land of ‘diggin’s,’ where a man came to make a fortune in a month and where they remained to die poor.” California next became “the great wheat land” as specialized agriculture boomed in the Central Valley. “Lastly has come its reputation of being a manufacturing State,” the newspaper declared. “This began years ago, but has grown by slow and laborious degrees to its present magnitude.”² A new industrial era was dawning in California, the *Chronicle* trumpeted. It was the inevitable outcome of an unexceptional path of regional development starting with mining, advancing to agriculture, and culminating with industry. To illustrate the promise of new Bay Region “home industries,” the *Chronicle* depicted five exemplary manufacturers and their capacity to create commodities and competition with imports.

The California Paper Company manufactured specialized wrapping and packaging for farmers and butchers. Each month an array of manufacturers consumed fifty tons of the paper mill’s manila paper, an indispensable input for everything from toilet tissue to gunpowder cartridges. Yet, the *Chronicle* most heartily celebrated the mill’s printing paper. Every day, California’s newspaper publishers devoured massive rolls weighing four tons each because of the widening circulation of the dailies, including the edition of the *Chronicle* on which the “Home Industries” article was printed. The California Paper Company was “peculiarly a home institution,” the *Chronicle* concluded. Although San Francisco was the proverbial dumping ground for cheap surplus paper imported from the east, the California mills kept pace. Specialized jobs, heavy investment in custom machinery built by Bay Region foundries, and freighting contracts with the California Steam Navigation Company created California markets and California consumers for California paper products.

The dangers inherent in shipping refined chemicals protected the San Francisco Chemical Works from importers. The Chemical Works supplied one-third of all sulfuric and nitric acid used by metal refiners, woolen mills, and many other Pacific Coast industries, while diversifying and spinning off firms in the process. The Chemical Works developed fertilizers and pest-controls for California agribusiness and also owned the San Francisco Candle Company, another of the *Chronicle*’s exemplar firms. Each day the Candle Company churned out upwards of one thousand boxes of candles using pearly, congealed stearic acid rendered from tallow at the Chemical Works. Candle exports circled the Pacific Rim from Sitka to Panama, and illuminated California’s rural households, as well. The Candle Company also used fatty acids supplied by the Chemical Works to manufacture soap in an adjacent factory.

Candles and soap were, however, mere byproduct industries. Mutton tallow processed at the San Francisco Chemical Works yielded glycerin that, when “washed” with nitric and sulfuric acids, created nitroglycerin, the material basis of the high explosives industry. The Chemical Works not only manufactured and supplied nitroglycerin, but was directly integrated into the production process for dynamite by Giant Powder Company, which the *Chronicle* profiled, as

¹ “Home Industries,” *San Francisco Chronicle*, January 1, 1886, 8.

² Ibid.

well. Giant's workforce of 125 men produced 40 tons of dynamite each day at the largest dynamite plant in the nation, according to the newspaper.

Incorporated in 1882, the Judson Manufacturing Company was the youngest but the most promising industry profiled by the *Chronicle*. Engines, pumps, and stamp mills exported throughout the Pacific Rim evinced the innovation and excellence of San Francisco's metalworkers and machinists. Custom orders for specialized equipment, however, outpaced bulk production of basic metal goods. While not the first rolling mill in the Bay Area, Judson Manufacturing embodied a new order of integration, mechanization, and efficiency. The company rolled iron bars and sheets, forged custom casts and bridge works, and assembled small batches of standardized agricultural machinery. Automated machinery and a corps of child workers debased unionized labor while achieving new economies of scale for the mass production of standardized nails, files, and other durable consumer goods previously supplied only by importers.

Along with its unabashed boosterism, the *Chronicle* admonished local consumers: "San Francisco people are pronounced importers and hence are discriminators against home production of all kinds."³ Both the hyperbolic celebration of Bay Region manufacturers and the promulgated imperative of patronizing home industries stemmed from alarm concerning California's economy in the mid-1880s. Judge Lorenzo Sawyer's epochal decision largely halted hydraulic mining in California, just as San Francisco corporations "played out" the Comstock Lode in Nevada. The *Chronicle* feared that trade imbalance, insatiable consumer demand, and specialized industries indicated fundamental flaws in California's economic growth. Through laudatory depictions of five local firms representing the chemicals sector and the iron industry, the *Chronicle* heralded the shift from resource extraction and processing to a new era of economic expansion and regional autonomy after thirty-five years of dependence on East Coast and European imports.

The *Chronicle's* quintet of manufacturers, however, represented neither a new stage of development nor a break from antecedent patterns of economic growth. Instead, Bay Region industries had been integral to a succession of resource rushes beginning with gold and followed in rapid succession by mercury and silver, copper and coal, wheat and timber, oil and iron ore, and fish and fur, all before the mid-1880s. In fact, the term "home industries" is far more incisive than the *Chronicle* intended. Each profiled firm was truly homegrown—sown by Bay Region capital, germinated by pragmatic innovation, cultivated by both skilled and degraded labor, and propagated by diversification, all in the service of transforming nature into commodities, and profits. A slightly closer look at the *Chronicle's* home industries helps illuminate the process of *resource industrialization*—the symbiotic relation between regional natural resources and localized industrial dynamism—at the core of California's distinctive mode of economic expansion.⁴

The California Paper Company profited from byproducts of prodigious wheat production in the Central Valley. The paper mills spun straw into paper and specialized agribusiness supplies before spinning off the first mills capable of rendering wood pulp from indigenous Pacific Coast trees, thus enabling the shift to timber inputs for regional paper production. The San Francisco Chemical Works likewise specialized in resource processing. Created in 1853 to

³ Ibid.

⁴ Richard Walker, "California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940," *Annals of the Association of American Geographers* 91, no. 1 (March, 2001): 184-85.

profit from federal government contracts, the works manufactured acids inputs for coining California gold at the San Francisco mint. The Chemical Work's diversification into mining supplies began its subsidiary Candle Works. Miners depended on candles to illuminate deep shafts and long tunnels where fire dangers precluded coal or oil illuminates. The Comstock Lode created monumental demand as leading corporate mines consumed upwards of eight tons of candles each month and annual regional consumption peaked at 360 tons during 1879. The San Francisco Candle Works was one of only two California firms that held its own against a powerful trade combination dealing in imported candles.⁵

An agent sent by Alfred Nobel mixed the first dynamite ever made in the U.S. at the Chemical Work's factory at Fifteenth and Valencia streets in San Francisco's Mission District in 1868. Mining entrepreneurs and financiers reinvested resource profits into groundbreaking mining supply industries, creating the Giant Powder Company and acquiring exclusive U.S. rights to Nobel's epochal innovations. With unprecedented power to blast tunnels, shatter boulders, and collapse riverbanks, dynamite was first known in the U.S. by the brand name "Giant Powder" as the Bay Area became the hearth of the U.S. high explosive industry. Giant Powder expanded to the Eastern Seaboard just two years later (1870), creating a novel industry and a national market *de novo*, well before the Du Pont Company's "Powder Trust" entered the high explosives industry.

The Judson Manufacturing Company represented a crucial diversification in California's economy: a shift from mining precious metals to harnessing natural resources as industrial inputs. Mining entrepreneurs and the Bay Region's foremost iron magnate, Irving Scott of the Union Iron Works, wrested control of California's best iron ore deposits and built the first blast furnace in California capable of smelting pig iron.⁶ They sought not only a regional monopoly on an imperative industrial input but also downstream diversifications flowing from iron ore, to pig iron, to wrought iron, and to hardware, agricultural machinery, and steel in an import substitution strategy truly meriting the term "home industry."

These five firms barely hint at the web of institutions and industries entrained in the extraction, processing, and manufacturing of California's natural resources. Well into the twentieth century, a symbiotic relationship between industrial dynamism and resource extraction fueled California's distinctive path of regional economic development, what geographer Richard Walker calls *prospector capitalism*.⁷

Figuratively, the term "home industries" is telling, as well. All five firms had headquarters near California Street in San Francisco, alongside banks, investment houses, and law offices, as well as the boardrooms of virtually every notable Western firm. With the exception of the California Paper Company's mill at the Port of Stockton, however, each firm dispersed from San Francisco in order to create or relocate factories on the edge of the Metropolitan Bay Area. Facing pressures from encroaching residents and land use regulations, the Candle Works fled a congested South of Market Street site, relocating in a new industrial

⁵ John Hittel, *The Commerce and Industries of the Pacific Coast of North America* (San Francisco: A. L. Bancroft & Co., 1882), 721; Clarence King, Samuel Emmons, and George Becker, *Statistics and Technology of the Precious Metals 6, Part III* (Washington, DC: Government Printing Office, 1885), 173.

⁶ Pig iron refers to rigid cast iron ingots used to produce wrought iron and steel inputs for everything from a tack to a battleship (see Chapter 4).

⁷ Walker, "Golden Road."

district at the foot of Potrero Hill.⁸ Breakthrough innovations punctuated by disastrous explosions sent Giant Powder Company hopscotching from Rock House Canyon (now Glen Park) in San Francisco to a site south of Golden Gate Park, and then to New Jersey in 1870. City ordinances then forced Giant Powder across the bay to Fleming Point in unincorporated West Berkeley. The San Francisco Chemical Works soon followed and Giant Powder Company soon anchored a dynamic industrial complex eventually consisting of high explosives plants, chemical works, detonator factories, and other kindred industries. The East Bay dynamite district stretched from West Berkeley ten miles north to the embryonic company town of Hercules, near Pinole in Contra Costa County. By 1880 these Bay Region firms accounted for at least eighty percent of all the high explosive produced in the U.S.⁹

Similarly, the Judson Manufacturing Company's implantation in the embryonic industrial suburb of Emeryville heralded the expansion of another specialized industrial sector, San Francisco's legendary metalworking and machinery industries. Both high explosives, a crucial tranche of the burgeoning chemicals sector, and metalworking illustrate the formative role of industrial suburbanization in broader processes of metropolitan expansion. The *Chronicle's* five firms evinced industrialists' broad metropolitan vision and clear strategy of factory dispersal that helped simultaneously establish individual nodes such as Emeryville, expand industrial agglomerations, and thus the Metropolitan Bay Area.

In addition to resource industrialization and industrial suburbanization, the five firms shared another feature overlooked by the *Chronicle*: the investments, entrepreneurialism, and innovations provided by Egbert Judson (Figure I.1). He was the president of four of the five showcased companies and a founding director and leading stockholder of Giant Powder Company. These firms only hint at the breadth of Judson's enterprise. According to one account:

While not recognized as a science or even a profession, one of the most intricate problems that exists is the possibilities of successful manufacture. It involves consideration of natural resources, possible consumption, the character of people to be employed, transportation, risks of changing prices, and heavy risks of capital. It was in this field Mr. Judson's capabilities were conspicuous, and most wonderful of all was the guarding and successful use of capital in various enterprises founded on his ideas alone.¹⁰

Or, as one eulogist put it, "His main hobby was to build up the manufacturing interests of this state."¹¹ Perhaps such hyperbole is forgivable considering Judson's central role in envisioning

⁸ The factory was located on Channel Street, between Rhode Island and De Haro streets. John L. N. Shepard, "Notes Furnished by J.N.L. Shepard Concerning the Life and Interest of Mr. Egbert Judson. San Francisco, Oct. 28, 1886," The Hubert Howe Bancroft Collection, Bancroft Library, University of California, Berkeley.

⁹ U.S. Census Office, Department of the Interior, *Statistics of Manufacturers Tenth Census vol. 2* (Washington DC: Government Printing Office, 1880), 93, 132, 136, 152, *Report on the Manufacturers of the United States at the Tenth Census (June 1, 1880)* (Washington DC: Government Printing Office, 1883), 1012.

¹⁰ "Local Notes," *Industry, A Magazine Devoted to Science, Engineering and Mechanical Arts, Especially on the Pacific Coast*, February 1893, 86.

¹¹ "Death's Long Roll," *San Francisco Chronicle*, October 10, 1893, 12.

and establishing no fewer than twenty firms engaged in mining and manufacturing California's resources. Indeed, Judson's enterprises show the distinctive interrelationship between resource rushes, capital accumulation (reinvestment), and industrial dynamism that fueled California's economic expansion (Figure I.2).

After creating the San Francisco Chemical Works, also known as Judson & Shepard Chemical Works, Judson spearheaded the formation of the Giant Powder Company and its east coast analogue, Atlantic Giant Powder Company in 1870. His shop floor experiments created Judson Powder, an entirely new class of high explosives subsequently known generically as "railroad powder."¹² Judson had a strong hand in the ownership and operation of a half dozen high explosives firms, chemicals manufacturers, and kindred supply industries before internecine competition engendered by his Judson Dynamite & Powder Company nearly imploded the entire Western explosives sector. Through development of commodious industrial land on the metropolitan periphery, he helped establish and expand the East Bay dynamite district. Judson also linked factories in the Newark Meadowlands to northwestern New Jersey uplands, creating a nascent chemicals cluster and regional supply chain modeled on his California original.

Judson and other Bay Region capitalists developed dynamite foremost as a mining supply, enabling a new scope and scale of industrialized mining. Early batches of Giant Powder followed the flow of Judson's investments up to the Sierra, where he was among the leaders of some of California's most economically productive and environmentally destructive hydraulic mining corporations (Spring Valley, Milton, North Bloomfield, and California Water mining companies). Judson wrested a vertical monopoly on California's richest silver strike in Cerro Gordo, Inyo County. In addition to consolidating mining claims and timber and water rights, Judson and his partners dominated local commerce and transportation stretching from the Owens Valley, through Death Valley, to Los Angeles. Yet investment in an innovative type of reverberatory furnace to smelt the complex silver-lead quartz, known as galena, proved to be the key to the domination of the lode. Silver ingots flowed steadily from the high desert to the Port of Los Angeles, and to Judson's Pacific Refinery and Shelby's Smelting Company in the Bay Region, as Judson became a celebrated "Bullion King."

Timber and paper industries marked Judson's diversification from mining precious metals to harvesting industrial inputs. In addition to the California Paper Company, Judson's Pioneer Pulp Company developed new chemistry, novel machinery, and modern mills in Placer County to manufacture wood pulp from indigenous Pacific Coast timber. This wet pulp enabled a shift from straw to wood-based paper, offsetting imports of Eastern and Scandinavian dry pulp. The firm expanded to Oregon and then merged with Crown-Williamette Paper Company, a successor to Crown Zellerbach Corporation. Judsonville was one of five colliery towns studding the Mt. Diablo coalfields in Contra Costa County, thirty-five miles northeast of Oakland. His Union and Empire coalmines added to the Mt. Diablo coalfield's production while supplying about thirty percent of all of California's coal consumption between 1867 and 1882. At the same time, Judson's narrow-gauge railroad and wharves helped develop the town of Antioch. From centralizing mining claims to acquiring water rights, and from speculative real estate in San Francisco's Mission District to industrial land development in the East Bay, property development undergirded all these enterprises.

Of course, Judson was just one actor in the constellation of capitalists and corporations orbiting around the Bank of California, the region's foremost financial institution beginning in the early 1860s. Through overlapping investment and ownership, as well as competitive and

¹² Manuel Eissler, *A Handbook of Modern Explosives* (London: Crosby Lockwood and Son, 1897), 62.

collaborative enterprises, he was embroiled in incessantly shifting alliances among California's leading financiers, mining entrepreneurs, and industrialists, who collectively developed a distinctive mode of corporate organization and accumulation strategy.

California Capitalism and Bay Region Innovation

An examination of industry is crucial for understanding both economic development in California and metropolitan expansion in the Bay Region. In Chapter 1, "Prospector Capitalism," I look at the formative role of industrial development in California's economic growth during the second half of the nineteenth century. I argue that a distinctive mode of capitalism developed in California in which resource extraction and industrial dynamism developed in unison, reinforcing each other and fueling economic expansion. First, I look at California's distinctive property regime. Imposed by federal policy and enacted through state-sanctioned violence, it undergirded California's resource-intensive growth through two contradictory effects. On the one hand was the wide and relatively equal distribution of public lands that enabled successive resource rushes. On the other hand, unfettered access to the public domain keyed the formation of a distinctive mode of California corporate organization with an accumulation strategy predicated on acquiring productive land and resource rights *en masse*. In addition to the striking consolidation of land, California's resource-oriented corporations precipitated technological dynamism and industrial diversification through vertical integration and reinvestment in an array of industrial endeavors. Land in California was the basis for not only resource riches but also industrial expansion. I then shift to an examination of industry itself.

In scholarly analysis of California's nineteenth century development, industrialization is often ignored or cast in the shadows of rigid categories of "mining" and "agriculture." Both boosters and more recent scholars have bemoaned California's trade imbalances, scarcity of home industries, insatiable consumer demand, and dearth of basic industrial inputs and fuels (such as coal, iron, and cotton). Further, scholars point to a threshold at the turn of the century, when the development of indigenous energy sources—petroleum fuels, natural gas, and hydroelectricity—precipitated an epochal shift to a discrete stage of industrial modernity. This spectacular industrial expansion has served as a gauge for antecedent industrial activities, which are statistically paltry in comparison. I show the general relations between resource extraction and industrial dynamism and illustrate the importance of California's nineteenth century manufacturers in broader patterns of economic development.

Yet the question remains: if the industrial production of commodities for profit is the lynchpin of economic life under capitalism, how do natural resources provide a viable foundation of long-term regional development? In Chapter 2, "Manufacturing Resources," I begin to answer this question by looking more closely at the inter-workings of California's resource-intensive economy. Specifically, I focus on the interrelationship between resource rushes, regional accumulation (reinvestment), and industrial dynamism. By way of illustration and narrative arc, I look at Egbert Judson's industrial endeavors. However, I want to emphasize that this is in no way intended as a celebratory or anecdotal account of Judson's life and livelihood. While acclaimed as a heroic Argonaut and entrepreneur *sui generis*, he was foremost a capitalist. Using Chinese, convicts, and children, he virtually detonated organized labor. Aided by his innovative high explosives, spiraling accumulation increasingly necessitated environmental despoliation. Equally important, Judson embodied the relationship between resources,

accumulation, and industrialization at the core of California's regional growth and the Bay Area's metropolitan expansion. This discussion culminates with an examination of the early U.S. high explosives industry in Chapter 3, "Breakthrough Technology."

Judson led a cadre of Bay Region capitalists who reinvested resource profits into new mining supplies industries. In doing so, their diversification of Bay Region mining supply industries largely created the incipient U.S. high explosives industry. In addition to illustrating the loop connecting resource extraction, reinvestment, and industrialization, the dynamite story demonstrates the role of technological innovation in attempts to "unlock" California's plentiful but stubborn natural resources. Furthermore, I point to the national significance of Bay Region industrial dynamism and technological innovations.

Throughout these chapters, I trace the development of a regional economic geography linking Bay Region factories, San Francisco boardrooms, and resource hinterlands. In Chapter 3, I shift to a more explicit discussion of the Bay Region's metropolitan development. Proprietary technological innovations, along with high rates of investment and fierce competition, engendered the rapid geographical expansion of San Francisco's pioneering high explosives manufacturers. In addition to the role of innovation in the creation of a national industry and market, I trace the development of a specialized industrial complex—a "dynamite district"—on the East Bay shoreline. I show how specialized and innovative Bay Region industries, the chemicals sector in this case, fostered localized technological dynamism and, at the same time, how the broad sway of industrial suburbanization was at the forefront of metropolitan expansion.

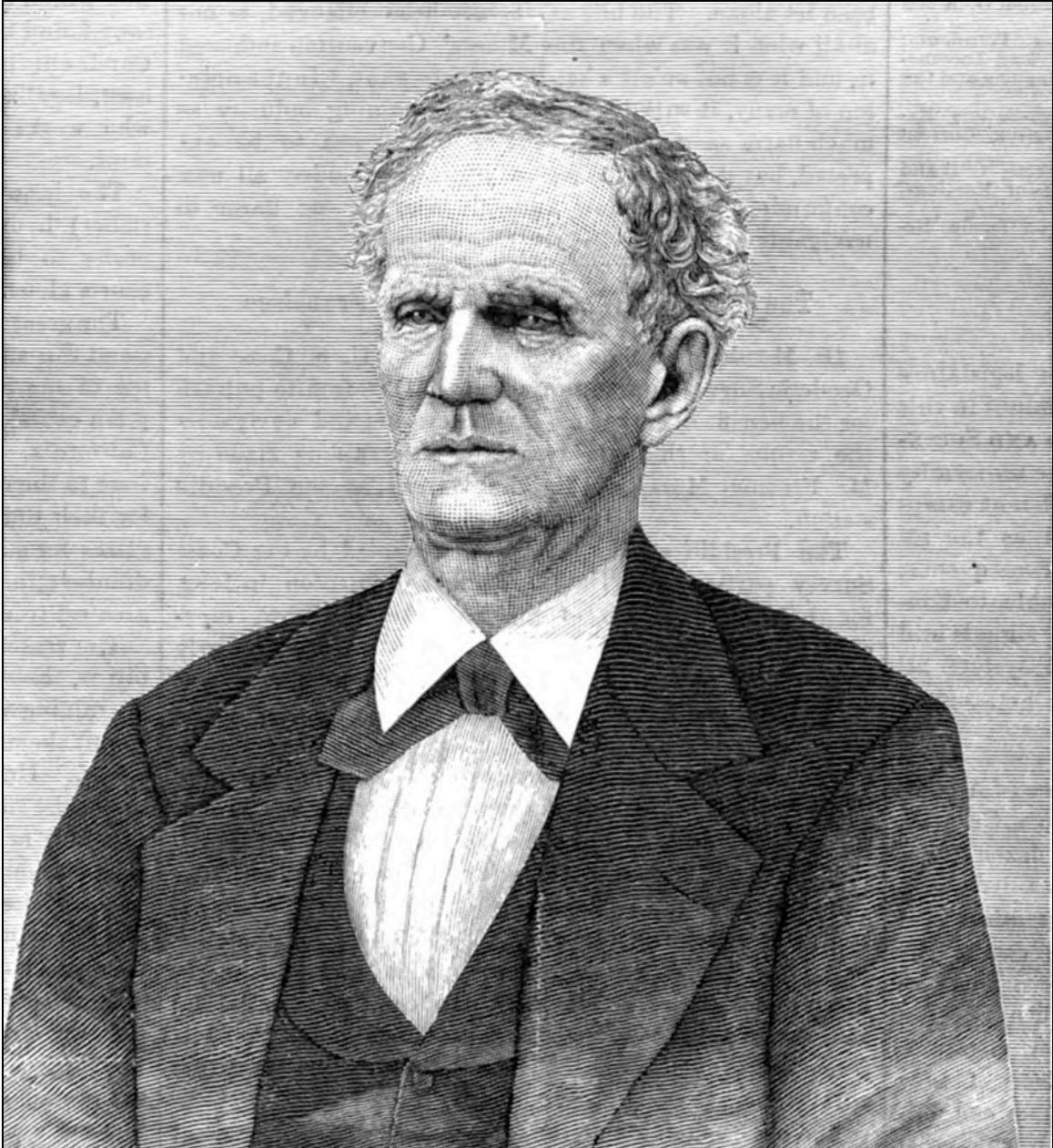


Figure I.1. Portrait of Egbert Putnam Judson (1812-1892). Source: "The Late Egbert Judson," *Mining and Scientific Press*, January 14, 1893, 1.

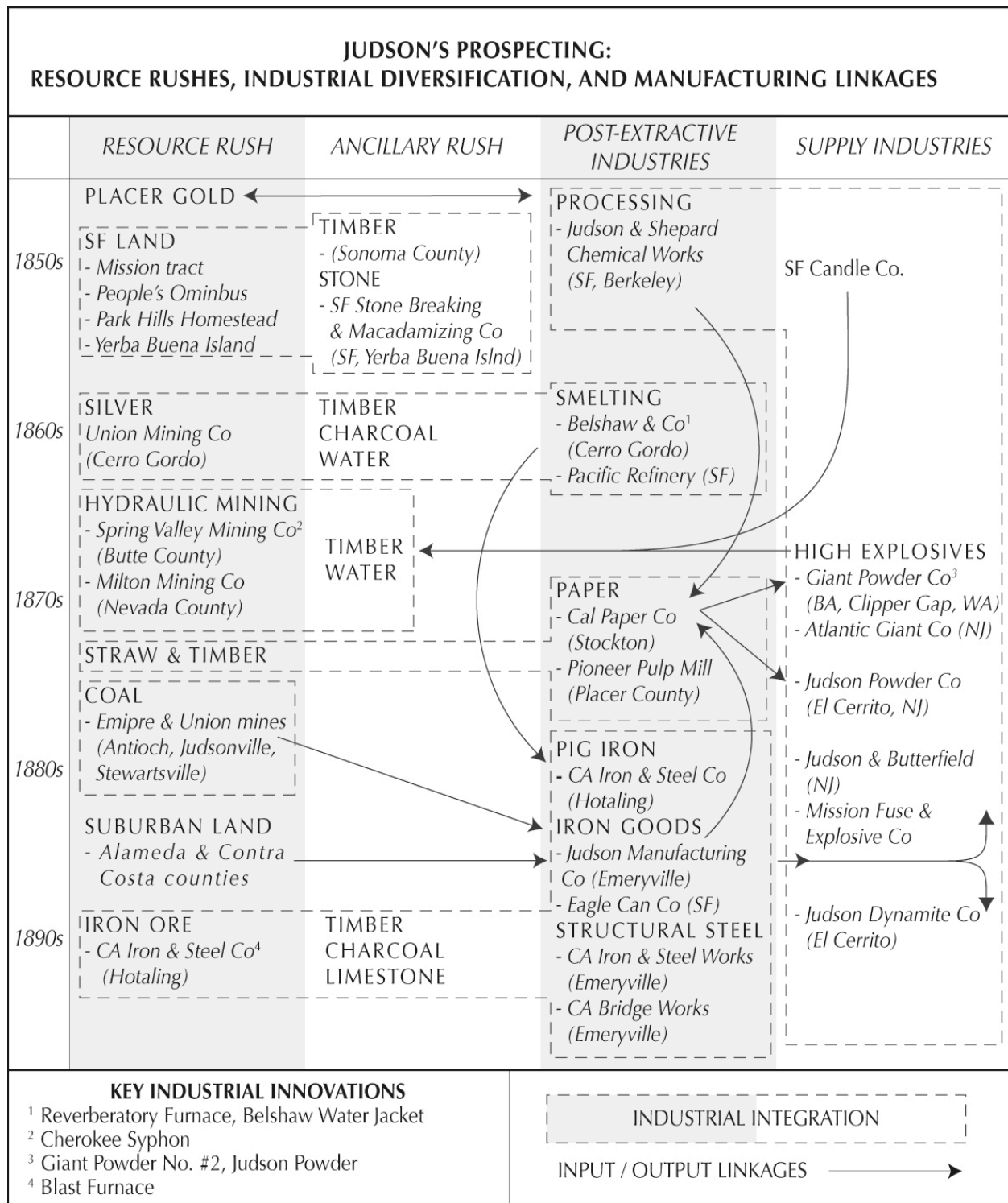


Figure I.2. Judson's industrial enterprises, illustrating the interrelations between resource rushes and industrial development. ("BA" is short for Bay Area). Chart by author.

Chapter 1

Prospector Capitalism

The term *Gold Rush* embodies the geographical particularities and temporal rhythms of early Anglo-American California. According to the conventional narrative, Samuel Brannan initiated the rush on May 12, 1848, when he charged into San Francisco's Portsmouth Square, held aloft a bottle of glittering particles in his left hand, and bellowed, "Gold! Gold! Gold! From the American River."¹ He published a special edition of the *California Star*, which circulated throughout the Mississippi Valley during the following two months and promulgated California's earthly riches. Skeptical dismissals became casual accounts, then informative reports blossomed into bona fide declarations of abundant and accessible gold, as newspapers promoted the Gold Rush internationally. News circled the Pacific Rim from Peru to the Philippines, reaching Australia as early as June 1848 and China just months later.² Men from California, Oregon, and Mexico led perhaps ten thousand miners into the Mother Lode by the year's end. The "mixed multitudes" soon followed. They arrived after a six-month overland trek from the Atlantic Seaboard or after a six-week voyage from war-torn China. They sailed around Cape Horn, or trudged across the Panama Isthmus, and continued north along the Pacific Coast. In all, an epochal international migration began as 200,000 prospectors reached California by the end of 1850.³ The promise of riches certainly held true: during five years following James Marshall's celebrated strike at Sutter's Mill, miners picked and panned roughly \$400 million worth of gold from alluvial deposits lining ancient creeks and active rivers in the Mother Lode.⁴

In addition to legendary riches, California's unique equality of opportunity quickly became mythologized in the international imagination. No rulers, landholding elite, or institutional authority barred access to nature's bounty. Instead, pastoral narratives described mild weather, gentle slopes, meandering streams, and copious gold in the Sierra foothills.⁵ Miners needed energy and enthusiasm but skill and capital were optional. It was the "great adventure for the common man," according to Carey McWilliams.⁶ Whereas California offered economic opportunities, the mining camps promised political democracy. The camps embodied a "degree and quality of unhampered, untroubled freedom to which it is hard to find a historical

¹ Douglas Watson, "Herald of the Gold Rush," *California Historical Society Quarterly* 10, no. 3 (September 1931): 298-301; "Samuel Brannan Dead," *Daily Alta California*, May 7, 1889, 8.

² Richard Stillson, *Spreading the Word: A History of Information in the California Gold Rush* (Lincoln: University of Nebraska Press, 2006).

³ Rodman Paul, *California Gold: The Beginnings of Mining in the Far West* (Lincoln: University of Nebraska Press, Bison Books, [1947] 1968), 21-27; Randall Rohe, "Origins & Diffusion of Traditional Placer Mining in the West," *Material Culture* 18, no. 2 (Fall 1986): 128.

⁴ Value in 1940s dollar value. Richard Walker, "California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940," *Annals of the Association of American Geographers* 91, no. 1 (March 2001): 173.

⁵ James Houston, "From El Dorado to the Pacific Rim: The Place Called California," *California History* 68, no. 4 (Winter 1989/90): 172-181; Michael Kowaleski, "Romancing the Gold Rush: The Literature of the California Frontier," in *Rooted in Barbarous Soil: People, Culture, and Community in Gold Rush California*, ed. Kevin Starr and Richard Orsi (Berkeley: University of California, 200), 204-225.

⁶ Carey McWilliams, *California: The Great Exception* (Berkeley: University of California Press, [1949] 1998), 26.

parallel,” one observer claimed.⁷ Indeed, the glamorous drama and celebratory depictions penned by both contemporary observers and more recent historians have forged a Gold Rush mythology. It was a heroic era and great Turnerian leap towards Manifest Destiny led by independent Argonauts, whose claims and camps created an indigenous democracy and laid the foundations for the commonwealth.⁸

Celebratory accounts should, of course, be tempered with recognition of the unsentimental realities structuring the quotidian lives and livelihoods of California’s independent miners. The rush on placer gold was as ephemeral as it was lucrative. After peaking at \$81 million in 1852, California’s gold production steadily declined by almost fifty percent by 1859.⁹ The “democracy in production” forged at the mining claims belied rudimentary technology, backbreaking labor, and rampant alcoholism, violence, and disease.¹⁰ Few struck it rich, geographer Gray Brechin claims, and fewer still held onto their winnings.¹¹ Speculation, usury, and fraud enabled San Francisco’s commission merchants, land developers, financiers, and political profiteers to seize the bulk of Gold Rush fortunes. The modest wages offered by California’s first hardrock mining corporations heralded the imposition of wage labor relations and increasing disparities in wealth between peripatetic rural miners and emergent urban professionals.¹² For instance, Brannan realized spectacular profits from his supply stores at Sutter’s Fort and Mormon Diggings, and bought up “almost a quarter of the city of Sacramento.”¹³ Although popularly recognized as the “publicist of the Gold Rush” and one of the wealthiest Californians during early statehood, Brannan is more accurately described as the epitome of self-serving power enabled by sudden wealth, political profiteering, and rampant speculation during the tumultuous genesis of San Francisco.¹⁴

The Gold Rush undoubtedly provided unique opportunities and liberties for thousands of young men, especially Yankees, Southerners, and, to a lesser extent, northern Europeans. It was the first and last “poor man’s Gold Rush,” according to McWilliams.¹⁵ Yet this notion of

⁷ Charles Shinn, *Mining Camps: A Study in American Frontier Government*, (New York: Charles Scribner’s Sons, 1885), 112.

⁸ Daniel Cornford, “‘We Live More Like Brutes than Humans’: Labor and Capital in the Gold Rush,” *California History* 77, no. 4 (1998/99): 178-104; Kawaleski, “Romancing the Gold Rush,” 204-5.

⁹ Clark, “Gold Districts of California,” 4.

¹⁰ McWilliams, *California*, 27.

¹¹ Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin*, (Berkeley: University of California Press, 1999), 31.

¹² Cornford, “Like Brutes,” 78-104; Mark Eifler, *Gold Rush Capitalists: Greed and Growth in Sacramento* (Albuquerque: University of New Mexico Press, 2002); Edward Leo Lyman, “The Beginnings of Anglo-American Local Government in California,” *California Historical Society Quarterly* 81, no. 3/4 (2003); Ralph Mann, *After the Gold Rush: Society in Grass Valley and Nevada City, California, 1849-1970* (Stanford: Stanford University Press, 1982).

¹³ “Samuel Brannan Dead,” *Daily Alta California*, May 7, 1889, 8.

¹⁴ Lyman, “Anglo-American Local Government,” 199-223.

¹⁵ McWilliams, *California*, 26.

poverty is relative. Although entrepreneurial and ambitious by their very presence, more than pecuniary interests unified California's cosmopolitan population. The forty-niners were almost exclusively male, typically educated, and predominantly middle-class in origins.¹⁶ Roughly three-fourths of the forty-niners were U.S. citizens. For these Anglo-Americans an "equalitarian republicanism," as historian Davis Goodman put it, reconciled self-aggrandizement with U.S. imperial aspirations.¹⁷ In California, a free labor ideology conflated blunt avarice and civic virtue.

Racialized violence and institutionalized exclusion quickly transformed the California Dream into a cruel illusion for Mexicans, Chinese, Chileans, and other ethnic minorities.¹⁸ The Foreign Miner's Tax in 1850 made race or color a basis for social and economic differentiation. As historian Daniel Cornford points out, white miners lacked compunction about expelling foreign miners from the diggings and from mining towns for many reasons. American miners resented the experience and superior prospecting skills of many Mexicans and South Americans. Belief in Manifest Destiny gave many Anglo-Americans a sense of entitlement and proprietary rights to the diggings. In fact, the depth of racist ideology cannot be overemphasized.¹⁹

Manifest Destiny and free labor ideology were subsumed within broader attitudes, ideologies, and politics associated with blatant forms of Anglo-American dominance over non-white populations, or white supremacy. Tomas Almaguer argues that it was the white man's burden to extend their domination to the Pacific Coast and to bring civilization and Christianity to the uncivilized heathens through importing and imparting superior political and economic systems.²⁰ Along with the gold booms, miners felt the first tremors along California's "racial fault lines" at Sierran gold claims and mining camps. Beginning with regulating access to natural resources and productive property, white supremacy helped forge a collective identity and Anglo-Americans began enjoying privileged access to economic, social, and legal power. Racist ideology helped structure a mutually constitutive class hierarchy and racial order dictating who gained access to opportunity, and proved crucial in the making of early white working class consciousness.²¹

Nevertheless, the gold nugget quickly became the synecdochical sign for California, inseparable from economic opportunities and new beginnings. A human flood inundated California and ebbed in San Francisco. The city's population grew from 460 people under

¹⁶ Walker, "Golden Road," 179.

¹⁷ Davis Goodman, *Gold Seeking: Victoria and California in the 1850s* (Stanford: Stanford University Press, 1994), 48.

¹⁸ On the Chinese experience, see: Jean Pfaelzer, *Driven Out: The Forgotten War Against Chinese Americans* (Berkeley: University of California Press, 2008); Alexander Saxton, *The Indispensable Enemy: A Study of Anti-Chinese Movements in California* (Berkeley: University of California Press, 1967); Liping Zhu, "No Need to Rush: The Chinese, Placer Mining, and the Western Environment," *Montana: The Magazine of Western History* 49, no. 3 (Autumn 1999).

¹⁹ Cornford, "Like Brutes," 186.

²⁰ Tomas Almaguer, *Racial Fault Lines: The Historical Origins of White Supremacy in California* (Berkeley: University of California Press, 1994), 12.

²¹ Almaguer, *Fault Lines*, 7-8; Cornford, "Like Brutes," 186.

Mexican sovereignty in 1847 to roughly 30,000 in 1851 as prospectors scuttled back and forth from the Sierra.²²

This *rush*, however, may refer to more than the haste and urgency of the gold-seeking legions. “The every-day jog-trot of ordinary human existence was not a fast enough pace for the Californians in their imperious pursuit of wealth,” according to one Briton’s observation of everyday life in incipient San Francisco:

People lived more there in a week than they would in a year in most other places. In the course of a month, or a year, in San Francisco, there was more hard work done, more speculative schemes were conceived and executed, more money was made and lost, there was more buying and selling, more sudden changes of fortune, more eating and drinking, more smoking, swearing, gambling, and tobacco-chewing, more crime and profligacy... So great was the constant fluctuation in the prices of goods, and so rash and speculative was the usual style of business, that no great idea of stability could be attached to anything...²³

Speculative mania, paroxysms of economic crisis, and enduring instability structured economic life and social order.

At this very moment, as McWilliams famously wrote, “the lights went on all at once, in a blaze, and they have never been dimmed.”²⁴ With both his analytical approach and profound insights attuned to California’s exceptionalism, McWilliams shows how the Gold Rush foreshortened California’s development, engendered explosive growth and incessant instability, and endowed the region with both astonishing advantages and intractable problems. Above all else, the incredible wealth that prospectors plundered from the earth made California exceptional:

California was charged with all sorts of dynamite in the form of latent or potential resources. Gold was the fuse and the spark that touched off these explosions. Hence the chain reaction effect which continues to the present time. Resources have not been developed in California on a piecemeal basis but in “wholes,” as entities... This particular relation between the kind of resources which existed in California and the energies which the discovery of gold released has produced exceptional dynamics which, for a hundred years, have been propelling California forward, not by steps, but by strides; not by inches but by miles.²⁵

In the wake of the Gold Rush, the development of resources as “wholes” took the form of a quick succession of natural resources rushes.

²² Mel Scott, *The San Francisco Bay Area: A Metropolis in Perspective* (Berkeley: University of California Press, 1959), 27.

²³ J.D. Borthwick, *The Gold Hunters: A First-hand Picture of Life in California Mining Camps in the Early Fifties*, Horace Kephart, ed. (New York: International Fiction Library, [1857] 1917), 59.

²⁴ McWilliams, *California*, 25.

²⁵ *Ibid.*, 37.

Blunt numbers attest to the role of natural resources in California's economic development (including Nevada, which was initially a satrapy of San Francisco capital).²⁶ California produced \$1 billion in gold by 1860, as well as \$360 million in silver by the mid-1880s, including over \$215 million from the Comstock Lode.²⁷ With a cumulative value of \$100 million by 1895, California's supplied half the world's mercury consumption between 1859 and 1895.²⁸ Starting with the Central Valley wheat, the economy shifted towards agriculture and California's enduring agricultural extractions totaled about \$5 billion by 1905.²⁹ Timber and lumber production totaled \$1 billion by 1912. Furs totaled \$25 million by 1900 and the cumulative value of salmon products reached roughly \$20 million ten years later. The "Black Gold Rush" made California the world's leading oil producer from 1905 until 1930. Along with \$1.7 billion worth of oil produced by 1920, California led the world in hydroelectric power.³⁰ By 1940, the cumulative value of California's major natural resources reached almost \$37 billion.³¹ Yet sheer numbers fail to fully illustrate the significance of natural resources in the entire California economy before World War II. Using a comprehensive definition including not only extraction and cultivation, but also materials processing, specialized machinery, utilities, and transportation, Richard Walker estimates that the resource sector accounted for close to forty percent of state employment and nearly thirty percent of income (value added) in both 1880 and 1940.³²

Indeed, McWilliams' claim holds true: as a stimulus to economic development, the gold rush was "the very best economic pump-primer."³³ While the significance of natural resources in California's economic development is clear, questions remain concerning how resource extraction proved a viable foundation for regional development. According to Lewis Mumford, "The mine is the worst possible local base for a permanent civilization," and scholars typically agree—mining and other extractive activities at best represent a tenuous and rudimentary stage of development.³⁴ Busts follow booms more often than not. Successful regions quickly advance

²⁶ Walker, "Golden Road," 172-74.

²⁷ George Becker, *Geology of the Comstock Lode and the Washoe District with Atlas* (Washington, DC: U.S. Geological Survey, 1882), 10-11; Eliot Lord, *Comstock Mines and Miners* (Washington, DC: U.S. Geological Survey, 1883), 73.

²⁸ David St. Clair, "New Almaden and California Quicksilver in the Pacific Rim Economy," *California History* 73, no. 4 (Winter, 1994/1995).

²⁹ George Henderson's *California and the Fictions of Capital* (New York: Oxford University Press, 1999); Richard Walker, *The Conquest of Bread: 150 Years of Agribusiness in California* (New York: The New Press, 2004).

³⁰ Henry Symons, *California Mineral Production and Directory of Mineral Producers for 1941*, California State Division of Mines, Bulletin 122 (Sacramento: California Division of Mines and Geology, 1941); Williams Watts, *Oil and Gas Yielding Formations of California*, California State Mining Bureau, Bulletin No. 19 (Sacramento: State Printing Office, 1900).

³¹ All dollars in 1940 value. Walker, "Golden Road," 173.

³² Walker, "Golden Road," 172-76.

³³ McWilliams, *California*, 35.

³⁴ Lewis Mumford, *Technics and Civilization* (Chicago: University of Chicago Press, [1934] 2010), 157.

from mining to agriculture in a teleological assent towards industrialization, according to conventional wisdom. But in California the Gold Rush proved epochal, exerting a profound influence on a distinctive mode of regional development that spurred both rapid exploitation of nature *and* long-term growth.³⁵

California's prodigious natural resources were irreducibly the product of diverse geomorphological provinces and eons of complex faulting, violent uplifting, and shifting weather and river systems. An appreciation of California's natural bounty and the formative role of resource plunder in regional development, however, must not be reduced to a vulgar environmental determinism. As McWilliams observed, "Most of California's resources are of a character which have required a high level of technology to unlock."³⁶ Placer gold was the only resource that was free for the taking. Much gold was mineralized in complex quartz, entombed by lava caps, or dispersed in gravel deposits. Silver was mired in a lead matrix. California's brittle sub-bituminous coal burned hot and fast, while petroleum was tarry, asphaltic, and sluggish. With advances in irrigation, many of the Central Valley's renowned specialty crops were equally viable elsewhere. Furthermore, the diversity of California's resources and the succession of rushes veiled their rapid exhaustion: placer gold lasted seven years, the Comstock Lode fifteen, and Cerro Gordo silver ten; Contra Costa County coal for about twenty years; sea otters and pinnipeds maybe thirty; Sacramento salmon two ten-year busts; sardines forty; and redwoods for a century.³⁷

There could be no Gold Rush, of course, without the existence of gold. But rather than casually attributing California's growth to the wealth of nature, the rapid discovery and plunder of nature's bounty was the outcome of a distinctive mode of regional development, or "Capitalism with a sharp eye for the land and the wealth of nature," as Walker puts it.³⁸ Minerals, agriculture, and oil fueled California's economic development, yet this was consonant with high income, regional accumulation, and industrial dynamism.

California's *sui generis* jumpstart and telescoped development were undoubtedly exceptional vis-à-vis other U.S. states. To briefly mention the storied particularities of place, however, is in no way to deny the formative influence of a global, systematic logic of capitalism. Both occur simultaneously.³⁹ California's regional development is best understood within a broader, comparative framework. That is, the grand abstractions of capital, industry, class, and state assumed decidedly Californian characteristics. The Gold Rush set in motion an exceptional capitalist economic order structured not only by resource plundering but also by distinctive regional patterns of state government and property distribution, as well as accumulation and industrial dynamism. In addition to McWilliam's *Great Exception*, California may also be considered a *great variant* among U.S. states—a regional capitalist order structured by reciprocity between resource extraction and economic development.

³⁵ Walker, "Golden Road," 168, 177.

³⁶ McWilliams, *California*, 36.

³⁷ Walker, "Golden Road," 177.

³⁸ Ibid.

³⁹ Allan Pred and Michael Watts, *Reworking Modernity: Capitalisms and Symbolic Discontents* (New Brunswick, NJ: Rutgers University Press, 1992).

Public Lands and Private Domains

The expropriation of land and creation of wage labor structured Karl Marx's concept of *primitive accumulation*. He wrote about the enclosure of the commons and the forced separation of the peasantry from their land, which "hurled" them into the wage labor market. "The history of this expropriation, in different countries, assumes different aspects," Marx added, "and runs through its various phases in different orders of succession, and at different periods."⁴⁰ Rather than a single pre-history of capitalism, primitive accumulation is an ongoing process.⁴¹ In California, the transition to a capitalist social order commenced with the Gold Rush itself, when conquering Americans implanted a new property regime as quickly as they extracted precious metal. Rather than the imposition of wage labor relations, however, primitive accumulation in California relied on state-sanctioned violence and court-mandated machinations for the legitimation and operation of private property.

California skipped the typically protracted process of exploration, survey, settlement, and provisional government that culminated in statehood. Instead, instant statehood in 1849 conferred power to youthful, white Californians to promote and control economic development. California's early legislators "regarded government by remote control as an unmitigated nuisance," as McWilliams put it.⁴² According to Walker, government fostered economic expansion by giving capitalist profligacy a free hand and only periodically reformed its most destructive practices.⁴³ In doing so, California's leaders quickly forged a distinctive and enduring autonomy within the federalist system, selectively deploying state power while otherwise maintaining a *laissez-faire* milieu.⁴⁴ Or, as historian Laurence Shoup argues, "government structures were in the hands of the capitalist class, a new ruling class that used government mainly for their own purposes and not for the welfare of the whole population."⁴⁵

Yet the immediate imperative for the new state government was to sanction and support federal policy, namely facilitating U.S. territorial expansion and capitalist penetration through the imposition of a new property regime. This involved two processes that overlapped both spatially and temporally: the expropriation of land to create the public domain and the immediate distribution of public lands, and the resource base, to private owners, which Californians did with a brutal avidity.

⁴⁰ Karl Marx, *Capital: A Critique of Political Economy*, vol. I (New York: International Publishers, [1867] 1967), 716.

⁴¹ David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford University Press, 2005), 159.

⁴² McWilliams, *California*, 43.

⁴³ Walker, "Golden Road," 171-72.

⁴⁴ Robert Chandler, "Uncertain Influence," *The Role of the Federal Government in California, 1846-1880*, *California History*, 81, no. 3/4 (2003): 224-271; Lyman, "Anglo-American Local Government," 199-223.

⁴⁵ Laurence Shoup, *Rulers and Rebels: A People's History of Early California, 1769-1901* (New York: iUniverse Books, 2010,) 103.

Annihilation and Marginalization

The Western frontier was both spatial and ideological, defining violent, savage, or backwards people and places beyond Anglo-American civilization, authority, and jurisdiction. The forward edge of Manifest Destiny created a boundary in which U.S. law and state violence were not only rationalized and regulated but also regarded as essential for progress.⁴⁶ Before European contact, California sustained more than 300,000 Indians, representing six of the seven major language groups and perhaps thirteen percent of the entire continent's native population.⁴⁷ Roughly 150,000 indigenous Californians survived the invasive people, pests, and pathogens accompanying Spain's imperial mandate to eradicate indigenous culture in Alta California. The Indian population plummeted to 65,000 by 1856, according to California Superintendent of Indian Affairs, T.J. Henley's informed estimates and insidious rationalizations:

The outrages upon the Indians, which have been, I regret to say, of frequent occurrence, have emanated from a few lawless and desperate men, for whose conduct the masses should in no way be held responsible. No philanthropist or friend of the Indian can or ought to desire a better state of feeling towards this unfortunate and apparently doomed race, than forms the sentiment of the people of California, embracing every class of our citizens, as well in the mining as in the agricultural district, from one extremity of the State to the other.⁴⁸

His facile and perfidious apology veiled the systematic, state-sanctioned genocide of Californians Indians.⁴⁹

U.S. settlement policies had the dual function of dispossessing and eradicating native Californians. For instance, in 1851 and 1852, federal agents signed eighteen treaties with 119 California tribes allocating them close to 7.5 million acres. Under pressure from Anglo-Californians, however, U.S. senators repudiated these treaties. Congress instead authorized five "military reservations" not to exceed a total of 125,000 acres, and conferred no legal recognition or land titles.⁵⁰ California's 1850 Act for the Government and Protection of Indians, better known as the "Indenture Act," legalized the white custody of Indian minors and the leasing of

⁴⁶ Nicholas Blomley, "Law, Property, and the Geography of Violence: The Frontier, The Survey, and the Grid," *Annals of the Association of American Geographers* 93, no. 1 (March 2003): 121-24.

⁴⁷ Stephanie Pincetl, *Transforming California: A Political History of Land Use and Development* (Baltimore: The Johns Hopkins University Press, 1999), 1.

⁴⁸ *The State Register and Year Book of Facts: For the Year 1859* (San Francisco: Henry G. Langley and Samuel A. Morison, 1859), 133-34.

⁴⁹ Benjamin Madley, "Yuki Indians: Defining Genocide in Native American History," *The Western Historical Quarterly*, 39, no. 3 (Autumn 2008): 304. Also see Lynwood Carranco and Estle Beard, *Genocide and Vendetta: The Round Valley Wars of Northern California* (Norman: University of Oklahoma Press, 1981); Albert Hurtado, *Indian Survival on the California Frontier* (New Haven: Yale University Press, 1988); George Harwood Phillips, *Indians and Indian Agents: The Origins of the Reservation System in California*, (Norman: University of Oklahoma Press, 1997); Michele Shover, "John Bidwell and the Rancho Chico Indian Treaty of 1852: Seduction, Betrayal, and Redemption," *Dogtown Territory Quarterly*, no. 42 (Summer 2000).

⁵⁰ Madley, "Yuki Indians," 310.

adult Indian prisoners, which opened the door for abduction and virtual slavery until 1863.⁵¹ All the while, California Indians suffered murders, rapes, abductions, rape-induced venereal diseases, and massacres at the hands of the U.S. army and state-sponsored militias. Historian Benjamin Madley estimates that native population plummeted to roughly 25,000 by the mid-1860s.⁵² Conquering Europeans and then Anglo-Americans literally decimated California's indigenous population and, in doing so, the vast majority of California's resource hinterland, including most of the Sierra, entered the public domain.⁵³

With statehood, the *Californios* experienced marginalization, rather than annihilation. In this case, the expropriation of land, and unfurling of a capitalist land market, relied on a new legal apparatus. Spanish governor of Alta California Pedro Fages conveyed the first land grants in 1774, under Law of the Indies edicts allowing settlement of tracts of land outside of pueblo, presidio, and mission boundaries. Spain's king, in whom all land ownership was vested by virtue of discovery, ceded no formal titles. Instead, the Spanish ranchos were provisional concessions based on cattle grazing permits issued by governors or military commanders under viceregal authority. Provisions required that grantees settle and utilize land while ensuring that no harm befalls nearby missions, pueblos, and Indian *rancherías* (villages). Eventually, Spanish officials granted a total of thirty land concessions, each a reward or *de facto* pension for high-ranking veterans of Spain's occupying army. After Mexican independence in 1822, the new regime confirmed Spanish grants before issuing close to eight hundred new ones.⁵⁴

On the eve of the Gold Rush, 813 claims to some 14 million acres of land embraced the subsequent site of every major city, including the bulk of lands surrounding the San Francisco Bay, and much of the best arable land in the coastal and Central valleys.⁵⁵ Roughly ninety-five percent of the concessions were of Mexican origin and most were less than fifteen years old. Contrary to the romantic myth of pastoral Alta California, the *Californio* elite actively participated in market-based, international trade and developed their lands as private property.⁵⁶ Yet a lack of fences combined with vague *disenos* (rough maps) failed to precisely delimit property boundaries on the ground and, as it would turn out, to clearly document land titles in the new U.S. courts.

Under the 1848 Treaty of Guadalupe Hidalgo, the federal government vowed to protect Mexican land titles. California statehood, however, initiated the rapid displacement of the

⁵¹ Almaguer, *Fault Lines*, 135-41; James Rawls, *Indians of California: The Changing Image* (Norman: University of Oklahoma Press, 1986), 85-108.

⁵² Madley, "Yuki Indians," 304.

⁵³ Robinson, *Land in California*, 67.

⁵⁴ *Ibid.*, 45, 51.

⁵⁵ Burgess Shumway, *California Ranchos: Patented Private Land Grants, Listed by County* (San Bernardino, CA: Borgo Press, [1942] 1988).

⁵⁶ Karen Bradley Clay, "Trade Without Law: Private-Order Institutions in Mexican California," *Journal of Law, Economics, and Organization* 13, no. 1 (April 1997): 202-32; David Igler, "Alta California, the Pacific, and International Commerce Before the Gold Rush," *A Companion to California History*, ed. William Deverell and David Igler (Malden, MA: Blackwell Publishing, 2008), 116-126; Leonard Pitt, *Decline of the Californios: A Social History of the Spanish-Speaking Californians, 1846-1890* (Berkeley: University of California Press, [1966] 1998).

Mexican ranchero class, as privately held land was transferred *en masse* to Anglo immigrants between 1848 and 1880. The Federal Land Law of 1851 set this process in motion. The Land Law compelled Californios to prove the validity of titles granted under Spanish and Mexican sovereignty before the California Land Claims Commission in San Francisco or Los Angeles, with the right to appeal to U.S. District Court in California, and then to the U.S. Supreme Court. The Commission adjudicated over 800 claims between January 1852 and March 1855, ruling overwhelmingly in favor of the claimants.⁵⁷

The Land Law, however, “prolonged an agony when speed was of the essence,” as historian Leonard Pitt put it.⁵⁸ While most Mexican claimants ultimately retained possession of their granted estates, they did so only after years of expensive litigation. Individual cases took an average of seventeen years to resolve. In the process, many *Californios* lost their land. Exorbitant legal fees forced many *Californios* to sell portions of their landholdings. Property also transferred hands through outright sales, unlawful ‘squatting,’ bankruptcy proceedings, and as payment for personal indebtedness resulting from extravagant expenditures, gambling, delinquent property taxes, and usurious interest rates to moneylenders and land speculators. Confirmation of title to the original grantee was often a legal fallacy. In many cases, the claimants no longer possessed the rancho land. Instead, it belonged to well-financed American buyers, who pushed the land claim through the confirmation and patenting process.⁵⁹

With statehood, annihilation of native populations, and appropriation of occupied lands, California’s productive resources became inextricably connected to the market. The distribution of public land to private parties followed, rapidly altering regional landownership patterns and social relations.

Private Domains

After the expropriation of land and creation of the public domain, expansion of the U.S. resource frontier required the imposition of a private property regime in order for prospectors to stalk and stake, and claim and commodify the land, thereby converting nature into natural resources. A property regime is a complex set of rules, principles, and procedures that in a specific community or society regulates control over, access to, and use of the means of existence and of production (resources), as well as the acquisition and transfer of such resources.⁶⁰ Despite its seeming individualism and esoteric legal appearance, private property is

⁵⁷ Over three-fourths of claimants received *de jure* title to their lands; sixteen of eighteen cases the government presented against Mexican rancheros before the U.S. Supreme Court were decided in favor of the original claimants. Almaguer, *Fault Lines*, 66; Robinson, *Land in California*, 106.

⁵⁸ Pitt, *Decline of the Californios*, 95.

⁵⁹ Almaguer, *Fault Lines*, 65-68; Robinson, *Land in California*, 106; David Igler, *Industrial Cowboys: Miller & Lux and the Transformation of the American West* (Berkeley: University of California Press, 2001), 45-46; Pitt, *Decline of the Californios*, Chapters 5 and 6.

⁶⁰ Blomley, “Geography of Violence,” 121; J.W. Singer, “Property and Social Relations: From Title to Entitlement,” *Property and Values: Alternatives to Public and Private Ownership*, ed. Charles Geisler and Gail Daneker (Washington, DC: Island Press, 2000), 3. Also see Sara Berry, “Social Institutions and Access to Resources,” *Africa: Journal of the International Africa Institute* 59, no. 1 (1989): 41-55; Carol Rose, *Property & Persuasion: Essays on the History, Theory, and Rhetoric of Ownership* (Boulder, CO: Westview Press, 1994).

social and political in both origins and effects. By distributing powers to control resources, private property helps create, perpetuate, and regulate social relations. The imposition of private property in California immediately had two profound consequences. On the one hand was especially open access to land and resources, which created relatively equal distribution of wealth and a pervasive small property class. On the other hand, the creation of a distinct kind of Western firm was predicated on amassing prodigious productive land. The pervasive and dynamic tensions between small property holders and nimble, land-based corporations underpinned California's early regional development.

The U.S. acquired California under the terms of the Treaty of Guadalupe Hidalgo in 1848, shortly after the discovery of gold. The Mexican War had left the region without a legislature, without bureaucracy, and without police or jails. "Not only were there no institutions to enforce the laws, there were no laws," legal historian Andrea McDowell argues.⁶¹ Certainly there were no laws governing property rights in mineral lands. Congress failed to exercise its constitutional power to legislate regulations in the new U.S. territory because of disagreements between northern and southern states about the status of slavery in California.⁶²

By the end of 1849, 100,000 gold-seekers, practically all men, had poured into California from every corner of the globe. These miners quickly created, codified, and enforced a distinctive system of property tenure based on mining claims (not fee-simple) with tight restrictions on claimholders' rights. Based loosely on Spanish precedent, this emergent common law of the diggings, or rights to mineral deposits, gave the first miner on the site usufruct through discovery, notice, and continuous use. That is, a miner could hold a small claim for as long as he worked it or left his tools in his diggings.⁶³

California not only promised gold but also land—both free for the taking. The "small mines claim system" created relatively equal access to the gold claims before initiating mass access to natural resources as settlers laid hold of land and claims to minerals, forests, and waters. In addition to the lack of regulated access to the public domain, government sales of public land widely distributed California's natural resources. From 1866 to 1880, public sales of land in California surpassed similar sales in all other states and comprised well over half of the sales for the entire country. In 1869 alone, the federal government sold close to two million acres and between 1862 and 1884 private parties purchased a total of over seven million acres of federally owned land in California.⁶⁴

Land distribution patterns and policies in California greatly influenced patterns of natural resource ownership and exploitation, as well as broader patterns of economic development. Significantly, open access to the public domain fostered a vibrant small property class, which has been largely overlooked, according to Walker.⁶⁵ Small property owners emerged as a robust

⁶¹ Andrea McDowell, "From Commons to Claims: Property Rights in the California Gold Rush," *Yale Journal of Law & Humanities* 14, no. 1 (2002): 2.

⁶² McDowell, "Commons to Claims," 2-3. Also see McDowell, "Real Property, Spontaneous Order, and Norms in the Gold Mines," *Law & Social Inquiry* 29, no. 4 (Autumn 2004): 771-828.

⁶³ McDowell, "Commons to Claims," 2-3; Robert Stewart Morrison, *Mining Rights on the Public Domain: Lode and Placer Claims* (Denver: The Smith-Brooks Printing Company, 1908); Rodman Paul, *California Gold*, 212-13.

⁶⁴ McWilliams, *California*, 94.

⁶⁵ Walker, "Golden Road," 170, 178-81. According to Walker, *petit bourgeoisie* aspirations extended deep into California's working class and help explain the rapid formation of working class conscious, especially among

class in California thanks to direct access to the profits of extraction. Rather than solely farmers, small merchants, shop owners, and manufacturers, a significant proportion of California's *petit bourgeoisie* consisted of "prospectors"—not only independent miners but also sourdoughs and wildcatters, ranchers and dairymen, and fishermen and hunters. From Mother Lode gold to the Cerro Gordo silver, from Contra Costa County coal to Shasta County copper, from Ventura County oil to Humboldt County Redwoods, and from Central Valley wheat to Los Angeles citrus, this "prospector class" occupied the bulk of the landscape, initiated new resource rushes, and incessantly sought new beginnings at the dynamic frontier of resource exploration and exploitation.

While new resource bonanzas repeatedly reinvigorated the prospecting *petit bourgeoisie*, larger-scale resource profiteers quickly exploited the governmental acquiescence of free access to public lands. Federal land policies, including gifts of public land, laid the groundwork for the increasing influence of Bay Region capital over the hinterland through the creation of individual and corporate industrial enterprises predicated on accumulating productive land *en masse*. The Pacific Railway Acts of 1862 and 1864 enabled the distribution of over eleven million acres, approximately sixteen percent of all federally owned land in the state.⁶⁶ The Timber Culture Act (1873-1891), Desert Land Act (1877), and Timber and Stone Act (1878-1891) likewise allowed entrepreneurs to claim and consolidate significant land and resources.⁶⁷ Industrial firms across California quite literally grew from the ground up and proved integral to the transformation and consumption of the California landscape between 1850 and 1900.⁶⁸

For instance, the California Redwood Company, Pacific Lumber Company, and other timber firms clear-cut massive swathes of old-growth Redwood, Ponderosa Pine, and Douglas-fir based on private rights to million of acres. Highly capitalized mining corporations extracted the deposits of gold and silver through contiguous mineral claims and quickly reinvested their profits in other land-based operations. The Southern Pacific and Northern Pacific railroads, financed by government gifts of land, remained the region's largest landowning corporations throughout the nineteenth century. By striking private deals with western industrialists, these railroads passed their bounty into the hands of other rising business enterprises. Land, therefore, provided the means for capitalized industries to expand across the West.

The cattle, water, and meatpacking enterprise Miller & Lux, a meat wholesaling partnership that formed in San Francisco in the early 1850s, provides perhaps the clearest example of land-based industry. Seeking to dominate San Francisco meat markets, the partners cultivated strong ties with San Francisco's leading bankers and integrated upstream by purchasing herds of cattle, acquiring extensive rangeland, and developing complex irrigation systems to grow feed. Through the artful use of public lands laws and governmental agents, the firm soon owned over 1.25 million acres in the Santa Clara and San Joaquin valleys, northern

California's skilled labor. Most important for the purposes of this chapter, however, is the role of small property resource bonanzas.

⁶⁶ The acts authorized construction of a central transcontinental railroad and awarded rights of way and ten alternate sections (340 acres) per mile of public domain to the railroads to assist them in linking the coasts.

⁶⁷ Pincetl, *Transforming California*, 6-7.

⁶⁸ David Igler, "The Industrial Far West: Region and Nation in the Late Nineteenth Century," *Pacific Historical Review* 69, no. 2 (May 2000): 168-68.

Nevada, and eastern Oregon. As early as 1870, the staggering scale of Miller & Lux's landholdings represented a magnification of the pattern of ranching and industrial agriculture in California, according to historian David Igler.⁶⁹

The divestiture of the bulk of fourteen million acres of Mexican land grants, legally or otherwise, provided another source of aggrandizement of a score of enormous landholders. Thomas Scott, president of the Pennsylvania Railroad, acquired about 250,000 acres of rancho land in the mid-1860s in his search for California oil and a transcontinental route for the Texas & Pacific Railroad from Marshall, Texas to San Diego.⁷⁰ W.W. Hollister and the Dibblee Brothers acquired 193,000 acres of rancho land in Santa Barbara County. Using a strategy of mortgages and foreclosures, James Ben Ali Haggin, along with partner Lloyd Tevis, amassed 162,000 acres in Kern County and jumpstarted intricate irrigation in the Central Valley. The coveted estates of debt-ridden Rancheros became the basis for prodigious agriculture and massive land speculations, as well as mining and transportation ventures leveraged by land assets.⁷¹

"The extractive character of most Pacific Slope industries made extensive landownership a crucial and powerful corporate asset," Igler argues.⁷² Beyond this seeming tautology—land-based enterprises required land—lay significant implications for identifying a distinct mode of corporate organization that developed in California, as well as a distinct mode of industrialization based on plundering and processing natural resources. As opposed to Alfred Chandler's "modern business enterprise," which continues to serve as the *de facto* model of early U.S. corporate organization, Igler sketches several defining characteristics of a generic western "large-scale firm." Although built with private capital, western firms utilized public officials and the larger political state to secure vast holdings of land and natural resources. These corporations operated out of the metropolitan core, primarily San Francisco, and incorporated peripheral hinterlands into urban markets and business networks. In addition to the interrelatedness of cities and hinterlands, Igler argues that environmental transformation and labor exploitation reinforced one another throughout the region. That is, rather than two separate phenomena, industrial enterprises in the Far West thrived by engineering natural landscapes and mobilizing large labor forces.⁷³

Finally, Igler notes that investment capital and industrial entrepreneurship were remarkably dynamic. The indigenous organization and strategy of mining companies in particular led to highly rationalized, vertically integrated firms directed by imperious and innovative leaders. Corporate expansion through spin-off subsidiaries developed as a common strategy against business risk, he argues. Diversification offered a method for western companies to control different "layers" of the production process while vertical integration

⁶⁹ Igler, *Industrial Cowboys*.

⁷⁰ William Hutchinson, *Oil, Land and Politics: The California Career of Thomas Robert Bard*, vol. 1 (Norman, OK: University of Oklahoma Press, 1965), 43-44; Gerald White, *Formative Years in the Far West: A History of Standard Oil Company of California and Predecessors Through 1919* (New York: Appleton-Century-Crofts, 1962), 7, 9.

⁷¹ Paul Gates, *Land and Law in California: Essays on Land Policies* (Ames: Iowa State University Press, 1991), 251-252; Gerald Nash, *State Government and Economic Development: A History of Administrative Policies in California, 1849-1933* (Berkeley: Institute of Governmental Studies, University of California, 1964), 102.

⁷² Igler, "Industrial Far West," 168

⁷³ *Ibid.*, 166-67, 190.

moved these firms beyond resource extraction in one industry to multiple extractive sectors, followed by the processing and marketing of products. By way of example, he points to the early lead of California bankers and businessmen William Sharon and William Ralston, and the San Francisco-based “Irish silver kings,” John Mackay, James Fair, James Flood, and William O’Brien. They collectively and competitively operated a handful of banks and mining companies in the Comstock region, supplying their mines with, for example, water through subsidiary companies. Igler concludes, “Beneath the Far West’s seeming haphazard, hit-and-run business activity lay an innovative and coordinated form of corporate capitalism—a form entirely missed by historians who limit their perspective to the ‘industrial belt which stretched from the eastern seaports to the Great Lakes.’”⁷⁴

Compared to the staggering scale of landownership by agricultural, ranching, timber, and railroad enterprises, mining companies assume a somewhat secondary status within Igler’s sketch of the Western firm. He argues that mining companies, along with oil and irrigation firms, operated on a smaller scale of acquisitiveness. That is, mining firms profited from strategic claims to lands and minerals, rather than the sheer extent of landholdings.⁷⁵ When considering the emergence and form of a distinctive Western corporation, however, the ancillary significance of mining companies is surprising. Mining firms dominated California’s physical geography and the West’s economic landscape. As Maureen Jung argues, “While railroads drove economic expansion in the eastern United States, mining was the first industry in the West to widely adopt the corporate form of organization.”⁷⁶

Mining corporations exerted a profound influence on California’s distinctive form of corporate organization and on the specialization of regional industries. California’s second mining corporation set the tone. Seven San Francisco financiers and attorneys created the Mariposa Mining Company in 1850. A stated capital stock of \$1 million was an exponential increase over its forerunner, the California State Mining and Smelting Company, which incorporated only months earlier.⁷⁷ The new corporation consolidated numerous mining claims and invested heavily in imported stamp mills, steam engines, and other machinery and equipment. Mining operations were managed by remote control from a San Francisco boardroom, where the corporation was joined at the hip with a leading banking house. Capital flowed from San Francisco and Sacramento investors, then from New York and Boston, before Paris and London stock exchanges began trading Mariposa Mining Company securities in 1851.⁷⁸

⁷⁴ Ibid., 176.

⁷⁵ Ibid., 170.

⁷⁶ Maureen Jung, “Capitalism Comes to the Diggings: From Gold-Rush Adventure to Corporate Enterprise,” *California History*, 77, no. 4 (1998/99): 52-53.

⁷⁷ While enterprises advertised, and embellished, the amount of capitalization at the time of incorporation, it is often impossible to know how much money was actually “paid in.”

⁷⁸ Jung, “Capitalism Comes to the Diggings,” 52, 63; “The Mariposa Mines,” *Sacramento Transcript*, September 13, 1850, 2; “The Mariposa Mining Company,” *Sacramento Transcript*, August 23, 1850, 3; “The Fremont Claim,” *Daily Alta California*, December 28, 1852, 2; “Taxes on the Fremont Grant,” *Sacramento Daily Union*, November 24, 1856, 1.

The Mariposa Mining Company proved prototypical. What quickly emerged was a coherent mode of corporate organization and an accumulation strategy involving a shift from working individual claims to vertically monopolizing entire lodes. Corporate consolidation of land and mining claims initiated this process and herein lay part of the dynamic between small property owners and large firms. Rather than solely acquiring swaths of the public domain, corporations consolidated numerous individual claims and small-scale companies' rights to productive lands with each new resource rush. George Hearst led the consolidation of claims on the Comstock's first bonanza strike in 1859, which keyed the first and greatest silver rush in the West. With a nominal capital of over \$5 million, Hearst's Ophir Gold and Silver Mining Company became the largest corporation in the West when formally incorporated in San Francisco on April 18, 1860.⁷⁹ A similar pattern of land consolidation occurred as the silver rush radiated from the Washoe District. Egbert Judson's Union Mine Company monopolized the best strikes on Cerro Gordo, California's richest silver strike in the high desert above Owens Lake, while his Giant Powder Company partners unfurled the same strategy in the nearby New Coso Mining District and with the Meadow Valley Mining District Company in southwest Nevada. The consolidation of devalued hydraulic gold mines and water companies began in the mid-1860s and revalorized California's sagging gold industry. Judson spearheaded the consolidation of claims to form the Spring Valley Mining Company, while his Giant Powder partners, backed by Ralston's Bank of California, acquired the claims composing the North Bloomfield Hydraulic Mining Company. Moreover, Judson and these partners collectively consolidated and controlled the Milton Mining and California Water companies. This general pattern adhered to not only precious metal claims. Ralston's "Bank Ring" consolidated Contra Costa County coalmines and formed the Black Diamond Mining Company, whose directors included California's most powerful capitalists. Judson followed suit with the centralization of mines and creation of Union and Empire mining companies in the same Mt. Diablo coalfield.

While perhaps small in extent compared to the lands held by ranching and railroad companies, productive mining claims were disproportionately valuable. Although highly speculative, the value of stocks in the Comstock's Gould & Curry Silver Mining Company was \$3,000 per foot, to take an extreme example.⁸⁰ Further, mining companies' consumption of the natural landscape was larger than supposed. As I discuss below, extraction industries required other natural resources and stimulated ancillary rushes on timber and water, for instance.

The role of mining companies in stimulating industrialization is most significant for the purposes of this dissertation. As I discuss below, and as I show in the following chapters, mining firms engendered industrial dynamism in several ways. The capitalization of productive mines went deeper than the acquisition of land and claims. "Industrial mining" required large capital outlays, generated by securities, to purchase machinery and other supplies, and to hire wage laborers. Mammoth steam engines, huge pumps, hoisting works, tramcars, and large quantities of wire rope, explosives, quicksilver, lumber, food, and the like were all required to deepen extractive activities. Further, the extent of vertical integration and attendant spin-offs cannot be underestimated. Companies controlled not only extraction but also on-site processing industries, transportation, housing, and provisioning. Through direct ownership or investment, firms controlled Bay Region smelting and refining industries, as well as supply industries, such as machinery and explosives. What emerges is a widespread and coherent strategy of vertical

⁷⁹ Brechin, *Imperial San Francisco*, 39; Jung, "Capitalism Comes to the Diggings," 68; Lord, *Comstock Mine*, 97.

⁸⁰ "San Francisco Stock and Exchange Board," *Daily Alta California*, March 6, 1863, 4.

monopolization on entire lodes. California's innovative modes of corporate organization linked together international securities markets, San Francisco boardrooms, Bay Region factories, and resource hinterlands. The ties between city and hinterland were reinforced not only by flows of investment and labor but also by specialized industry co-evolving with California's resource-oriented economy.

Invisible Industries

Five years before he published *The Impending Crisis of the South*, and his incendiary abolitionist agenda gained traction with North Carolina republicans, Hinton Helper recounted his unprofitable and embittering three-year sojourn in California.⁸¹ In *The Land of Gold: Reality Versus Fiction*, Helper described a Gold Rush society marked by "corruption, villainy, outlawry, intemperance, licentiousness, and every variety of crime, folly and meanness."⁸² His sensationalistic vitriol encompassed California's economic prospects, as well:

If we inquire after the manufacturing and mechanical resources of the State, we will find that she has none whatever. Nor can she establish, encourage or maintain these arts, for the reason that she would be under the necessity of importing, not only the machinery and raw materials, but also the fuel... She has to import every thing she uses, but has nothing to export, except her gold, which, instead of being a blessing to her, is a curse.⁸³

Of course, gold proved no curse, yet Helper anticipated a impediment to regional growth that would inhibit industrialists and bedevil boosters for decades: California's dearth of energy resources and lack of basic industrial inputs fettered industrial expansion and, therefore, perpetuated dependency on imports.

John Hittell's prolific promotions made him California's "one-man Chamber of Commerce," as historian Claude Perry phrased it.⁸⁴ The scrupulous research and voluminous information entombed in *The Resources of California* and *The Commerce and Industries of the Pacific Coast of North America* distinguished Hittell among early California's historiographers, economists, and statisticians. Empiricism aside, he combined *laissez-faire*, Spencerian social Darwinism, and white supremacist ideologies in a "California gospel" that prophesied a Pacific Coast commercial empire thanks to the mythic builders of the commonwealth.⁸⁵ Hittell was Helper's polar opposite but the two saw eye-to-eye when viewing California's industrial horizon.

⁸¹ David Brown, *Southern Outcast: Hilton Rowan Helper and the Impending Crisis of the South* (Baton Rouge: Louisiana State University Press, 2006).

⁸² Hinton Helper, *The Land of Gold: Reality Versus Fiction* (Baltimore: Sherwood & Co., 1855), 36-37.

⁸³ *Ibid.*, 19.

⁸⁴ Claude Petty, "John S. Hittell and the Gospel of California," *Pacific Historical Review* 24, no. 1 (February 1955): 4.

⁸⁵ Petty, "Hittell," 7.

Hittell filled all nine editions of *The Resources of California* with laudatory assessments of California's climate, geology, zoology, botany, agriculture, mining, commerce, government, and "social conditions." His bleak evaluation of the region's industrial prospects, however, tarnished the Golden State. High wages and usurious interest rates "render it impossible for California to compete with foreign manufacturers in many branches of employment," he stated in 1863.⁸⁶ California's scarcity of bituminous coal and apparent unsuitability for cotton production deprived manufacturers of key energy sources and staple industrial inputs. Inconstant and expensive coal imports precluded iron production. Despite *de facto* protection for home industries created by high transportation costs, "a large proportion of the manufactured goods consumed here are imported from abroad, and probably will be for many years to come," he surmised.⁸⁷

Fifteen years later Hittell lamented, "We produce no manufactures for exportation and many years may elapse before we supply the finer articles needed for home consumption."⁸⁸ High wage and fuel rates persisted while his litany of impediments to industrialization grew considerably. A transient population, litigious land titles, insufficient waterpower in the Bay Area, high transportation costs, and prohibitively expensive industrial land near deep-water ports all stymied capital investment and manufacturing expansion. "Our agricultural and mining industries have reached advanced development in some branches while our manufacturers are backwards," Hittell concluded in 1879.⁸⁹

University of California President and history professor Benjamin Ide Wheeler concurred. California's economy had languished and reached a point of "half-stagnation" by the 1880s:

The first impulses had spent their force; new activities did not develop; new resources did not for the moment appear; fuel oil and water power... had not then come into play; wheat-raising still dominated agriculture, with declining product; irrigation, which has turned miles of desert into garden, was yet only in crude beginnings. A torpor lay upon the land.⁹⁰

The *Twelfth Census* federally confirmed the boosters' grim outlook: geographic isolation, expensive wages and fuels, and exceptional attractions offered by mining and agriculture constrained California's industrial development before 1900.⁹¹

Early twentieth century historians perpetuated this conventional wisdom concerning early California's industrial deficiencies. For example, Robert Cleland and Osgood Hardy's *March of Industry* summarized the "handicaps" faced by California's early manufacturers. In addition to

⁸⁶ John Hittell, *The Resources of California* (San Francisco: Roman & Company, 1863), 304.

⁸⁷ Ibid.

⁸⁸ Hittell, *Resources*, 1879, 184.

⁸⁹ Ibid., 183-84.

⁹⁰ Benjamin Ide Wheeler, "A Forecast for California and the Pacific Coast," *The Outlook*, September 23, 1911, 168.

⁹¹ *Twelfth Census of the United States, Vol. VIII, Manufacturing, Pt. III, States and Territories* (Washington, D.C.: Government Printing Office, 1900), 33-34.

the issues outlined by Hittel, California lacked a sufficient population to furnish a domestic market for home industries. Interrupted trade with eastern states during the Civil War protected California's "infant industries" and sparked a burst of consumer goods manufacturing, such as boots, shoes, and clothing and liquor, soap, and cigars. Growing urban populations also led to incipient "local industries," such as gas plants, planing mills, and brick works. But material advances proved ephemeral with the inundation of imports following the war. Cleland and Hardy concluded that, "Despite the progress made in the 1860s, California in 1870 could not appropriately be called a true manufacturing state."⁹²

Another explanation for California's putative lack of industrial dynamism surfaced in the 1930s. First encapsulated by Bernard Devoto, the *Plundered Province* thesis cast California as a semi-dependent colony of eastern capital, a satrapy of Wall Street investment bent on pillaging California's natural resources.⁹³ Under the lash of Eastern manufacturers' demands for raw materials, rudimentary firms developed in California that were adept only at resource plunder. Like resource scarcity tracts, preoccupations with trade imbalances, and fears concerning California's lack of home industries, the *Plundered Province* concept structured subsequent understandings of regional economic development.

Indeed, many contemporary historians echo these bleak sentiments and offer similar explanations for California's seemingly sluggish industrial growth before 1900. The sway of merchant capital and more lucrative prospects in real estate, mining, transportation, and agriculture diverted potential industrial capital investment throughout the latter nineteenth century.⁹⁴ Trade disruptions and attendant consumer demand spurred increased output from California's grain, flour, and lumber industries during the Civil War but a "blight of competition" trailed the Union Pacific's transcontinental railroad in 1869. With mass production and economies of scale, eastern manufacturers "brought death to infant industry" in California, except in custom goods or commodities prohibitively expensive to ship.⁹⁵ Coming full circle, Paul Rhode draws verbatim on the 1900 *Census of Manufacturing* to explain California's "lackluster" industrialization and relative weakness of manufacturing activity vis-à-vis national trends during the 19th century. He argues that exceptional attractions offered by mining and

⁹² Robert Cleland and Osgood Hardy, *March of Industry: California* (San Francisco: Powell Publishing Company, 1929), 134.

⁹³ Bernard Devoto, "The West: A Plundered Province," *Harper's*, August 1934, 355-364. Also see Earl Pomeroy, *The Pacific Slope: A History of California, Oregon, Washington, Idaho, Utah, and Nevada* (Reno: University of Nevada Press, [1965] 2004), 83-89, 297-305; Gerald Nash, *The American West in the Twentieth Century: A Short History* (Englewood Cliffs, NJ, 1973), 233-34, 300; William Robbins, "'Plundered Province' Thesis and the Recent Historiography of the American West," *Pacific Historical Review* 55, no. 4 (November 1986): 577-579; Paul Rodman and Michael Malone, "Tradition and Challenge in Western Historiography," *Western Historical Quarterly*, 16, no. 1 (January 1985): 27-35.

⁹⁴ William Bullough, Richard Orsi, and Richard Rice, *The Elusive Eden: A New History of California* (New York: McGraw-Hill, 1996), 279; Mike Davis, *City of Quartz: Excavating the Future in Los Angeles* (New York: Vintage Books, 1992); Earl Pomeroy, *The Pacific Slope*, 113.

⁹⁵ Quote from Pomeroy, *Pacific Slope*, 112; Andrew Rolle, *California: A History* (Arlington House, Ill: Harlan Davidson, 1987), 229; Bullough, et al., *Elusive Eden*, 279.

agriculture, in addition to the state's isolation and high rates of wages and fuels, impeded significant industrial expansion.⁹⁶

Looking at California's precipitous industrial expansion beginning at the turn of the century, it is easy to see why many scholars perceive the waning decades of the nineteenth century as the doldrums of manufacturing (Figure 1.1). For example, between 1899 and 1904, the number of California manufacturing establishments and production workers increased by thirty-five percent and twenty-four percent, respectively, far outpacing national rates. Value added by California industries increased by 150 percent between 1899 and 1909, and another 275 percent during the following decade.⁹⁷

The development and deployment of cheap and reliable regional energy sources fueled California's industrial expansion. Oil companies led the way by tapping vast petroleum fields in the southern San Joaquin Valley and Los Angeles region and pioneering fuel oil, as well as natural gas, for industrial power. By 1909, California manufacturers relied on petroleum for ninety-two percent of their energy consumption, as opposed to a nation average of only four percent.⁹⁸ California led the nation in development of hydroelectric resources, too. Twenty-five electric plants supplied clean and inexpensive power to about seven percent of California's manufactures in 1899 and the rate mushroomed to over fifty percent by 1914, fifteen years before comparable rates were reached at the national level.⁹⁹

The determining effects of regional energy sources cannot be underestimated, according to many contemporary scholars. In his foundational history of energy development in California, James Williams writes:

As the twentieth century unfolded, California's oil and gas resources helped to establish a strong regional economic base, which, in turn, helped override the restricted economic development that had stemmed from California's geographic isolation and its colonial relationship with the Eastern United States.¹⁰⁰

Herein lies the conventional explanations and assumptions concerning early California's lack of manufacturing: California suffered from a weak regional economic base, largely due to exogenous factors; California was a plundered province, beholden to eastern finance and firms; only the "discovery" of radically new regional energy sources could override the grim patterns of antecedent economic development; and California reached a discrete stage of industrialization in the early twentieth century.

⁹⁶ Paul Rhode, *The Evolution of California Manufacturing* (San Francisco: Public Policy Institute of California, 2001), 15-18.

⁹⁷ *Ibid.*, 11.

⁹⁸ Rhode *Evolution*, 48; James Williams, *Energy and the Making of Modern California* (Akron, OH: University of Akron Press, 1997), 371.

⁹⁹ Jessica Teisch, "Greater Western Powder, 'White Coal,' and Industrial Capitalism in the West," *Pacific Historical Review* 70, no. 2 (May 2001): 222; Williams, *Energy*, 170-174.

¹⁰⁰ Williams, *Energy*, 141.

Envisioning Industry

Great as are the results of the last ten years' effort in making our State independent of foreign supply, we believe that the results of the next ten years will manifest a productive and manufacturing ability in our people surprising to the most sanguine in California's power to rely on her own resources. Our workshops, foundries and manufactures will multiply as the raw material of their labors is found in our mountains or produced from our soils.

Daily Alta California, 1861¹⁰¹

The conventional understanding of California's industrial growth before 1900 warrants reconsideration. Even a brief review of the literature concerning California's early economic development reveals a disjuncture. During the first fifty years of statehood, Californians sustained themselves by "some miracle of economic levitation," as historian Earl Pomeroy put it.¹⁰² After languishing for decades, the development of cheap, reliable sources of fuel instantaneously unleashed California's industrial dynamism and manufacturing expansion. "Black gold" and "white coal," it seems, were magic keys that unlocked California's industrial kingdom, creating new circuits for surplus capital investment; new home industries capable of mass-production and import substitution; and new jobs that propelled population growth, multiplier effects, and domestic market expansion. And *voila*, a discrete stage of industrial modernity.

While California's oil, natural gas, and hydroelectric power undoubtedly facilitated rapid industrial expansion, such inexpensive and reliable sources of energy did not *create* California's industrial dynamism. Nor was California's shift to petroleum and natural gas simply an adaptation to the region's resource endowment. Conversely, the development of new energy sources is better understood as an outcome of antecedent development and indigenous technology. That is, these new fuel sources were one result of the broader, resource-intensive industrialization at the heart of California's distinctive mode of economic growth. A quick dismissal of the significance of California industry before 1900 overlooks prodigious investments and incessant innovations deployed to grapple with California's plentiful but stubborn natural assets. A symbiotic relationship between industry and extraction fueled regional economic growth for a century in California.

Both nineteenth century commentators and contemporary scholars have largely overlooked the formative role of industry in California's early economic growth. Although dwarfed by subsequent expansion, California's industrial development was in no way static or sluggish. According to historian David St. Claire's census data analysis, the growth of California's manufacturing sector outpaced its gold mining industry by 114 percent between 1850 and 1860. California's industrial sector (excluding gold mining) then grew from eighteenth in output among U.S. states in 1860 to twelfth in 1880 (with output per capita exceeding that of Ohio and Illinois in 1870).¹⁰³ "There was no significant delay or lag in developing California

¹⁰¹ "New Channels for California Trade and Industry," *Daily Alta California*, March 17, 1861, 2

¹⁰² Pomeroy, *Pacific Slope*, 111.

¹⁰³ David St. Clair, "The Gold Rush and the Beginnings of California Industry," *California History*, 77, no. 4 (1998/99): 190-1.

industry,” he argues, “and while the obstacles to growth were formidable, the history of California industry is the story of overcoming these obstacles, not succumbing to them.”¹⁰⁴ Rapid simultaneous developments in mining and agriculture, or dramatic twentieth century industrial growth, do not alter this.

Beyond parsing data and posting empirical indicators, St. Claire’s statistics point to the slipperiness of census classifications. Rigid manufacturing, mining, or agriculture categories obfuscate two key elements of California’s industrial development. First is the relationship between industry and extraction. Second are technical innovations and convergent technologies that created dynamic interactions and linkages among sectors. Perhaps the clearest example of a specialized industry that both coevolved with resource extraction and impacted mining, agriculture, and other manufacturing sectors was California’s dynamic metalworking and machinery industry (see Chapter 4). Chemicals industries likewise developed in tension with resource activities, initially for assaying and processing metals before diversifying into mining supplies, most significantly dynamite (see Chapter 2).

Focusing on the nuances of California’s dynamic manufacturers helps dispel another entrenched belief concerning California’s early industrial floundering. A lack of home industries and attendant reliance on imports became a thorn buried deep in the hide of California’s boosters and analysts. Bemoaning trade imbalances and insatiable demands, however, gives trade primacy in California’s growth. Consumer demand does not propel long-term regional development. While the Gold Rush initiated a population boom and increased demand for both consumer and capital goods, import substitution *followed* the creation and elaboration of specialized resource-oriented industries. According to geographers Michael Storper and Richard Walker, demand itself indicates industrial dynamism:

Ironically, then, in successfully developing places import substitution generally takes place *after* dynamic growth sectors have been established: the market largely follows industrialization rather than preceding it. The crucial issue is therefore not export *per se*, but the ability to generate or attract dynamic growth sectors that generate a virtuous circle of increasing productivity, income, and consumption.¹⁰⁵

In this sense, import substitution was an epiphenomenon of the Bay Region’s specialized industrial complexes.

Census data aggregated at the state level also effaces a key geographic element of California’s industrial development. That is, statistical portraits of California fail to depict the conspicuous centralization of innovative industries in San Francisco and, starting in the early 1880s, the greater Bay Region (Figure 1.2). Historians long overlooked San Francisco’s industrial base, mainly because of the scope of its spectacular mercantile sector, as well as finance and real estate sectors.¹⁰⁶ Yet the growth of employment in manufacturing outpaced that

¹⁰⁴ Ibid., 193.

¹⁰⁵ Michael Storper and Richard Walker, *The Capitalist Imperative: Territory, Technology and Industrial Growth* (Oxford: Basil Blackwell, 1989), 188.

¹⁰⁶ Walker argues that the percentage of workers employed in manufacturing was lower than that in eastern cities of its size. Yet percentages are misleading because San Francisco’s mercantile empire was so much larger than any

in trade and transportation by six percent during the 1870s.¹⁰⁷ According to historians William Issel and Robert Cherny, San Francisco's diversified manufacturing sector had become as important to the city's economy as trade and commerce by the 1880s. Between 1870 and 1890, the value of San Francisco's manufactured goods increased almost 330% (from \$37 million to \$180 million, representing about \$300 per capita).¹⁰⁸ The number of companies of every size doubled during the period, with the greatest growth in very large firms, as well as small ones, indicating high incentives for entry and innovation. Foodstuffs, clothing, textiles, hardware, leather, and provisioning accounted for approximately half of manufacturing employment and about a third of the manufacturing output of the city, replacing many imports. By 1880, manufacturing occupied a third of San Francisco's workforce and counted for two-thirds of statewide employment and income. The city had more manufacturing establishments, more employees in workshops, greater capitalization, larger value of materials, and higher value of products than all the other twenty-four western cities combined.¹⁰⁹ And from this industrial core, industries soon dispersed to the periphery of the Bay Area.

Yet the question remains: if the industrial production of commodities is the linchpin of economic life under capitalism, how do natural resources provide a viable foundation for long-term regional growth? What about metropolitan development? In this chapter, I have argued that California possessed a distinctive mode of regional development predicated on a symbiotic relationship between natural resources and industry. I have shown that California's distinctive property regime undergirded resource-intensive growth through the wide distribution of public lands, as well as formation of a distinctive mode of corporate organization predicated on consolidating productive land and resource rights. I have claimed that these resource-oriented firms helped foster industrial expansion and technological innovation. I have also illustrated the extent and general character of industry in the state and in the San Francisco Bay Area. In all, I have argued that industrial dynamism and resource extraction developed in unison, reinforcing each other in California. In the next chapter, I focus more closely on the interworkings of California's resource-intensive economy and the Bay Region's metropolitan development through showing the interrelationships between resource rushes, regional accumulation, and industrial dynamism.

other comparable city's. See "Industry Builds Out the City: The Suburbanization of Manufacturing in the San Francisco Bay Area," in *Manufacturing Suburbs: Building Work and Home on the Metropolitan Fringe*, ed. Robert Lewis (Philadelphia: Temple University Press, 2004), 94-95.

¹⁰⁷ William Issel and Robert Cherny, *San Francisco, 1865-1932: Politics, Power, and Urban Development* (Berkeley: University of California Press, 1986), 25.

¹⁰⁸ *Ibid.*, 23.

¹⁰⁹ *Ibid.*, 25.

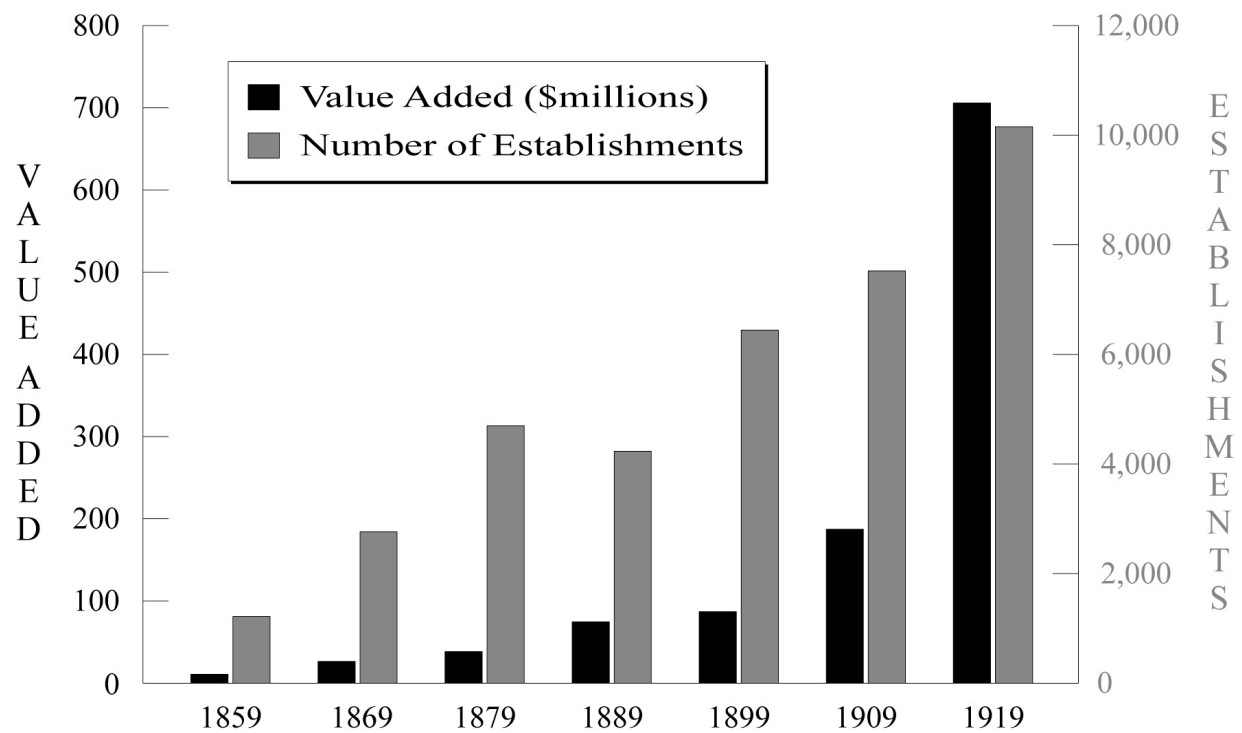


Figure 1.1. California Manufacturing, 1859-1909 (value added in thousands of dollars, 2000 value). Census data compiled by Paul Rhode, *The Evolution of California Manufacturing* (San Francisco: Public Policy Institute of California, 2001), 12.

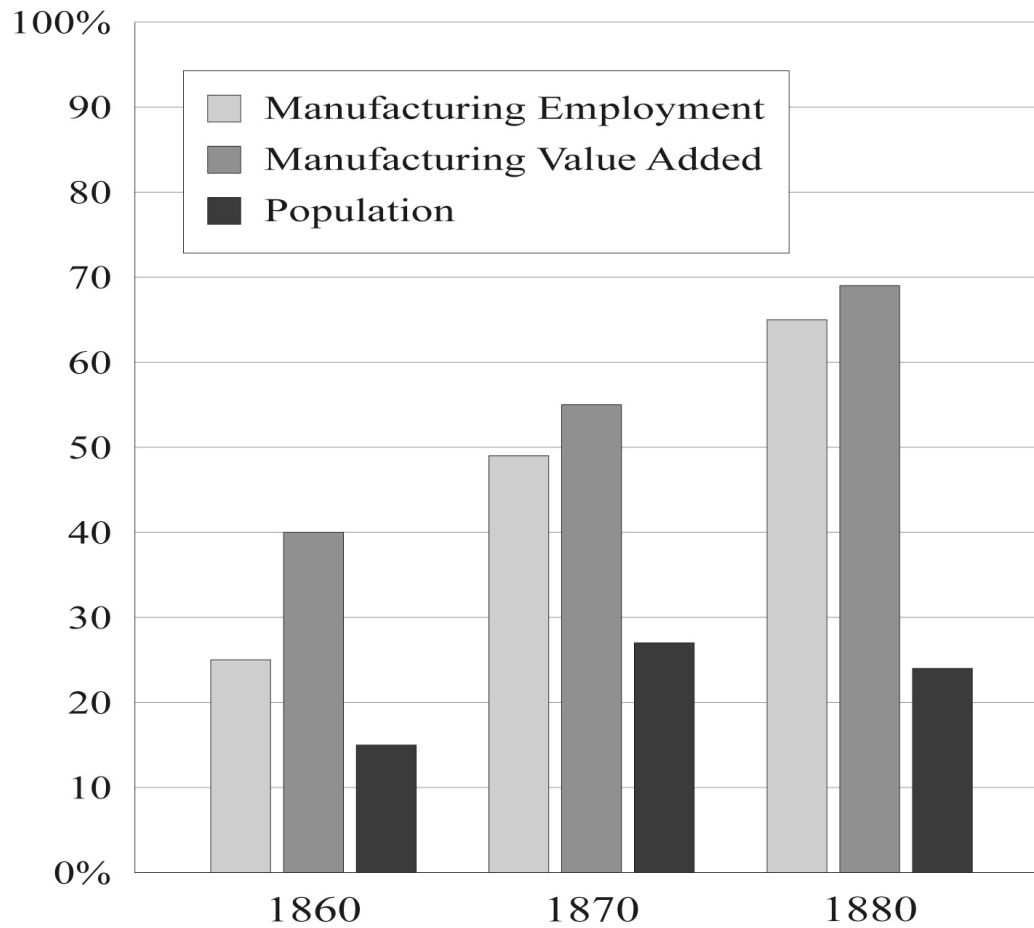


Figure 1.2. San Francisco's Share of Industry and Population in California. Census data compiled by William Issel and Robert Cherny, *San Francisco, 1865-1932: Politics, Power, and Urban Development* (Berkeley: University of California Press, 1986), 2.

Chapter 2

Manufacturing Resources

A spectacular gold bar arrived in San Francisco in 1873, the *Scientific American* reported.¹ Weighing 141 pounds and valued at \$41,000, Egbert Judson's Spring Valley Mining Company cast the bar and the mine's leaders assumed it was the largest in the world. The San Francisco banking house of Seligman & Company, however, possessed a gold bar worth \$50,000 and, worse yet, it came from Helena, Montana. Spring Valley's laborers went back to work at Cherokee Flat in Butte County. After a thirty-five day "run" of hydraulic mining, they "cleaned-up" enough gold to cast a 299-pound bar worth over \$71,000. The mining company subsequently made a gold bar valued at about \$90,000. These bars possessed no advantages for Spring Valley, except for aggrandizing the mine's leaders and evincing California's hydraulic mining boom.

Considering they owned the largest hydraulic mine in California—or at least the most highly capitalized—the leaders of the North Bloomfield Mining Company thought it right and proper that they should best Spring Valley's gold bar. The clean up after a twenty-day run at Dutch Flat in Nevada County was average but the resulting gold bar was exceptional. North Bloomfield required a custom-built cast to make a \$100,000 bar that weighed over 500 pounds. In December 1882, the Bank of California displayed the largest gold bar ever cast in the U.S. at its palatial headquarters in downtown San Francisco. It was a fitting tribute to the bank that channeled investment into new resource frontiers and to the cadre of financiers, mining magnates, and industrialists known collectively as the Bank Ring, who ruled the West's most economically productive and environmentally destructive mines.

The gold bars and symbolic rivalry between two of California's leading hydraulic mining corporations belied the interlocking investments, overlapping ownership, and complex alliances among their leaders. For example, Judson and Bank Ring leaders L.L. Robinson and Thomas Bell collectively owned and operated not only Spring Valley and North Bloomfield mines but also the Milton Mining and California Water companies.² As one measure of the scope and scale

¹ "Great Gold Bars," *Scientific American*, December 9, 1882, 377.

² Amos Bowman, *Report on the Property and Domain of the California Water Company Situated on the Georgetown Divide: Embracing the Mining, Water and Land Resource of the Country, Between the South and Middle Fork of the American River in El Dorado County, California* (San Francisco: A.L. Bancroft, 1874); David Dalin and Charles Fracchia, "Forgotten Financier: Francois L.A. Pioche," *California Historical Quarterly* 53, no. 1 (Spring 1974): 19; Henry DeGroot, "Hydraulic and Drift Mining," in *Second Report of the State Mineralogist of California, from December 1, 1880, to October 1, 1882*, Henry Hanks (Sacramento: State Office, 1882), 170; Taliesin Evans, "Hydraulic Mining in California," *Century Illustrated Magazine*, January 1883; Powell Greenland, *Hydraulic Mining in California: A Tarnished Legacy* (Spokane, WA: The Arthur H. Clark Company, 2001), 192-93, 200-04, 220; Robert Kelley, *Gold vs. Grain: The Hydraulic Mining Controversy in California's Sacramento Valley* (Glendale, CA: The Arthur H. Clark Company, 1959), 16, 31-40, 60, 125, 220-1; Waldemar Lindgren, *The Tertiary Gravels of the Sierra Nevada of California*, United States Geological Society, Professional Paper 73, (Washington: Government Printing Office, 1911); Alonzo Phelps, *California's Representative Men* (San Francisco: A. L. Bancroft and Company, 1881), 213-15; *United States Annual Mining Review and Stock Ledger for the Year 1879: Part II, Pacific Coast* (New York: The Mining Review Publishing Company, 1879), 49; Jack Sturgeon, "A History of Cherokee Flat, Butte County, California," (master's thesis, Chico State University, 1961); Richard Stretch, Charles Waldeyer, and Hamilton Smith, Jr., "Reports on the Spring Valley Hydraulic Gold Company Comprising the Cherokee Flat Blue Gravel and Spring Valley Mining and Irrigating Company's Property, Situated at Cherokee Flat, Butte County, California" (New York: John Caulon Printers, 1879); Harry Wells, Frank Gilbert, and W. L. Chambers, *History of Butte County, California* (San Francisco: Harry L. Wells, 1882), 212.

of these mining operations, Spring Valley, North Bloomfield, and Milton collectively owned twelve of the twenty “principal” dams in California³ and four mining companies accounted for over thirty percent of the water storage capacity of all California’s mining companies.⁴ These mines were also among the most heavily capitalized. Construction of reservoirs, ditches, and tunnels cost the North Bloomfield and Milton companies over \$4 million and Spring Valley about \$2 million.⁵ Such investment enabled new scales of throughput and made the hydraulic mines among the most productive in California. North Bloomfield and Milton netted over \$2.7 million in profit between 1877 and 1883.⁶ Spring Valley eventually encompassed a “mammoth aggregation” of over 500 acres of mining claims, which produced upwards of \$20 million, making it perhaps the most productive hydraulic mine in California history.⁷

These mines were also among the West’s most environmentally destructive. By 1882, North Bloom had shifted through an estimated thirty-seven million cubic yards of the Sierra and the Spring Valley another 10.5 million.⁸ Walter Lindgren’s reporting for the U.S. Geological Society estimated a total of almost 1.3 billion cubic yards of debris, or “slickens” excavated by hydraulic mining companies choked the Yuba, Bear, American, and Feather river basins, and coated the Central Valley.⁹ Judson, Robinson, and Bell comprised three of the five Executive Committee members of the Hydraulic Miners’ Association, the powerful private regulatory body pitted against the Anti-Debris Society during the late 1870s and 1880s. Judson led their attempts to privatize the entire Yuba River watershed, over 1,300 square miles, before the Sawyer decision largely halted hydraulic mining in California in 1884.¹⁰

³ Augustus J. Bowie, Jr., *A Practical Treatise on Hydraulic Mining in California* (New York: D. Van Nostrand Company, 1895), 104.

⁴ Total capacity was about eight billion cubic feet. U.S. Bureau of the Mint, *Report of the Director of the Mint Upon the Production of Precious Metals in the United States During the Calendar Year 1883* (Washington, D.C.: Government Printing Office, 1884), 714.

⁵ *Ibid.*, 708.

⁶ *Ibid.*, 714.

⁷ Greenland, *Hydraulic Mining*, 197; Wells et al., *History of Butte County*, 212.

⁸ DeGroot, “Hydraulic and Drift Mining,” 170.

⁹ Lindgren, “The Tertiary Gravels,” 21.

¹⁰ On the Hydraulic Miners’ Association and Sawyer decision, see: Doris Foley and S. Griswold Morley, “The 1833 Flood on the Middle Yuba River,” *California Historical Society Quarterly* 28, no. 3 (September 1949): 233-42; Andrew Isenberg, *Mining California: An Ecological History* (New York: Hill and Wang, 2005), 166-75; Kelley, *Gold vs. Grain*, 218-21; “A Miners’ Convention,” *Sacramento Daily Record-Union*, July 24, 1882, 2; Grove Karl Gilbert, Department of the Interior, United States Geological Survey, Professional Paper 105, *Hydraulic Mining Debris in the Sierra Nevada* (Washington, D.C.: Government Printing Office, 1917); Marilyn Ziebarth, “California’s First Environmental Battle,” *California History* 63, no. 4 (Fall 1884): 274-79; Lester Robinson, *Remarks of L. L. Robinson Before the House Committee on Water Rights and Drainage, February 17, 1887: In Support of the Assembly Bill 451, Relating to the Impounding Reservoirs for mining and Other Debris* (1887), 39.

Judson, Bell, and Robinson also led mining corporations that collectively and competitively rushed California's richest silver strikes in the high desert above the Owens Valley in Inyo County¹¹ and California's thickest coal seams in the shadow of Mt. Diablo in Contra Costa County (Figures 2.1 and 2.2).¹² All these mining ventures had a common accumulation strategy of vertical monopolization of entire deposits, or "lodes," of natural resources—everything from mining claims to railroads and from water rights to smelters. In addition to dominating individual extraction sites, they diversified their mining enterprises seeking to vertically integrate mining supplies and equipment industries. In doing so, Judson, Robinson, and Bell helped create the Giant Powder Company, the first dynamite manufacturer in the U.S. Dynamite enabled a new scope and scale of mining activity and a new order of speed and efficiency. The deepening reach of extractive enterprises led to spiraling profits, which were fed back into the Bank of California and were, in turn, reinvested in new mining enterprises. Thus, the gold bars were a product of hydraulic mining, the Bank Ring, and dynamite; that is, the spiraling feedback loop between resource rushes, regional accumulation, and industrial dynamism that fueled California's development.¹³

Three distinct moments of regional capital accumulation occurred alongside California's primary resource bonanzas. During the Gold Rush, miners and their money tended to remain in California because of great possibilities for making more profits. These "sticky hands" included all sorts of prospectors, as well as merchants, financiers, and industrialists (often one in the same), who pumped money into commercial and urban systems while finding new diggings in

¹¹ On California silver mining at Cerro Gordo and New Coso in Inyo County, see: Richard Barsness, "Iron Horses and an Inner Harbor at San Pedro Bay, 1867-1890," *Pacific Historical Review* 34, no. 2 (August 1965); Francis Drake, "Early Smelting at Cerro Gordo," *Mining and Scientific Press* 10, no. 21 (May 21, 1910); A. Eilers, "Contributions to the Records of Lead-Smelting in Blast Furnaces," *Transactions of the American Institute of Mining Engineers*, vol. 1 (Philadelphia: American Institute of Mining Engineers, 1873), 388; Philip Fradkin, *The Seven States of California: A Natural and Human History* (Berkeley: University of California Press, 1995), 30-33; Adolph Knopf, "Mineral Resources of the Inyo and White Mountains, California," in *Contributions to Economic Geology; Short Papers and Preliminary Reports, Part I: Metals and Nonmetals Extract Fuels*, ed. David White (Washington D.C.: Government Printing Office, 1914), 99, "The Darwin Silver-Lead Mining District, California," Department of the Interior, United States Geological Survey, Bulletin 580-A (Washington: Government Printing Office, 1914); C.H. Laidlaw, "Cerro Gordo," *Mining Reporter* 53, no. 7 (February 15, 1906): 168; Robert Likes, *Looking Back at Cerro Gordo* (Pittsburgh: Rosedog Books, 2010); Remi Nadeau, *City-Makers: The Story of Southern California's First Boom, 1868-76* (Los Angeles: Trans-Anglo Books, 1965); New Coso Mining Company, *Report of L. L. Robinson, President of the New Coso Mining Company on the Properties of the Company at Darwin, Inyo Co., Cal., Dec., 1875* (San Francisco: B.F. Sterett, 1875); Raymond Rossiter, *Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains* (Washington DC: Government Printing Office, 1872), 16-7; John Walton, *Western Times and Water Wars: State Culture, and Rebellion in California* (Berkeley: University of California Press, 1992), 75-86; George Wheeler, *Preliminary Report Concerning the Explorations and Surveys Principally in Nevada and Arizona* (Washington: Government Printing Office, 1871), 50-51.

¹² Margaret Ballard, *History of Coal Mining in the Mount Diablo Region, 1859-1885*, (master's thesis, University of California, Berkeley, 1931); Fredrick Hulaniski ed., *The History of Contra Costa County, California* (Berkeley: Elms Publishing Company, 1917), 94-9; William Irelan, *Eleventh Report of the State Mineralogist, Two Years Ending September 15, 1892* (Sacramento: State Printing Office, 1893), 166-7, 191-2; Mae Fisher Purcell, *History of Contra Costa County*, (Berkeley: The Gillick Press, 1940), 355-8; Raymond Sullivan and John Watters, "History of Mount Diablo Coalfield, Contra Costa County," *California Geology* 33, no. 3 (March 1980).

¹³ Richard Walker, "California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940," *Annals of the Association of American Geographers* 91, no. 1 (March, 2001): 171-72.

farmlands, forests, and fisheries, as well as mines. Keyed by 1860s silver mining and securities speculation on the Comstock Lode, an alarming amount of capital became concentrated in the Bank of California during the second phase of accumulation. Close on the heels of capital centralization, the reinvestment of resource profits into an array of new enterprise marked the crucial moment of regional accumulation. According to Walker:

The third dimension of the spiraling circulation of capital in California was the rapid return of profits into new enterprise. This was developmental investment that went beyond resource grabs, rapid extraction, and self-aggrandizement. It marks a decisive moment of capitalism emergent and triumphant: using the wealth of nature as a lever to raise the level of productivity and widen the base of expansion.¹⁴

Reinvestment included the deepening of extraction enterprises, the expansion of commercial and transportation networks, and, most significantly for the purposes of this chapter, diversification into a spectacular range of industrial pursuits.

In California, resource bonanzas were not passive withdrawals from the earth. Instead, a symbiotic relation between regional natural resources and localized industrial dynamism—a process of *resource industrialization*¹⁵—fueled California’s distinctive path of economic expansion. Facets of this interaction included natural resource processing industries and secondary demands for natural resource products, including ancillary rushes for water and timber to feed mines, as well as coal and iron ore to feed industry. Most important for this chapter and the next, is a third aspect of resource industrialization, production of equipment and supplies for extraction and processing, such as machinery and explosives.

Sticky Hands and Suburban Lands

“I went up in ‘fifty in a whale boat,” Judson claimed, “up to Sacramento, helped to row it.”¹⁶ He joined the rush to the Sierra foothills where miners picked and panned gold worth almost \$300 million during California’s first five years of statehood.¹⁷ Judson presumably fared well in the goldfields and, more significantly, he returned to San Francisco and remained to prospect.

Gold production required more than mining, and Judson’s San Francisco Chemical Works helped transform gold dust into useful goods, as I discuss below. In addition to reinvesting in resource processing industries, suburban land development provided an outlet for his wealth during a land rush in San Francisco that paralleled the Gold Rush in the Sierra.

¹⁴ Ibid., 183.

¹⁵ Ibid., 184-85.

¹⁶ “Testimony Taken of the Committee on Mining Debris as Reported to the Assembly, Twenty-Second Session, 1877-78,” *Appendix to the Journals of the State and Assembly of the Twenty-Second Session of the Legislature of the State of California* IV (Sacramento: State Office, 1878), 64.

¹⁷ William Clark, *Gold Districts of California*, California Division of Mines and Geology Bulletin 193 (Sacramento: California Division of Mines and Geology, [1963] 1970), 4.

Judson acquired a large tract centered at Fifteenth and Valencia streets when the Mission District was “the only green spot in the vicinity of the city.”¹⁸ After building his chemical works in 1853, he began subdividing and selling lots, partnering with “the father of the Mission,” John Center.¹⁹ Judson developed Park Hills Homestead at Fourteenth and Market streets with Thomas Varney, a subsequent founding director of both the Bank of California and Giant Powder Company, as well as with Claus Spreckels, the “Sugar King.”²⁰ After subdividing and selling much of his San Francisco landholdings, Judson’s Western Addition and Mission District lands appraised for close to \$370,000 at the turn of the century.²¹

Urban real estate development and speculation were a major avenue for amplifying one’s riches without extracting anything but rent.²² Nevertheless, the commodification of raw land and creation of (sub)urban space required ancillary resource rushes for building materials, as well as industrial enterprises to foster urban expansion. During the mid-1850s, Judson acquired a chunk of the 48,800-acre Sotoyome Rancho near Healdsburg in Sonoma County and financed production of lumber, a highly coveted building material in early San Francisco.²³ With Emeryville founder Joseph Emery (discussed in Chapter 4) and John Center, Judson created the San Francisco Stone Breaking and Macadamizing Company, a street construction company that quarried rock on Yerba Buena Island in the Bay of San Francisco.²⁴

Partnering with his neighbor Robert Woodward, proprietor of the eponymous amusement park, Judson financed the People’s Omnibus Line.²⁵ Woodward’s Garden eventually included a museum, a play house, a dance hall, a skating rink, a zoo, an aquarium, seal ponds, bear pit, deer park, and both beer and flower gardens.²⁶ It was one of several small, privately owned pleasure parks and sylvan retreats that, along with Union and Pioneer horseracing tracks, made the Mission District “the favorite resort for all those who sought an hour’s relief from the excitement of the city.”²⁷ In all, Judson diversified his prospects with construction businesses and

¹⁸ Quote from Thaddeus Stevens Kenderline, *California Revisited, 1858-1879* (Doylestown, PA: Doylestown Publishing Company, 1898), 92; “Woodwards Garden,” *San Francisco Chronicle*, May 18, 1889, 8.

¹⁹ San Francisco Board of Supervisors, *San Francisco Municipal Reports for the Fiscal Year 1872-73* (San Francisco: Spaulding & Barto Printers, 1873), 532; Horatio Stoll, “Growth and Development of the Mission,” *San Francisco Call*, July 18, 1908, 10.

²⁰ “Park Hills Homestead” (advertisement), *San Francisco Chronicle*, April 30, 1869, 2. See Chapter 3 for a discussion of homestead associations. On Spreckels, see Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin*, (Berkeley: University of California Press, 1999), 175-80.

²¹ “Judson Owned Realty in Several Counties,” *San Francisco Call*, July 24, 7.

²² Brechin, *Imperial San Francisco*.

²³ L. A. Norton, *Life and Adventures of Col. L. A. Norton* (Oakland: Pacific Press Publishing House, 1877), 333-342; “Letter from Mr. Wallace—No. 5,” *Daily Alta California*, March 25, 1860, 1.

²⁴ “Stonebreaking Company,” advertisement in *Daily Alta California*, November 20, 1863, 1.

²⁵ “Omnibus Line,” *Daily Alta California*, April 7, 1866, 1.

²⁶ Benjamin E. Lloyd, *Lights and Shades in San Francisco* (San Francisco: A.L. Bancroft & Company, 1876), 397.

²⁷ The Willows and Russ’s Garden were popular resorts. Quote from J. D. Borthwick, “Three Years in California, Chapter IV,” *Hutchings’s California Magazine* October, 1857, 174; Frank Soul’e, John Gihon, and James Nisbet, *The*

transportation projects, seeking land appreciation in the Mission District. In doing so, he joined a coalition of local landowners who collectively created an instant suburb, while fostering San Francisco's southward sprawl. Moreover, Judson anticipated metropolitan expansion on a larger scale by acquiring large tracts of peripheral land in early Emeryville, Berkeley, and further north along the East Bay shoreline.²⁸

Judson discovered "new diggings," quickly diversifying into other extraction enterprises. He developed stock ranches in San Benito County and Monterey County, where he owned 12,300 acres.²⁹ With his enduring business partner John Shepard, Judson raised some of California's first purebred short horn cattle, which he imported from New York in the 1850s.³⁰ He also invested in a \$400,000 canal project that conveyed water from the upper San Joaquin River twenty miles into Fresno County in order to irrigate 60,000 acres of alfalfa fields and sell speculative farmsteads in Fresno County.³¹

Herein lies the first moment of regional accumulation. Resource wealth tended to remain in California, as prosperous and middling prospectors became "sticky hands" by seizing an array of profitable opportunities that propelled regional growth. "It was not necessary that everyone become fabulously rich," Walker asserts, "only that a great deal of money touch many hands and be injected into the veins of the commercial economy."³²

The Gold Bust

The vast majority of gold extracted in California came from the Mother Lode, a belt of sheared, folded, and faulted rocks in the central Sierra Nevada foothills. Ranging from a few hundred feet to four miles wide, the system of *en echelon* gold-quartz veins traces ancient Jurassic Period faults from Mariposa County for 120 miles north to El Dorado County. Eons of uplift and erosion distributed gold particles throughout California's Tertiary river system, where it became trapped, compressed, and cemented into dense auriferous gravel deposits. Creeks cut gullies, streams excised ravines, and rivers carved canyons throughout the Sierra's western escarpment during the formation of the modern drainage system. In doing so, flows of water eroded exposed quartz and trenched through ancient riverbeds, washing particles of gold down stream where it accumulated in piles of sand, silt, and gravel accumulating on river banks, bars,

Annals of San Francisco (New York: D. Appleton and Company, 1854), 471; Terence Young, *Building San Francisco's Parks, 1850-1930* (Baltimore: The Johns Hopkins University Press, 2004), 37.

²⁸ "Club of Architects," *San Francisco Call*, September 22, 1901, 30.

²⁹ Ibid.

³⁰ *The American Stock Journal* 2 (1866), 29; Louis Allen, *The American Herd Book Containing Pedigrees of Short-Horn Cattle* 11 (Buffalo: Warren, Johnson & Co, 1872), 255; John L. N. Shepard, "Notes Concerning the Life and Interest of Mr. Egbert Judson. San Francisco, Oct. 28, 1886," The Hubert Howe Bancroft Collection, Bancroft Library, University of California, Berkeley.; Robert Ashburner, "Reminiscences of Shorthorn Breeders and Breeding in California," *Pacific Rural Press*, September 22, 1906, 181-182; Pail P. Parker, "The Live Stock Industry in California," *Pacific Rural Press*, July 2, 1910, 12.

³¹ Shepard, "Notes"; "Club of Architects," *San Francisco Call*, September 22, 1901, 30; "Judson Owned Realty in Several Counties," *San Francisco Call*, July 24, 1903, 7.

³² Walker, "Golden Road," 182.

and beds. These superficial deposits, or surface placers, became the legendary treasure trove that stunned the world in 1849.³³

Indeed, California's placer gold offered unprecedented fortunes to early prospectors.³⁴ Miners extracted a slab of gold weighing 195 pounds at Carson Hill in 1854 and the fifty-pound "Dogtown nugget" at Magalia in Butte County five years later.³⁵ Yet prospectors rarely found nuggets weighing over five ounces. Instead they found tiny gold grains, granules, or flakes no bigger than a sunflower seed. The sheer volume, extensive distribution, and ease of access and extraction required little knowledge, expertise, or capital. Using only a pick or shovel, early prospectors rapidly depleted the "easy pickings." Anglo miners quickly adopted the Spanish term *placer*, which referred to both surface alluvial deposits containing gold and several mining techniques.³⁶ Simple panning was the earliest and most ubiquitous placer technique used by the forty-niners. South Americans and Mexicans introduced Sonoran placer mining techniques, including panning with wooden *bateas*. Tin or iron pans quickly emerged as the dominant tool for river panning, enabling miners to wash gravel with a circular, flipping motion that dumped lighter material over the side of the pan while using gravity for the heavier gold particles to remain.³⁷ Simple and portable, panning techniques rapidly diffused throughout the goldfields enabling solitary miners to efficiently and profitably shift through surface placers. Panning, however, was laboriously slow and unsuitable for large-scale operations, which became increasingly important as the surface placers dwindled.

Key innovations, such as the rocker or cradle, initiated larger-scale gold mining by 1850 and the long tom and sluice soon followed:

³³ Total gold production from the Mother Lode reached 115 million ounces, or 3,600 tons by 1995, representing roughly seventy-five percent of all California gold. The Feather, Yuba, and American rivers contained the most gold, followed by the Bear, Mokelumne, Stanislaus, and Merced rivers. J. K. Bohlke, "Mother Lode Gold," in *Classic Cordilleran Concepts: A View From California*, ed. Eldridge Moores, Doris Sloan, and Dorothy Stout (Boulder, CO: Geological Society of America, 1999), 55-6; Clark, *Gold Districts*, 1, 15, 19; Mary Hill, "Geology of the Sierra Nevada," *California Natural History Guides* 37, (Berkeley: University of California Press, 1975); Clarence Logan, "Mother Lode Gold Belt of California," Bulletin No. 108 of the Division of Mines, State Department of Natural Resources (November 1934) (Sacramento: California State Printing Office, 1935); Rodman Paul, *Mining Frontiers of the Far West, 1848-1880* (New York: Holt, Rinehart and Winston, 1963), 31-32.

³⁴ Placer mining techniques, including hydraulic mining, accounted for nearly all of California's gold production before 1860 and the vast majority before 1873

³⁵ Clark, *Gold Districts*, 9-10.

³⁶ Placer mining techniques include panning, hydraulicking, and dredging. Hardrock techniques includes quartz and drift (tunnel) mining. Albert Fay, *A Glossary of the Mining and Mineral Industry* (Washington, DC: Government Printing Office, 1947); Otis Young, Jr., *Western Mining: An Informal Account of Precious-Metals Prospecting, Placering, Lode Mining, and Milling on the American Frontier from Spanish Times to 1893* (Norman: University of Oklahoma Press, 1970), 102-23.

³⁷ On the adoption and elaboration of Native American and South American mining techniques, see: Edwin Beilharz and Carlos Lopez, *We Were 49ers! Chilean Accounts of the California Gold Rush* (Pasadena, CA: Ward Ritchie Press, 1976); Rodman Paul, *California Gold: The Beginnings of Mining in the Far West* (Lincoln: University of Nebraska Press, Bison Books, [1947] 1968), 51-52; J.S. Holliday, *The World Rushed In: The California Gold Rush Experience* (Norman: University of Oklahoma Press, [1981] 2002), 38; Randall Rohe, "Origins & Diffusion of Traditional Placer Mining in the West," *Material Culture* 18, no. 3 (1986); William Ryan, *Personal Adventures in Upper and Lower California in 1848-1849* vol. 2 (London: William Shoberl, Publisher, 1850), 13-15.

No fact can be more encouraging to those who take an interest in California prosperity than that, as the mines fail to reward individual labor, feebly assisted by imperfect apparatus, inventions are constantly coming into use which more than make up for the poorness of the dirt by the rapidity and efficacy of their operations.³⁸

Like panning, these variations on a wooden trough all used water, motion, gravity, and trapping mechanisms to separate gold from mud and gravel. While employing simple, hand-operated techniques, these new implements increased the throughput of sediment allowing miners to process greater volumes of dirt and gravel, often requiring three or more miners and spurring partnerships³⁹ (Figure 2.3). River mining relied on basic placer mining techniques but operated on a larger scale and required more capitalization, mechanization, and cooperation. Vernacular engineering feats, including dams, ditches, and flumes, diverted rivers and streams from their beds, often using a steam-powered pump, known as a “jack,” to move large rocks and boulders. River miners then “turned” the drained streambeds with pans, rockers, long toms, or sluices. During 1850, river mining diffused throughout most of the mining districts; it was the principal technique used on the American River while river mining companies practically monopolized the Tuolumne River. The inability to test the richness of a streambed before initiating mining and the threat of early destructive rains, however, introduced more risk and uncertainty. Nevertheless, river mining keyed the transformation of placer mining from a solitary venture to a joint enterprise, because mechanization required more investment and teamwork. River mining companies accounted for a bulk of the gold yield at the height of the Gold Rush (1852-1854) before peaking in 1856 and represented the first time miners began pooling resources and working together in large numbers.⁴⁰

Gold production did not stop with mining. In addition to the lumber and equipment industries, with the inception of the Gold Rush numerous industries became entrained in the extraction and processing of gold, none more important than the quicksilver and chemicals industries for post-extraction processing. Large gold flecks could be picked out of the pan but miners needed mercury, known as quicksilver, to process gold dust and improve their yields. Mercury formed an amalgam with gold and silver, which miners then heated in order to render precious metals, as well as environmental pollutants. Miners then separated the purified precious metals with acids. Known by such names as the Virginia Rocker, Grizzly Bumper, and Quicksilver Machine, by 1850s miners and manufacturers had introduced equipment, perhaps developed in the Southern Appalachians, that incorporated mercury into the sifting process. The new implements required five men to load gravel on stilted cradles up to nine feet long, then wash the paydirt, often with a canvas hose, through a perforate cast iron base of the cradle, and into mercury-laden drawers. These heavy and expensive rockers never achieved wide use but quicksilver did, and proved indispensable to gold and silver recovery until the introduction of the

³⁸ “How the California Mines are Worked,” *The Wild West*, December 1, 1854, 1.

³⁹ Paul, *California Gold*, 50-53, 61-62; Fay, *Glossary*.

⁴⁰ Holliday, *Rush For Riches*, 64, 66; Rodman Paul, *California Gold*, 129; Maureen Jung, “Capitalism Comes to the Diggings: From Gold-Rush Adventure to Corporate Enterprise,” *California History*, 77, no. 4 (1998/99): 62-3; Rohe, “Traditional Placer Mining,” 140-42.

cyanide process in 1890. California's quicksilver mines produced one-half of the world's mercury during a quicksilver rush spurred by extraction industries. The New Almaden Mine near San Jose accounted for over sixty percent of California's output between 1850 and 1890.⁴¹ The trickle of mercury "lost" while amalgamating placer deposits soon became a lethal flood. In a six-year period, the North Bloomfield Mining Company lost upwards of eleven tons of the liquid metal into the Yuba River. Yet that proved measly compared to over seven thousand tons of quicksilver that Comstock mines and mills lost over sixty years, mostly into Nevada's Carson River.⁴²

The small scale of California's independent miners and early partnerships attracted scant outside investment and larger river mining companies grew primarily with their members' capital and sweat equity because of the expense and scarcity of labor.⁴³ But before the forty-niners had finished scouring Sierran riverbeds, the discovery of thick gold-quartz veins on John Fremont's Rancho Mariposas precipitated a speculative hardrock mining boom that not only restructured the incipient mining industry but also exerted a profound influence on California's economic development.

"In this neighborhood all is quartz! Quartz!" the *Sacramento Transcript* reported in September 1850, adding that the demand for microscopes surpassed that for pickaxes.⁴⁴ "The Pathfinder" Fremont was the incarnation of Manifest Destiny. A leader of the Bear Flag Revolt (1846) and a Mexican War hero, Fremont lobbied for statehood before becoming one of California's first two U.S. senators and the 1856 Republican presidential candidate. He resigned his army position but retained his military title, which endowed him with social distinction and aided in his railroad, land, and mining schemes.⁴⁵ Fremont bought Rancho de las Mariposas (ranch of the butterflies) for \$3,000 in 1847 from Juan Bautista Alvarado, who was forced to liquefy his assets to pay off creditors.⁴⁶ With the discovery of gold a year later, he "floated" his lands over fifty miles east of the original claim. That is, he resurveyed and redrew the boundaries of the seventy square-mile tract—nearly the size of the Washington, DC—encompassing fourteen miles along both sides of the Merced River, near John Sutter's famous gold strike.⁴⁷ By 1850, the booster press speculated that Fremont's quartz mines on

⁴¹ David St. Clair, "New Almaden and California Quicksilver in the Pacific Rim Economy," *California History* 73, no. 4 (Winter 1994/1995), "The Gold Rush and the Beginnings of California Industry," *California History* 77, no. 4 (1998/99): 197-98; Rohe, "Origins & Diffusion," 132.

⁴² Brechin, *Imperial San Francisco*, 61.

⁴³ Jung, "Capitalism Comes to the Diggings," 62-63; Paul, *California Gold*, 60.

⁴⁴ "The Mariposa Mines," *Sacramento Transcript*, September 13, 1850, 2.

⁴⁵ Brechin, *Imperial San Francisco*, 123.

⁴⁶ Leonard Pitt, *Decline of the Californios: A Social History of the Spanish-Speaking Californians, 1846-1890* (Berkeley: University of California Press, [1966] 1998), 36.

⁴⁷ Pitt, *Decline of the Californios*, 3; Andrew Rolle, *John Charles Fremont: Character as Destiny* (Norman: University of Oklahoma Press, 1991), 112, 237; Federal Writers' Project of the Works Progress Administration of Northern California, *California: A Guide to the Golden State*, (New York: Hastings House, 1939), 500.

Rancho Mariposas “will produce more treasure than all that is contained by the illimitable placers.”⁴⁸

Compared to the simple techniques and rudimentary technology of placer mining, hardrock mining, also known as quartz mining, represented the “high technology” of the Gold Rush. Quartz mining required tunneling to reach the ore, blasting and hewing the quartz from rock matrix, hoisting ore to the surface, pulverizing it with stamp mills and *arrastres* (rotating circular grinding stones), and amalgamating the gold. Each of these steps required complex, capital-intensive techniques, sophisticated and experimental machinery, and the application and practical mastery of scientific processes. Experiments with extracting, unlocking, and recovering gold from quartz also required new mechanisms to capture larger blocks of capital. California’s state legislature cleared the path for generating a new scale of investment with “An Act Concerning Corporations,” ratified in California’s 1850 state Constitution. This general corporations law permitted companies to incorporate without seeking approval of a special act of the legislature, though it prohibited bank corporations altogether. The law held shareholders individually and personally liable for their share of corporate debts. In other words, those who invested in corporations were required to pay assessments levied by corporate management when additional funds were required to keep the company afloat.⁴⁹

The Mariposa Mining Company was a prototypical Western mining corporation. Seven San Francisco financiers and attorneys created the company in 1850. Its stated capital stock of \$1 million was an exponential increase over its forerunner, the California State Mining and Smelting Company, which had incorporated only months earlier, becoming the state’s first mining corporation. While corporations advertised, and embellished, the amount of capitalization at the time of incorporation, it is usually impossible to know how much money was actually “paid in.” The new corporation relied on the consolidation of Fremont’s land and claims, which he then leased to the new corporation.⁵⁰ Mining operations were managed by remote control from a San Francisco boardroom, where the corporation was joined at the hip with a leading banking house, Palmer, Cook & Company.⁵¹ Stocks raised funds for the capitalization of the mines, a huge investment in imported stamp mills, steam engines, and other machinery and equipment. Capital flowed from San Francisco and Sacramento investors, and then from New York and Boston, before Paris and London stock exchanges began trading Mariposa Mining Company securities in 1851.⁵² A quartz mining boom ensued and 105 new mining companies incorporated in California.⁵³ In addition to foreign stock ownership, promoters created mining corporations on the east coast and in Europe in hopes of capitalizing on California’s mining boom. British investors, for instance, not only sank nearly \$10 million

⁴⁸ “The Mariposa Mining Company,” *Sacramento Transcript*, August 23, 1850, 3.

⁴⁹ Jung, “Capitalism Comes to the Diggings,” 62; *The Statutes of California Passed at the First Session of the Legislature* (San Jose: J. Winchester, State Printer, 1850), 347.

⁵⁰ “The Fremont Claim,” *Daily Alta California*, December 28, 1852, 2.

⁵¹ Rolle, *Character as Destiny*, 174.

⁵² Jung, “Capitalism Comes to the Diggings,” 52, 63; “The Mariposa Mines,” *Sacramento Transcript*, September 13, 1850, 2; “The Mariposa Mining Company,” *Sacramento Transcript*, August 23, 1850, 3.

⁵³ Jung, “Capitalism Comes to the Diggings,” 64.

into shares of California mining corporations but promoted thirty-two mining companies created in London to mine gold in California.⁵⁴

The failings of Mariposa Mining Company proved typical. Miners swarmed the company's Rancho Mariposas claims, asserting that Fremont's rights to the Mexican grant covered only agricultural and grazing, not minerals. Although ousted with the aid of militia sent by a compliant governor, the outlay for digging tunnels and developing stamp mills, as well as subsequent court costs, ruined the Mariposa Mining Company.⁵⁵

Speculative fervor veiled geologic ignorance and financial profligacy. According to the California Miners' Association:

The early locations were made at any point where croppings were found, and mills built before developments warranted. Millions were squandered by men ignorant of quartz mining or milling, and upon the exhaustion of free gold surface ore, and when sulphurets began to appear, the mines closed down.⁵⁶

Expensive imported machinery and early California stamp mills proved ill-adapted. "Nearly all the machinery that had hitherto been applied to California veins has been attended with failure, and the most successful operations are still wide of perfection," an English engineer and investor observed.⁵⁷ Lawsuits consumed significant mining profits as well. Few of the early corporations distributed a single dollar in dividends before the bubble burst, spurring widespread disillusionment and a collapse of outside investment in California mining by 1853.⁵⁸

Nevertheless, the quartz boom and bust proved invaluable for subsequent hardrock mining operations, most notably the Comstock Lode and the successful quartz mining boom centered in Grass Valley, Nevada County beginning in the mid-1860s. Prospectors who survived the "quartz fever epidemic," according to the *Sacramento Daily Transcript*, "came out poorer, if not wiser men."⁵⁹ The geologic and technical pitfalls of the 1850s engendered innovative

⁵⁴ Ibid., 67.

⁵⁵ According to landscape architect and one time Las Mariposas manager Fredrick Law Olmsted, Fremont was "a selfish, treacherous, unmitigated scoundrel." In 1856, the courts confirmed Fremont's claim, which was assessed at \$1 million (president Franklin Pierce conveyed to Fremont a signed copy of the confirmed grant at the White House). He refused to pay taxes on the land while the title was in dispute. Nevertheless, Fremont claimed the mining controversies bankrupted him. "When I came to California I hadn't a cent. Now I owe two million dollars!" he lamented. Quoted in Andrew Rolle, *Character as Destiny* (Norman: University of Oklahoma Press, 1991), 237; Federal Writers' Project, *California*, 500; "The Fremont Claim," *Daily Alta California*, December 28, 1852, 2; "Taxes on the Fremont Grant," *Sacramento Daily Union*, November 24, 1856, 1.

⁵⁶ Charles Yale, "The Mineral Industry of California," in *California Mines and Minerals; Published by the California Miners' Association Under the Direction of Edward H. Benjamin, Secretary of the California Meeting of the American Institute of Mining Engineers*, California Miners' Association (San Francisco: Press of L. Roesch Company, 1899), 9.

⁵⁷ Frank Marryat, *Gold Quartz Mining in California: Practical Observations During a Residence of Two Years, 1850-51, and 1852, in the Mining Districts of the Country* (London: Smith, Elder, and Co., 1852), 16.

⁵⁸ Ronald Limbaugh, "Making Old Tools Work Better: Pragmatic Adaptation and Innovation in Gold-Rush Technology," *California History* 77, no. 4 (Winter, 1998/99): 36.

⁵⁹ "Quartz Mining," *Sacramento Daily Transcript*, May 5, 1857, 2.

technologies and techniques that structured subsequent mining successes.⁶⁰ San Francisco foundries and machine shops experimented with drills, air compressors, water pumps, hoisting equipment, and a crowning technological achievement of the Gold Rush, the California stamp mill.⁶¹

San Francisco's emergent financial sector followed a similar trajectory of extraordinary growth and sudden collapse. Busts overshadowed booms during the 1850s, most notably an enduring slump from 1853 to 1858 as bankers and lenders grappled with the astonishing and volatile expansion of the urban commercial system. The decline in foreign investment into California mines in 1853 coincided with a slump in San Francisco's previously booming real estate market; beginning in December 1853, land values declined by seventy-five percent and the retreat lasted several years. Then news of instability of the New York City parent company of Page, Bacon, & Company reached San Francisco and fomented a run on the San Francisco bank by depositors. The ensuing financial panic of 1855 precipitated a general collapse that bankrupted several of the city's largest banks and shook all of the remaining financial institutions. Merchants fell with the banks and, with lending and credit frozen, 197 bankruptcies occurred in 1855 with collective liabilities outweighing assets by almost \$7 million.⁶²

Despite economic downturns and dwindling outside investments, California miners and financiers continued to invest regional capital in new mining corporations, frequently buying out early enterprises in hopes of running them more efficiently. In fact, the number of mining corporations grew notably throughout the 1850s. Of a total of 432 mining corporations formed in the 1850s, sixty-six percent (183) incorporated between 1855 and 1859 (while sixty-one percent of California's non-mining corporations, or eighty-eight of 144, formed during the same period).⁶³ These dramatic increases in corporate formation help evince the efficacy of California's "sticky hands" in keeping the nascent regional economy afloat while developing the tools and technologies, and the business organizations and extraction enterprises that would structure subsequent mining successes.

Commerce, Coins, and Chemicals

As California's emergent corporate economy became increasingly abstract, San Francisco industrialists worked on the concrete realities of everyday commerce. Gold dust settled in San Francisco but a scarcity of money circulating in the young state constrained economic expansion. Merchants hoarded coin in order to conduct trade with the U.S. Customhouse and eastern and European importers, both of which demanded payment in specie. Firms imported foreign currency and private companies began manufacturing gold coins in 1849, but these efforts failed to compensate for the dearth of U.S. currency. Prussian florins, Indian rupees, California coins,

⁶⁰ Rodman Paul, *Mining Frontiers*, 33.

⁶¹ Limbaugh, "Old Tools," 129-139; St. Clair, "Beginnings of California Industry," 199.

⁶² Roger Lotchin, *San Francisco, 1846-1856: From Hamlet to City* (New York: Oxford University Press, 1974), 59-60, 63-64.

⁶³ Jung, "Capitalism Comes to the Diggings," 63.

French francs, English pounds, American money, and gold dust all circulated, creating incessant conflict over exchange rates.⁶⁴

Californians quickly addressed the currency issue. At the hitherto largest public meeting held in San Francisco on September 9, 1848, residents fixed the value of gold (\$16 per ounce) in hopes of creating a universal equivalent for financial transactions. Considering the surfeit of gold dust, the massive influx of population, and the huge importation of goods with attendant tariff duties, the crowd appointed a committee to lobby Congress to establish a U.S. mint in San Francisco. After seventeen months of congressional dawdling, California senator William Gwin's bill slating the creation of the San Francisco mint passed in 1853. During this period, from 1850 to 1852, the Philadelphia mint transformed California gold into close to \$6 million worth of \$20 coins.⁶⁵

Along with promulgating plans for the new mint, the federal government solicited private chemical suppliers. When Judson returned from the goldfields to San Francisco, he shifted from resource extraction to resource processing, capitalizing on lucrative contracts for "parting acids." Partnering with Shepard, Judson bought the San Francisco Chemical Works, also known as Judson & Shepard Chemical Works, in 1853 (hereafter SFCW). Shepard handled the company's finances while Judson managed manufacturing and a workforce of eighteen men earning up to \$8 per day at the 2,400 square-foot factory located at Fifteenth and Valencia streets in San Francisco's suburban Mission District.⁶⁶

SFCW manufactured acids using sodium nitrate imported from Iquique, Chile and sulfur from New York and then, by 1857, directly from Sicily, Italy. The Works supplied nitric and sulfuric acids to gold and silver assayers and refiners. Sodium carbonate manufacturers on the Pacific Coast and Sandwich Islands (Hawaii) relied on SFCW's sulfuric acid, as did merchant houses in Valparaiso, Chile. Tanners used SFCW's muriatic acid for soldering. Yet the vast majority of SFCW's output, about fifty percent of sulfuric acid and ninety-five percent of nitric acid, supplied the new mint.⁶⁷

Plumes of bright orange vapor drifted out of chimneys and swirled behind an American eagle perched on the denticulated cornice atop San Francisco's new mint. (Figure 2.4) The statue peered down on heavy iron shutters and thick fireproof walls built to protect "machinery of the newest, finest and strongest kind."⁶⁸ The elongated glass necks of acid bottles rose out of wooden crates sitting on the pavement of Commercial Street between Montgomery and Kearny

⁶⁴ Robert Chandler, "An Uncertain Influence: The Role of the Federal Government in California, 1846-1880," *California History* 81, no. 3/4 (2003): 242; Lotchin, *San Francisco*, 61-62; Soul'e et al., *Annals*, 526; Benjamin Cooper Wright, *Banking in California: 1849-1910* (San Francisco: H.S. Crocker Company, 1910), 7-9; "The Branch Mint," *Sacramento Daily Union*, May 3, 1854, 1.

⁶⁵ Edgar Adams, *Private Gold Coinage of California, 1849-55: Its History and Its Uses* (Brooklyn: E.H. Adams, 1913), 48; Chandler, "Uncertain Influence," 241-42; "The Mint Open," *Daily Alta California*, April 4, 1854, 2; Frank Soul'e, et al., *Annals*, 525-26.

⁶⁶ John Hittell, *The Commerce and Industries of the Pacific Coast of North America* (San Francisco: A. L. Bancroft & Co., 1882), 720; Shepard, "Notes"; "From California," *New York Times*, March 9, 1860, 2.

⁶⁷ "The San Francisco Chemical Works," *Sacramento Daily Union*, November 28, 1857, 1; Shepard, "Notes."

⁶⁸ Soul'e, et al., *Annals*, 526.

streets. Although simply a remodeled assayer's office, the San Francisco branch mint depended inherently on chemicals for the most prodigious resource possessing operation in the West.⁶⁹

During its first month of operation in April 1854, the mint paid prospectors over \$1 million for their gold dust.⁷⁰ Manufacturing each pound of gold coins required roughly five pounds of sulfuric acid and two and one-half pounds of nitric acid. Assayers melted gold dust in lead crucibles, cast it into bars, and applied chemicals to determine its purity and contents (placer gold dust typically included three to five percent silver, as well as other metals). Founders then melted gold and silver together and poured the amalgam into cold water in order to form granules that resembled popcorn. Workers boiled the granules in nitric acid for six hours in order to separate gold and silver. They washed, filtered, and treated the silver with muriatic acid, which rendered a fine pure powder. A hydraulic press transformed the powder into circular cakes, thus readying the silver for coinage. The gold was boiled for another six hours in a fresh nitric acid bath, washed and filtered, and then pressed into cakes and dried in a furnace. Workers then melted and re-melted the gold, molded and assayed it, and then cast standardized ingots weighing about sixty ounces apiece. They "pickled" the ingots in sulfuric acid before delivering it to the rolling room, where each ingot passed through rollers thirteen times before being dried in an annealing furnace. Workers drew and cut the rolled gold and millers shaped each coin into a perfect circle. A sulfuric acid bath softened and cleansed the coins before they were stamped by machine. The mint provided "respectable jobs" for women who performed clerical tasks and worked as adjusters, separately weighing each coin to ensure it fit within legal tolerances.⁷¹

From April 1854 to June 1858, the mint received deposits totaling almost twenty tons of gold, which rendered almost \$90 million in gold coins and close to \$600,000 in silver coins, at a cost of roughly \$1.3 million.⁷² In 1856 alone, the mint consumed over 325 tons of acids produced by the SFCW, helping account for the company's \$40,000 profit.⁷³ By this time Judson and Shepard had invested \$80,000 in their chemical works, prompting the booster press to claim, "There is now, it is believed, no one similar manufactory in the Union where so large a quantity of nitric acid is prepared as at the San Francisco Chemical Works."⁷⁴

⁶⁹ Located on the north side of Commercial Street, between Montgomery and Kearny streets, San Francisco's branch mint opened on April 3 1854. Chandler, "Uncertain Influence," 242; "The Mint Open," *Daily Alta California*, April 4, 1854, 2.

⁷⁰ "San Francisco Correspondence," *Sacramento Daily Union*, May 15, 1854, 3.

⁷¹ "Coining Money, at the San Francisco Branch Mint," *Hutchings' California Magazine*, October 1856, 151.

⁷² *The State Register and Year Book of Facts: For the Year 1859* (San Francisco: Henry G. Langley and Samuel A. Morison, 1859), 136.

⁷³ "The San Francisco Chemical Works," *Sacramento Daily Union*, November 28, 1857, 1.

⁷⁴ *Ibid.*

Speculative Bubbles and Capital Piles

California is very important for me because nowhere else has the upheaval most shamelessly caused by capitalist concentration taken place with such speed.

Karl Marx, 1880⁷⁵

After years of prospecting on the edges of the Great Basin, and scrabbling on borderlines of subsistence, miners discovered a rich ore deposit on a remote desert mountainside east of the Sierra escarpment in Nevada Territory. They immediately formed a company and began working the claim in June 1859. Unlike California's surface placers, Nevada's silver was mineralized in heavy quartz veins and entombed in vast ore bodies. Possessing neither the knowledge nor the capital for intensive quartz mining, the claim-holders sold out to a group led by George Hearst, who wasted no time chasing rumors from the failing quartz mines in Nevada County to the narrow ledge in the Washoe Valley, two hundred miles northeast of San Francisco.⁷⁶

Hearst's partnership initiated the first systematic mining on the Comstock Lode. A workforce of 10 miners, earning \$3 to \$4 in daily wages, extracted and crushed over 500 tons of quartz. They packed thirty-eight tons of the richest silver ore in boxes and sacks, and then transported it on muleback to San Francisco. Smelting by Joseph Moshiemer yielded roughly \$110,000, incredible returns by California standards.⁷⁷ With a nominal capital of over \$5 million, Hearst's Ophir Gold and Silver Mining Company became the largest corporation in the West when formally created in San Francisco on April 18, 1860.⁷⁸

This bonanza strike on the Comstock Lode keyed the first and greatest silver rush in the West. The trickle of California's disenchanting prospectors quickly became a human flood, transforming a barren desert outpost into Virginia City. Speculation raged unchecked as miners frantically staked nearly 17,000 claims along a 2.5-mile stretch of the Washoe Valley.⁷⁹

⁷⁵ Mins Leonard trans. and ed., "Unpublished Letters of Karl Marx and Friedrich Engels to Americans," *Science and Society* 2, no. 2 (Spring, 1938): 226.

⁷⁶ The story of the Comstock Lode is told by many. See for example, Brechin, *Imperial San Francisco*; A. D. Hodges, *Amalgamation at the Comstock Lode, Nevada* (New York: American Institute of Mining Engineers, 1890); Ronald James, *The Roar and the Silence: A History of Virginia City and the Comstock Lode* (Reno: University of Nevada Press, 1998); Ronald James and Elizabeth Raymond ed., *Comstock Women: The Making of a Mining Community* (Reno: University of Nevada Press, 1998); Eliot Lord, *Comstock Mines and Miners* (Washington, D.C.: U.S. Geological Survey, 1883); George Lyman, *The Saga of the Comstock Lode: Boom Days in Virginia City* (New York: Charles Scribner's Sons, 1934), *Ralston's Ring* (New York: Charles Scribner's Sons, 1937); Michael Makley, *The Infamous King of the Comstock: William Sharon and the Gilded Age in the West* (Reno: University of Nevada Press, 2006); Gunther Peck, "Manly Gamblers: The Politics of Risk on the Comstock Lode, 1860-1880," *Journal of Social History* 26, no. 4 (Summer, 1993); Charles Shinn, *The Story of the Mine as Illustrated by the Great Comstock Lode of Nevada* (New York: D. Appleton and Company, 1903); Grant Smith, *The History of the Comstock Lode, 1850-1920*, (Reno: Nevada Bureau of Mines and Mackay Scholl of Mines, [1943] 1966); William Wright, *A History of the Comstock Lode & Mines* (Virginia, NV: F. Boegle, A.L. Bancroft & Co., 1889).

⁷⁷ Lord, *Comstock Mines and Miners*, 61-2; Rodman, *Mining Frontiers*, 62-63; Jung, "Capitalism Comes to the Diggings," 68.

⁷⁸ Brechin, *Imperial San Francisco*, 39; Jung, "Capitalism Comes to the Diggings," 68; Lord, *Comstock Mines*, 97.

⁷⁹ Jung, "Capitalism Comes to the Diggings," 68; Lord, *Comstock Mines*, 62, 73; Paul, *Mining Frontiers*, 63.

Prospectors easily discovered outcroppings of silver but intensive mining required extensive capital. Miners, financiers, and charlatans quickly acquired and consolidated claims under corporate ownership. For instance, twelve Californians, chiefly from San Francisco, acquired contiguous claims running 1,200 feet along a ledge just south of the Ophir mine. They incorporated the Gould & Curry Silver Mining Company by January 1861 to exploit the second Comstock bonanza strike.⁸⁰ The Gould & Curry distributed close to \$3 million in 1863 and '64, considerably more than the par value of its stock (4,800 shares at \$500 each) and more than fifteen times the amount actually invested by the stockholders through early assessments.⁸¹ These dividends would prove an absolute windfall compared to subsequent corporate payouts.

Speculative fervor buoyed Bay Region industries. "The California foundries and machine shops were taxed to their utmost to keep pace with their multiplying orders, and hundreds of creaking wagons, burdened with their freight of iron, were dragged over the steep grades of the Sierra Nevada to the valleys beyond," as Eliot Lord of the U.S. Geological Survey described it.⁸² Indeed, the technical challenges of extracting and processing the complex amalgam of silver and gold provided an unprecedented stimulus for industrial innovations, as San Francisco's foundries and machine shops expanded with a stream of orders for expensive, powerful, and often experimental machinery—mammoth steam engines and pumps, intricate hoisting works and tram-cars, and massive stamp mills and amalgamating pans required to extract, move, crush, and process silver ore while keeping flood waters at bay. San Francisco possessed at least thirteen foundries and thirty machine shops, and the city's ironworking industries collectively employed 3,000 workers by the late 1860s.⁸³ San Francisco manufacturers shipped mining machinery and equipment not only to Nevada but also to Idaho, Oregon, Washington, Colorado, Arizona, and North Carolina, as well as to British Columbia, Mexico, Nicaragua, Bolivia, and Australia. Exports to China and Japan soon followed.⁸⁴

Mining supply and equipment industries likewise flourished with demand for wire rope, hardware, explosives, leather, quicksilver, timber, lumber, and food. During 1866, for example, provisions consumed at the Gould & Curry mine, as distinct from the Gould & Curry Mill, included 162 kegs of blasting powder and close to 25,000 feet of fuse, as well as shipments of candle, nails, and nuts and bolts totaling over twenty tons each.⁸⁵ Furthermore, the mine

⁸⁰ The Gould & Curry incorporated by June 1860, with a capital stock of \$2.4 million. "Mining Corporations formed in 1860," *Sacramento Daily Union*, January 1, 1861, 3.

⁸¹ Lord, *Comstock Mines*, 128-29.

⁸² *Ibid.*, 113.

⁸³ Industrialists built another twenty-nine metalworks in other California and Nevada cities, including Sacramento, Nevada City, Marysville, Stockton, and Sonora. J. Ross Brown, *Mineral Resources of the States and Territories West of the Rocky Mountains*, (Washington, DC: Government Printing Office, 1868), 226-27.

⁸⁴ Brown, *Mineral Resources*, 228; Henry Hanks, *Second Report*, 193; Rossiter Raymond, *Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains* (Washington, DC: Government Printing Office, 1870), 472.

⁸⁵ S. G. Brock, *Report on the Internal Commerce of the United States for the Year 1890, Part II of Commerce and Navigation* (Washington DC: Government Printing Office, 1891), 659.

consumed over two million feet of timber and lumber, as well as eighty tons of charcoal.⁸⁶ Indeed, secondary resource rushes for water and timber to fuel mining enterprises consumed broad swaths of the Western landscape. Describing the shafts and supports that the Virginia and California mines had required to access massive ore bodies during the great bonanza from 1875 to 1877, one federal official claimed that “12,000 acres of dense forests of tall pine timber from the eastern slopes of the Sierra Nevada, in Washoe County, was thus entombed in the bonanza bowels of the Comstock.”⁸⁷ During the twenty-year Comstock boom, mining companies consumed a yearly average of 15.5 million feet of timber and lumber, as well as 36,680 cords of wood, at an annual cost of about \$1.1 million.⁸⁸

Experimental and expensive mills for post-extraction processing constituted perhaps the most significant facet of industry at the Comstock Lode. According to John Hittell, “The reduction of silver ore costs on an average, from three-to-five times as much as the reduction of auriferous quartz.”⁸⁹ Equipped by Bay Region metalworking firms, seventy-six mills lined the Carson River and Washoe creeks by 1861, collectively operating 1,153 stamps capable of pulverizing 1,200 tons of quartz each day.⁹⁰ Neither the experimental nature of early processing nor the profligacy of San Francisco mining corporations was underestimated by Lord:

Mills were furnished with expensive machinery which failed upon trial to reduce ore cheaply or effectively and was of necessity discarded, and the money was lavishly expended also in the construction and equipment of mills belonging to wealthy mining corporations as if drawn from an inexhaustible treasury.⁹¹

By 1864, the Gould & Curry’s owners had invested nearly \$1.5 million constructing “the most conspicuous monument of inexperience and extravagance ever erected in a mining district.”⁹² Early experimentation culminated in the Washoe Process, a viable method of crushing dry ore in batteries and amalgamating it in pans measuring four feet wide and fourteen inches deep. Reduction of silver began with an iron muller gently distributing forty pounds of mercury throughout a charge consisting of 300 pounds of ore, a pint of salt, and a few ounces of copper.⁹³ The incredible consumption of quicksilver and attendant milling supplies may be gleaned when considering that Comstock Lode companies mined and milled close to 600,000 tons of ore in

⁸⁶ Brock, *Internal Commerce*, 659.

⁸⁷ *Ibid.*, 647.

⁸⁸ *Ibid.*

⁸⁹ Hittell, *Resources of California*, 1863, 285.

⁹⁰ Lord, *Comstock Mines*, 114.

⁹¹ *Ibid.*, 122.

⁹² *Ibid.*, 124.

⁹³ Hodges, *Amalgamation*, 2-3; Smith, *History*, 41-45.

1876 alone.⁹⁴ Mining companies eventually constructed a total of 230 mills in the Comstock district.⁹⁵

The symbiotic relationship between Bay Region industries and Comstock mines helped account for an increase in silver production from \$1 million in 1860 to \$12.4 million in 1863.⁹⁶ Over the course of about two decades, the Comstock Lode yielded about \$200 million in silver and \$150 million in gold (in 1890s dollar values, or a total of approximately \$6 billion in current value).⁹⁷ Nevertheless, the sharpest jolt to the regional economy came not from resource extraction but from stock trading during an epochal shift from speculating on mining claims to gambling on corporate securities.

The San Francisco 'Change and the Fiscalization of Mining

As Comstock Lode miners and engineers grappled with the technical challenges of extracting and processing the complex amalgam of gold and silver, San Francisco capitalists developed sophisticated methods of organizing and financing mining enterprises. After California legislators passed laws facilitating corporations in 1850, the corporate structure became the easiest way to garner capital for new enterprises. Yet, silver mining speculation precipitated an unprecedented wave of incorporations: California miners, financiers, and swindlers incorporated 1,000 mining corporations in 1860 alone, almost doubling the total number of California incorporations during the 1850s.⁹⁸ The legacy of the 1855 panic, however, continued to hamper outside investment and the few brokers that traded stocks operated in small offices or on city curbstones.⁹⁹ San Francisco's bankers and financiers needed a centralized marketplace to raise funds for myriad Pacific Coast enterprises.

In September 1862, these financiers formed the San Francisco Mining Stock and Exchange Board, later the San Francisco Mining Exchange, or just the 'Change, the first of its kind in the U.S.¹⁰⁰ A formal, legal stock exchange allowed for the purchase and sale of mining securities and stocks of all kinds on a much larger scale, and the increase in transactions created incredible opportunities for brokers to collect commissions. By March 1863, the 'Change sold U.S. Treasury and other legal tender notes; state bonds; bonds for seventeen counties stretching from San Diego to Siskiyou; bonds for San Francisco, Sacramento, Marysville, Stockton,

⁹⁴ Lord, *Comstock Mines*, 416.

⁹⁵ Nevada Division of Environmental Protection, "Location of Comstock Lode Mills," United States Environmental Protection Agency, *Carson River Mercury Superfund Site*, (San Francisco: EPA, 2011).

⁹⁶ Smith, *History*, 27.

⁹⁷ Brock, *Internal Commerce*, 646.

⁹⁸ Jung, "Capitalism Comes to the Diggings," 64; Lord, *Comstock Mines*, 69.

⁹⁹ Lloyd, *Lights and Shades*, 33-40; Smith, *History*, 26.

¹⁰⁰ Charles Fracchia, "The Founding of the San Francisco Mining Exchange," *California Historical Society Quarterly* 48, no. 1 (March 1969): 3-18; Joseph King, *History of the San Francisco Stock and Exchange Board* (San Francisco: The Stanley-Taylor Company, 1910). Maureen Jung argues that the increase in transactions and opportunities for the collection of brokerage commissions largely precipitated the formation of the 'Change.

Benicia, and other California cities; and stocks in the West's largest insurance, gas, telegraph, water, and railroad companies. Nevertheless, thirty-eight Comstock mining companies' stocks, as well as fourteen other mining company securities, dominated the market. For example, shares of the San Francisco Insurance Company and an omnibus company sold for around \$100 each, while Gould & Curry and Ophir stock cost \$3,000 and \$2,500, respectively.¹⁰¹ "Silver mining stock is now preferred as an investment for money over everything else," the *Daily Alta* reported, as the number of mining corporations skyrocketed.¹⁰² Financiers formed six new mining stock exchanges in San Francisco, and nine in the vicinity of the Comstock Lode, along with exchanges in Sacramento, Stockton, and Marysville. But they proved mere conduits for capital flowing into the central market in San Francisco.¹⁰³

The speculative frenzy for Comstock Lode corporations solidified San Francisco's role as the nation's western financial pole. "The mining regions of the coast are so numerous now, that it is almost impossible to remember them all," the *Daily Alta* claimed, quickly adding that mining companies in all Western regions relied on San Francisco:

Here alone stock can be sold, money obtained for starting business, and machinery purchased. As the prosperity of a company depends greatly upon the market value of stock, and the stock, except under extraordinary circumstances, could not be sold unless the company had its office here, it results that all the mining companies which expect to attain much importance, are incorporated and have their offices in San Francisco. This it is, that we every day see reports of companies organized in San Francisco, to work mines at various point on the coast, from Crescent City to Acapulco, and from Black Point to Utah.¹⁰⁴

Brokers' offices proliferated on Montgomery Street and clustered around the 'Change, while demand for stock certificates precipitated a boom in the lithography and printing businesses.

Fueled by the bonanzas of several Comstock mines, high hopes reigned. Between March 1862 and June 1863, Gould & Curry stock increased from \$500 to \$4,400 and, valued at \$6.6 million, it supplanted Ophir as the "richest" silver mining company in the West.¹⁰⁵ The speculative bubble reached astonishing proportions by 1863, when the *Daily Alta* reported that about 1,600 mining companies had incorporated in San Francisco and the cash value of stock owned by Californians topped \$50 million.¹⁰⁶ By May 1864, the aggregate value of Comstock mining company securities reached \$81 million.¹⁰⁷ The rich superficial deposits of the Ophir and Gould & Curry mines, however, showed clear signs of exhaustion, and a panic hit the market.

¹⁰¹ "San Francisco Stock and Exchange Board," *Daily Alta California*, March 6, 1863, 4.

¹⁰² Quote from "City Items: San Francisco the Greatest Silver Market of the World," *Daily Alta California*, August 3, 1863, 1; Jung, "Capitalism Comes to the Diggings," 69.

¹⁰³ Brechin, *Imperial San Francisco*, 36-37; Jung, "Capitalism Comes to the Diggings," 69.

¹⁰⁴ "City Items: San Francisco the Greatest Silver Market of the World," *Daily Alta California*, August 3, 1863, 1.

¹⁰⁵ Ibid.

¹⁰⁶ "City Items: San Francisco the Greatest Silver Market of the World," *Daily Alta California*, August 3, 1863, 1.

¹⁰⁷ Shoup, *Rulers and Rebels*, 172.

Insider stockholders attempted to discreetly dispose of their shares but fomented a disastrous rash of stock dumping. Gould & Curry mining shares plummeted from \$6,300 to \$900, and the aggregate values of Comstock stock suffered a decline of \$60 million within just ten days.¹⁰⁸ During the panic, “outsider” investors fell with the market. Only fifteen percent of California-based Comstock mining corporations actually possessed prospected mines and only two percent of these corporations had paid dividends when the market collapsed.¹⁰⁹

With the discovery of the Comstock Lode and the institutionalization of the stock market, public interest in mining investment had soared, as did the possibility for pure speculation and outright fraud. The panic primarily ruined the general public, thousands of “outsider” stockholders during the drastic shift from speculative investments in silver claims to blind gambling on mining securities. “There is no limit as to profession or trade; and we might add, as to creed or sect,” according to one colorful account.¹¹⁰ “Lawyers, doctors, preacher, bankers, merchants, clerks, bookkeepers, mechanics, and in fact persons in every occupation are allured into this species of speculation. Women also get the mania.”¹¹¹ Nevertheless, this lottery was not without reason or rationalization. Commenting on the early proliferation of mining corporations, the *Daily Alta* explained:

Nine-tenths of these companies, probably a much larger proportion, have no claim that will pay, and their capital exists only on paper; and yet the organization of so many companies indicates great activity and enterprise, much labor, extensive prospecting, high hopes, and a substantial basis of prosperity somewhere.¹¹²

The 1864 panic was merely the first in a succession of wild bonanzas and devastating busts that lasted until the mid-1880s. Stock prices gyrated wildly as the 'Change siphoned capital from the Atlantic Seaboard and Europe, and became the world's leading exchange devoted to mining.¹¹³ Each boom sparked more incorporations, with higher capitalizations, and intensified the frenzy for nearly all stock offerings, whether or not mines were actually in production. For example, from January to May in 1872, the market value of 150 mining corporations listed on the 'Change increased from \$17 million to \$81 million. That bull market collapsed in May 1872, but within two years, the market reached a value of over \$262 million.¹¹⁴ By January 1875, the aggregate value of the Ophir, Consolidated-Virginia, and California mines reached over \$193 million, which topped entire assessed value of San Francisco real estate by \$3

¹⁰⁸ Lord, *Comstock Mines*, 181; Shoup, *Rulers and Rebels*, 172; Smith, *History*, 59.

¹⁰⁹ Hodges, *Amalgamation*, 20.

¹¹⁰ Lloyd, *Lights and Shades*, 40-41.

¹¹¹ *Ibid.*

¹¹² “City Items: San Francisco the Greatest Silver Market of the World,” *Daily Alta California*, August 3, 1863, 1.

¹¹³ Brechin, *Imperial San Francisco*, 37.

¹¹⁴ Glenn Vent and Cynthia Birk, “Insider Trading and Accounting Reform: The Comstock Case,” *The Accounting Historians Journal* 20, no. 2 (1993): 70; Smith, *History*, 129-33.

million, according to historian Russell Elliott.¹¹⁵ Within a month, however, Consolidated-Virginia stock plummeted by over ninety percent and the California fell by close to seventy percent.¹¹⁶

In all, only five of the hundreds of publicly traded Comstock mines paid more in dividends than they collected in assessments, according to Brechin's calculations. Millions were drained away in fraud, waste, bribery, litigation, inefficiency, or simply in building the requisite infrastructure to extract ore from the rugged flanks of a desert mountain. One federal official estimated that the Comstock Lode in fact cost five times what it added to the economy. Hapless investors, rather than sparkling silver profits, created the bulk of fortunes made by financiers and insider traders.¹¹⁷

The value of security transactions at the 'Change exponentially outpaced both Comstock silver and California gold production between 1863 and 1877, providing one indication of the spectacular speculative bubble inflated largely at the expense of everyday investors (Figure 2.5). While undoubtedly accelerating the material development of extraction enterprises, the expansion of speculative mining securities and the institutionalization of a regional stock market increasingly skewed the relationship between *fictitious capital* and *accumulated capital*.¹¹⁸ That is, the value of mining securities far outpaced what could be realized in commodity form. Each boom on the Comstock Lode leveraged more and more fictitious capital in order to sustain growth and each bust revealed the lack of liquid assets or actual commodity transactions. The securities bubble and succession of booms and bust left public investors marooned with devalued and worthless stocks. The mines overall proved to be dismal investments but insiders made fortunes, none more so than the cadre of financiers associated with William Ralston's Bank of California.

Banking on the Bubble

The formation of the Bank of California was a milestone in the financial history of capitalism in California and represented the initial consolidation of a new ruling class in the state.

Laurence Shoup¹¹⁹

William Ralston was a founding officer and the treasurer of the Ophir and Gould & Curry mines.¹²⁰ Previously, he created several banking and gold exchange firms and his shipping

¹¹⁵ Russell Elliott, *History of Nevada* (Lincoln University of Nebraska Press, 1987), 136.

¹¹⁶ Ibid.

¹¹⁷ Brechin, *Imperial San Francisco*, 43.

¹¹⁸ David Harvey, *The Limits to Capital* (Oxford: Basil Blackwell Publishers, [1982] 1999), 265-68; Karl Marx, *Capital: A Critique of Political Economy; Volume III* (New York: International Publishers, 1967), 441.

¹¹⁹ Shoup, *Rulers and Rebels*, 182.

¹²⁰ Ralston was treasurer of the mining firms from 1860 to '61 and from 1865 to '72. Jung, "Capitalism Comes to the Diggings," 76; Lord, *Comstock Mines and Miners*, 89.

operations linked him to New York transportation tycoon Cornelius Vanderbilt.¹²¹ In 1863, Ralston spearheaded the formation of the Pacific Insurance Company, whose board of directors numbered thirty of California's foremost capitalists and created a template for the Bank of California.¹²² In July 1864, the Bank of California became the state's first incorporated bank, thanks to a 1862 revision of the California Constitution allowing for the incorporation of banks and joint stock companies, and thus creating a mechanism for consolidating larger blocks of investment capital.¹²³ With a "paid-up" capital of two million dollars, only two of New York's fifty-five banks exceeded the value of the Bank of California.¹²⁴

The Pacific Coast's most venerated financier, Darius Ogdon Mills, served as the emblematic president of the Bank of California, but Ralston directed the bank's loans and investments while serving as the bank's cashier. Bank of California directors and leading stockholders consisted of California's preeminent capitalist, powerbrokers, financiers, merchants, industrialists, and mining entrepreneurs, though such differentiations were increasingly blurred. The Bank Ring initially sought to monopolize not only mines but also California's waterways. That is, they sought to control both commerce and mining. Furthermore, they sought to develop San Francisco and the Bay Region in order to strengthen the industrial, transport, and financial links between the Pacific Coast and the Western resource frontier. Initial members of the Bank Ring controlled productive Comstock enterprises, including the Gould & Curry and Empire Milling and Mining Company, as well as key supply industries, such as the New Almaden Quicksilver Mine and Pope & Talbot lumber dealers. Peter Donohue of Union Iron works and John Risdon of the Risdon Iron Works helped the Ring control crucial mining machinery industries. The Bank Ring included rulers of Pacific Coast water routes including: Pacific Mail Steamship Company, which dominated shipping channels between California and Asia; California Steam Navigation Company, which monopolized the entire business of California's inland waters; the Oregon Steamship Company, which controlled Pacific Coast routes from San Francisco north to the Columbia River; and the Central Wharf Company of San Francisco. The Bank of California also controlled regional financial and commercial systems with leaders of the Pacific Insurance Company, California State Telegraph Company, San Francisco Gas Company, San Francisco City Water Works, San Francisco & San Jose Railroad, the Sacramento Valley Railroad, and Wells Fargo and Company. Nevertheless, Ralston quickly focused the bank's venture capital and the Bank Ring's financial acumen on the Comstock Lode.¹²⁵

¹²¹ Lloyd, *Lights and Shades*, 72; Lynne Pierson Doti and Larry Schweikart, "From Hard Money to Branch Banking: California Banking in the Gold Rush Economy," in *A Golden State: Mining and Economic Development in Gold Rush California*, ed. James Rawls and Richard Orsi (Berkeley: University of California Press, 1999); Jung, "Capitalism Comes to the Diggings," 222.

¹²² "City Items," *Daily Alta California*, July 15, 1863, 1.

¹²³ Bailly Millard, *History of the San Francisco Bay Region 1* (Chicago: The American Historical Society, Inc., 1924), 402; Shoup, *Rulers and Rebels*, 177.

¹²⁴ Lloyd, *Lights and Shades*, 112.

¹²⁵ Brechin, *Imperial San Francisco*, 38; Ira Cross, *Financing an Empire: A History of Banking in California 1* (San Francisco: The S. J. Clarke Publishing Company, 1927), 260; Doti and Schweikart, "Hard Money," 222; Issel and Cherny, *San Francisco*, 28-33; John Hittell, *A History of the City of San Francisco and Incidentally of California* (San Francisco: A. L. Bancroft, 1878), 410-11; Lyman, *Ralston's Ring*, 3; Shoup, *Rulers and Rebels*, 176-182.

The creation of the Bank of California marked the second step in California's accumulation process, with "large concentrations of capital [rising] out of the vortex of resource extraction and commerce," as Walker explains.¹²⁶ That is, Ralston initiated an alarming centralization of capital in the Bank of California and in the hands of his associates. This began with two interlocking processes. On the one hand, the Bank Ring wrested control of the Comstock Lode by consolidating ownership of mining corporations, vertically integrating silver extraction operations, especially milling. On the other hand was "inside" information gleaned from the mines, which the Bank Ring deployed for securities speculation, stock market manipulation, and fraud and public fleecing on an epic scale.

Stockjobber and alleged card sharp William Sharon opened the Bank of California's branch office in Virginia City during a mining depression in November 1864. The branch allowed the bank to more seamlessly shift capital and ostensibly withstand the vicissitudes of mining. However, with easy access to the bank's capital, Sharon emerged as the so-called Czar of the Comstock and "adroitly devoured mines, mills, business associates, transportation, judges, legislators, and Sierra timberlands."¹²⁷ Despite prevailing uncertainty about the Comstock's prospects in 1864, Sharon loaned money to mining and milling companies at a rate of two percent with property and mills as collateral, which undercut competing Virginia City banks that charged from three to five percent. With assessments continuing on seemingly exhausted mines and dormant mills, the bank simultaneously wagered on the devalued shares of principal mines.¹²⁸ Ralston's \$650,000 gamble paid off when the Kentuck mine produced \$2 million in silver during 1865, making the bank flush with more than \$1 million in profits.¹²⁹ Led by the Bank Ring's Yellow Jacket and the Chollar-Potosi mines, Comstock production revived by 1866 and three years of prosperity ensued.¹³⁰

While consolidating productive mines, the Bank Ring's initiated a strategy of vertical integration by forcing foreclosures. Sharon, et al. obtained mills through a "freezing-out process," in which mines controlled by the Bank Ring refused to process their ore at independent mills. Without income from ore processing, the mills defaulted on their loans from the Bank of California, which then repossessed, if not dispossessed, the mills.¹³¹ With seven mills obtained, Ralston, Sharon, Mills, and Alvinza Hayward incorporated the Union Milling and Mining Company in 1867. The Union soon consolidated upwards of thirty mills, which, like their mines, continued to operate as formally autonomous corporations, and dominated the Comstock milling business for roughly a decade:

¹²⁶ Walker, "Golden Road," 182.

¹²⁷ Quote from Brechin, *Imperial San Francisco*, 39; Doti and Schweikart, "Hard Money," 222; Smith, *History*, 49.

¹²⁸ Hodges, *Amalgamation*, 6; Lord, *Comstock Mines*, 246; Smith, *History*, 6, 50.

¹²⁹ Doti and Schweikart, "Hard Money," 223-24.

¹³⁰ One indication of the Bank Ring's dominance of the Comstock mines: nine mines controlled by the Bank Ring employed over sixty percent of the total workforce during the boom of 1877. Michael Makley, *John Mackay: Silver King in the Gilded Age* (Reno: University of Nevada Press, 2009), 113.

¹³¹ Hodges, *Amalgamation*, 6.

In short time the Union Mill and Mining Company were the owners of all the big mills on the Comstock. Then onlookers realized what had occurred. The whole Lode, like a lemon, had been caught between the jaws of a colossal combine, and every ounce of juice was being squeezed direct into the coffers of Ralston's Ring.¹³²

Ralston, Sharon, and Mills constructed a vertical monopoly on the Comstock's riches, controlling all stages of production from mines to mills to water and timber, and to railroads that took the bullion out and brought supplies in.¹³³ This monopoly produced the most valued asset: information. While boring deeper and deeper into the Comstock Lode, the Bank Ring reached new depths of avarice on the 'Change, devoting more energy to manipulating the market and defrauding investors than to discovering and extracting ore.

By controlling information from the mines, members of the Bank Ring possessed an advantage *sui generis*. Insider trading was legal during the 1800s and the Bank Ring indulged in the use of privileged knowledge about conditions in the mines to manipulate the market to aggrandize their fortunes from the investment of others. The barest hint of a new discovery in the mines triggered mayhem in San Francisco and exhaustion fomented a frenzied rush for the exit. Those who had the latest information held an invaluable advantage over outsiders. Relying on advance knowledge about progress in the mines, Ralston, Sharon, and Bank Ring allies also fed rumors to the press and timed assessment calls and stock sales to drive prices up or down according to their plans. Additionally, they repeatedly defrauded investors by spreading false reports about the conditions at the mines.¹³⁴

Not content with returns earned from mere information, the Bank Ring engaged in outright fraud. Management of the Gold & Curry Mine first deployed the "shut-down" in 1863, and it subsequently became common practice. Whenever a vein or ore body was discovered, the miners were detained in the mine for days at time. Only the managers and their associates would possess inside information, thus enabling them to complete their stock deals before releasing either the miners or the public information. Investors initially assumed that a shut-down indicated a new strike and stock prices rose accordingly. Management rings, however, soon began to shut-down worthless or failing mines to manipulate market and rig stock deals, often in conjunction with circulating false reports of new discoveries.¹³⁵ Indeed, a parade of callous directors and managers enhanced their insider trading profits by withholding information and publishing operating reports and prospectuses that were intentionally incomplete, misleading, inaccurate, or too late to be of value. The average investor had little access to reliable

¹³² The Bank Ring hoarded Union Milling & Mining Company stock, rather than distributing it through the market; Ralston, Mills, and Sharon eventually held all Union stock. Lyman, *Ralston's Ring*, 86.

¹³³ Brechin, *Imperial San Francisco*, 41-42; Shoup, *Rulers and Rebels*, 182-83; Adolph Sutro, *Why Does the Bank of California Oppose the Sutro Tunnel?* (Washington, D.C.: M'Gill and Witherow, 1872).

¹³⁴ Lord, *Comstock Mines*, 286-87, 316-19; Vent and Cynthia, "Insider Trading," 70.

¹³⁵ Lord, *Comstock Mines*, 288-289, 316-19; Vent and Birk, "Insider Trading," 71-2.

information and proper assessments, thus adding insurmountable risk to already dubious investments.¹³⁶

As Brechin put it, the Bank of California quickly came to share with the stock exchange the position of switching yard for development capital on the Pacific Coast.¹³⁷ By 1868, the Bank Ring had taken over the Exchange and elected its own directors to the latter's board and Ralston built the most embellished financial headquarters west of the Mississippi.

Fictitious Capital and Material Development

The influence and capital of the Bank were directed to the development of the resources of the State. Mining received an impetus from it that soon made it a self-sustaining and profitable industry; and agriculture, that was yet an experimental project, was developed into the chief resource of the State by its friendly support. Manufacturing in all its branches, by the encouragement it offered, sprung into a flourishing activity, and commerce, although prematurely great, was strengthened in its sinews by its upholding touch. It was the guardian of the infant industries on the coast, sustaining them until they had grown strong enough to stand alone.

Lights and Shades in San Francisco, 1876¹³⁸

The epochal shift from speculation on silver claims to gambling on mining securities created epic fraud, public fleecing, and capital centralization among a cadre of financiers linked with William Ralston and the Bank of California. The speculative bubble and fictitious capital, however, led to material development as the Bank Ring reinvested Comstock profits into not only silver mining but also an array of extractive enterprises and industrial endeavors.¹³⁹ Following the regional circulation of resource profits and the centralization of capital, the third dimension of accumulation in California was the rapid reinvestment of profits into new enterprise. "This was developmental investment that went beyond resource grabs, rapid extraction, and self-aggrandizement," Walker argues. "It marks a decisive moment of capitalism

¹³⁶ Despite public outcry, such abuses were tolerated as long as silver and gold poured from the mines. California politicians legislated financial and accounting and disclosure reforms only after the last great Comstock bonanza in 1880. Arthur Lakes, *Prospecting for Gold and Silver* (Scranton, PA: The Colliery Engineer Co, 1895), 185-89; Lord, *Comstock Mines*, 286-87, 316-19; Vent and Birk, "Insider Trading," 70, 72, 79.

¹³⁷ Brechin, *Imperial San Francisco*, 38.

¹³⁸ Lloyd, *Lights and Shades*, 113.

¹³⁹ It must be noted that in this wave of credit and financing during the 1860s and '70s the Bank of California was not alone. By 1868, ten insurance companies operated out of San Francisco headquarters, collectively holding about \$6 million in capital, and thirty-five firms from outside the state operated branches in the city. In addition to the Bank of California, the Pacific Bank operated under state charters by the end of the 1860s, as did twelve unincorporated banks, several savings banks, and seven savings and loan institutions. By 1887, the 148 banks in the rest of the state outnumbered San Francisco's twenty-six, but the city had almost twice as many assets (over \$144 million) of all other California counties combined (close to \$80 million). Issel and Cherny, *San Francisco*, 23-24.

emergent and triumphant: using the wealth of nature as a lever to raise the level of productivity and widen the base of expansion.”¹⁴⁰

In addition to Comstock silver, Ralston’s resource extraction enterprises included the North Pacific Fur Company (1865), which capitalized on the Alaskan fur trade. He paid to shore-up Sherman’s Island for wheat cultivation in the Sacramento-San Joaquin River Delta. Ralston invested \$1 million in the Culp Consolidated Tobacco Company of Gilroy’s scheme to harvest Havana seeds in the Santa Clara Valley, and he helped the Buena Vista Vini-Cultural Society acquire 6,000 acres of vineyards in Sonoma and Los Angeles counties.¹⁴¹

Ralston sought to strengthen the links between California’s resource economy and San Francisco’s burgeoning industries (Figure 2.6). His Montgomery Street Land Company (1864) sought to extend Montgomery Street to the San Francisco Bay at the Pacific Steamship Company wharves. The \$2 million project filled Mission Bay, creating 200 blocks of industrial land that accommodated Bank Ring industries. Among the metalworking and machinery firm bolstered by Bank Ring funds were Irving Scott’s Union Iron Works and the Vulcan and Risdon ironworks, as well as the Pacific Rolling Mill Company, California’s first rolling mill and steel producer. Investments in resource processing industries began with the takeover of John Center’s defunct Pacific Woolen Mills and the derelict Mission Woolen Factory in 1865. At a cost of \$1 million, the resultant Pacific and Mission Woolen Mills assured that wool, a leading Pacific Coast staple, would not have to be shipped to the east coast in order to be woven into cloth and imported back into California. Other investments included the San Francisco and Pacific Sugar Refinery, which occupied the largest building in the state at the corner of Harrison and Eighth streets and shipped raw sugar and syrup throughout the West, as well as the Union Pacific Silk Manufacturing Company, which made ribbon in Visitacion Valley.¹⁴²

Ralston channeled bank funds into the transportation and commercial systems. He financed the excavation of the rocky shoreline at Hunter’s Point in order to create the California Dry Dock Company’s gigantic graving dock for repairing damaged sea-going vessels in 1866. He invested in the San Francisco, Oakland and Alameda Railroad, as well as the San Francisco and San Joaquin Railroad (initially surveyed to reach his Gilroy tobacco fields). Ralston invested about \$600,000 in the Kimble Manufacturing Company, which manufactured rolling stock at a factory on the corner of Bryant and Fourth streets. Loans to the “Big Four” for Central Pacific railroad construction certainly strengthened California’s commercial and transportation system.¹⁴³

A San Francisco booster *sui generis*, Ralston helped make San Francisco the “Paris of the West” by introducing Second Empire and French Renaissance architecture, which was fashionable among New York’s elite. In 1869, he financed the Temple of the Muses on

¹⁴⁰ Walker, “Golden Road,” 183.

¹⁴¹ Lyman, *Ralston’s Ring*, 14, 57-8, 83-4.

¹⁴² Hubert Howe Bancroft, *Chronicles of the Builders of the Commonwealth: Historical Character Study*, vol. 4 (San Francisco: The History Company, Publishers, 1892), 50-60; Asbury Harpending, *The Great Diamond Hoax and Other Stirring Incidents in the Life of Asbury Harpending* (San Francisco: The James H. Barry Co., 1913), 121-122, 141-43; Issel and Cherny, *San Francisco*, 28; Lyman, *Ralston’s Ring*, 12-14, 32, 56-7, 82-3.

¹⁴³ Lyman, *Ralston’s Ring*, 82-4; M. W. Wood, *History of Alameda County, California* (Oakland: Holmes Book Co., [1883] 1969), 676; “The Second Grand Enterprise of Our City,” *Daily Alta California*, August 19, 1867, 1; “Incorporations,” *Daily Alta California*, September 1, 1867, 1.

California Street between Kearny and Dupont streets, based on New Orleans' Galliers French Opera House. Additionally, he invested in the Grand Hotel at Montgomery and Market streets, considered the most sumptuous hostelry in the West. Between 1872 and his death in 1875, Ralston built the Palace Hotel on the block bounded by Market, New Montgomery, Jessie and Annie streets. The anticipated \$1.75 million expense ballooned to \$5 million and the hotel was soon known as the "Bonanza Inn"¹⁴⁴

Ralston's activities illustrate the crucial moment in California's nineteenth century history. Silver mining and securities speculation on the Comstock Lode precipitated capital concentration in the Bank of California followed immediately by reinvestment facilitated largely by Ralston and the Bank Ring. The San Francisco 'Change channeled the wealth of nature into an increasingly expansive and diversified base for economic expansion. As Ralston's enterprises help show, reinvestment included the deepening of extraction ventures, the expansion of commercial and transportation networks, and diversification into an array of range of industrial pursuits. In this chapter, I have argued that equipment and supply industries for extraction and processing, such as machinery and explosives, were a crucial facet of resource industrialization. In the following chapter, I illustrate the significance of the Bay Region's innovative mining supplies sector for metropolitan expansion, regional development, and the national economy.

¹⁴⁴ Lloyd, *Lights and Shades*, 50-57; Lyman, *Ralston's Ring*, 121.

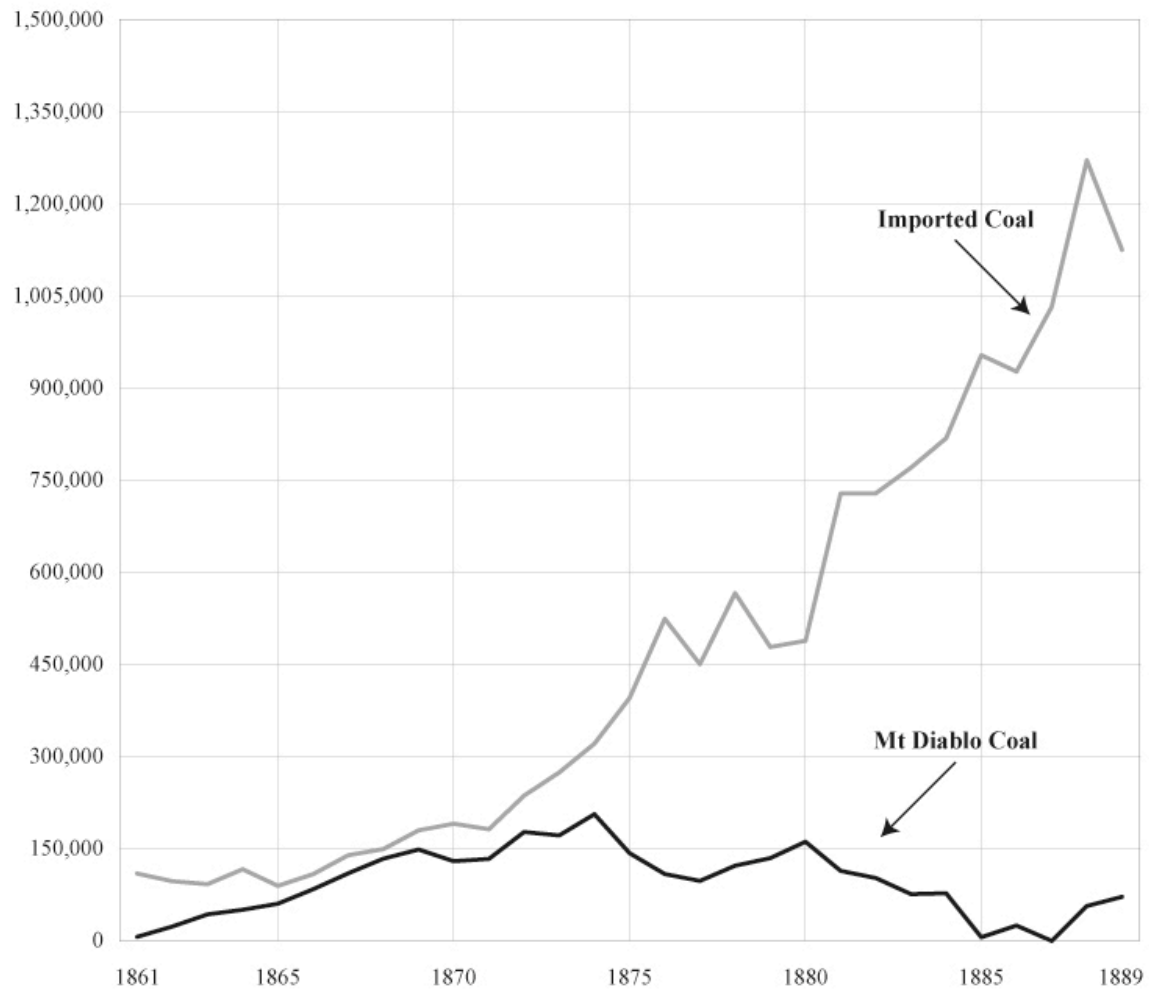


Figure 2.1. Mt. Diablo coal production and coal imports to California in tons. Led by the Bank Ring's Black Diamond Mine and Judson's Union & Empire Mine, the Mt. Diablo Coal produced roughly 30 percent of all coal consumed in California during the 1860s and '70s. With California's wheat bonanza, coal imported as ballast on wheat trading vessels glutted the Bay Region market in mid-1870s and '80s. Chart by author. Data from: S.G. Brock, *Report on the Internal Commerce of the United States for the Year 1890, Part II of Commerce and Navigation* (Washington, D.C.: Government Printing Office, 1891), 254-5; Watson Goodyear, *The Coal Mines of the Western Coast of the United States* (A.L. Bancroft & Company, 1877), 133; William Ireland, Jr., *Seventh Annual Report of the State Mineralogist, For the Year Ending October 1, 1887* (Sacramento: State Office, 1888), 168; Edward Parker, "Coal," in *Material Resources of the United States: Part II—Nonmetals*, Department of the Interior, United States Geological Survey (Washington, D.C.: Government Printing Press, 1911), 107.

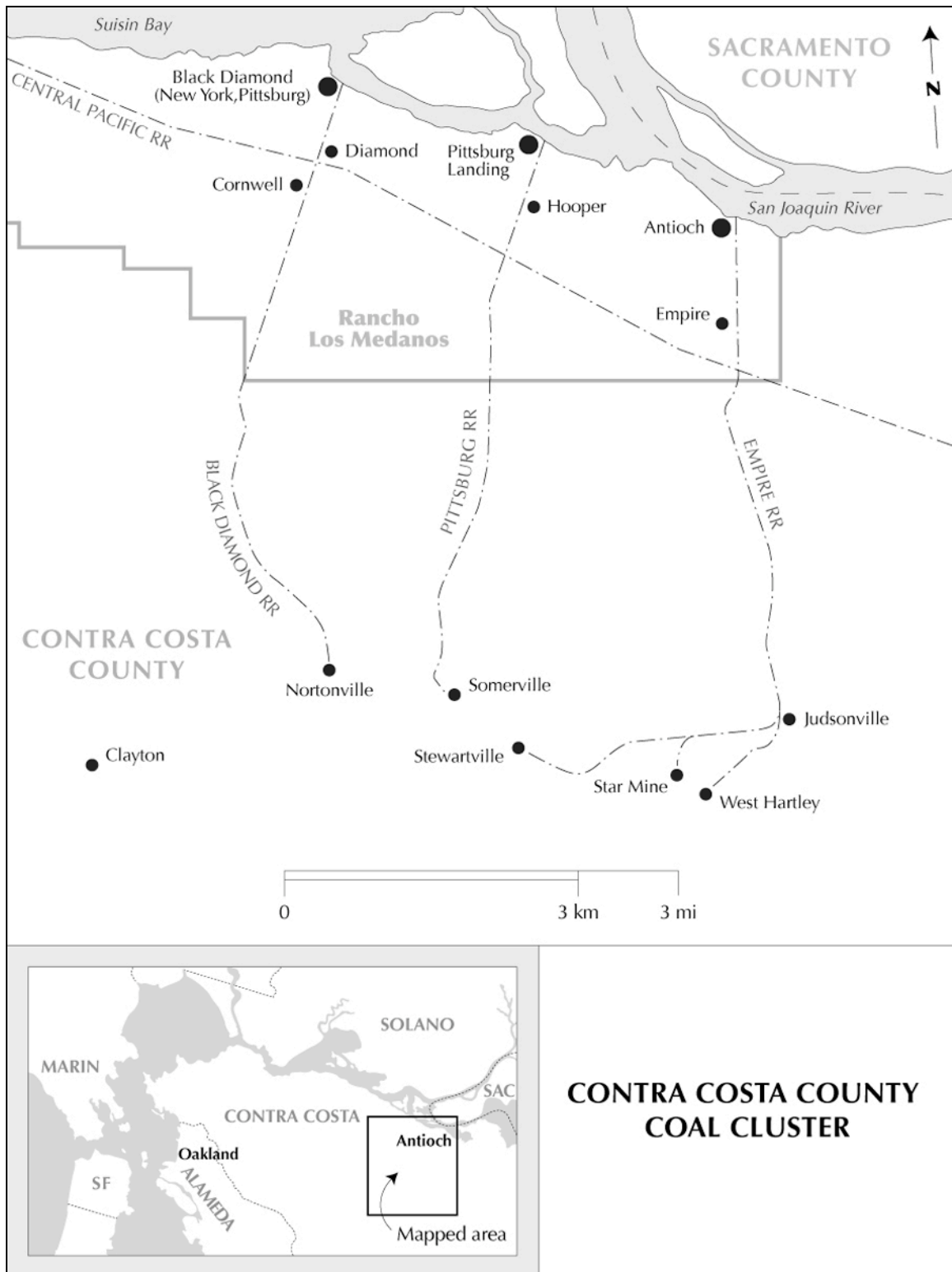


Figure 2.2. Colliery and company towns, including Judsonville, in the Mt. Diablo coalfields. Map by author, following Raymond Sullivan and John Watters, "History of Mount Diablo Coalfield, Contra Costa County," *California Geology* 33, no. 3 (March 1980).



Figure 2.3. “Traditional” placer mining techniques including sluicing, tommying, cradling, panning, drifting, tunneling, fluming, and shafting. Source: “How the California Mines are Worked,” *The Wild West*, December 1, 1854, 1.



Figure 2.4. The San Francisco Mint, 1856. Plumes of vapor drift above an American eagle perched on San Francisco's first branch mint, located on Commercial Street between Montgomery and Kearny streets. Source: "Coining Money, at the San Francisco Branch Mint," *Hutchings' California Magazine*, October 1856, 145.

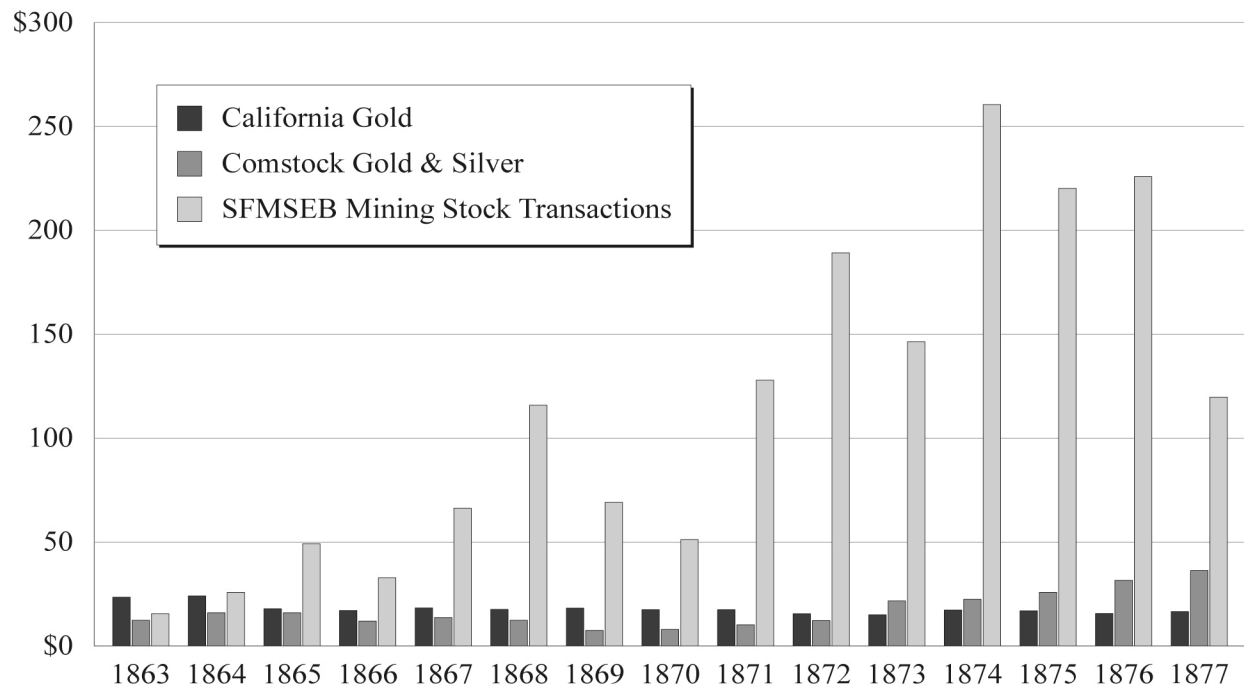


Figure 2.5. The Comstock Bubble: Mining Production and Securities Sales at the San Francisco Mining Exchange, 1863-1877, in millions of dollars. According to Maureen Jung, these numbers depict sales at the ‘Change and, therefore, understate the total amount of mining stock transactions by roughly forty percent. Chart by author. Data Maureen Jung, “Capitalism Comes to the Diggings: From Gold-Rush Adventure to Corporate Enterprise,” *California History*, 77, no. 4 (1998/99): 70.

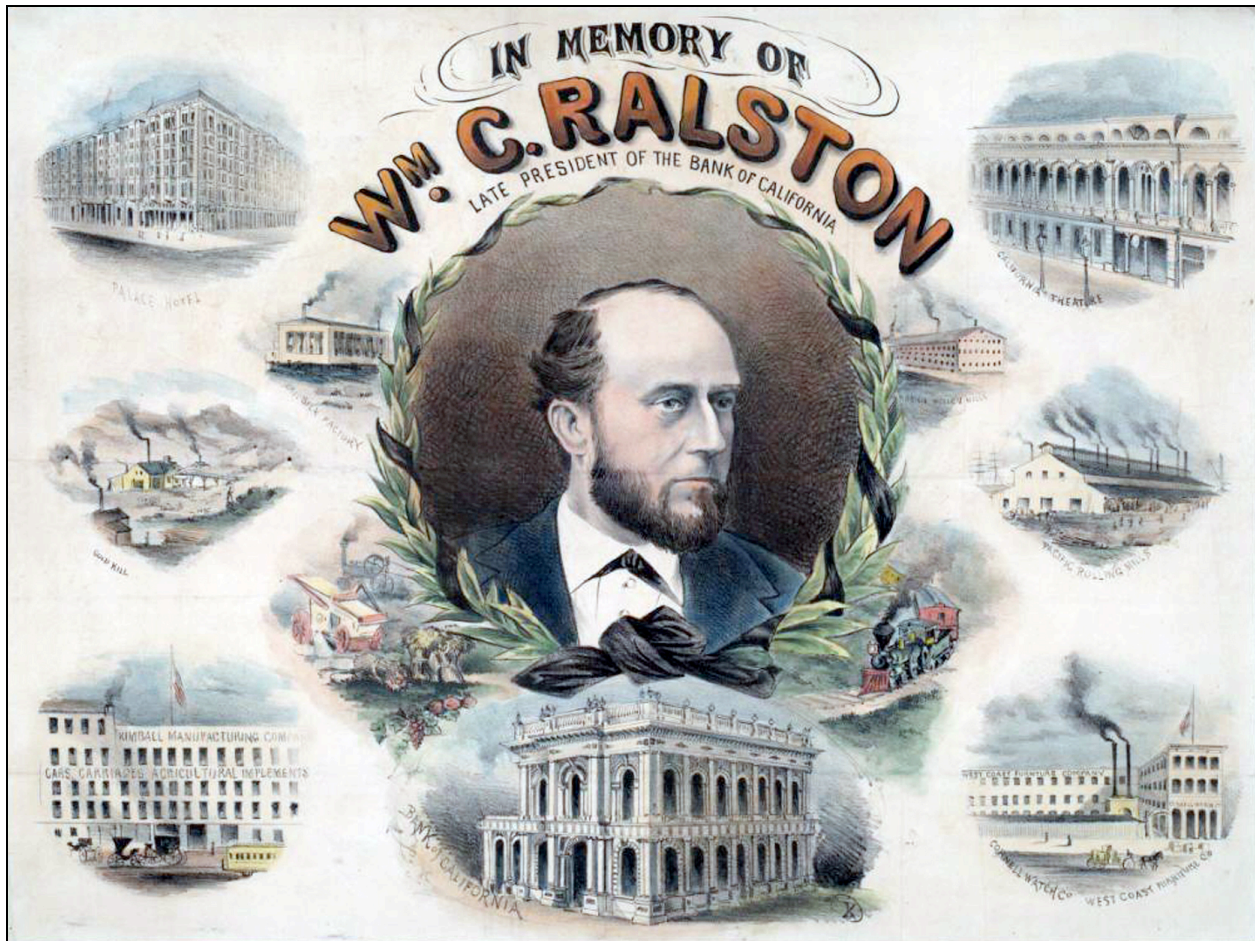


Figure 2.6. Ralston's ventures, (clockwise from top left): Palace Hotel, California Theater, Mission Woolen Mills, Pacific Rolling Mills, Cornell Watch Co and West Coast Furniture Co, Bank of California, Kimbell Manufacturing Company, Gold Hill Mine, and California Silk Factory. Robert B Honeyman, Jr. Collection of Early Californian and Western American Pictorial Material, The Bancroft Library, University of California, Berkeley.

Chapter 3

Breakthrough Technology

Perhaps no other technology better merits the term *creative destruction* than dynamite.¹ “The railroads that cross yawning chasms, bore through mountains, and wind around precipitous cliffs are possible only because of dynamite, the giant builder,” George Lord claimed in a 1912 *Harper’s* article, “Building A Country with Explosives.”² His celebration of the constructive use of dynamite encompassed not only transportation development—railroads, canals, and subways—but also quarrying stone and mining iron, coal, gold, silver, lead, tin, and copper. By extension, the creation of steel-framed skyscrapers and fuel and energy for homes, factories, trains, and ships relied on explosives. Dynamite was the “new farm hand,” capable of clearing stumps, draining swamps, felling trees, and renewing soil. Considering the significance of dynamite for an array of industrial enterprises, Lord claimed that the future of explosives promised to be purely constructive:

Just as electricity, once the terror of the superstitious, had been made a servant of varied daily utility, so nitroglycerine, the erratic and dangerous jihn of the laboratory, had become through the vehicle of dynamite the servant and friend of miner, engineer, and farmer.³

Explosives undergirded the nation’s commerce and industry, Lord concluded, and contemporary historians concur. In his popular history of high explosives, Stephen Brown claims:

Next to Nobel’s invention of dynamite, it is hard to imagine another single technological discovery or innovation that has had as long, and as lasting, an impact on human affairs and the shaping of our physical and social environment. Without Nobel’s dynamite our modern economy would not exist...⁴

Hyperbole aside, Brown rightly highlights the formative role of high explosives in economic development, a role that has been largely overlooked in academic research. The use of high explosives, however, did not qualitatively change extant industries (with the exception of the chemicals sector). Instead, dynamite enabled profound increases in the speed, efficiency, and

¹ By the turn of the century, dynamite was a generic term for any explosive obtained by absorbing liquid nitroglycerin into a solid base. Willoughby Walke, *Course of Instruction for Artillery Gunners; Gunpowder and High Explosives* (Washington: Government Printing Office, 1893), 28.

² George Lord, “Building A County with Explosives,” *Harper’s*, May 18, 1912, 13.

³ Ibid. The cruelly violent and purely destructive use of high explosives remained foremost in the military imagination and popular consciousness, but the large-scale production of high explosives for munitions—smokeless powder (nitrocellulose) and Ballistite, Cordite, and other propellants—did not commence in the U.S. until World War I.

⁴ Stephen Brown, *A Most Damnable Invention: Dynamite, Nitrates, and the Making of the Modern World* (Toronto: Viking Canada, 2005), 5.

magnitude of a vast array of industrial endeavors. Or, as economic historian Joel Mokyr put it, “If there ever was a labor-saving invention, this was it” (Figure 3.1).⁵

The production of dynamite, as opposed to its applications, introduces another dimension of creative destruction. Joseph Schumpeter famously coined the term in order to describe the essential role of technological innovation in industrial expansion and economic growth. For Schumpeter, innovation is the endogenous engine of capitalist expansion that “incessantly revolutionizes the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one.”⁶ Schumpeter’s defense of capitalism hinges on the role of entrepreneurialism. As opposed to inventing, entrepreneurs innovate by not only figuring out how to use “inventions” but also by introducing new means of production, new products, and new forms of organization.⁷ Competition cannot be disentangled from innovation. And, like innovation, it is best understood as a process endogenous to industrial production (rather than through a disembedded market). New technologies, new commodities, and new types of organization constitute “competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits of the existing firms but at their foundations and their very lives.”⁸

Entrepreneurial innovations culminate in gales of creative destruction, unrelenting barrages of change that make obsolete old inventories, ideas, technologies, skills, equipment, factories, and places. As old industries are rendered obsolete by the process of creative destruction, new sectors emerge. In this way, Schumpeter’s heroic entrepreneur leads the way in creating new industries, which, in turn, precipitate major structural changes in the economy. Schumpeter argued, most generally, that creative destruction is a requisite condition for progress and improved standards of living. But his heroic entrepreneur should not obfuscate the role of competition and innovation in labor exploitation and systemic crisis.⁹ Nevertheless, Schumpeter’s assertion that technological innovation lies at the core of economic development and that it is an evolutionary and endogenous aspect of industrial production help explain the following discussion of high explosives.

The chemicals sector, including pharmaceuticals, along with the electrical, telecommunications, and steel industries, represented the technological frontier of the “Second Industrial Revolution,” or “Technical Revolution” (1870-1914).¹⁰ Dynamite was a crucial

⁵ Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (New York: Oxford University Press, 1990), 120.

⁶ Joseph Schumpeter, *Capitalism, Socialism, and Democracy* (London: George Allen and Unwin, [1943] 1976), 83.

⁷ On the myth of invention, see Alan Trachtenberg, *The Incorporation of American: Culture and Society in the Gilded Age* (New York: Hill and Wang, 1982).

⁸ Schumpeter, *Capitalism*, 85.

⁹ David Harvey, *The Condition of Postmodernity: An Enquiry into the Origins of Social Change* (Cambridge, MA: Blackwell, 1989), 105-6.

¹⁰ Alfred DuPont Chandler, Jr. *Shaping the Industrial Century: The Remarkable Story of the Evolution of the Modern Chemical and Pharmaceutical Industries* (Cambridge, MA: Harvard University Press, 2005); Mokyr, *Lever of Riches*, 268; Eric Hobsbawm, *Industry and Empire: The Birth of the Industrial Revolution* (New York: The New Press, [1968] 1999), 150-56.

tranche of the burgeoning chemicals industry and this is what differentiated dynamite from ordinary gunpowder, or black powder.

Thirteenth century Chinese alchemical knowledge drifted into Europe, undergirding the development of gunpowder weapons and the protracted “military revolution” during the fifteenth and sixteenth centuries. Black powder became integral to war-making, imperialism, and territorial expansion with major state-controlled production centers in Britain, Denmark, France, Germany, Italy, Portugal, Russia, Sweden, and Spain in the eighteenth and nineteenth centuries, as well as through enduring contracts between the U.S. federal government and private powder producers, most notably the Du Pont Company. Gunpowder’s capacity for violence was matched only by potential for creation, especially in civil engineering projects and mining operations beginning in the early seventeenth century. When considering the scope and scale of its practical application, its role in international trade, military conflict, colonial expansion, and relations between state, capital, and society, historian Brenda Buchanan argues that black powder has been “an invisible factor in the historical process.”¹¹

While dynamite was on the cutting edge of the chemicals sector during the second half of the nineteenth century, the “black art” of mixing gunpowder had remained relatively static for centuries. Gunpowder is a mechanical mixture that *combusts*, or decomposes into hot gas, relatively slowly as it burns. Nitroglycerin, the basis for dynamite and other high explosives, is a chemical compound that *detonates*. That is, it decomposes into gas in a few millionths of a second, or about one thousand times faster than black powder. Black powder’s gradual combustion creates a pushing effect, whereas nitroglycerin explodes with an exponentially more violent shattering effect. Put another way, as chemist and historian George Brown explains, the difference between black powder and dynamite is tantamount to a pedestrian being bumped by a bicyclist versus being smashed by a locomotive.¹²

Alfred Nobel patented nitroglycerin in 1863 but the chemical compound was nothing new. Ascanio Sobrero, a chemist at the University of Turin, Italy, is credited with “discovering” it in 1846.¹³ The unpredictability and volatility of the yellowish, oily, and poisonous liquid precluded any commercial or military applications. It was “wholly unmanageable.”¹⁴ Nobel is credited with “taming” nitroglycerin. That is, he commercialized a known technological possibility, which involved, most generally, a new process of mixing glycerin, sulfuric, and nitric acid at low temperatures. Nobel predicated his patent on the idea that the known chemical compound had never been produced on a large scale or used for industry. His patented liquid nitroglycerin, branded as Explosive Blasting Oil and known also as glonoine, was therefore the first commercial nitroglycerin product.¹⁵ Thus Nobel’s Blasting Oil was an *innovation* rather

¹¹ Black powder consists of four essential ingredients: nitrate, sulfur, charcoal, and water. In the second half of the nineteenth, black powder was made by six or seven processes. Brenda Buchanan, “Editor’s Introduction: Setting the Context,” *Gunpowder, Explosives, and the State: A Technological History*, ed. Brenda Buchanan, (Aldershot, England: Ashgate Publishing Company, 2006), 2.

¹² George Brown, *Big Bang: A History of Explosives* (New York: Sutton Publishing, 1998), 102.

¹³ Henry Drinker, *A Treatise on Tunneling, Explosive Compounds, and Rock Drills* (New York: John Wiley & Sons, 1878), 66; George William MacDonald, *Historical Papers on Modern Explosives* (New York: Whittaker & Co., 1912), 160-163.

¹⁴ “What is Dynamite,” *Frank Leslie’s Popular Monthly*, December 1884, 765.

¹⁵ Henry Drinker, *Treatise*, 66.

than an *invention*. Rather than a single breakthrough or solitary act of genius, Blasting Oil represented the practical mastery of existing technology and transformation of antecedent innovations into commercially viable products and profit making activities.

Nobel's detonator proved equally significant and, like nitroglycerin, relied on existing technology. Nitroglycerin required a much hotter spark to detonate compared to the heat required to ignite black powder. Nobel developed and patented a reliable and practical detonator, or blasting cap. A fuse provided the initial shock that set off mercury fulminate housed in a copper tube. The fulminate, in turn, detonated the nitroglycerin. His resulting patents enabled the large-scale use of nitroglycerin and, with the exception of alterations for an electric spark, Nobel's blasting caps remained an industry standard throughout the 1920s.¹⁶

Although early nitroglycerin seemed insensitive to friction or percussion, it proved extremely unstable over time.¹⁷ The startling frequency of explosions during its transportation transformed the original "lightening in a bottle" into the "infernal compound."¹⁸ Nobel then developed a method of stabilizing the volatile liquid by impregnating it in an inert base. The result was Nobel's Dynamite No. 1, a pasty compound initially packed into cartridges but soon rolled into cylinders a bit longer than the average candle, then cut in to shorter lengths as needed. The solid matrix retained the explosive violence of liquid nitroglycerin, yet stabilized the chemical compound making it safer to handle, transport, store, and use.¹⁹ Thus, a *technological breakthrough*, or qualitative shift to new technological frames for an entirely new industry commenced in the 1860s.²⁰ Despite Nobel's monumental innovations, the technological shifts that so altered the nature of the explosives industry cannot be simply attributed to several key discoveries or epochal acts of genius. Instead, the development of high explosives, like most technological change, is better understood as an ongoing evolutionary process.

Powered by dynamite and its derivatives, the U.S. explosives industry—black powder and nitroglycerin-based high explosives for commercial and military applications—expanded roughly tenfold between 1869 and 1909. The total value of annual production increased from \$4.2 million to over \$40 million during this period and capital investment rose at an even sharper rate.²¹ Chemical high explosives gradually supplanted black powder. Between 1880 and 1900,

¹⁶ Kenne Fant, *Alfred Noble: A Biography*, trans. Marianne Ruuth (New York: Arcade Publishing, 1993), 78; MacDonald, *Historical Papers*, 170-71.

¹⁷ Drinker, *Treatise*, 64.

¹⁸ "Nitro-Glycerine as Freight—An Important Suit and Heavy Damages," *New York Times*, August 22, 1867.

¹⁹ C. A. Woodbury and W. C. Holmes, "Commercial Explosives Industry," *Industrial and Engineering Journal* 27 (1935): 632-637; John Dolan, "The Nobel Era," in *Explosives in the Service of Man: The Nobel Heritage*, ed. John Dolan and Stanley Langer (Cambridge: The Royal Society of Chemistry, 1996), 24-25.

²⁰ Michael Storper and Richard Walker, *The Capitalist Imperative: Territory, Technology and Industrial Growth* (Oxford: Basil Blackwell, 1989), 114.

²¹ Bureau of the Census, Department of Commerce, *Thirteenth Census of the United States, Taken in the Year 1910, Vol. 10, Manufacturers, 1909; Reports for Principal Industries* (Washington, D.C.: Government Printing Office, 1913), 567.

the value of annual dynamite output increased from \$1.6 million to over \$8 million.²² In all, the production of dynamite increased by 325 percent over the course of twenty-five years, exceeding 1,500 tons in 1905, when production of high explosives surpassed that of black powder. Dynamite production increased by over fifty percent during the following five years, by which time E. I. Du Pont de Nemours Corporation (hereafter Du Pont) dominated the entire U.S. explosives industry.²³

The Du Pont Dynasty

Between 1902 and 1912, Du Pont and its principal subsidiaries and affiliates directly controlled well over two-thirds of the total U.S. explosives output and nearly all private manufacture of military ordinance, making it among the most profitable businesses in the U.S.²⁴ The Du Pont dynasty was the culmination of a century of powder production and political profiteering and, through celebratory accounts and scholarly analysis, the du Pont family has also monopolized the historiography of the U.S. explosives industry.²⁵

Extensive political capital on both sides of the Atlantic proved instrumental for the creation of the Du Pont Company in 1802, a family gunpowder manufacturing company located on Brandywine Creek near Wilmington, Delaware. The aristocratic du Pont family had fled to the U.S. during the French Revolution. Through French government contacts, the du Ponts imported custom machinery, skilled labor, and other technological assets from Europe.²⁶

²² Census Office, Department of the Interior, *Statistics of Manufacturers Tenth Census*, vol. 2 (Washington DC: Government Printing Office, 1880), 93, 132, 136, 152, *Report on the Manufacturers of the United States at the Tenth Census (June 1, 1880)* (Washington DC: Government Printing Office, 1883), 1012, *Census Bulletin No. 210: Manufacturers, Chemicals and Allied Products* (Washington, D.C.: Government Printing Office, 1902), 74.

²³ Bureau of the Census, Department of Commerce, *Bulletin 92, Census of Manufacturers, 1905, Chemicals and Allied Products* (Washington, D.C.: Government Printing Office, 1908), 83.

²⁴ These figures do not include the sales by a number of companies that were more or less controlled by Du Pont through minority stock holdings or the sales by several large companies that did not compete with the Du Pont combination. Merle Thompson, *Trust Dissolution* (Boston: The Gorham Press, 1919), 156; William Stevens, "The Powder Trust, 1872-1912," *Quarterly Journal of Economics* 26, no. 3 (May 1912): 478.

²⁵ See, for example: William Carr, *The DuPonts of Delaware: A Fantastic Dynasty* (New York: Dodd, Mead & Company, 1964); Alfred DuPont Chandler, Jr., *Strategy and Structure: Chapters in the History of the American Industrial Enterprise* (Cambridge, MA: MIT Press, 1962), *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Belknap Press, 1977); Alfred DuPont Chandler, Jr. and Stephen Salsbury, *Pierre S. Du Pont and the Making of the Modern Corporation* (Washington, DC: Beard Books, [1971] 2000); Ernest Dale, "Du Pont: Pioneer in Systematic Management," *Administrative Science Quarterly* 2, no. 1 (June 1957); Davis Dyer and David Sicilia, *Labors of a Modern Hercules: The Evolution of a Chemical Company* (Boston: Harvard Business School Press, 1990); Kenneth Elzinga, "Predatory Pricing: The Case of the Gunpowder Trust," *Journal of Law and Economics* 13, no. 1 (April 1970); David Hounshell and John Kenly Smith, Jr., *Science and Corporate Strategy: Du Pont R&D, 1902-1980* (New York: Cambridge University Press, 1988); Neil Kay, "Hercules and Penrose," *Contributions to Political Economy* 18, no. 1 (December 1999); Stephen McNamee, "Du Pont-State Relations," *Social Problems* 34, no. 1 (February 1987); Edith Penrose, "The Growth of the Firm—A Case Study: The Hercules Powder Company," *The Business History Review* 34, no. 1 (Spring 1960); Joseph Wall, *Alfred I. Du Pont: The Man and His Family* (New York: Oxford University Press, 1990); Norman Wilkinson, *Lammot Du Pont and the American Explosives Industry* (Charlottesville, VA: University of Virginia Press, 1984), 253.

²⁶ Bessie Gardner du Pont, *E.I. du Pont de Nemours & Company, A History, 1802-1902* (Boston: Houghton Mifflin Company, 1920); McNamee, "State Relations," 2-4; Darwin Stapleton, "Eleve des Poudres: E.I. du Pont's Multiple

Gunpowder contracts provided by founding fathers, most notably Thomas Jefferson, led to enduring ties to the federal government and especially close relations with the army. Du Pont became “the government’s powder-makers,” a crucial agent in U.S. war making and territorial expansion.²⁷

With a glut in gunpowder markets in the wake of the Civil War and increased production capacity among powder mills, General Henry du Pont embarked on an aggressive program to consolidate the powder industry. In 1872, du Pont led the seven largest black powder manufacturers in the U.S. in the formation of the Gunpowder Trade Association of America (hereafter GTA). During the 1873 financial panic, Du Pont began acquiring a controlling interest in more than a half dozen of the larger powder companies and soon held sway over GTA. Like other trusts formed during this period, the GTA privately regulated the gunpowder industry by fixing prices, establishing production quotas, and delimiting sales territories in order to limit competition. In addition to mergers and acquisitions, the GTA engaged in predatory pricing, or pricing powder below marginal costs in certain geographic markets in order to discipline or remove competitors. Secret takeovers, dummy corporations, and cross-ownership of competing firms also enabled Du Pont to eliminate competitors or forced them into the cartel.²⁸

Du Pont made a late entry into the high explosives industry, seeking to consolidate dynamite companies beginning around 1880. Although Du Pont created a subsidiary dynamite company (Repauno Chemical Company), its growth in the high explosives sector consisted primarily of acquiring and merging other firms. Through the GTA and the Eastern Dynamite Company, a holding company that controlled over half of the dynamite production the U.S., Du Pont created the “Powder Trust,” which effectively eliminated competition by 1900.²⁹ Innovative capacity, manufacturing technique, company organization, or other *internal* aspects of firm organization did not enable Du Pont’s dominance. Instead, the growth of the small family powder mills into the mighty E. I. du Pont de Nemours Corporation at the turn of the century is better understood in terms the firm’s *external* relations with state actors and institutions, as well as kindred and competing companies.³⁰

The reorganization of Du Pont in 1902 is heralded as an epochal moment. Led by Alfred, a contingent of young du Ponts purchased the Du Pont Company and, as Alfred Chandler put it, “Alfred’s decision and determination to hold on to the du Pont Company changed more than the

Transfer of French Technology,” in *Gunpowder, Explosives, and the State: A Technological History*, ed. Brenda Buchanan, (Aldershot: Ashgate Publishing Company, 2006), 230-38.

²⁷ Quote from Lord, “Building,” 13.

²⁸ Carr, *DuPonts of Delaware*, 191-192; Chandler, *Strategy and Structure*, 54; Dale, “Systematic Management,” 27; Dyer and Sicilia, *Labors of a Modern Hercules*, 41; Elzinga, “Predatory Pricing,” 224-25; Henry Seager and Charles Gulick, *Trust and Corporation Problems* (New York: Harper & Brothers, 1929), 406-408; Thompson, *Trust Dissolution*, 148-49.

²⁹ In its various guises, the GTA was the most enduring, stable, and effective trust, save the Standard Oil Company. Like other trusts and combinations, it remained legal until the passage of the Sherman Antitrust Act of 1890, though the Powder Trust was not “busted” until 1912. Chandler and Salisbury, *Pierre S. Du Pont*, 57; William Stevens, “The Dissolution of the Powder Trust,” *The Quarterly Journal of Economics* 27, no. 1 (1912): 202-7, “Powder Trust,” 444-45.

³⁰ McNamee, “Du Pont-State Relations.”

course of its history: they revolutionized the American explosives industry.”³¹ This revolution is depicted as a shift from a dispersed cartel to a consolidated corporation, from horizontal combination to vertical integration, from private regulation to centralized administration, and from predatory price-cutting to industrial rationalization. According to the received wisdom, Du Pont precipitated immediate and thorough restructuring of not only the high explosives industry but also U.S. corporate organization in general.

Du Pont consolidated seventy percent of the nation’s explosives production facilities by merging the GTA and the Eastern Dynamite Company. A new multistory headquarters in Wilmington housed a new corps of senior managers, who provided centralized oversight of new and reorganized divisions. Bent on domination through economies of scale and throughput, Du Pont rationalized production seeking a new order of efficiency in order to reduce unit costs. Du Pont concentrated production facilities into a small number of plants strategically located with regard to suppliers and markets in order to streamline national distributing and marketing. To ensure a steady flow of inputs, the company vertically integrated nitroglycerin production and acquired nitrate beds in Chile. Branch offices and salaried salesman replaced the old systems of contracted sales agents. Finally, Du Pont built Eastern Laboratory, an autonomous research and development unit charged with improving the company’s high explosives products and production processes. Only the General Electric Company possessed anything comparable in the U.S. Du Pont created a second research facility in 1903, the Experimental Station, located across the Brandywine River from the du Pont family’s original powder mill.³²

In all, Du Pont created “an ideal type of integrated, centralized, functionally departmentalized enterprise,” according to Chandler (himself a du Pont).³³ It was a harbinger of “managerial capitalism” and an exemplar of the “visible hand” of a corps of salaried white-collar employees and centralized coordination of vertically integrated production, sales, and marketing. Ascendant scientific knowledge born in functionally detached laboratories was seemingly seamlessly applied to industrial production. All the while, the du Pont family retained ownership of the firm, as opposed to control by an investment houses, such as J.P. Morgan, which was rare in American business at the time.³⁴

The Powder Trust and subsequent E. I. Du Pont de Nemours Corporation certainly fashioned innovative modes of inter-firm governance, private regulation, and centralized corporate management, but the eastern monolith did little to develop and diversify the high explosives industry before the turn of the century, if not before World War I. The corpus of literature on the Du Pont dynasty at best skims over the early decades of dynamite production and largely banishes the role of Bay Region firms to footnotes. Indeed, Chandler’s “visible hand” continues to firmly grasp the received wisdom concerning the U.S. explosives industry. Du Pont is integral to a broader economic history focusing on the creation of a proper U.S. corporation, or “the modern American business enterprise.” Du Pont serves a prototype, helping elevate Chandler’s important model into a national template for corporate manufacturers that

³¹ Chandler, *Strategy and Structure*, 53.

³² Chandler, *Visible Hand*, 439, 442; Chandler and Salsbury, *Pierre S. Du Pont*, 118; Dale, “Systematic Management,” 25; Hounshell and Smith, *Corporate Strategy*, 11, 13.

³³ Chandler, *Visible Hand*, 442.

³⁴ Chandler and Salsbury, *Pierre S. Du Pont*, 118-19; Dale, “Systematic Management,” 25.

continues to eclipse geographic differentiation, not to mention an array of other modes of industrial organization. The structure and strategies of Western firms remain invisible and the influence of Californian technology on eastern industrialism is beyond the pale.

Dynamite Before Du Pont

Revolutions in the American high explosives industry occurred decades before the Powder Trust began consolidating the bulk of the industry. With due respect to Du Pont's formidable organizational prowess, it was the aggressive investment, experimental production, fierce competition, and rapid geographical expansion of Giant Powder Company and other early Bay Region dynamite manufacturers that fashioned U.S. high explosives industry *de novo*. The history of the early U.S. high explosives industry shows that California was neither a technological backwater nor a tenuous extension of an eastern industrial core. On the contrary, Bay Region dynamite manufacturers largely shaped the products, technique, and geography of the national high explosives industry before the turn of the century.

As opposed to the triumphant "modern business enterprise," the early U.S. dynamite industry is better understood in terms of the Bay Region's dynamic corporations and California's resource-intensive regional development. Technological innovations in the service of resource extraction created the Bay Region high explosives industry and fostered its rapid national expansion between the late-1860s and early 1890s. A look at the early high explosives industry provides several insights into the evolutionary and geographical processes of technological innovations. First, the Bay Region high explosives industry shows that learning and innovation occurred through experimentation and problem-solving in the process of actual industrial production, rather than in a discrete realm of science and research. Second, along with accumulation and competition, technological innovations enabled rapid and far-flung industrial dispersal, followed by the creation of a specialized industrial cluster. Furthermore, the East Bay's high explosives agglomeration itself perpetuated innovative activity and localized industrial dynamism.

Technological innovation is foremost a cumulative and on-going process of *learning*.³⁵ Learning in this sense involves much more than *information*, or facts that can be transferred impersonally through technical plans, manuals, directions, and the like. Instead, learning centers around *knowledge*, defined as skill or know-how that is not routinized, standardized, or codified. Knowledge involves combinations of facts that interact in intangible ways. Perfect information is plausible because, with time and money, a firm could learn all the extant facts pertaining to its endeavor. Perfect knowledge is impossible because knowledge is embodied in people and firms, is context dependent, and is often proprietary. Significantly, knowledge is tacit, meaning it cannot necessarily be fully articulated and is therefore acquired through interactive learning and shared experience. As Michael Polanyi put it, "We can know more than we can say."³⁶

Technology refers to knowledge embedded in products, routines, and organizations. But technology cannot be reduced to things alone. At the same time, reducing innovations to ideas

³⁵ Alice Amsden, *The Rise of "the Rest": Challenges to the West from Late-Industrializing Economies* (New York: Oxford University Press, 2001), 3; Michael Storper, *The Regional World: Territorial Development in a Global Economy* (New York: The Guilford Press, 1997), 238.

³⁶ Michael Polanyi, *The Tacit Dimension* (Chicago: University of Chicago Press, [1966] 2009), 4.

severs technology from its material base of tools and products, and people and firms. Technological innovation involves epistemological transformations—new knowledge—that help create new products, processes, and organization, as well as new places where these commodities are made, bought, and sold. The possibilities inherent in technology are discovered, understood, and elaborated in a process of learning-by-doing through industrial production. As Storper and Walker argue, “Industrial production is at once a process of commodity production and of technological transformation.”³⁷ Learning and innovation—the creation of new knowledge and new products—occurred in experimental production, rather than in a rarefied realm of science and research where the roots of innovation are deracinated from actual industrial production.³⁸

As I discuss below, GPC acquired Nobel & Co.’s North American patents and became the first U.S. company to manufacture dynamite. GPC’s early success, however, is not attributable simply to historical timing or acquisition of privileged information. Alfred Nobel also provided GPC with chemical formulas, machinery designs, and factory plans, as well as an agent who embodied experience and know-how. Rather than the seamless application of abstract scientific knowledge or codified engineering information, GPC’s dynamite production consisted of a collaborative relationship with Nobel & Co. and an evolutionary process of learning-by-doing and problem solving to nurture Nobel & Co.’s *knowledge-based assets* and develop new technological, managerial, and organizational capabilities.³⁹

To borrow Chandler’s term, GPC was the “first mover,” the initial enterprise in the U.S., whose owners, managers, and laborers learned to develop, make, and sell a new product at a volume sufficient to create a new national market.⁴⁰ This practical mastery refers to what Schumpeter called the “creative response” of entrepreneurial firms, which was followed by the “imitative response” of competing firms.⁴¹ Yet, in the nascent high explosives industry, the process of learning relied heavily on the skill and know-how of individual human agents. Further, efforts to circumvent GPC’s patents engendered not only imitation but also rapid innovation and diversification of high explosives products.

GPC was the *first mover* in a literal sense, as well. In addition to new products and novel production processes, technological innovations enabled industries to create new places. The evolutionary process of technological innovation followed a geographical path of industrial development. Learning in the early high explosives industry was a complex and path-dependent

³⁷ Storper and Walker, *Capitalist Imperative*, 100.

³⁸ Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (New York: Oxford University Press, 1990), 275-76; Storper and Walker, *Capitalist Imperative*, 100, 108.

³⁹ *Knowledge-based assets* refer to sets of technological and managerial know-how embodied in individuals and firms, including: skills necessary to manufacture particular products and to expand capacity; skills required to design entirely new products and processes; and skills essential to coordinate the operations of the enterprise. Amsden, *Rise of “the Rest,”* 3.

⁴⁰ Chandler, *Industrial Century*, 7-8.

⁴¹ Joseph Schumpeter, “The Creative Response in Economic History,” *The Journal of Economic History* 7, no. 2 (November, 1947). Also see Edith Penrose’s foundational work and Gary Field’s more recent study of organizational innovation: Edith Penrose, *The Theory and Growth of the Firm* (New York: Oxford University Press, [1959] 1995); Gary Fields, *Territories of Profit: Communications, Capitalist Development, and the Innovative Enterprises of G. F. Swift and Dell Computer* (Stanford: Stanford Business Books, 2004).

process, creating and, in turn, created by geography.⁴² The geography of the early high explosives industry was marked by three moments: localization of pioneering firms in San Francisco; industrial dispersal to the east coast and to the East Bay; and the formation of a specialized agglomeration—a “dynamite district”—on the East Bay shoreline.

Technological innovations, along with high rates of accumulation and fierce competition, enabled rapid and far-flung industrial dispersal, as GPC created profitable factory locations and new markets. Emanating from San Francisco, expansion occurred simultaneously on both the national scale (through the creation of an eastern analogue, Atlantic Giant Powder Company) and on the metropolitan scale (through industrial suburbanization to the East Bay). Although separated by 3,000 miles, a common logic determined dispersal on both national and metropolitan scales. Spurred by competition, GPC and other pioneering Bay Region firms could break away from the industrial core in San Francisco due to high rates investment and proprietary technology. These “windows of locational opportunity,” as Storper and Walker put it, are moments when the experimental unfurling of new commodities, manufacturing techniques, production systems, or modes of corporate organization release a firm from dependence on external supplies, serial face-to-face transactions and, therefore, the external economies and advantages of industrial agglomerations.⁴³ The local production environment was of secondary importance for industrial dispersal, be it national industrial expansion or Bay Region industrial suburbanization. Instead, GPC necessarily created its own production environment because its specialized inputs, machinery, manufacturing techniques, and labor were otherwise unavailable.

Finally, after fleeing San Francisco, GPC anchored a specialized cluster of dynamite manufacturers, chemical works, and other kindred industries in the East Bay (and, to a far lesser extent, in northwestern New Jersey). Here the dynamics shifted, in part, from the internal capabilities of individual firms to interrelations and interdependencies among multiple firms.⁴⁴ Spatial propinquity facilitated on-going processes of collective learning and technology transfer because of the highly tacit nature of knowledge and complexity of emergent technology. Knowledge is spatially “sticky” and tacit knowledge is not easily communicated other than

⁴² For geographical perspectives on evolutionary economics, see Ron Boschma and K Frenken “Why is Economic Geography not an Evolutionary Science? Towards an Evolutionary Economic Geography,” *Journal of Economic Geography* 6, no. 3 (2006); Ron Boschma and Jan Lambooy, “Evolutionary Economics and Economic Geography,” *Journal of Evolutionary Economics* 9, no. 4 (1999); Kurt Dopfer and Jason Potts, “Evolutionary Realism; A New Ontology for Economics,” *Journal of Economic Methodology* 11, no. 2 (2004); Ron Martin and Peter Sunley, “Path Dependence and Regional Economic Evolution,” *Journal of Economic Geography* 6, no. 3 (2006); Kevin Morgan, “The Exaggerated Death of Geography,” *Geography* 89, no. 1 (January 2004).

⁴³ Storper and Walker, *Capitalist Imperative*, 71-5. Also see, Ron Boschma and G.A. van der Knaap, “New Technology and Windows of Location Opportunity,” in *Economics and Evolution*, ed. Jan Reijnders (Lyme, NH: Edward Elgar, 1997), 171-202.

⁴⁴ On urban and metropolitan agglomerations and industrial districts, see: Robert Lewis, *Chicago Made: Factory Networks in the Industrial Metropolis* (Chicago: University of Chicago Press, 2008); Ann Markusen, “Sticky Places in Slippery Space: A Typology of Industrial Districts,” *Economic Geography* 72, no. 2 (1996); Anna Lee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (Cambridge, MA: Harvard University Press, 1996); Alan Scott, *On Hollywood: The Place, The Industry* (Princeton: Princeton University Press, 2005); Alan Scott and Michael Storper, “Regional Development Reconsidered,” in *Regional Development and Contemporary Industrial Response: Extending Flexible Specialisation*, ed. Huib Ernste et al. (London: Belhaven, 1992), 3-24; Storper, *Regional World*.

through personal interaction or shared experience.⁴⁵ The development of the specialized dynamite district reflected the growth of know-how (managerial, technological, and organizational) and was a cumulative process shaped less by natural endowment than by the growing competencies and capabilities of Bay Region firms. At the same time, the rich technological milieu perpetuated this collective accumulation of knowledge and practical mastery of production. Localized technological dynamism was both the input and outcome of the East Bay dynamite district. This dynamism was most clearly expressed through the role of human agents, competition, and spin-off firms. It was a process of learning-by-doing *sui generis*, a literal trial by fire with disastrous explosions punctuating each innovative leap.

Liquid Earthquake and Giant Powder

A new explosive is announced called “Dynamid,” or “Giant Powder”... its explosion is immensely powerful.

Harper’s Weekly, 1868⁴⁶

Henry du Pont took control of the Du Pont Company in 1850 and began a vigorous sales campaign via company representatives, including commission merchants capitalizing on the demand for black powder in California.⁴⁷ Hazard’s and Whipple’s powders soon joined Du Pont in the West and importers had shipped 11,393 kegs and 3,518 cases of black powder to San Francisco by 1853.⁴⁸ Enormous demands coupled with tenuous supplies created wild price fluctuations. Kegs of powder selling for \$2.50 in January 1854 fetched \$10 by the end of the year.⁴⁹ With the deepening of extraction activities and spectacular demands from California quartz mines and Comstock Lode corporations, imported black powder cost as much as \$20 per keg in the early 1860s.⁵⁰ Commission merchants made quick and prodigious profits but suffered from inconstant shipments from far-flung suppliers, though San Francisco entrepreneurs knew that black powder could be more cheaply and reliably manufactured in California.

Home production of black powder began in 1862, when San Francisco financiers’ search for a powder factory site lead them to the San Lorenzo Canyon near Santa Cruz, about seventy miles south of San Francisco. Dense Redwood and pine forests supplied inputs for fuel, charcoal, and kegs. The San Lorenzo River provided waterpower and easy access to oceangoing vessels at Santa Cruz wharfs. Incorporated in 1864, the California Powder Works Company (hereafter CPWC) quickly constructed dams and flumes, roads and wharfs. They ordered machinery from San Francisco workshops and contracted with chemical suppliers in California

⁴⁵ Storper, *Regional World*, 107.

⁴⁶ “Home and Foreign Gossip,” *Harper’s Weekly*, May 12, 1868, 327.

⁴⁷ James T. White, Robert Lamot, Rodmond Gibbons, “Great Expectations: The Business Correspondence of Gibbons & Lamot, Gold Rush Black Powder Merchants,” *California Historical Quarterly* 55, no. 4 (1976/1977): 291-93.

⁴⁸ Vivian, *Interests of California*, 421-22.

⁴⁹ Ibid.

⁵⁰ Edward Harrison, *History of Santa Cruz County, California* (San Francisco: Pacific Press Publishing Company, 1892), 200.

and Peru. Within two years, CPCW supplied over one-half of all the powder used in California and immediate success precipitated rapid expansion. Under Bank Ring control, CPWC doubled its capital stock and, by 1879, “Powder Mill Flat” consisted of twenty-one mills, ten shops, six magazines, and an “entire village” for workers, along with thirty-five other buildings stretching for a mile along the banks of the San Lorenzo River (Figure 3.2).⁵¹

Bank of California leader and mining magnate Alvinza Hayward and former Vigilance Committee president William T. Coleman created CPMC’s first competitor. Like many early Bay Region manufacturers, the merchant house of Hayward, Coleman & Co reinvested trading profits in manufacturing enterprise, incorporating the Pacific Powder Mill Company in 1866. The new firm bought six hundred acres in Olema, near Bolinas in Marin County and acquired invaluable assets: practical experience, skill, and know-how. J.W. Olds, “the pioneer powder maker of California” helped build CPWC before the rival firm hired him to design an expansive factory complex, which included several mills, a pulverizer, a refinery, and pressing, drying, and packing houses, as well as dormitories.⁵²

The success of the two powder mills bolstered boosters’ hopes of California’s industrial autonomy:

Since this home made article came into use, the prices, besides being reduced, have been preserved from those capricious fluctuations arising from an alternatively depleted and over-stocked market, and with present facilities for manufacture, it is not probable that California or the adjacent States or Territories will, for any length of time, be dependent even in part upon these distant and uncertain sources of supply...⁵³

This vision of regional self-sufficiency proved prophetic but the significance of black powder diminished as soon as nitroglycerin trickled into California. San Francisco merchant Julius Bandmann introduced “liquid earthquake” to California and it soon became clear that even the best black powders left much to desire compared to the new explosive’s power to unlock gold quartz, access auriferous gravel, and obliterate Sierran batholiths. J. Bandmann, through the merchant house of Bandmann, Nielson & Company, would provide San Francisco financiers an unparalleled advantage in international technology transfer.

Extensive mining operations and burgeoning railroad development made Germany an apt location for Alfred Nobel to establish his European dynamite empire. Julius Bandmann’s brother, Christian, was a business lawyer in Hamburg with many connections in the German mining industry. With an initial investment of 25,000 marks, Bandmann largely financed Nobel

⁵¹ Hubert Howe Bancroft, *The Works of Hubert Howe Bancroft, Volume XXIV, History of California, Vol. VII, 1860-1890* (San Francisco: The History Company, Publishers, 1890), 99; Titus Fey Cronise, *The Natural Wealth of California* (San Francisco: H. H. Bancroft & Company, 1868), 620-621; Hittell, *Commerce and Industries*, 710; Harrison, *History of Santa Cruz*, 200; Roy Sharpe, “Pioneering in High Explosives: The Story of California Dynamite,” *San Francisco Chronicle*, November 23, 1913, 2; Vivian, *Interests of California*, 422; *Santa Cruz County, California: Illustrations* (San Francisco: Wallace W. Elliot & Company, 1879), 49.

⁵² Quote from “Pacific Powder Mill Company,” *Daily Alta California*, June 16, 1866, 1. Henry Langley, ed., *The San Francisco Directory For the Year Commencing December, 1869* (San Francisco: Henry G. Langley, Publisher, 1869), 298; “Real Estate Transactions in Marin County,” *Daily Alta California*, November 26, 1871, 1.

⁵³ Cronise, *Natural Wealth*, 620-621.

& Co., becoming a partner when Alfred registered the new firm in Hamburg's trade register in June 1865.⁵⁴ Or as, J. Bandmann later recalled, his brother "invested a great deal of money in this explosives business, and he became a partner to protect himself."⁵⁵

J. Bandmann wasted little time promoting California to Nobel. "Have you ever seen mines in which three hundred to seven hundred kegs of gunpowder are exploded at once?" he questioned Nobel in a letter written in April 1866. "We have such mines, and call them 'hydraulic mines,'" the San Francisco entrepreneur continued:

Mountains which are saturated with gold are washed with water brought from high up in the mountains in a conduit pipe; the rock is often too hard, and then a tunnel is made into which as many as seven hundred kegs, with twenty-five pounds of gunpowder, are placed and exploded. This method, however, costs much time and money. Now an artesian well hole, of about four to five inches in diameter, and about two hundred feet deep, filled with glonoine, would result in an enormous saving of time and money. The Central Pacific Railroad alone consumes about 300 kegs of gunpowder a day. It is, therefore, worth while to introduce your oil.... Please come and send us a telegram to say when.⁵⁶

Nobel quickly recognized the instant market for his new Explosive Blasting Oil. As J. Bandmann recounted:

He sent samples of it to various parts of the world, to New York, Australia and Brazil, and to me... I received 4 or 5,000 pounds, which came here by way of Panama by steamer. That was the advent of that material on this coast, and, in the whole United States only a small quantity had, about the same time, been received, and this was in New York. No person knew what nitro-glycerine was.⁵⁷

Yet, the world would soon find out. Business insiders quickly realized nitroglycerin's profound commercial potential but learned that Nobel's ability to safely manufacture, transport, and use it was dubious, at best. Eager to capture markets and protect patents, Nobel & Co. began manufacturing and distributing blasting oil before fully understanding its chemical characteristics.⁵⁸ The practical mastery of production outpaced an understanding of the underlying science concerning the behavior of the chemical compound and the consequences were disastrous.

A peculiar smell alarmed guests at the Wyoming Hotel in New York City on November 5, 1865. A porter followed the scent to a wooden crate. A German tourist had abandoned the

⁵⁴ *Giant Powder Co. v. Vulcan Powder Co.*, vol. 2 (D. Cal. 1879), 929; Fant, *Alfred Noble*, 133.

⁵⁵ Julius Bandmann, "Biographical Materials, Relating to Julius Bandmann; Dictation of Mr. Julius Bandmann, 8/31/89," 9, The Hubert Howe Bancroft Collection, The Bancroft Library. University of California, Berkeley,

⁵⁶ Quoted by Herta Pauli, *Alfred Nobel: Dynamite King—Architect of Peace* (New York: L.B. Fischer, 1942), 96.

⁵⁷ Bandmann, "Biographical Materials," 6.

⁵⁸ Nicholas Halsz, *Nobel: A Biography of Alfred Nobel* (New York: Orion Press, 1959), 71.

crate and then hotel employees used it as a footrest for polishing their shoes. Noticing wisps of smoke drifting out of the crate, the porter quickly carried it outside and tossed it into the gutter. While he returned to the hotel, the crate exploded, shattering every window within one hundred yards and cleaving a deep crater into Greenwich Street. The blast injured nineteen people, many seriously, and startled New Yorkers almost two miles away in Union Square. Investigators soon determined the crate held ten pounds of nitroglycerin and New York City newspapers quickly asserted that the mysterious German traveler was Nobel's sales agent.⁵⁹

A month later, an indebted and desperate American exporter sought to sabotage his own heavily insured cargo aboard the German steamer, *Mosel*. He hid a crude nitroglycerin bomb in the ship's hold but it detonated prematurely, killing its creator and thirty-eight others, and injuring about 200 people in Bremerhaven, Germany.⁶⁰ News of an accident in Sydney, New South Wales (Australia) reached the U.S. in March 1866. Two cases of nitroglycerin detonated, annihilating warehouses and an undetermined number of bystanders.⁶¹

The *New York Times* described the explosion at Aspinwall, Panama as "one of the most terribly magnificent spectacles ever witnessed."⁶² A funnel of red flames and white smoke burst from a docked steamship, carrying two-dozen men, bales of cargo, and chunks of metal high above the deck. Forty-seven people died and another seventy were injured in the April 1866 disaster. The explosion obliterated the *European*, a 1,700-ton ironclad steamer *en route* from Hamburg to San Francisco, and total damages caused by the accident exceeded \$1 million. According to a bill of lading, a cargo of Nobel's "Glonoine Oil" consigned to Bandmann, Neilson & Co was aboard the ship.⁶³ Investigators later attributed the rash of explosions to nitroglycerin's increased sensitivity under confinement due to the rapid decomposition of impure acids used in the manufacturing process. Vitriolic newspaper reports, however, targeted Nobel, as Henry du Pont and the GTA fomented a national panic.⁶⁴

Federal anti-nitroglycerin legislation greeted Nobel in New York City on April 15, 1866, as he arrived in the United States seeking to protect his patent and to form a company to manufacture blasting oil.⁶⁵ The next day in San Francisco, a man saw a column of smoke suddenly shoot hundreds of feet above the Wells Fargo building. He heard a blast, felt the ground tremble, and saw flurries of shattered glass and bricks. "This is no earthquake," he supposed, "a volcano has suddenly opened in the heart of the city."⁶⁶ Blocks away from the

⁵⁹ Fant, *Alfred Nobel*, 84; Herta Pauli, *Alfred Nobel: Dynamite King—Architect of Peace* (New York: L.B. Fischer, 1942), 91-92; "Explosion in Greenwich-Street," *New York Times*, November 6, 1865.

⁶⁰ Halsz, *Nobel*, 70.

⁶¹ "Nitro-Glycerine as Freight—An Important Suit and Heavy Damages," *New York Times*, August 22, 1867; Halsz, *Nobel*, 70; Pauli, *Alfred Nobel*, 93.

⁶² Aspinwall is now Port of Colon, Panama. "Disaster at Aspinwall," *New York Times*, April 21, 1866, 1, 8.

⁶³ Fant, *Alfred Noble*, 84; Pauli, *Alfred Nobel*, 93.

⁶⁴ Fant, *Alfred Noble*, 84; Pauli, *Alfred Nobel*, 94; "Nitro-Glycerine as Freight—An Important Suit and Heavy Damages," *New York Times*, August 22, 1867..

⁶⁵ Patented in the U.S. in 1865.

⁶⁶ "The Pacific Coast; The Nitro-Glycerine Explosion in San Francisco," *New York Times*, May 12, 1866, 3.

Wells Fargo building, rescue workers found a piece of spine and a chunk of skull, with hair still attached.⁶⁷ Someone's arm had been blasted through the third-story window of an adjacent structure. "A silence, born of horror and sympathy, prevailed through all the vast throngs around," the *Alta* concluded, as rumors of Nobel's and Bandmann's culpability swirled.⁶⁸ Federal law soon forbade the shipment of explosives on passenger vehicles and San Francisco ordinances prohibited the storage of nitroglycerin in the city.⁶⁹ The disasters, however, proved the product.

Bandmann approached Egbert Judson in hopes of storing samples of Nobel's Blasting Oil on Yerba Buena Island, a small island in the San Francisco Bay to which Judson held a tenuous title. The perils inherent in transporting nitroglycerin were undeniable but not untenable given the potential market, and Bandmann soon sought a franchise from Nobel for the exclusive rights to manufacture and sell blasting oil in the Western U.S. Bandmann again sought Judson's help soliciting subscribers for the new company, as Judson would have it.⁷⁰ He claimed to have successfully solicited twenty subscribers, who bought one hundred shares each and organized the Pacific American Blasting Oil Company on March 11, 1867.⁷¹ As the San Franciscans prepared to seize a Western monopoly on the controversial explosive, Bandmann heard from his brother that Nobel had something far superior in the works.

In order to address the problem of instability and the attendant dangers in transporting nitroglycerin, Nobel sought to develop a solid form of high explosive, demonstrating the role of problem solving and the cumulative nature of technological innovation. Large deposits of kieselguhr, or diatomaceous earth, surrounded Nobel's factory in Krummel, near Hamburg. The soft, inert, and siliceous sedimentary rock easily crumbled into a fine powder. When he impregnated kieselguhr with nitroglycerin, it rendered a greasy, pasty substance that retained the explosive violence of the liquid explosive. Further, it required the mercury fulminate blasting cap for detonation. In all, Nobel's new explosive was safer to transport, store, handle, and use than either nitroglycerin or black powder. "Alone, it may be hammered, crushed, or jarred with impunity. If set on fire, even in large masses, it will simply burn to ash," according to one expert.⁷² Nobel sought a new name for his explosive "not to hide its nature, but to emphasize its explosive traits in the new form," he wrote.⁷³ He trademarked "Dynamite," referencing the

⁶⁷ "Terrible Calamity," *Daily Alta California*, April 17, 1866, 1

⁶⁸ W.R. Quinan, *High Explosives* (London: Sir Issac Pitman & Sons, 1912), 20.

⁶⁹ Federal regulations, however, failed to specify an effective enforcement mechanism and were widely ignored. Mark Aldrich, "Regulating Transportation of Hazardous Substances," *the Business History Review* 76, no. 2 (Summer 2002): 270.

⁷⁰ *Giant v. Vulcan*, vol. 1, 509-10.

⁷¹ *Giant v. Vulcan*, vol. 1, 509-10; "Death's Long Roll," *San Francisco Chronicle*, January 10, 1893, 12.

⁷² Drinker, *Treatise*, 72.

⁷³ Quoted by Fant, *Alfred Noble*, 94.

Greek word for power, *dynamis*. But Nobel hedged his bets with the full trademarked name: “Dynamite or Nobel’s Safety Powder.”⁷⁴

Looking to sever ties with the east coast contractee for Blasting Oil rights (United States Blasting Oil Company), whose directors preferred selling stocks and licenses rather than actually manufacturing nitroglycerin, Nobel sought California capital for U.S. dynamite production. Bandmann rallied the group of San Francisco investors around the new dynamite prospect, and awaited the arrival of a representative of Nobel & Co., who would manufacture and demonstrate Nobel’s dynamite in California.

Bandmann welcomed a representative of Nobel & Co., Theodore Winckler, to San Francisco in July 1867.⁷⁵ After settling in a downtown boardinghouse on Stockton Street between Jackson and Washington streets, Winckler endeavored to make a batch of dynamite in order to demonstrate its usefulness and adaptability to California, according to a deal hashed out between J. Bandmann and Nobel & Co.⁷⁶ “He said he wanted a place to manufacture this Giant Powder to show us,” Judson later explained, “and I told him I didn’t know of any place, unless we went to our factory at the Mission, corner of Fifteenth and Valencia.”⁷⁷ A two-room “shanty” on the Judson & Shepard Chemical Works site proved sufficient; Winckler only requested “a good lock that nobody could pick.”⁷⁸ According to an affronted Judson, “He kept the door locked, and would not allow anybody to go in there; would not allow me to go, even, inside the door.”⁷⁹

Winckler, who was not a chemist or scientist by training, evinced the experimental nature of dynamite production one week later, when he offered Judson \$50 to detonate a quarter of an ounce of the first dynamite ever made in the U.S. on the chemical works site.⁸⁰ Judson accepted but the test failed when he incorrectly fastened the fuse to the blasting cap.⁸¹ Winckler detonated the dynamite himself at the subsequent trial on August 10, 1867. He divided three pounds of dynamite into fifteen separate “shots” and obliterated several boulders obstructing the route of the Bay View Railroad at the base of Potrero Hill.⁸² Three days later, Bandmann, Judson, and

⁷⁴ Woodbury and Holmes, “Commercial Explosives Industry,” 632-637; John Dolan, “The Nobel Era,” in John Dolan and Stanley Langer ed., *Explosives in the Service of Man: The Nobel Heritage* (Cambridge: The Royal Society of Chemistry, 1996), 24-25; Quinan, *High Explosives*, 20; Walke, *Course of Instruction*, 29.

⁷⁵ Winckler and his brother Wilhelm, along with E. Bandmann, were among Nobel’s early partners, though the Swedish trading firm Winkler & Company invested no capital. Fant, *Alfred Noble*, 133.

⁷⁶ *Giant v. Vulcan*, vol. 2, 62, 929-30.

⁷⁷ *Giant v. Vulcan*, vol. 1, 412.

⁷⁸ *Ibid.*

⁷⁹ *Ibid.*, 412-13.

⁸⁰ It was “undoubtedly the first dynamite ever manufactured in the United States,” according to Van Gelder and Schlatter’s singular encyclopedic history of the U.S. explosives industry, Arthur Pine Van Gelder and Hugo Schlatter, *History of the Explosives Industry in America* (New York: Columbia University Press, 1927), 405.

⁸¹ *Giant v. Vulcan*, vol. 1, 413.

⁸² J. Bandmann testimony, *Giant v. Vulcan* V2, 931.

fifteen other financiers and mining magnates incorporated the Giant Powder Company.⁸³ Fearing that miners would misspell or mispronounce “dynamite,” the new board or directors chose a “simple English name”: Giant Powder.⁸⁴

Beginning with knowledge-based assets and then blossoming into an increasingly collaborative relationship with Nobel & Co. (patent rights would flow both ways until 1885), GPC generated the practical capabilities and the innovative capacities *in situ* that helped shape the incipient U.S. high explosives industry. Tacit knowledge, experimental technology, and untried techniques transferred by Nobel’s agent, however, proved an insufficient base for actual dynamite production. Rather than a straightforward and seamless application of innovative technology to industrial production, GPC’s manufacturing techniques and production processes required a protracted process of learning-by-doing. Despite Nobel & Co.’s “secret recipe” and proprietary designs for everything from kettles to factories, the production of Giant Powder in the Bay Region required incessant experimentation and problem solving.

Practical Disasters

The operations of the Company were at first but a series of experiments...

LL Robinson, GPC’s first Annual Meeting, 7 Nov 1868⁸⁵

GPC leased property from its president, L.L. Robinson, in Rockhouse Canyon (now Glen Canyon Park), about five miles from downtown on the southern edge of San Francisco.⁸⁶ A crew of Chinese workers built an eight-foot-high fence around the one-acre property and then started grading, digging, and building.⁸⁷ Completed by March 1867, GPC’s complex included a 1,500 square-foot factory, a kieselguhr processing building, and a powder packinghouse.⁸⁸ The Chinese crew lived in a “shanty” built atop a stable, just forty-five feet from a nitroglycerin repository.⁸⁹ As in other perilous types of labor in the West, Chinese performed the most dangerous jobs for the least pay. Yet, GPC’s Chinese workers would prove indispensable. Novel and unfolding technology, techniques, and manufacturing processes necessarily required on the job training and the development of highly specialized skills. Geographer Don Mitchell’s insightful and incisive explanation of the role of migrant farmworkers in California is equally applicable to nineteenth century Chinese “coolies” in general and, in particular, to GPC’s workers, who were, “Both indispensable as a class and completely expendable as individuals.”⁹⁰

⁸³ “Incorporation,” *Daily Alta California*, August 18, 1867, 2.

⁸⁴ Bandmann, “Biographical Materials,” 9.

⁸⁵ L.L. Robinson, “First Annual Meeting of Giant” (November 7, 1868), *Giant v. Vulcan*, vol. 2, 134.

⁸⁶ *Giant v. Vulcan*, vol. 2, 119; Van Gelderland Schlatter, *History of Explosives*, 405, 433.

⁸⁷ *Giant v. Vulcan*, vol. 1, 447, vol. 2, 1053; “Fearful Explosion,” *New York Times*, December 5, 1869, 5.

⁸⁸ *Giant v. Vulcan*, vol. 1, 239, vol. 2, 885; “Fearful Explosion,” *New York Times*, December 5, 1869, 5.

⁸⁹ “Fearful Explosion,” *New York Times*, December 5, 1869, 5.

⁹⁰ Don Mitchell, *The Lie of the Land: Migrant Workers and the California Landscape*. Minneapolis: University of Minnesota Press, 1996), 16.

Under Fuch's direction, Judson purchased materials, ordered custom equipment, and managed construction of the dynamite works.⁹¹ From the very beginnings, a schism developed between California's self-identified "powdermen" as opposed to scientists or theorists, all of whom Judson pejoratively termed "chemists."⁹² Fuchs' role in constructing the new works consisted of "much experimenting," Judson claimed. "Dr. Fuchs didn't know enough to put up anything at all; he was a scientific man and a chemist but he didn't know anything about what a tackle was or anything else of that kind, and I put the thing up myself."⁹³ Judson ordered custom equipment for rendering nitroglycerin from the Fulton Foundry in San Francisco based on Nobel's designs.⁹⁴ The resulting iron "kettle mixer" measured about two and one-half feet in diameter and encased a labyrinth of forty-one coiled cast iron pipes that, using prodigious ice supplied by the American and Russian Commercial Company, helped cool the acids.⁹⁵ When a design flaw limited the flow of water through the pipes, Judson experimented with mining pumps but quickly scrapped Nobel's iron pipe design, substituting his own designs and materials.⁹⁶

Despite agonizingly slow shipping, Bandmann, Neilson & Co imported kieselguhr and some nitroglycerin from Nobel & Co. in Hamburg.⁹⁷ Yet, Judson's San Francisco Chemical Works soon supplied all the chemical inputs for GPC's nitroglycerin production, namely nitric and sulfuric acids, which workers combined in an anhydrous mixture in order to nitrate, or "wash," glycerin.⁹⁸ Workers separated the resultant nitroglycerin from the spent acids, then ran it through a hose into a wooden barrel and neutralized it with a soda solution. They drew the contents into another tub and incorporated the nitroglycerin into kieselguhr at a ratio of about two to one.⁹⁹ Judson found Nobel's method of drying kieselguhr too labor intensive and constructed a reverberatory furnace to dry it, though much of the "light stuff" drifted away through the chimney.¹⁰⁰ Finally, Chinese workers packed the powder into paper cartridges waterproofed with paraffin and stored Giant Powder for shipping. Fuchs' first weeklong production run, which ended on March 16, 1868, yielded 1,300 pounds of dynamite. Two months later, Nobel received his U.S. patent and conveyed it, along with all product and

⁹¹ *Giant v. Vulcan*, vol. 2, 883-885.

⁹² Van Gelder and Schlatter, *History of Explosives*, 442.

⁹³ *Giant v. Vulcan*, vol. 1, 417.

⁹⁴ *Giant v. Vulcan*, vol. 1, 415

⁹⁵ Van Gelder and Schlatter, *History of Explosives*, 1406.

⁹⁶ *Giant v. Vulcan*, vol. 1, 416-18

⁹⁷ *Giant v. Vulcan*, vol. 1, 133, 291, 339, 401, 420; Van Gelder and Schlatter, *History of Explosives*, 431.

⁹⁸ Van Gelder and Schlatter, *History of Explosives*, 681.

⁹⁹ "Fearful Explosion," *New York Times*, December 5, 1869, 5.

¹⁰⁰ *Giant v. Vulcan*, vol. 1, 419.

production information, to J Bandmann, who assigned the patent to GPC. Nevertheless, Nobel & Co. continued providing direct technical assistance via a third agent sent by Nobel.¹⁰¹

Judson, Robinson, and other GPC directors immediately shipped Giant Powder to their hardrock mines in Grass Valley and Nevada City and to their hydraulic operations overlooking the Yuba River on the San Juan Ridge.¹⁰² Fuchs traveled into the foothills in order to demonstrate the explosives for other mining companies.¹⁰³ Although a discussion of labor resistance to Giant Powder is beyond the scope of this chapter, Bandmann's thoughts speak volumes.¹⁰⁴ Comparing the danger of Giant Powder accidents to those caused by black powder, he reasoned:

In the early years the miners could be seen here in the City showing the blue marks of the black powder in their faces. And in that respect dynamite has been a boon I might say for the miners; when accidents do happen the miner is killed outright, which is doubtless much preferable to losing his eyes merely, or some members of his body.¹⁰⁵

GPC's workers fared little better.

Around 7:00 on the evening of December 6, 1869, a GPC employee saw a bright flash. Next thing he remembered was regaining consciousness beneath a pile of smoldering timbers. GPC imposed the same safety regulations as Nobel's German factory, but nitroglycerin had leaked from a wooden tub and saturated GPC's factory floor. The explosion ripped through GPC's buildings, blew four houses to atoms, and tore down the entire fence encircling the property. Not one plank remained in place. The conflagration burnt two men "to a crisp"; only a portion of one man's watch chain allowed investigators to identify the victims because their heads and limbs were missing. The blast seriously injured six of GPC's eight Chinese workers, one whose eye was "nearly burnt out."¹⁰⁶

¹⁰¹ A chemist named Dr. Casemans replaced Fuchs; VanGelber and Schlatter, 433

¹⁰² *Giant v. Vulcan*, vol. 1, 448, vol. 2, V2 886

¹⁰³ Bandmann, "Biographical Materials," 11.

¹⁰⁴ In addition to safety issues, dynamite relied on narrower boreholes, which required less labor than the two-man drilling teams who prepared charges of black powder. On labor conflicts engendered by the introduction of high explosives in the California's mining sector, see Hittel, *The Commerce and Industries*, 70; Richard Lingenfelter, *The Hardrock Miners: A History of the Mining Labor Movement in the American West, 1863-1893* (Berkeley: University of California Press, 1974); Ralph Mann, *After the Gold Rush: Society in Grass Valley and Nevada City, California, 1849-1870* (Stanford: Stanford University Press, 1982); Paul, *California Gold*, 326-27, 350-51; Alexander Saxton, *The Indispensable Emery: Labor and the Anti-Chinese Movement in California* (Berkeley: University of California Press, 1971), 58-60; Giant Powder Company, "Giant Powder, Manufactured Exclusively but the Giant Powder Company, San Francisco, Cal." (San Francisco: Franklin Printing, 1868), 5; "Giant Powder in Quartz Mining, *Daily Alta California*, May 22, 1869, 2; "Semi-Annual Review of Gold Mining in California," *Daily Alta California*, July 9, 1869, 2.

¹⁰⁵ Bandmann, "Biographical Materials," 14.

¹⁰⁶ "Fearful Explosion," *New York Times*, December 5, 1869, 5; "The Explosion at the Giant Powder Works," *Daily Alta California*, December 7, 1869, 1. Dynamite workers across the nation subsequently suffered from severe headaches, insomnia, and "maniacal attacks due to a form of chemical poisoning known as 'nitroglycerin head,'

GPC's first major accident rattled San Francisco's hills and razed the Rock House Canyon factory only one year after its construction, forcing GPC to reconsider the spatial requirements and organization for dynamite production. GPC bought one hundred acres of sand dunes south of what is now Golden Gate Park in the first of three relocations before 1890, each precipitated by a massive explosion.¹⁰⁷ At the request of GPC, Nobel & Co. sent a fourth agent to oversee operations.¹⁰⁸ Production at the new site commenced early in 1870, and the plant manufactured sixty tons valued at \$120,000 two years later.¹⁰⁹ But expansion also occurred on a far larger scale, as GPC leapfrogged the Rocky Mountains in hopes of creating and securing a national dynamite market.

Eastern Prospects

Alfred Nobel created an instant multinational corporation and a vast network of dynamite manufacturers linked through his technology, patents, and oversight in an attempt to fashion a global high explosives market. Between 1865 and 1873, he created or licensed seventeen dynamite factories in Czechoslovakia, France, Finland, Germany, Italy, Norway, Portugal, Pressburg (Slovakia), Scotland, Spain, Sweden, and Switzerland, as well as the U.S. Worldwide exports and further expansion soon followed as Nobel's empire grew to encompassed twenty-nine firms and close to one hundred production units.¹¹⁰ Nobel & Co.'s high rates of innovation and accumulation provided great freedom for factory location as he frantically expanded in order to preclude patent infringement. High explosives production relied on proprietary technology, specialized inputs, custom machinery, and unique job tasks. Though precluded from locating in cities, dynamite factories could take advantage of cheap land and labor on the metropolitan periphery because of their lack of reliance on dedicated suppliers, specialized labor pools, external economies, or other agglomeration advantages (though government contracts and state-run firms influenced factory location). This strategic locational logic of rapid industrial expansion adhered to the national scale, as well.

Within the U.S., the cutting edge of the chemicals sector sliced from West to East. GPC exported California technology, manufacturing processes, and production systems to the east coast and created a new national industry and a new industrial geography in the image of the Bay Region. GPC's rapid eastern expansion illustrates how high rates of innovative, accumulation, and competition fostered great freedom for industrial dispersal and factory location. GPC created its own conditions for production because specialized inputs, labor, and machinery were otherwise unavailable. Matters of transportation and distribution certainly influenced factory

according to the prevailing medical wisdom. George Ebright, "The Effects of Nitroglycerine on those Engaged in its Manufacture," *Journal of the American Medical Association* 62, no. 3 (1914): 201.

¹⁰⁷ Giant Powder Company's second site extended south from what is now Kirkham Street to Ortega Street, and from 20th to 32nd Avenue, an area covered by 28 city blocks. Van Gelder and Schlatter, *History of Explosives*, 433-34.

¹⁰⁸ Van Gelder and Schlatter, *History of Explosives in America*, 433-34.

¹⁰⁹ San Francisco Board of Supervisors, "Report to the Surveyor-General," in *San Francisco Municipal Reports for the Fiscal Year 1871-72, Ending June 30, 1872* (San Francisco: Cosmopolitan Printing Company, 1880), 174.

¹¹⁰ Fant, *Alfred Noble*, 34-5;

location but, on the local scale, these factors were secondary to GPC's ability to generate its own resources.

The original agreement with Nobel & Co. provided GPC rights to make and market dynamite in the West. Nevertheless, Alfred Nobel pushed for eastern expansion before GPC had finished building its first factory. As early as November 1867, Edward Bandmann wrote to his brother with Nobel's entreaty to GPC directors to buy out a dubious company in New York that held Nobel's U.S. nitroglycerine patent. Nobel promised to then transfer all eastern rights for his U.S. patents to the San Francisco corporation. Nobel extended a six-month option on these eastern rights for over one year until the Bay Region entrepreneurs were ready to expand in 1870.¹¹¹

Although an autonomous corporation, Atlantic Giant Powder Company was essentially GPC's subsidiary, or branch plant. The new firms consisted of Bay Region actors, capital, and evolving technology. Incorporated by Judson, Robinson, Risdon and other GPC leaders, one board of directors initially managed both companies and Bandmann, Neilson & Co handled all sales.¹¹² Capitalized with \$800,000, Giant Powder's eastern analogue was incorporated in California and headquartered on California Street in San Francisco.¹¹³ Furthermore, GPC favored California investors. A two-week stock offering gave GPC investors' exclusive rights to buy Atlantic Giant stocks for \$5 apiece, payable in gold coin.¹¹⁴ In addition to California investment capital, the San Francisco capitalists created their own source of finance and credit. Sather & Company Bank served as a treasurer for both Giant companies, before Judson invested \$100,000 and John Shepard assumed leadership when they publicly incorporated the formerly private and eminently prominent financial institution.¹¹⁵

GPC directors selected a factory site at McCainsville, later Kenvil, near canal, river, and railroad connections in the northern New Jersey highlands, about four miles from Dover, which was an important iron mining center.¹¹⁶ The New Jersey site encompassed kieselguhr deposits,

¹¹¹ Edward Bandmann to Julius Bandmann, November 15, 1867, *Giant v. Vulcan*, vol. 2, 119-21; Van Gelder and Schlatter, *History of Explosives*, 408-9.

¹¹² Van Gelder and Schlatter, *History of Explosives*, 481.

¹¹³ "Dividend Notice," *Daily Alta California*, August 16, 1875, 2.

¹¹⁴ "Notice to Giant Powder Co. Stockholders," *Daily Alta California*, April 28, 1871, 3.

¹¹⁵ Sather & Company Bank began in 1851 when a Norwegian merchant and a New York financier started buying gold dust in a "shanty" built on piers on Washington Street between Battery and Sansome streets. Francis Drexel, founder of Philadelphia financial empire, joined the pair, forming Drexel, Sather, and Church. After surviving decades of California's financial turbulence, the private bank was restructured and incorporation as Sather & Company Bank (1887) with a \$1.25 million capital stock. Judson Manufacturing Company Vice President Anthony Chabot also invested \$100,000, making him and Judson by far the largest stockholders (see Chapter 5). San Francisco National Bank succeeded Sather & Co in 1897. Le Roy Armstrong, *Financial California: An Historical Review of the Beginnings and Progress of Banking in the State*, (San Francisco: The Coast Banker Publishing Company, 1916), 51, 137; George Spaulding & Co., *Gold Mines and Mining in California: A New Gold Era Dawning on the State*, (San Francisco: George Spaulding & Co., 1885), 174; "Sather's Bank Incorporated," *Daily Alta California*, March 20, 1887, 1; "Banking Interests of California," *San Francisco Call*, January 18, 1894, 6; "A National Bank," *San Francisco Call*, December 3, 1897, 12.

¹¹⁶ Van Gelder and Schlatter, *History of Explosives*, 481.

though the absorbent was initially imported from Germany.¹¹⁷ Along with Giant Powder leaders and a Nobel & Co. chemist, a crew of seven Chinese GPC workers traveled from San Francisco to New Jersey and broke ground in 1871.¹¹⁸ The value of GPC's specialized workforce was evident by their very presence, though, at the same time, practical experience, skill, and know-how did little to alleviate degraded working conditions. The Chinese crew lived in a farmhouse that also served as a dynamite packinghouse.¹¹⁹ Judson partnered with an East Coast chemicals works, creating the Butterworth & Judson Company in 1871. Located at the junction of the Morris & Essex Canal, the Newark & New York Railroad, and the Passaic River, the new firm's nitrating house was among the first plants to locate at the recently reclaimed and "improved" Newark Meadowlands.¹²⁰ Judson created an autonomous and proprietary supplier in order to profitably provide Atlantic Giant with scarce or otherwise unavailable chemical inputs, modeling the new supply chain on his California original (Figure 3.3).

"The practices indulged in during the period would turn the hair of a modern powderman white," according to one description of the early operation of the Kenvil plant.¹²¹ The superintendent allegedly laid his cigar, between puffs, on a board resting on top of a nitroglycerin wash tank and permitted smoking throughout the factory. In the dynamite mixing room, workers laid cartridges of dynamite around a red-hot stove to prevent it from freezing during winter months. Chinese workers dipped cartridges of dynamite into pots of stearic acid simmering on a kitchen stove.¹²² Nevertheless, workers produced 84 tons of dynamite, as well as 55,000 electric detonators and 20,000 blasting caps, for the construction of the Misconnetcong Tunnel on the Lehigh Valley Railroad near Easton Pennsylvania, which introduced Giant Powder in the east in 1874 and helped GPC seize a national market, albeit ephemerally.¹²³

Slaying Giants

In America... competition has been keen, sharp, bitter. Legal decisions early opened the field to all by destroying the only persistent attempt at monopoly. American enterprise (another name for rashness where dynamite is concerned) which bids men rush into a business whether they know anything about it or not, had done the rest.

¹¹⁷ Atlantic Giant built a kieselguhr refinery by 1876. Drinker, *Treatise*, 69, 71.

¹¹⁸ Van Gelder and Schlatter, *History of Explosives*, 409.

¹¹⁹ The last Chinese employee returned to San Francisco in 1880. Van Gelder and Schlatter, *History of Explosives*, 482.

¹²⁰ Charles Platt, *Dover Dates, 1722-1922: A Bicentennial History of Dover, New Jersey* (Morristown, NJ: The Jerseyman Press, 1927), 220.

¹²¹ Van Gelder and Schlatter, *History of Explosives*, 482.

¹²² *Ibid.*, 482-83

¹²³ Account by Army Corps of Engineers Captain Alexander Mackenzie cited by Henry Drinker, *Treatise*, 303-15; Van Gelder and Schlatter, *History of Explosives*, 484.

California Powder Works, 1897¹²⁴

Chinese laborers chipped and chiseled, and bored and blasted for twenty-four hours a day but failed to penetrate the granite wall near Donner Pass in August 1866. After thirty days of backbreaking, often deadly work, the construction of Summit Tunnel had progressed only thirty feet. They attacked the tunnel from four different angles but the sluggish rate only decreased during the following two months. Charges of black powder backfired out of boreholes like gunshots without disturbing the surrounding rock, according to a railroad engineer. While the most daunting, Summit Tunnel was only one of fifteen tunnels planned by the Central Pacific but stymied by the igneous impenetrability of the Sierran batholiths.¹²⁵

Before Nobel patented dynamite, J. Bandmann invited Central Pacific officials to a demonstration at Hunter's Point, an isolated corner of southeast San Francisco.¹²⁶ He poured two pounds of Nobel's nitroglycerin Blasting Oil into a narrow hole drilled nine feet into a boulder the size of a school bus. The detonation splintered the rock, throwing it entirely from its bed. Bandmann then hammered drops of nitroglycerin on an iron slab in a failed attempt to ignite or explode the oil. The display of destructive powder and seeming safety immediately converted the railroad officials. The Central Pacific ordered a dozen cases of Nobel's Glonoine. Each case contained four tins, and each tin held twenty-five pounds of nitroglycerin. Bandmann packed the cases in wooden crates, using sawdust for insulation, and shipped the nitroglycerin to the Sierra. Under Bandmann's supervision, Charles Crocker and a team of Central Pacific engineers tested the oil, blasting roadbeds and boring tunnels by detonating up to a case of nitroglycerin at a time. Bandmann had just begun writing an advertisement for Nobel's Blasting Oil based on the railroad company's glowing reviews when the nitroglycerin explosion at the Wells Fargo building rocked San Francisco. An ensuing public backlash quickly suspended Bandmann, Neilson & Co's trade.¹²⁷ The urgency of the Central Pacific's race to beat the Union Pacific Railroad to Utah, however, trumped popular opinions or public perceptions concerning the danger of nitroglycerin.

The chemical formula of nitroglycerin was no secret among chemists but the manufacturing process was. Crocker sought out California's most talented chemist, a Scot named James Howden, to "take this literal devil and deprive him of his horns."¹²⁸ Through a protracted process of experimentation and learning-by-doing, Howden mastered large batch production of nitroglycerin, problem solving on the fly in the Sierra Nevada. "He commenced some few months ago to experiment in the manufacture of nitro glycerine, and after many tests

¹²⁴ California Powder Works, "Hercules Powder: Sporting, Cannon, and Mining Powder," (California Powder Works, 1897), Trade Catalogue Collection—Hagley Imprints, index.cpc, Hagley Museum and Library, 25; Dean Ivey, "The Beginnings of the High Explosives Industry in the United States," 17, Research Reports, 1953-1978, MS1643 43.pdf, Hagley Museum and Library.

¹²⁵ John Gilliss, "Tunnels of the Pacific Railroad," *Van Nostrand's Electric Engineering Magazine* April 1870, 421; Norman Tutorow, *The Governor: The Life and Legacy of Leland Stanford, a California Colossus*, vol. 1, (Spokane, WA: Arthur H. Clark Co., 2004), 251; Van Gelder and Schlatter, *History of Explosives*, 1098.

¹²⁶ "Nobel's Patented Blasting Oil," *Daily Alta California*, April 18, 1866, 1.

¹²⁷ Bandmann, "Biographical Materials," 6, 10; "Nitro-Glycerine," *Daily Alta California*, November 25, 1866, 2.

¹²⁸ "Letter From Donner Pass," *Sacramento Daily Union*, April 19, 1867, 2.

and trials and loss of time, he has finally brought the compound into practical and entirely successful use up here,” according to one newspaper correspondent.¹²⁹

By January 1867, red flags surrounded Howden’s crude nitroglycerin factory, a mere shed’s roof suspended on four posts over an old kettle that he used for chemicals processing near Summit Tunnel’s central shaft. He had the glycerin and acids transported by train and then hauled fifteen miles by mule wagon to his makeshift factory. Howden combined twenty-two pounds of sulfuric acid and eleven pounds of nitric acid in a large stoneware jar immersed in snow. When the temperature of the mixture dropped to thirty-two degrees, he added seven pounds of glycerin and slowly stirred the mixture. An assistant then began whirling a broad stick in a large tub of water, creating a vortex into which Howden poured the chemical compound. During the “wash,” the insoluble nitroglycerin sank to the bottom of the tub and workers poured out the spent acids with the water.¹³⁰ Chinese laborers soon mixed batches of nitroglycerin at Howden’s behest. Howden reportedly began drinking to excess within a few months and Chinese crews began independently mixing nitroglycerin at tunnel shafts and railheads.¹³¹

Except for white foremen, Chinese composed the vast majority of the Central Pacific’s workforce.¹³² Typically organized into gangs numbering thirty or forty, Chinese laborers carried tin boxes full of nitroglycerin to tunnel headings and poured it through iron pipes into holes they had drilled by hand. Nitroglycerin was highly toxic; ingestion of one drop caused pervasive and violent headache, several more drops led to muscle spasms, lockjaw, and a speedy death, according to the prevailing medical wisdom.¹³³ Trial-and-error blasting methods and accidental explosions maimed and killed untold hundreds. Railroad workers learned quickly, or paid dearly. These dangers and deaths posed little concern for railroad officials, who delighted in the economy of cheap labor and the efficacy of high explosives.¹³⁴ With two thousand detonations during two months, gangs of Chinese laborers bored through 1,650 feet of granite and completed Summit Tunnel.¹³⁵ Central Pacific engineers concluded that nitroglycerin doubled the effectiveness of black powder, easily compensating for higher production costs. By the spring of 1867, Central Pacific Railroad counsel Judge Edwin Crocker wrote to Collis P. Huntington, exuberantly reporting on his brother’s progress: “Hurrah! For nitroglycerine.”¹³⁶

¹²⁹ Ibid.

¹³⁰ Ibid.

¹³¹ Robert West Howard, *The Great Iron Trial: The Story of the First Trans-Continental Railroad* (New York: G. P. Putnam’s Sons, 1962), 221-2.

¹³² The completion of the Central Pacific in 1869 released a formidable number of Chinese construction workers trained in tunneling, drilling, and handling high explosives. Working for half the price (typically \$1.50 per day) of their Anglo counterparts, they spurred intense competition at Western resource extraction sites. Saxton, *Indispensable Enemy*, 58.

¹³³ “Letter From Donner Pass,” *Sacramento Daily Union*, April 19, 1867, 2.

¹³⁴ Howard, *Great Iron Trial*, 221-222; Van Gelder and Schlatter, *History of Explosives*, 391, 408.

¹³⁵ Gilliss, “Tunnels of the Pacific Railroad,” 421; “Letter From Donner Pass,” *Sacramento Daily Union*, April 19, 1867, 2.

¹³⁶ Cited by Tutorow, *The Governor*, 253.

Tacit knowledge and practical mastery of nitroglycerin production proved an invaluable asset. Fresh off his successes with the Central Pacific, the CPWC (California Powder Works Company) hired Howden to develop a challenge to Giant Powder. Competition with dynamite had weakened California's oldest gunpowder company. For hardrock mining, Giant Powder was unexcelled at any price and black powder sales suffered immediately. CPWC promised Howden a free hand, providing capital, inputs from the Santa Cruz mill, and ten percent of gross sales. In return, Howden created the Hercules Powder Works, a CPWC subsidiary, and built a nitroglycerin factory near the southeastern corner of Golden Gate Park.¹³⁷ Moreover, Howden and his brother created the Golden Gate Chemical Works, creating a supply chain modeled after Judson's San Francisco Chemical Works and GPC.¹³⁸ CPWC entered the high explosives market as early as 1869, after Howden mixed nitroglycerin with mealed black powder. This Black Hercules Powder was a deficient product but, costing just \$.50 per pound, it forced GPC to reduce Giant Powder prices by almost sixty percent (from \$1.75 to \$.75 per pound).¹³⁹ GPC quickly retaliated with the first of at least eleven patent infringement suits filed in federal courts on both coasts.¹⁴⁰

With Black Hercules Powder under patent litigation, Howden developed a new product initially named White Hercules but soon branded as Hercules Powder. Unlike Giant Powder's inert kieselguhr base, Howden impregnated nitroglycerin into a solid secondary explosive (magnesium carbonate), which amplified the explosive power of nitroglycerin.¹⁴¹ Containing only one-half as much nitroglycerine as Giant Powder, Howden's *active base* dynamite was cheaper yet nearly equipotent to the original kieselguhr dynamite. By 1871, close to thirty Western gold, silver, and coal mining companies had adopted Hercules powder, according to one report.¹⁴² The new dynamite prospects precipitated Bank Ring investments in 1871, increasing CPWC's capital from \$300,000 to \$450,000, and then to \$1 million during the following year. After Howden's untimely death in 1874, CPWC employee Joseph Willard usurped Howden's letters, papers, plans, and other intellectual property and quickly patented Hercules Powder on behalf of the powder works, thus commercializing a new grade of high explosives.¹⁴³

To many chemists, the commercialization of active base, or "active dope," dynamite seemed untenable. One expert explained that linking nitroglycerin to a subsidiary explosive "would be like attempting to quicken the electric current by coupling it to the velocity of a

¹³⁷ Howden built the factory on land owned by CPWC president John Baird located on Central Road near Fourth Avenue in today's Haight-Ashbury district. Van Gelder and Schlatter, *History of Explosives*, 408, 498-99; "Explosion at the California Powder Works," *Daily Alta California*, October 7, 1870, 1; "Nitro-Glycerine Explosion," *Daily Alta California*, December 22, 1872, 1; "The Explosion," *Daily Alta California*, June 23, 1872, 1; "Howden's Patent," *Daily Alta California*, June 6, 1893, 10.

¹³⁸ Van Gelder and Schlatter, *History of Explosives*, 499.

¹³⁹ Van Gelder and Schlatter, *History of Explosives*, 408

¹⁴⁰ Stevens, "The Powder Trust," 462; Van Gelder and Schlatter, *History of Explosives*, 420-21.

¹⁴¹ Walke, *Course of Instruction*, 30.

¹⁴² "The Mechanic's Fair," *Dial Alta California*, August 16, 1871, 1.

¹⁴³ "Howden's Patent," *Daily Alta California*, June 6, 1893, 10.

locomotive.”¹⁴⁴ Nobel had patented a nitroglycerin and gunpowder mixture as early as 1863, yet it was imbricated with his development of a detonator, rather than as a stand-alone type of high explosive. Although Nobel is credited with making the first active base dynamite, Howden, Judson, and several other American powdermen and chemists recognized the potential of active bases and new grades of dynamite to fill the wide gap between the slow action of mechanical gunpowder and the brisance of chemical dynamite.

The advent of Hercules Powder fomented a frenzy of competition in the incipient dynamite industry. Rather than jostling for advantages in commodities markets or seeking market share by under-pricing competitors, upstart explosive companies harnessed experimental and unspooling technology in search of new goods, manufacturing techniques, and production processes. Through experimenting with vast combinations and permutations of absorbent bases—wood pulp, rosins, asphalt, coal, barley and wheat flour, and so forth, as well as a suite of chemical compounds—new companies sought to develop novel types of active base dynamite to fill the wide gap between black powder and keiselguhr dynamite. Rather than exploring new scientific frontiers, however, the great impetus for rapid innovation and diversification revolved around legality. That is, attempts to circumvent GPC’s patents structured competition and innovation in the early U.S. high explosives industry.

U.S. manufacturers took the lead in the developing and diversifying graded and active base dynamites, in which a portion of the nitroglycerin was replaced by a lower explosive compound, which acted as both an absorbent and a secondary explosive. Beginning with Hercules Powder, a slew of innovative and imitative dynamites hit the market. Judson developed and patented an active base dynamite for GPC known as Giant Powder No. 2, which contained forty percent nitroglycerin and competed directly with Hercules Powder (Dynamite No. 2 soon became a generic term for active base dynamites containing around forty percent nitroglycerin). CPWC, in turn, developed Hercules Powder No. 1, a seventy-five percent nitroglycerin powder competing directly with the original dynamite or Giant Powder, known as Giant Powder No. 1. As one indication of innovative activity, the U.S. government issued over one hundred patents for explosive compounds and kindred products, not including reissues, between 1865 and 1880.¹⁴⁵

Most significant of all the new graded high explosives was Judson Powder, “perhaps the first real American contribution to the dynamite industry.”¹⁴⁶ Rather than a discrete invention or single act of genius, Judson Powder was the product of incessant shop floor experimentation with new combinations of existing materials and new manipulations of known manufacturing techniques. Judson claimed to have constantly tinkered in the Giant Powder factories in California and New Jersey, as well as in the Judson & Shepard Chemical Works in San Francisco:

With black powder I have tried nitro-glycerine. I have tried it with almost everything that would burn up. I have tried it with rosin and with coal tar; with all sorts of bituminous coal and anthracite coal, wood pulp, paper pulp, and gun-

¹⁴⁴ George Mowbray, *Tri-Nitro-Glycerin as Applied in the Hoosac Tunnel* (New York: D. Van Nostrand, 1874), 85.

¹⁴⁵ Drinker, *Treatise*, 99-107.

¹⁴⁶ *Atlantic Dynamite Co. v. Climax Powder Manufacturing Co.*, 72 F. 925, 928 (W.D. Penn. 1895).

cotton, and thousands of things that I have mixed it with. I have been mixing it for 10 or 12 years and tried everything.¹⁴⁷

Judson surrounded his workshop with fifty pails of water. He rebuilt his workshops with fireproof brick rather than flammable wood and switched from steel, to brass, and then to wooden implements in order to reduce sparks. He used a beef tallow bath sitting on an open flame to heat wrought iron pots full of sodium nitrate, ground coal, rosin, and asphaltum before developing steam-jacketed kettles.¹⁴⁸ Judson's experiments culminated on Halloween in 1876, when he patented his eponymous powder, which initially contained five percent nitroglycerin, and created an entirely new class of explosives later known generically as "Railroad Powder."

Judson Powder had the look and feel of black powder, yet the power and stability of dynamite. As opposed to using a secondary explosive as an absorbent, Judson coated individual grains of black powder with nitroglycerin. Unlike sticky, congealed dynamite, the new powder was "free-running." With a granular texture like black powder Judson Powder could be poured into deep boreholes and other tight spaces. At roughly the same price, it was far more powerful than black powder and safer, too. Significantly, Judson Powder produced a gentler, heaving explosion compared to the shattering effect of dynamite. The new powder was specialized for collapsing soft riverbanks at California's hydraulic mines, as well as for disjointing brittle coal seams in Pennsylvania's mining regions.¹⁴⁹

Judson incorporated the Judson Powder Company but its boundaries with the Giant Powder companies were porous. On both coasts, Judson Powder shared factory space and production processes with Giant Powder and Judson's chemical works (San Francisco Chemical Works and Butterfield & Judson Chemical Company) supplied his new firms, as well. Although a discrete corporation, Judson Powder's production, patent rights, licensing, and sales agreements remained fluid. For instance, Bandmann & Co. initially sold Judson Powder under the Giant Powder Company masthead.¹⁵⁰

In addition to Giant Powder No. 2 and Judson Powder, Nobel added to the Giant Powder product line with the conveyance of his U.S. patent for gelatinated nitroglycerin, known as Gelatine Dynamite, Gelignite, and blasting gelatin. By dissolving a nitrated fiber such as gun cotton, into gently heated nitroglycerin, and then mixing the compound with wood pulp or other agents, Nobel produced a powerful compound with the consistency of jelly and the color of honey. With a ninety-two percent nitroglycerin content, the new product was "undoubtedly the highest explosive known to mankind" and quickly spurred a new class of plastic gelatin dynamite.¹⁵¹ Thus, Bandmann, Neilson & Co marketed a comprehensive line of high explosives

¹⁴⁷ *Giant v. Vulcan*, vol. 2, 900-01.

¹⁴⁸ Van Gelder and Schlatter, *History of Explosives*, 487-8.

¹⁴⁹ Sir Frederick August Abel, (advertisement), *Mining Accidents and their Prevention*, (New York: The Scientific Publishing Company, 1889); Drinker, *Treatise*, 100-01; Manuel Eissler, *A Handbook of Modern Explosives* (London: Crosby Lockwood and Son, 1897), 62; Arthur Marshall, *A Short Account of Explosives* (Philadelphia: P. Blakiston's Son and Co., 1912), 44; Walter Snelling and Christian Storm, *Analysis of Black Powder and Dynamite*, Bureau of Mines Bulletin 51 (Washington: Government Printing Office, 1913), 64; Charles George Warnford Lock, *Practical Gold-Mining*, (London: E & F. N. Spon, 1889), 343-44.

¹⁵⁰ Advertisement, *Daily Alta California*, December 5, 1881, 2.

¹⁵¹ Drinker, *Treatise*, 90-9, 104; Walke, *Course of Instruction*, 30; "Powder," *Daily Alta California*, 7 Jul. 1889, 12.

under the Giant Powder Company masthead by the mid-1870s. Grades of high explosives ranging from Judson Powder to Giant Powder No. 1, to Giant Powder No. 2, to Gelatine Dynamite filled the gap between black powder and nitroglycerine (Figure 3.4). By way of illustration, the Mechanics Institute of San Francisco tested the strength of several GPC brands by detonating a charge of explosives underneath a thirty-pound iron ball. Giant Powder No. 1 threw the ball 683 feet, the ball flew 591 feet when blasted by Giant Powder No. 2, Judson Powder sent the ball a distance of 350 feet, and black powder flung the ball only forty seven feet.¹⁵² By the late 1870s, Giant and Hercules ran neck and neck, each company making and selling about 500 tons on the West Coast, and competition soon spilled into the east (Figure 3.5).¹⁵³

No one felt the competition more than the du Ponts and their GTA. Henry du Pont initially went on the offensive: “It is only a matter of time how soon a man will lose his life who uses Hercules, Giant...or any explosive of that nature. They are all vastly more dangerous than Gunpowder, and no man’s life is safe who uses them,” he warned in 1869.¹⁵⁴ But while decrying the inherent dangers of dynamite, and lobbying Congress for anti-nitroglycerin legislation, Du Pont began investing modest funds in CPWC, and acquired one-third interest in the company by 1871.¹⁵⁵ In doing so, Du Pont and the GTA initiated a twenty-five year process of leveraging, acquiring, and consolidating Bay Region technology and technique, and firms and factories. It began with the leading western black powder mill and quickly led to dynamite companies.

Both eastern and western gunpowder firms competed fiercely for valuable mining and construction markets in the Intermountain West. Du Pont orchestrated a ruinous price cutting campaign against CPWC in the Rocky Mountain Region and acquired a majority interest of CPWC stock in 1875.¹⁵⁶ To control competition in the states and territories of Utah, Wyoming, Montana, Colorado, and New Mexico—a territory known as the “Neutral Belt”—the GTA forced CPWC’s hand in an agreement allowing the GTA, putatively in consultation with agents of the California company, to determine minimum powder prices (under penalty of one dollar per keg payable in gold) in order to eliminate internecine price-cutting practices.¹⁵⁷ In 1880, CPWC renewed the agreement for five years with an added proviso that the members of the GTA would yield all markets in California, Oregon and Nevada and the territories of Arizona, Idaho, Washington, and Alaska, or British possessions west of the Rockies. In return, CPWC

¹⁵² *Report of the Twelfth Industrial Exhibition Under the Auspices of the Mechanics’ Institute of the City of San Francisco* (San Francisco: Thomas’ Cosmopolitan Steam Printing House, 1878), 176-78.

¹⁵³ James Steele, “Report on the Drug Market of San Francisco,” *Proceedings of the American Pharmaceutical Association at the Twenty-seventh Annual Meeting Held in Indianapolis, Ind., September, 1879* (Philadelphia: Sherman & Co., Printers, 1880), 636-7.

¹⁵⁴ du Pont, *E.I. du Pont de Nemours*, 121.

¹⁵⁵ Henry du Pont allegedly purchased CPWC stock in the name of his daughter, Sophie. Wilkinson, *Lammot Du Pont*, 250.

¹⁵⁶ Du Pont’s share reached over 43 percent valued at \$750,000. Ivey, “Beginnings,” 30; Thompson, *Trust Dissolution*, 148-49; Wilkinson, *Lammot du Pont*, 250.

¹⁵⁷ Chandler and Salsbury, *Pierre S. Du Pont*, 58.

agreed to refrain from exporting east of the Neutral Belt.¹⁵⁸ Thus, CPWC controlled one of seven black powder markets, which the GTA delimited and regulated through a series of compacts lasting until 1895.¹⁵⁹

CPWC dominated the Western black market, enduring as the only firm in the region by 1880. But despite their stranglehold on the Pacific Coast, competition with dynamite stunted the gunpowder industry; the value of annual gunpowder production had increased by only \$100,000 between 1870 and 1880.¹⁶⁰ Indeed, dynamite posed an inexorable threat to the Du Pont combination. Competition between Giant Powder and CPWC's Hercules Powder raged in California and the phenomenal growth of the high explosives industry spilled into the Neutral Belt and then into Midwestern and Atlantic states.

The introduction of Judson Powder in 1876 added a new dimension to the explosives market. In California, it made rapid inroads on the remaining black powder trade, hurting CPWC and Eastern black powder exports to the Pacific Coast. When Atlantic Giant made and marketed Judson Powder in the East, it cut into sales of Hercules Powder and encroached on gunpowder sales in the copper, coal, and iron mining regions.¹⁶¹ Lamot du Pont provided one indication of the threat posed by Judson Powder in a letter he wrote, but never sent, to Egbert Judson promising the withdraw of black powder makers from the western markets if Judson would pull his railroad powder from the east.¹⁶²

Competition crescendoed when CPWC trailed GPC towards the east. Joseph Willard, who had worked closely with James Howden in the original Hercules Powder Company, created a Hercules Powder plant in Cleveland in 1877, close to burgeoning copper and iron mines in the Great Lakes region. Harnessing the latest Bay Region technology and techniques, the Ohio branch plant manufactured 143,155 pounds of Hercules Powder within a year, and output then increased spectacularly, reaching 1.3 million pounds in 1880.¹⁶³ By this time, dynamite prices had decreased by about forty percent (since 1874), further undercutting the Powder Trust's profits.¹⁶⁴

California capitalists followed GPC straight to New Jersey, as well. "Silver King" John Mackay, who held close to \$100,000 in the two Giant companies' stock, acquired the U.S. rights to the Belgium Forcite Works' Swedish patent for a gelatin dynamite.¹⁶⁵ He incorporated the

¹⁵⁸ Stevens, "The Powder Trust," 447-48

¹⁵⁹ *Ibid.*, 452.

¹⁶⁰ *Ninth Census, 1870, Vol. III, Statistics of Wealth and Industry*, 44, *Tenth Census of the United States, Vol. II, Statistics of Manufacturers, 1880*, 93.

¹⁶¹ Ivey, "Beginnings," 29, 31-2.

¹⁶² Lamot Du Pont to Egbert Judson (unsent), July 2, 1882, cited by Ivey, "Beginnings." 30.

¹⁶³ Richard Edwards, "Hercules Powder Company," *Industries of Cleveland: Trade, Commerce and Manufacturers for the Year 1878*, (Cleveland: Richard Edwards, 1879), 147; Van Gelder and Schlatter, *History of Explosives*, 504, 518; Ivey, "Beginnings," 21.

¹⁶⁴ Ivey, "Beginnings," 31.

¹⁶⁵ The "Irish Silver Kings," James Fair, James Flood, John MacKay, and William O'Brien wrested control of the Consolidated Virginia Mine in 1872 and hit the richest of all the Comstock bonanzas, worth about \$150,000 (in 1870 dollars). In 1875, they created the Nevada Bank with a \$5 million capital and aligned with the "Big Four"

American Forcite Powder Manufacturing Company in 1883 and built a plant on a 450-acre site located only three miles north of Atlantic Giant's Kenvil factory. Judson advised and assisted a Forcite company official in constructing independent sulfuric and nitric acid plants near the new factory complex. American Forcite manufactured the first commercially practical gelatin dynamite in the U.S. and supplied not only New Jersey iron mines but also Bay Region financiers' Anaconda coppers mine in Montana.¹⁶⁶

According to Lammot du Pont, after CPWC introduced Hercules Powder in the Lake Superior iron and copper districts, the black powder market declined by ninety-five percent during the late 1870s. About one-half the powder mills in the East were forced to shut down. Prices of high explosives fell by forty percent during this period and dynamite outsold black powder by a ratio of three to one.¹⁶⁷

With patent litigation and technological barriers barring Du Pont's direct entry into the dynamite industry, competition in the east shifted from technological innovation to corporate combination as Du Pont attempted to form a dynamite trust in the image of the GTA. Lammot du Pont drafted the first attempted national consolidation in 1876. He proposed freezing all litigation, consolidating all patents into one holding company, and excluding all black powder firms except Du Pont and its "friends." With consolidation, Du Pont envisioned increasing dynamite prices by thirty percent and divided profits in a manner that illustrated the primacy of Bay Region firms—GPC would get about one-quarter of all proceeds, CPWC's Hercules Company would receive almost twenty percent, CPWC and Du Pont Company were slated to receive about fifteen percent each, Judson Powder Company would be entitled to almost ten percent, and allied black powder firms would divide the remaining ten percent.¹⁶⁸ After this attempt failed, Lammot initiated another effort in 1879 to consolidate all patents into one corporation, and then divided the U.S. among three companies in the West and four in the east, leaving the neutral belt wide open. Yet, GPC continued attacking all patents using nitroglycerin in the courts, and Du Pont's strategy to enter the dynamite market shifted from syndicating corporations to acquiring California technology and know-how.

Lammot du Pont led the eastern old guard into the dynamite business by learning and leveraging California technology. With Du Pont's interest in CPCW, Lammot gained access to the Hercules Powder plant in Cleveland, where he learned a great deal about dynamite production. Joseph Willard, the superintendent of the Cleveland plant, mentored Lammot, who visited frequently:

The overall layout of a dynamite factory, the placement of the several structures, their design and materials of construction, and the machinery and equipment

Central Pacific Railroad associates in order to supplant the Bank of California as the preeminent financial institution in the West. Fair, Flood, and MacKay collective owned \$270,000 worth of stock in the Giant and Atlantic Giant companies in 1880. San Francisco Board of Supervisors, "Subsequent Personal Property Assessment," *San Francisco Municipal Reports for the Fiscal Year 1879-80, Ending June 30, 1880* (San Francisco: W. M. Hinton & Co., 1880), 1002-03, 1006; Shoup, *Rulers and Rebels*, 232-35.

¹⁶⁶ Eissler, *Handbook*, 50-3; Van Gelder and Schlatter, *History of Explosives*, 453-61; "Powder Works Blow Up," *Daily Alta California*, November 10, 1886, 5.

¹⁶⁷ Ivey, "Beginnings," 21-22, 30, 32; Stevens, "Powder Trust," 462.

¹⁶⁸ Ivey, "Beginnings," 31-2.

contained in them were all matters which Lammot had now become familiar when he began putting down on paper his plans for the construction of a high explosives plant in the fall of 1879.¹⁶⁹

As technological barriers to entry gradually fell, a Supreme Court decision cleared the way for the unfettered manufacture of active base dynamite by 1880.¹⁷⁰ With legal barriers removed, Lammot sought to apply knowledge gleaned at the Cleveland plant to Du Pont dynamite production. More significantly, the acquisition of Bay Region factories and firms followed the application of California technology. Nevertheless, California actors and institutions remained largely at the helm of Du Pont's dynamite operations during the subsequent fifteen years.

Lammot du Pont formally entered the dynamite industry when Henry allowed him to resign from the Du Pont partnership and organize the Repauno Chemical Company in 1880, for which Du Pont and its leading friendly competitors, Laflin & Rand Powder Company and Hazard Powder Company (which Du Pont actually owned), furnished the capital.¹⁷¹ Not only did the new firm rely on CPWC technology and technique, but Hercules Powder plant manager, Joseph Willard, continued to impart skill and know-how to Lammot. In this instance, Willard provided experienced powdermen, including Hercules employees and his own relatives, to build and operate the new dynamite plant. With a new headquarters in Philadelphia and factory in Gibbstown, New Jersey, Repauno soon began modest production of Atlas Powder, a knock-off of Hercules Powder No. 2.¹⁷²

A year later, the Lammot contingency organized the Hercules Powder Company and acquired CPWC's Hercules Powder plant in Cleveland. Despite the change in ownership, the eastern firm retained CPWC's production processes, management organization, and sales structure until the mid-1890s.¹⁷³ Du Pont and its allies also began buying Atlantic Giant stock and acquired one-third of the company by 1882. Du Pont and Giant Powder leaders reorganized Atlantic Giant as the Atlantic Dynamite Company in 1882, with a capitalization of \$3 million. Yet, they incorporated the new firm in California and GPC leaders, including Judson, composed the entire board of directors. Moreover, the Atlantic Dynamite Company and GPC conspired to fix prices and divided profits made from sales on the Pacific Coast and in Central and South America until 1894.¹⁷⁴

In the east, an agreement between the Atlantic Dynamite, Judson Powder, Repauno, Hercules Powder, Du Pont, Hazard, and Laflin & Rand companies set the boundaries of the

¹⁶⁹ Wilkinson, *Lammot Du Pont*, 253.

¹⁷⁰ The ruling protected only Nobel's original kieselguhr dynamite. Van Gelder and Schlatter, *History of Explosives*, 421-22.

¹⁷¹ Lammot quickly abandoned his initial attempt at constructing a dynamite plant because of its close proximity to the Du Pont powder mills on the Brandywine River near Wilmington.

¹⁷² Chandler and Salsbury, *Pierre S. Du Pont*; Eissler, *Handbook*, 38; Stevens, "The Powder Trust," 462-64; Van Gelder and Schlatter, *History of Explosives*, 194, 562-68.

¹⁷³ Du Pont relocated the plant to Ashburn, Missouri in 1893. Van Gelder and Schlatter, *History of Explosives*, 519-20.

¹⁷⁴ "A Trust's Troubles," *San Francisco Call*, April 7, 1895, 13.

various members' districts, dictated dynamite output and prices, and standardized the percentages of nitroglycerin in each grade of dynamite.¹⁷⁵ The arrangement released each company's patents and the Atlantic Dynamite Company received forty-five percent of all profits on the combined sales of all the parties, which served as royalties and as a settlement of all past infringements claims.¹⁷⁶ This agreement largely consolidated and standardized the high explosives market in the east. The firms retained their trademarks and brand names because, as William du Pont explained to his cousin Lammot, "the more brands in the market in *supposed* opposition, the less inducement for outside people to go into the business."¹⁷⁷

In 1895, Du Pont interests created the Eastern Dynamite Company by merging Hercules Powder Company, Repauno Chemical Company, and Atlantic Dynamite Company. The New Jersey holding company, in effect, institutionalized the Powder Trust. Eastern Dynamite controlled dynamite prices and output, negotiated for distant markets, and completed an agreement with California companies that regulated the Neutral Belt. Like the GTA, Eastern Dynamite began to buy out its competitors, particularly new ones, such as MacKay's American Forcite Powder Company.¹⁷⁸ Unlike the GTA, it purchased stock in its own name because it was a holding company, rather than a trust. Despite the Du Pont's role in facilitating and orchestrating the "Powder Trust," California technology and management largely undergirded the eastern high explosives industry until the mid-1890s.

The Dynamite District

Dynamite, the most common of high-powered explosives, was introduced into the United States at a small factory situated in what is now Golden Gate Park, San Francisco... The story of its subsequent manufacture in this state furnishes a superb example of trade enterprise and aggression, that resulted in the opening of the markets of the world to the California product.

San Francisco Chronicle, 1913¹⁷⁹

While Du Pont began leveraging California technology and techniques, and consolidating California firms and factories, Bay Region companies dominated the national high explosives industry. California possessed only seven of the nation's twenty-two dynamite manufacturers in 1880, yet these California companies accounted for about ninety percent of all capital investment and over seventy percent of aggregate national output. When including the Atlantic Giant Powder Company in New Jersey, California-based firms accounted for at least eighty percent of

¹⁷⁵ Ivey, "Beginnings," 33.

¹⁷⁶ Alfred Nobel sold his shares of both Giant companies in 1885, terminating his active participation in the U.S. high explosives industry. Chandler and Salisbury, *Pierre S. du Pont*, 61; Van Gelder and Schlatter, *History of Explosives*, 421, 490-91.

¹⁷⁷ William du Pont to Lammot du Pont, June 24, 1882, cited by Ivey, "Beginnings," 33.

¹⁷⁸ Chandler and Salisbury, *Pierre S. du Pont*, 61; Stevens, "Powder Trust," 462-3.

¹⁷⁹ Roy Sharpe, "Pioneering in High Explosives: The Story of California Dynamite," *San Francisco Chronicle*, November 23, 1913, 2.

total national output.¹⁸⁰ California dynamite manufacturers imported raw inputs, including potash from India, sodium nitrate from Peru, and sulfur from Italy and Japan, but the production of acids and nitroglycerin was a home industry. As early as 1882, California firms exported one-third of their total output (about 500 tons) to British Columbia, the Sandwich Islands (Hawaii), and Central America, predominantly Mexico.¹⁸¹ By 1890, only four of the nation's thirty-two high explosives plants remained in California but these plants accounted for fifty-six percent of aggregate capitalization and almost sixty-five percent of the value of all output.¹⁸² National statistics, however, efface a key geographical aspect of the national high explosives industry: the vast majority of California's dynamite production occurred within a fifteen-mile stretch of East Bay shoreline from unincorporated West Berkeley to the proto-company town of Hercules near Pinole in western Contra Costa County. From the 1870s to the '90s, the East Bay dynamite district formed the core of both the Metropolitan Bay Area's specialized chemical cluster and the nation's high explosive industry.

The Powder Trust's process of centralization in the east appeared neat and tidy compared to the riot of competition raging in the Bay Region's dynamite district. Innovation, accumulation, and competition opened a window of location freedom for San Francisco's pioneering dynamite manufacturers to leapfrog the bay in search of profits on the metropolitan periphery. In doing so, GPC and CPWC anchored a specialized industrial agglomeration—dynamite district—representing a tremendous concentration of capital, knowledge, and know-how.

GPC led the way to the East Bay after an explosion of nine tons of Giant Powder in January 1879 razed their second San Francisco factory. Bolstered by residents' strenuous objections to rebuilding the plant, the San Francisco Board of Supervisors ousted GPC.¹⁸³ The Judson & Shepard Chemical Works similarly came under attack by Mission District residents and faced prosecution in the city's criminal court to abate the nuisance of manufacturing chemicals in the vicinity of churches and in the midst of a thickly settled neighborhood.¹⁸⁴ Indeed, there is no better example of a "nuisance land use" than dynamite manufacturing (Figure 3.6). Governmental regulations and encroaching residents certainly forced GPC to flee San Francisco, yet GPC possessed a great capacity to capitalize on cheap, commodious land and permissive, tax-hungry county governments. With high capitalization, proprietary technology, a

¹⁸⁰ *Statistics of Manufacturers Tenth Census*, vol. 2 (Washington DC: Government Printing Office, 1880), 93, 132, 136, 152, *Report on the Manufacturers of the United States at the Tenth Census (June 1, 1880)* (Washington DC: Government Printing Office, 1883), 1012.

¹⁸¹ Hittell, *Commerce and Industries*, 707-08.

¹⁸² Census Office, Department of the Interior, *Report on the Manufacturing Industries of the United States at the Eleventh Census, 1890, Vol. VI, Pt. III* (Washington, D.C.: Government Printing Office, 1895), 100-03, 216-17, 290. By 1900, California possessed only seven percent the nation's high explosives factories, yet these plants accounted for one-quarter of the value of national output. *Census Bulletin No. 210: Manufacturers, Chemicals and Allied Products*, 70.

¹⁸³ "Giant Powder," *San Francisco Chronicle*, July 10, 1892, 13.

¹⁸⁴ "Alleged Nuisance of Chemical Works," *Daily Alta California*, December 15, 1876, 1; "A Supervisor's Blunder," *San Francisco Chronicle*, June 27, 1877, 3; "Acid Works," *Daily Alta California*, July 12, 1877, 1; "San Francisco Chemical Works," *Daily Alta California*, January 11, 1877, 3.

uniquely specialized workforce, and dedicated suppliers, GPC possessed great capacity to realize profitability on the metropolitan edge.

Within the broader framework of industrial suburbanization, the selection of a new factory site hinged on speculative property development. Specifically, Judson's suburban property holdings became the decisive factor when he sold GPC a \$20,000 commodious site at Fleming Point in unincorporated West Berkeley in 1879. Judson moved his chemical works to an adjacent tract on the San Francisco Bay in Alameda County.¹⁸⁵ The new factory complex sat on an oblong knoll elevated considerably above the bay and separated from main shore by a swath of marsh (Figure 3.7).

After trailing GPC to the east, CPWC dispersed to the East Bay in 1879. The company acquired a twenty-two-acre tract on San Pablo Bay near the town of Pinole in Contra Costa County, located just fifteen miles north of GPC's West Berkeley factory. CPWC soon concentrated all dynamite production in its massive modern Hercules Powder plant, and eventually acquired a magnificent tract of 3,000 acres extending some two miles into the eastern foothills. The new Hercules plant soon became one of the largest in the world and exports from Pinole reached every state west of the Mississippi, as well as British Columbia, Canada, and Mexico. In 1900, the firm orchestrated the incorporation of the town of Hercules in order to protect the plant from new Contra Costa County land use ordinances.¹⁸⁶

San Francisco's third and final dynamite manufacturer fled the city but relocated across the Golden Gate in Marin County, as opposed to the East Bay. After Andrew Sharon replaced his brother William as the Bank of California's agent in Virginia City, he partnered with Charles Fish, who was a leader of the Nevada Bank and of the prolific Consolidated Virginia mine. They organized the Vigorite Powder Company in 1877. At a plant near (the impending) Golden Gate Park in San Francisco, powdermen experimented with new absorbents, including ground peas and sawdust. "Silver King" James Fair successfully tested the Vigorite Powder at the Consolidated Virginia mine at the Comstock Lode but production of the powder proved prohibitively expensive. Leaders of the firm then introduced wood pulp as an absorbent in active base dynamite. Vigorite built a new factory at California City in Marin County (now Tiburon) and manufactured two grades of powder by 1879. Vigorite supplied powder to construct San Francisco sea walls and Marin County railroads, as well as to mining enterprises in California, Nevada, and Mexico. Vigorite eventually relocated its plant to a seventy-acre tract previously occupied by the Warren Powder Company on Point Isabel, just one mile north of GPC's Flemming Point site.¹⁸⁷

¹⁸⁵ The property is now Golden Gate Fields horseracing track in Albany. Judson subsequently sold GPC another site near Truckee in the Sierra Nevada, where GPC built a black powder plant to more effectively compete with CPWC. John L. N. Shepard, "Notes Furnished by J.N.L. Shepard Concerning the Life and Interest of Mr. Egbert Judson. San Francisco, Oct. 28, 1886," The Hubert Howe Bancroft Collection, Bancroft Library, University of California, Berkeley; "Manufacture of Powder," *San Francisco Chronicle*, October 20, 1895, 5.

¹⁸⁶ Hittell, *Commerce and Industries*, 710; Mae Fisher Purcell, *History of Contra Costa County* (Berkeley: Gillick Press, 1940), 646; Van Gelder and Schlatter, *History of Explosives*, 505-08.

¹⁸⁷ Michael Makley, *John Mackay: Silver King in the Gilded Age*, (Reno: University of Nevada Press, 2009), 113, *The Infamous King of the Comstock: William Sharon and the Gilded Age in the West* (Reno: University of Nevada Press, 2006), 111; W.R. Quinan, "Publisher's Department: Report on Vigorit Powder," *Overland Monthly and Out West Magazine*, August 1881, 1-20; Roy Sharpe, "Pioneering in High Explosives: The Story of Dynamite in California," *San Francisco Chronicle*, November 23, 1913, 2; Van Gelder and Schlatter, *History of Explosives*, 422,

Flows of capital, knowledge, and labor created a Bay Region high explosives agglomeration that operated on the metropolitan scale. However, due to the experimental nature of dynamite production, spatial proximity proved key for the creation of the East Bay dynamite district, where interaction and innovation was most clearly expressed through competition and spin-offs.

In 1871, L.L. Robinson split with GPC and helped finance the Vulcan Powder Company. The firm hired Robert Warren, a nitroglycerin manufacturer who fled Massachusetts after an injunction obtained by Atlantic Giant ended his production of Warren's Powder. For a purported \$20,000 salary for one year, Vulcan hired him to construct a small plant on the Truckee River, two miles outside Reno, Nevada in 1878 to capitalize on Sierra gold and Comstock silver mining. A year later, the firm bought 250 acres of marshland near San Pablo (contemporary Richmond), about five miles north of GPC's West Berkeley plant. Workers constructed a levee five-feet high and eight-feet wide to protect the new factory, which was located on San Pablo Creek and allowed a thirty-ton sloop to approach the company's wharf. Vulcan Powder Company reached the height of its prosperity in the late 1880s, when it supplied powder for the Sutro Tunnel at the Comstock Lode and other mines and railroads. Vulcan Powder exports reached Central and South America, the Hawaiian Islands, and Australian colonies before the firm suffered from over-expansion and dwindling trade during the 1890s, when Vigorite Powder Company acquired all its capital stock. Warren had spun-off his own firm, Warren Powder Company, which manufactured a variant of Vulcan Powder during the early 1880s at a Point Isabel factory. After the courts opened-up dynamite production, Warren abandoned the factory and assumed leadership of the Vulcan Dynamite Company of Pennsylvania, located near Allentown, which soon sold out to the Reapauno Chemical Company.¹⁸⁸

Vulcan Powder spun off another firm in 1881, after Orlando Hardy of Akron, Ohio came to California and introduced a Judson Powder knock-off. What Hardy lacked in capital he compensated for with a contract to supply the Southern Pacific Railroad. Vulcan financed the construction of a small factory adjacent to their own and Hardy patented new dynamite and machinery before an explosion destroyed the plant. Vulcan then bought a narrow strip of land at Stege (contemporary Richmond) about a mile north of GPC's plant. Hardy housed all facets of powder production in a single, long building, which was sandwiched between the Eureka and Tonite powder companies. After operating for about a year and selling all the powder it could make, the factory blew-up, killing every employee. Vulcan then bought the neighboring Eureka plant and Hardy built a new factory, adaptively reusing the old buildings as much as possible. After a conflict over royalties, Hardy split with the Vulcan Powder Company and sold his patents to GPC, who sent him to manage GPC's British Columbia plant.¹⁸⁹

Robinson led a cadre of Bank Ring mining entrepreneurs in the creation of the Tonite Power Company in 1880. The new company built a factory at Stege and partnered with the

640-45; "Vigorite," *Daily Alta California*, December 9, 1876, 1; "Vigorit Powder," *Daily Alta California*, March 5, 1881, 3.

¹⁸⁸ Purcell, *Contra Costa County*, 646-47; Steele, "Report on the Drug Market," 637; Van Gelder and Schlatter, *History of Explosives*, 646-54; "Office of the Vulcan Powder Company, San Francisco, February 17, 1879," *San Francisco Chronicle*, February 22, 1879, 2.

¹⁸⁹ Van Gelder and Schlatter, *History of Explosives*, 650-51, 469; "Mors Subita," *Daily Alta California*, March 28, 1882, 2.

Cotton Powder Company of England in order to mass produce nitrocellulose. Claiming superiority for the hot environments in the Sutro Tunnel and in Comstock Lode mines, Tonite Powder Company engaged in a vitriolic feud with Bandmann, Nielson & Co of the Giant Powder Company, which the San Francisco press covered in depth. While Tonite Powder perhaps had a tendency to spontaneously combust, its main trouble concerned increasing prices for imported specialized cotton inputs and decreasing prices of nitroglycerin. The Tonite factory closed in 1885 and then the California Cap Company acquired their site and buildings for detonator production.¹⁹⁰

Finally, banker Gustav Sutro, cousin of Comstock tunnel engineer and San Francisco mayor (1894-96) Adolph Sutro, bankrolled the Safety Nitro Powder Company in 1880. Their factory was at Point Pinole, a small peninsula jutting into San Pablo Bay about seven miles north of the west Berkeley site and four miles southwest of the company town of Hercules. It manufactured dynamite based on a formula that stabilized nitroglycerin for transporting. GPC acquired the firm in the early 1890s.¹⁹¹

Suppliers and kindred industries clustered in the East Bay, as well. Although some manufacturers integrated chemical processing into their dynamite production, numerous chemicals manufacturers followed Judson & Shpard Chemical Works to the East Bay. Both Vulcan and Vigorite powder companies spun off autonomous but proprietary chemical companies. Judson, Alvinza Hayward, Gustav Sutro of the Safety Nitro Powder Company, and Edward Lukens of the Vigorite Powder Company incorporated the Mission Fuse and Explosive Company, which manufactured fuses and blasting caps.¹⁹² By the turn of the century, Stege alone included Metropolitan Match Company, Union Super Phosphate Company, Pacific Cartridge Company, and several branches of the Stauffer Chemical Company (which resulted from a merger of Judson's San Francisco Chemical Works and Vulcan Powder Company's Western Chemical Company).¹⁹³

California Conflagrations

Paroxysms of competition and price-cutting among Bay Region manufacturers sent the price of dynamite plummeting to ten cents per pound, the lowest price in U.S. history. California firms soon formed a combination modeled after the Powder Trust. "Something of the kind appeared to be absolutely needed to prevent an illustration of the Darwinian theory of the survival of the fittest," one trade journal concluded.¹⁹⁴ The Giant, CPWC (Hercules), Safety Nitro, Vulcan, and Vigorit companies, along with six chemical works, formed a "Powder Pool"

¹⁹⁰ Eissler, *A Handbook*, 90-4; Van Gelder and Schlatter, *History of Explosives*, 654-5; Whitman Symmes, "How Dynamite is Made," *The Chemical Engineer* 5, no. 7 (May 1907): 366; "Tonite Powder," *Daily Alta California*, May 31, 1881, 1; "Tonite Powder," *Daily Alta California*, June 3, 1881, 1.

¹⁹¹ Van Gelder and Schlatter, *History of Explosives*, 446-47; "Safety Nitro Company," *Daily Alta California*, July 16, 1881, 1; "Life and Death of Gustav Sutro," *San Francisco Call*, March 3 Mar, 1897, 14.

¹⁹² "New Incorporations," *Daily Alta California*, October 21, 1887, 2.

¹⁹³ Hittell, *Commerce and Industries*, 706; Gerald Kutney, *Sulfur: History Technology, Applications & Industry* (Toronto: ChemTec Publishing, 2007), 14; Symmes, "How Dynamite is Made," 366.

¹⁹⁴ "Advance in Powder on the Pacific Coast," *The Engineering and Mining Journal* 38 (July 5, 1884): 5.

in 1884. The firms agreed to share all patents in the West and in the Neutral Belt, with the exception of Giant's U.S. patent for Nobel's blasting gelatin. Moreover, the three-year agreement fixed output and prices, and pooled and divided proceeds *pro rata* entitling GPC and CPWC to 37.5 percent each, Safety Nitro to 11.5 percent, and Vulcan and Vigorite to the remaining 13.75 percent.¹⁹⁵ The regional dynamics that created the East Bay dynamite district, however, precipitated the collapse of the Powder Pool. Shifting alliances among imperious capitalists, shuffling contracts to provided dynamite to mining companies, and embedded production processes and commodity chains created internecine competition that nearly imploded the West Coast high explosives industry.

On each coast, three discreet corporations were financially and functionally integrated in the production of dynamite under the auspices of the Giant Powder Company (GPC, Judson Powder Company, and the San Francisco Chemical Works in the East Bay; Atlantic Giant Powder Company, Judson Powder Company, and Butterfield & Judson Chemical Company in New Jersey). Judson's chemicals companies supplied inputs and Giant Powder and Judson Powder shared not only common supply chains but were also intertwined in the same production processes and on the same factory sites.

Judson began manufacturing and marketing new grades of his Judson Powder that contained up to twenty percent of nitroglycerin, whereas his original powder contained only five percent. The new products, known as Judson's F, FF, and FFF Powder, resembled low-grade dynamite, rather than Judson's original free-running railroad powder, and quickly encroached on Giant Powder sales. Consequently, Giant and Atlantic Giant Powder companies ramped-up production of several new lines of explosives to compete with regular and F-grades of Judson Powder. Atlantic Giant began producing a low-grade dynamite, known locally as "Slim Jim," in order to compete directly with the new, more potent Judson powders. After acquiring Orlando Hardy's patents, GPC in West Berkeley began manufacturing an improved type of free-running railroad powder known as Hardy's Powder. Further, both the East Bay New Jersey Giant Powder plants introduced innovative acid recovery systems installed by Alfred Nobel's agent (Dr. Jensen) when he taught the companies how to manufacture Gelatine Dynamite. Acid recovery plants concentrated "spent" sulfuric acid that had been used in nitroglycerin production. Vertical integration and new modes of efficiency reduced profits for Judson's chemicals companies. When GPC constructed its own nitric and sulfuric acid plants, Judson disposed of all his interest in the Giant Powder companies that he helped create.¹⁹⁶

At the age of seventy eight, Judson created his own dynamite company, initiating a "powder war" with GPC that nearly imploded the entire Western high explosives industry. Judson developed a new type of active base dynamite and gathered a group of mining entrepreneurs and experienced powdermen: "The present company is composed of men experienced in the manufacture, and also as mine owners, familiar with the uses and adaptation of explosives to various purposes," according to one report.¹⁹⁷ Judson incorporated the Judson

¹⁹⁵ Van Gelder and Schlatter, *History of Explosives*, 512; "An Exploded Pool," *Daily Alta California*, May 12, 1888, 1; "Explosion of Powder Pool," *Los Angeles Daily Herald*, May 27, 1887, 1; "Cheaper Powder," *San Francisco Chronicle*, January 9, 1891, 8.

¹⁹⁶ Platt, *Dover Dates*, 220; Van Gelder and Schlatter, *History of High Explosives*, 440-3, 489, 681-2; "How the Miner's Dynamite is Made," *Mining and Scientific Press*, March 2, 1907, 315.

¹⁹⁷ Editorial, *Industry* 3, no. 34 (May 1891): 159.

Dynamite & Powder Company on September 6, 1890 with a capital of \$2 million, of which Judson and Shepard each held over thirty percent. Key investors included Bank Ring financier Thomas Bell and Judson's Cerro Gordo partner Mortimer Belshaw. Edward Luken, who formerly managed the Vigorite Powder Company, became president of the new firm. Directors soon included Hayward and other preeminent mining entrepreneurs, creating links to far-flung extraction enterprises. For example, as the new firm was organized, Judson announced that he had already obtained contracts with several mining companies, including Anaconda Mining Company in Montana, a corporation that Judson and other Judson Dynamite Company directors owned.¹⁹⁸

The new firm acquired eighty-five acres stretching around the base of Albany Hill (now in Albany and the Richmond "annex"), located only a half-mile from GPC's West Berkeley across the Alameda, Contra Costa County border. The new firm constructed perhaps the largest powder works on the Pacific Coast. The factory complex on the north side of the hill included a nitroglycerin manufacturing plant, dynamite mixing house, and packing and boxing houses. Magazines, chemicals storehouses, a drying house for wood pulp (likely sourced from Judson's Pioneer Pulp Mill), and a power house sat on the west side of the hill. Chinese laborers constructed a joint office and laboratory, as well as a segregated boarding house, at the southwestern edge of the factory complex, near the Southern Pacific railroad tracks (Figure 3.8). The Judson & Shepard Chemical Works on Flemming Point easily supplied chemicals to the new dynamite company.¹⁹⁹

The Powder Pool soon dried up. "Eastern competition was fierce and there is prospective competition on this Coast, as the Judson Company is about to start manufacture of dynamite. The prices of powder are low enough, but they are likely to go lower," CPWC president claimed in 1891 while withdrawing his firm from the Western compact.²⁰⁰ Indeed, within a year dynamite prices plummeted to ten cents per pound, placing most Bay Region high explosives firms on the brink of bankruptcy.²⁰¹ The price war pitting Judson Dynamite against Giant Powder culminated with a bang.

Around 9:30 on a Saturday morning in July 1892, GPC's nitroglycerin factory exploded, throwing iron girders like javelins into the bay.²⁰² During the next six minutes of chaos and

¹⁹⁸ Dumas Malone ed., *Dictionary of American Biography* 10 (New York: Charles Scribner's Son, 1933), 23; Van Gelder and Schlatter, *History of Explosives*, 682-83; Editorial, *Industry* 3, no. 34 (May 1891): 159; "New Enterprises," *San Francisco Chronicle*, July 7, 1890, 16; "Millions of Capital," *San Francisco Call*, September 7, 1890, 4; "Joseph Knowland Sr. is Dead," *San Francisco Call*, November 14, 1912, 5.

¹⁹⁹ Van Gelder and Schlatter, *History of Explosives*, 683; Editorial, *Industry* 3, No. 34 (May 1891), 159; "Judson Powder Company," *Alameda County: The Eden of the Pacific; The Flower Garden of California* (Oakland: *Oakland Tribune*, 1898), 221; "The Late Egbert Judson," *Mining and Scientific Press*, January 14, 1893, 1.

²⁰⁰ "The Powder Pool," *Daily Alta California*, November 9, 1891, 5.

²⁰¹ Along with the new dynamite company, Judson interests incorporated the Western Fuse and Explosives Company, located in Fruitvale (later part of southwestern Oakland). The new fuse company participated in a three-company combination that monopolized the Wet Coast detonator industry and allegedly several Bay Region firms to better withstand lower profits during the "powder war." "Across the Bay," *San Francisco Call*, June 16, 1891, 8; "War on Fuse Compact Impending," *San Francisco Chronicle*, November 29, 1896, 31. Van Gelder and Schlatter, *History of Explosives*, 511; "The Late Egbert Judson," 1.

²⁰² Descriptions of the explosion drawn from, Joseph Baker, *Past and Present of Alameda County, California*, vol. 1, (Chicago: S.J. Clarke Publishing Co., 1914), 347; "Blown Sky High," *San Francisco Call*, July 10, 1892, 1, 7; "Giant Powder," *San Francisco Chronicle*, July 10, 1892, 13; "Powder Explosion at West Berkeley, July 9, 1892,"

confusion, blue and pink flames crept up a stream of spent sulfuric acid that flowed out of the nitration house. The concussion from the explosion of the nitration house detonated 350 tons of Giant Powder stored in a 45,000 square-foot brick magazine. As a new crater rapidly filled with bay water, 150 tons of black powder and several hundred pounds of dynamite housed in two adjacent magazines blew up. Smoke streaked with blue and pink vapor crested the hill as the Judson & Shepard Chemical Works burned to the ground. Chinese workers ran for the shoreline, lugging carboys of nitric acid that burst into red smoke and leaked trails of burning chemicals. The conflagration sparked acids in a drainage ditch, which acted like a fuse and detonated the lead-lined chambers in the powder works. The chain reaction continued as the Judson Powder mixing house, packinghouse, and magazine combusted. The explosion of the detonator warehouse blasted sheds and brick building into the bay. Stately managers' homes, neat rows of workers' cottages, Chinese laborers' dormitories, and residential hotels caught fire, while GPC's wharf burned above the bay.

Witnesses on the Oakland Long Wharf described a huge red moon rising on a cloud of smoke over the bay shore. They saw it burst like a balloon full of fire and twenty-five seconds later the first shock wave violently rattled trains and trolleys on the pier. A quick succession of four more shocks twisted the Southern Pacific railroad tracks into knots before shattering virtually every windowpane on the State College campus in Berkeley. One shock threw the needle off a seismograph in East Oakland. The shock waves jounced off the bay and wrenched massive iron doors off their hinges at the mint. The explosion smashed windows and rattled buildings fifty-five miles away in Healdsburg, Sonoma County. The West Berkeley explosions caused no damage in Sacramento, though they caused terrified people to flee state capital buildings.

The explosion at GPC's Flemming Point plant made national headlines. Despite relatively few fatalities (six), the media considered it the most extensive dynamite accident in U.S. history.²⁰³ Damages to GPC approached \$200,000, while the destruction of the Judson & Shepard Chemical Works added another \$150,000.²⁰⁴ Such financial losses became all the more devastating considering that powder companies carried no insurance. The property loss compelled Giant Powder to reorganize and relocate. GPC acquired the Safety Nitro Powder Company and reincorporated as Giant Powder Company, Consolidated (capitalized at \$5 million). With Berkeley and Oakland's strenuously objecting to rebuilding on the Flemming Point site, Giant Consolidated shouldered the expense of moving to Safety Nitro Powder Company's inactive plant on Point Pinole.²⁰⁵

The explosion had also thrown Judson from his buggy, which was trundling only 500 feet from one of GPC's magazines.²⁰⁶ Judson and John Shepard wasted little time suing GPC for

Publications of the Astronomical Society of the Pacific 4 (September 3, 1892): 187-90; "Manufacture of Powder," *San Francisco Chronicle*, October 20, 1895, 5.

²⁰³ "Five Were Killed," *Chicago Daily Tribune*, July 10, 1892, 2; "Mighty Force of Powder," *New York Times*, July 10, 1892, 1.

²⁰⁴ Van Gelder and Schlatter, 445.

²⁰⁵ Van Gelder and Schlatter, 446-47; "The Powder Works," *San Francisco Chronicle*, August 8, 1893, 4; "A New Powder Company," *San Francisco Call*, August 24, 1892, 3; "Manufacture of Powder," *San Francisco Chronicle*, October 20, 1895, 5.

²⁰⁶ "Death's Long Roll," *San Francisco Chronicle*, January 10, 1893, 12.

damages to their chemical works.²⁰⁷ Judson died well before the litigation ended but he issued a posthumous Parthian shot when the courts ruled in his favor. Giant lost all its land and interests in Alameda County in the \$46,000 assessment of damages, which was especially aggravating considering the Judson had originally sold Giant the land for \$20,000.²⁰⁸ According to former San Francisco mayor and Giant Powder Company president, Edward Pond:

Mr. Judson, who sold us the land and obtained a judgment in connection with Mr. Sheppard [sic.], was a large stockholder in the Giant Powder Company, and the Judson Chemical Company sold us more than half the sulphuric and nitric acids used in the manufacture of explosives. He knew for what purpose the land on Flemmings Point was to be used when he sold it to the company in which he was largely interested. But that is neither here nor there; if the decision stands the effect will be greatly to the disadvantage of the powder manufacturing industry of California...it is a blow below the belt of the industry.²⁰⁹

The threat of foreign opposition finally quenched the competitive conflagration raging in the dynamite district. In 1897, a German high explosives manufacturer and the Nobel-Dynamite Trust of London began constructing dynamite, black powder, and detonator factories near Jamesburg, New Jersey. Led by Du Pont, the American Powder Trust firms quickly negotiated an arrangement known as the “European Agreement,” which finally brought the Judson and Giant companies into the trust. The ten-year agreement divided the globe into four proprietary regions. All U.S. territories and possessions, as well as from Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, and Venezuela belonged to the U.S. companies. Other South American countries and the Caribbean Islands, save Spanish colonies, became “syndicated territory,” or common areas for all parties to the agreement. The Dominion of Canada and Spanish possessions in the Caribbean became a “free market,” unaffected by the agreement. European firms got the rest of the world. This created, in effect, a global Powder Trust.²¹⁰ The so-called Mexican Agreement followed within a year. CPWC, Judson Dynamite & Powder Company, and Giant Powder Company, Consolidated entered into a compact with the eastern Powder Trust’s eastern dynamite manufacturers regulating Western high explosives markets. The ten-year sales agreement required the withdrawal of the eastern Hercules brand from Mexico and divided the Neutral Belt among CPWC (forty percent), Giant Consolidated (twenty percent), Judson Dynamite & Powder Company (fifteen percent), and the eastern companies (twenty-five percent).²¹¹

²⁰⁷ “For Heavy Damages,” *San Francisco Chronicle*, August 10, 1892, 5.

²⁰⁸ “A Big Powder Works Deal,” *San Francisco Chronicle*, September 4, 1895, 14.

²⁰⁹ “Manufacture of Powder,” *San Francisco Chronicle*, October 20, 1895, 5.

²¹⁰ Stevens, “The Powder Trust,” 465-67.

²¹¹ Like the other syndicates, trusts, and agreements, the Mexican Agreement provided for a board of representative representing each of the firms involved. The board possessed judiciary powers and dictated output and prices. Stevens, “The Powder Trust,” 467-69; Van Gelder and Schlatter, *History of Explosives*, 512.

With these agreements came the virtual consolidation of the American dynamite industry and practical elimination of competition, which marked a broad shift from technological innovation to corporate syndication in the early high explosives industry. Du Pont secured control of all but ten of the companies in the Powder Trust by 1902. The Bay Region's Giant, Judson, and Vigorite companies remained autonomous, albeit briefly. Through the California Investment Company, Du Pont acquired the balance of CPWC stock and then absorbed and merged the Judson and Vigorite companies in 1904. Du Pont soon consolidated every dynamite manufacturer in the U.S. except for Giant Powder Company and one eastern firm (Aetna).²¹²

With mounting reform and overwhelming evidence, the federal government filed suit against Du Pont under the Sherman Antitrust Act in 1907. Litigation concluded in 1912 with a final decree ordering Du Pont to divest about half of its factory capacity and markets to two new firms, created to provide competition. One was Atlas Powder Company, which acquired Giant Powder Company, the first and last autonomous dynamite manufacturer in the West. While a subsidiary, Giant remained a separate corporate entity and continued production at Point Pinole until 1960. The other new firm, Hercules Powder Company, referenced the nation's second dynamite manufacturer. Du Pont retained its monopoly on military ordinance, which was seemingly integral to national security. Although the ruling divided Du Pont into three discrete firms, the final dissolution agreement negotiated by Du Pont and the Justice Department enabled the du Pont family to retain ownership of all three companies.²¹³

Du Pont swallowed the Bay Region's pioneering high explosives manufacturers and little physical evidence remains of the East Bay dynamite district. Urban growth has erased most vestiges of the California firms from the landscape, while scholarly research focusing on the Du Pont dynasty has obfuscated the crucial role of California technology in the burgeoning high explosives sector.

The nation's early dynamite industry originated in San Francisco, dispersed to the Atlantic Seaboard and Midwest, and clustered along a fifteen-mile stretch of East Bay shoreline. Initiated by the collaboration between Alfred Nobel and GPC, Bay Region technology and capital largely forged the national high explosives industry from the late 1860s to the early 1890s. Technological innovation, high profits, and fierce competition gave the Bay Region's early dynamite manufacturers great freedom for industrial expansion and factory relocation. GPC and CPWC depended little on the local production environment or extant industrial capabilities because these leading firms in the new and experimental dynamite industry necessarily had to create their own inputs and other factors of production. The suburbanization of specialized, innovative, and highly capitalized factories created the East Bay dynamite district. Rather severing connections to the urban core, however, flows of capital, knowledge, and know-how created an integrative metropolitan high explosives agglomeration. Through industrial suburbanization, the expansion of the dynamite industry also engendered metropolitan growth.

The East Bay dynamite district evinced the dynamic nature of Bay Region industrialization. Innovative firms created the dynamite district and, in turn, the spatial propinquity of numerous manufacturers perpetuated learning and localized technological

²¹² Chandler and Salsbury, *Pierre S. Du Pont*, 93-104; Stevens, "Powder Trust"; VanGelder and Schlatter, *History of Explosives*, 513.

²¹³ Davis and Sicilia, *Labor of Modern Hercules*; Hounshell and Smith, *Science and Corporate Strategy*, 11, 13; McNamee, "Du Pont-State Relations," 4-5; Stevens, "Dissolution of the Powder Trust"; VanGelder and Schlatter, 450-51.

dynamism, which is most clearly illustrated by competition and spin-offs. Further, individual human actors proved essential for collective learning and industrial coordination.

While the Bay Region's first dynamite manufacturers did not depend on the local production environment, the geography and structure of the early high explosives industry was uniquely a California creation, inextricably tied to boarder patterns of regional development, or prospector capitalism. Industrial specialization and geographic differentiation was linked directly to resource hinterlands through flows of capital, technology, corporation organization, and labor.

Dynamite was foremost a mining supply. Indeed, the *Alta California* quickly broadcast the significance of Giant Powder for the mining sector:

Any intelligent manager of sufficient knowledge and experience in quartz mining, may, in using Giant powder and China labor, make the same improvements and perform the same amount of work and in shorter time for the sum of \$1,500 than is now done at an expense of \$5,000, in using ordinary blasting powder and labor at \$3 per day.

Daily Alta California, 1869²¹⁴

Through both investment and corporate leadership, dynamite entrepreneurs and mining magnates were often one in the same. Interaction between San Francisco boardrooms, East Bay factories, and Sierra Nevada mines greatly influenced the development and differentiation of high explosives. Beginning with experiments at the Gold & Curry mine in 1868, Giant Powder quickly supplanted black powder for hardrock tunneling on the Comstock Lode.²¹⁵ Judson Powder was tailored for California's hydraulic mines. The Nevada Reservoir and Ditch Company used 50,000 pounds of Judson Powder to "thoroughly loosen" a bank of auriferous gravel two hundred feet above Sucker Flat, Nevada County in January 1879.²¹⁶ Several months later, workers at the Daraneles Hydraulic and Drift mine detonated 36,000 pounds of Judson Powder in a single blast, shattering some 500,000 cubic yards of cemented gravel.²¹⁷ The superintendent of Egbert Judson's Spring Valley mine in Butte County fired 25,000 pounds of Judson Powder during May 1880.²¹⁸ Miners at Judson's and other GPC director' Milton Mining and Water Company used 425,400 pounds of Judson Powder to collapse over 30 million cubic feet of riverbank at Manzanita Hill, Nevada County between 1870 and 1882.²¹⁹ These are merely a few examples how mining companies adopted specialized grades of high explosives in California's resource hinterlands.

²¹⁴ "Giant Powder in Quartz Mining," *Daily Alta California*, May 22, 1869, 2.

²¹⁵ Grant Smith, "The History of the Comstock Lode, 1850-1920," (Reno: Nevada Bureau of Mines and Mackay Scholl of Mines, University of Nevada, [1943] 1966), 245.

²¹⁶ Henry Hanks, *Second Report of the State Mineralogist of California, from December 1, 1880, to October 1, 1882* (Sacramento: State Office, 1882), 67.

²¹⁷ Hanks, *Second Report*, 67.

²¹⁸ *Ibid.*

²¹⁹ Augustus J. Bowie, Jr., *A Practical Treatise on Hydraulic Mining in California* (New York: D. Van Nostrand Company, 1895), 212.

In addition to the direct application of dynamite as a mining supply, the high explosives industry was ensnared in California's distinctive mode of regional capitalism and the broader process of resource industrialization. Reinvestment of mining profits financed the development of dynamite, which, in turn, enabled deeper, more efficient, and more profitable extraction activities in a virtuous circle of economic expansion fueled by feedback between resources rushes, capital accumulation (reinvestment), and industrial dynamism.

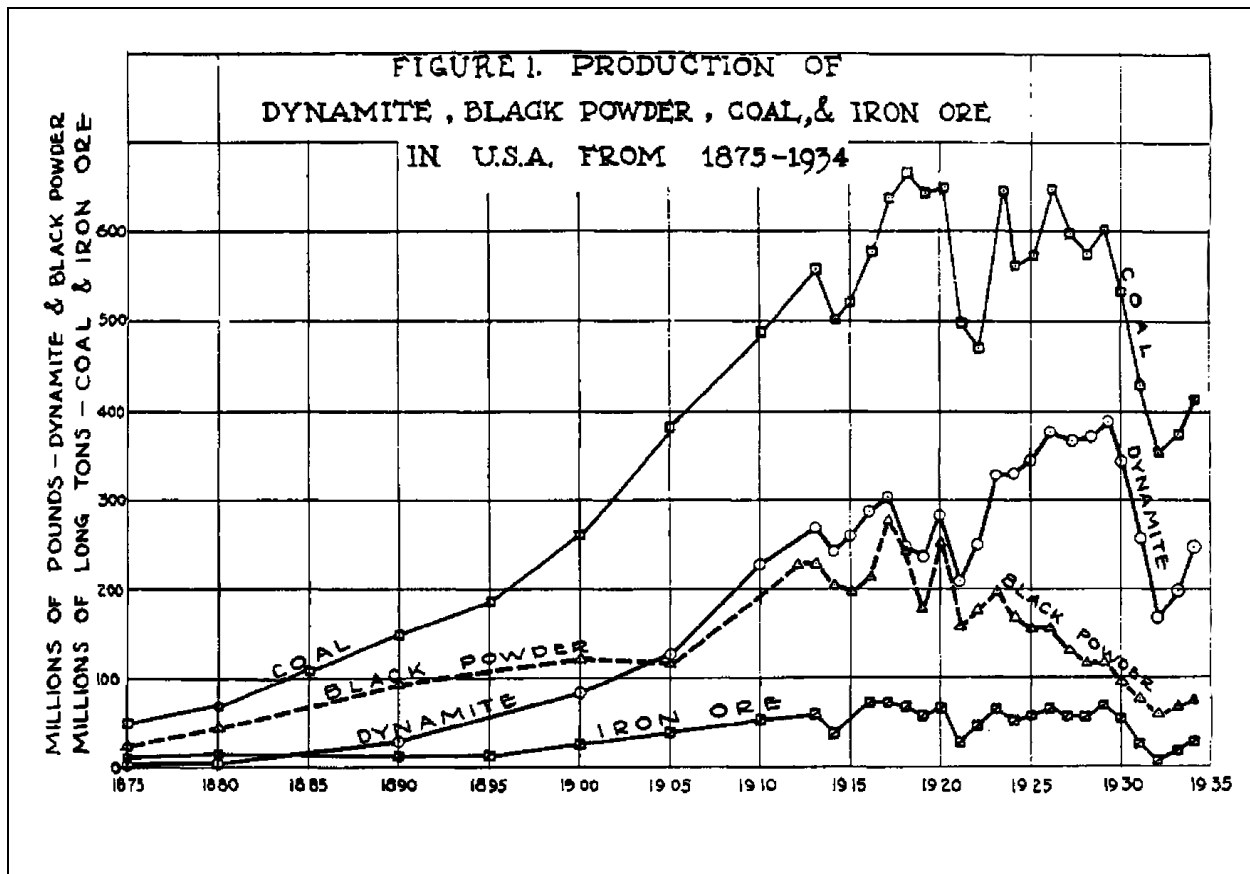


Figure 3.1. U.S. production of dynamite, black powder, coal, and iron, 1875-1935. Source: C. A. Woodbury and W. C. Holmes, "Commercial Explosives Industry," *Industrial and Engineering Journal* 27 (1935): 634.



Figure 3.2. The California Powder Works, located on the San Lorenzo River near Santa Cruz, Ca. "The California Powder Works; Santa Cruz County, California," no date, Britton & Rey Lithographer. Robert B Honeyman, Jr. Collection of Early Californian and Western American Pictorial Material, The Bancroft Library, University of California, Berkeley.

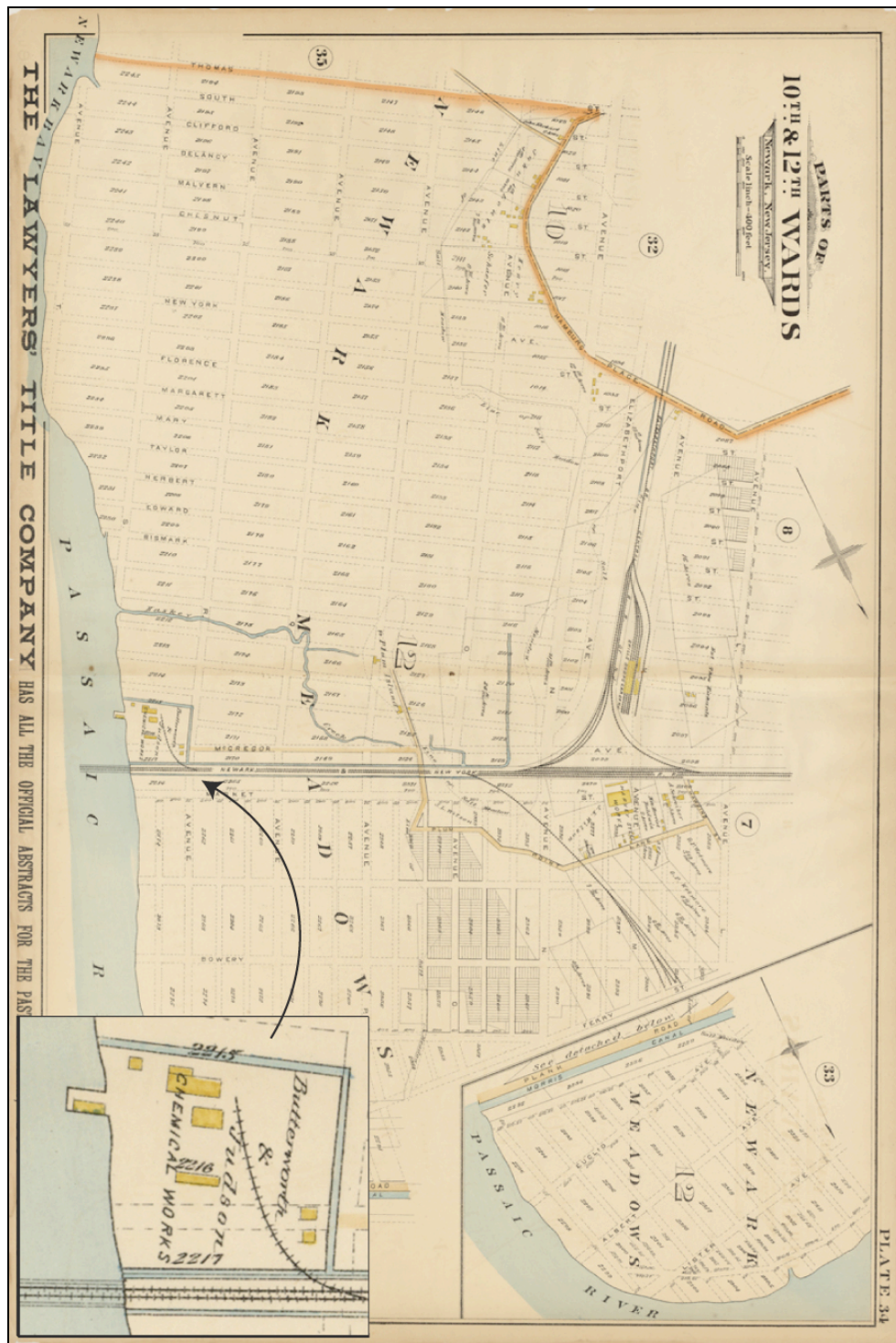


Figure 3.3. The Butterworth-Judson Company, 1887. Constructed in 1871, Butterworth-Judson was a pioneering firm at the Newark Meadowlands, located at the junction of shipping and rail lines. Source: *Atlas of the City of Newark, New Jersey; From Official Records, Private Plan & Actual Surveys, By Scarlett & Scarlett, Surveyors and Civil Engineers* (Newark, N.J.: Scarlett & Scarlett, 1887). Digital Archive of Newark Architecture, Barbara and Leonard Littman Architecture and Design Library, New Jersey Institute of Technology.

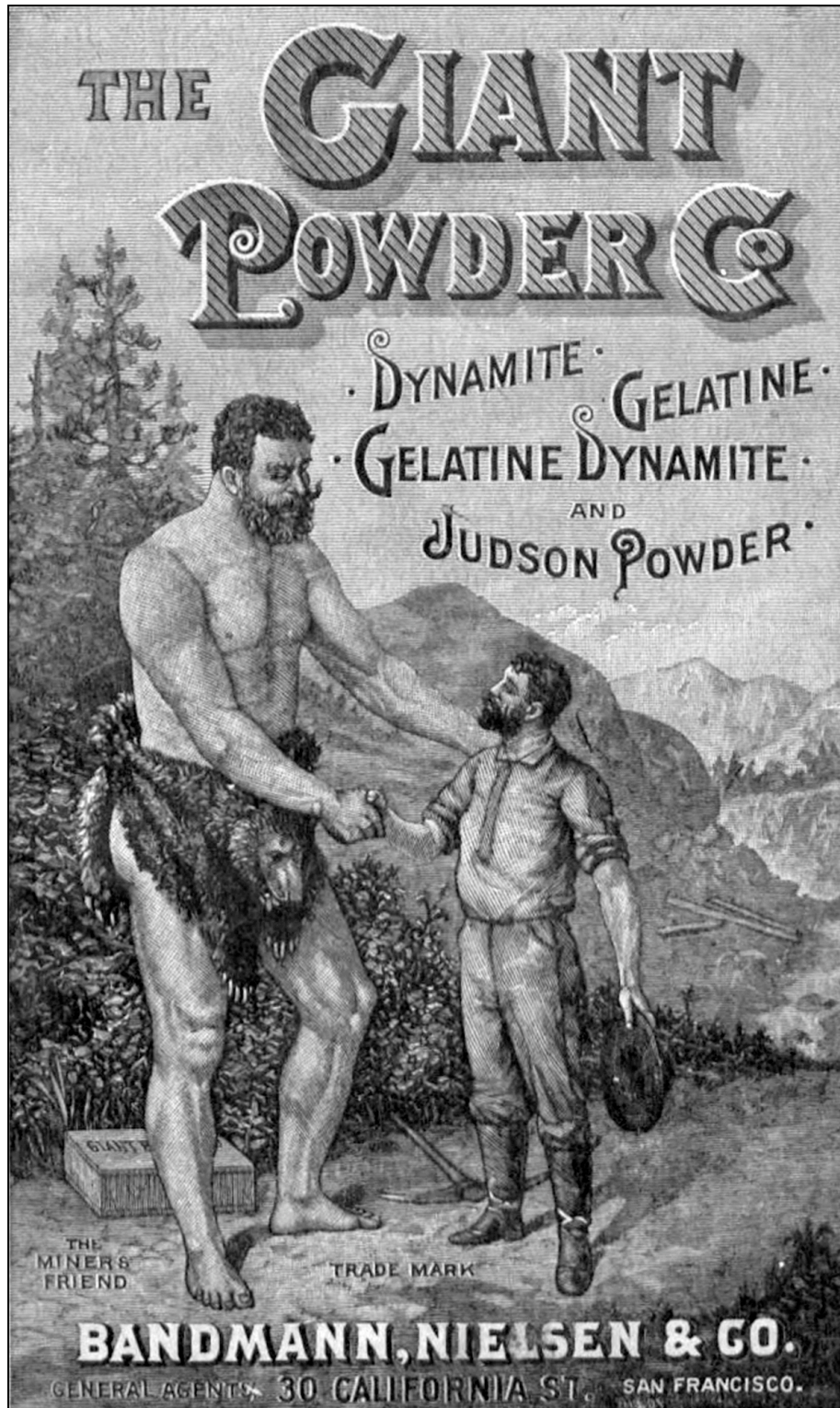


Figure 3.4. “The Miner’s Friend,” 1884. Giant Powder Company targets western mining companies in this advertisement for the latest Nobel innovations and Egbert Judson’s blasting powder. Source: Giant Powder Company, “Dynamite, Gelatine, Gelatine Dynamite, and Judson Powder, (Giant Powder Company, 1884(?), Trade Catalogue Collection—Hagley Imprints, index.cpc, Hagley Museum and Library, 1.

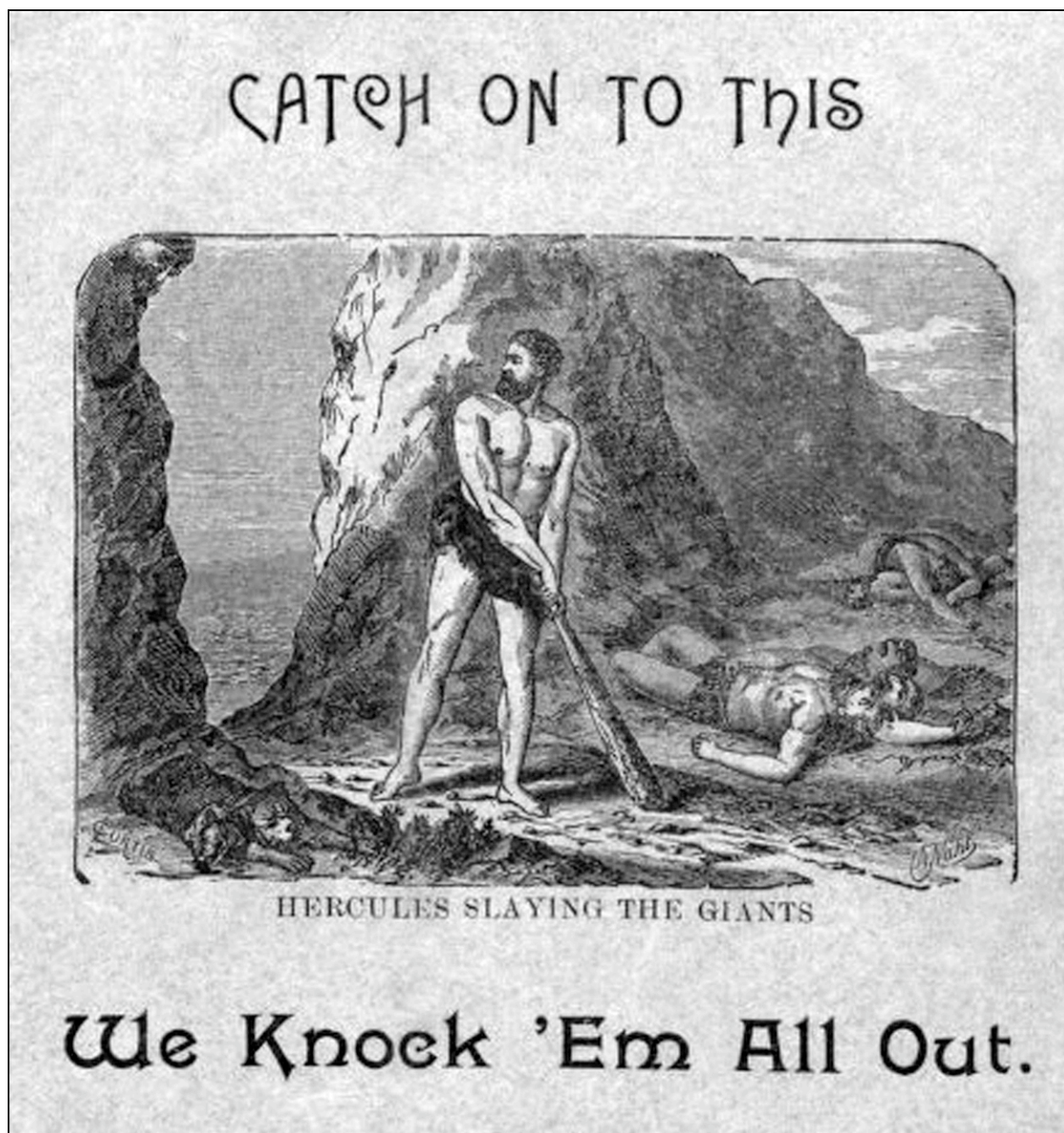


Figure 3.5. "Hercules Slaying the Giants," 1897. The fierce competition between the nation's first two major dynamite manufacturers is depicted in this California Powder Works Company advertisement for Hercules Powder. Source: California Powder Works, "Hercules Powder: Sporting, Cannon, and Mining Powder," (California Powder Works, 1897), Trade Catalogue Collection—Hagley Imprints, index.cpc, Hagley Museum and Library, 36.

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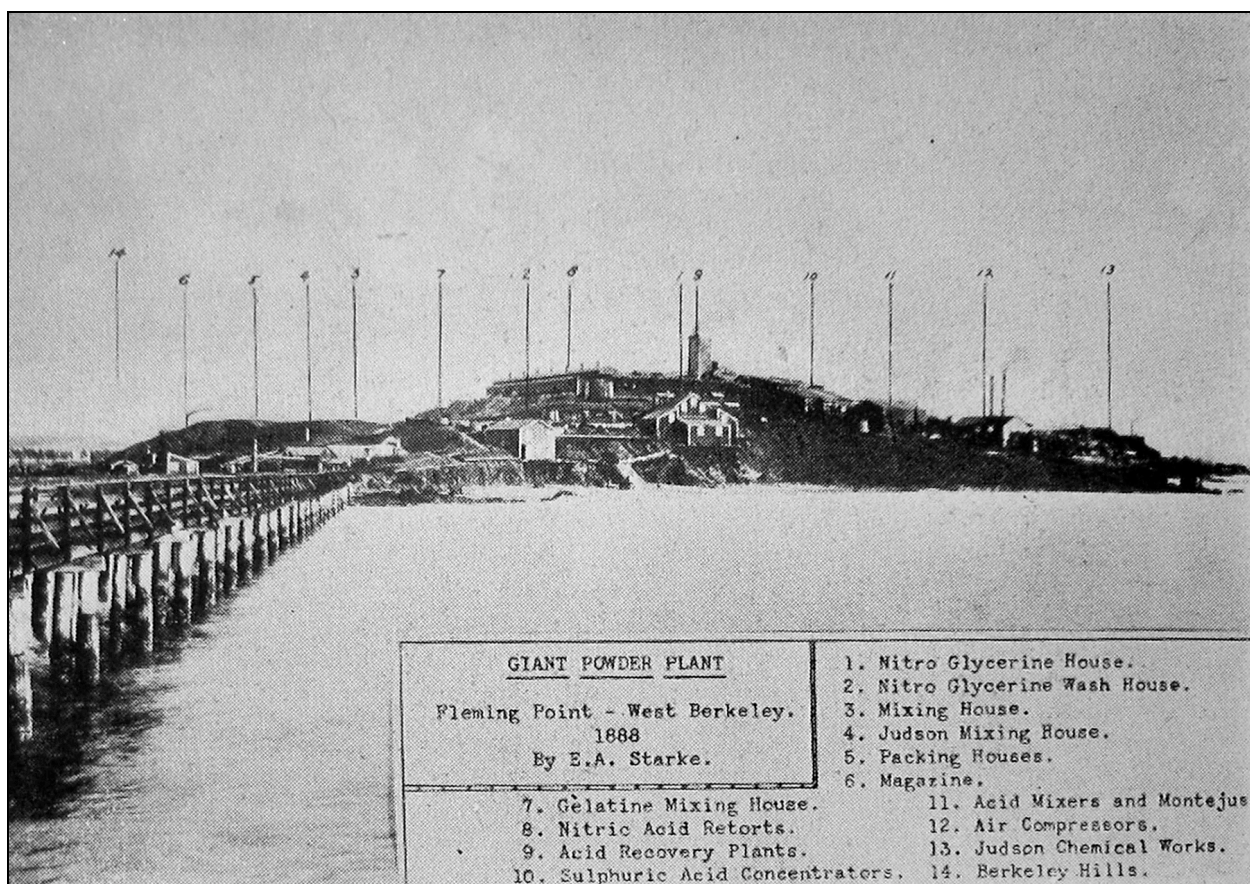


Figure 3.7. Giant Powder Plant, West Berkeley, 1888. Looking eastward from the San Francisco Bay at the Fleming Point manufacturing complex, Giant's third Bay Region factory and the first in the East Bay (currently the site of Golden Gate Fields horseracing track). Three autonomous corporations—Giant Powder Company, Judson Powder Company, and the Judson & Shepard (San Francisco) Chemical Works—shared the factory site and production processes for numerous grades of high explosives. Source: Arthur Van Gelder and Hugo Schlatter, *History of the Explosives Industry in America* (New York: Columbia University Press, 1927), 442.

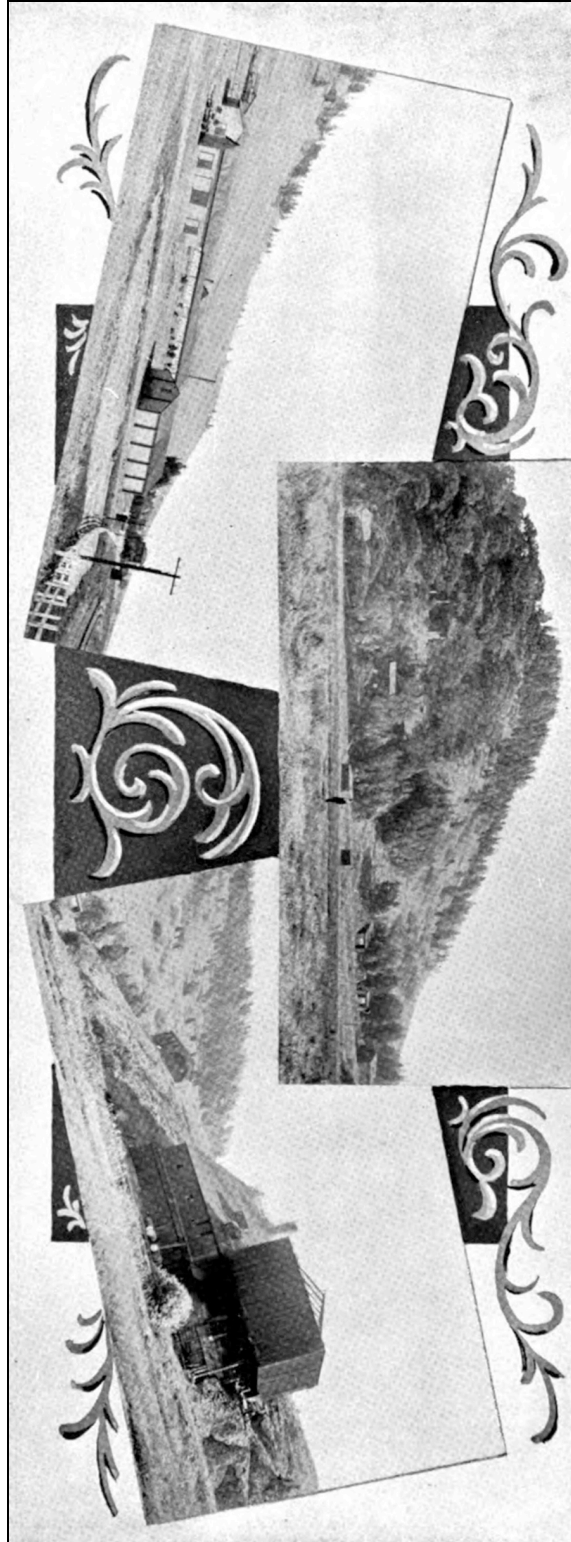


Figure 3.8. Views of the Judson Dynamite & Powder Company factories at the base of Albany Hill (the site is now in the Albany and the Richmond “annex” and includes the site of the Pacific East Mall). Source: “Judson Powder Company,” *Alameda County: The Eden of the Pacific; The Flower Garden of California* (Oakland: Oakland Tribune, 1898), 221.

Part II

Industrial Suburbs

Joseph Emery built cities. He developed California's earliest stone quarries on Angel and Yerba Buena islands in the bay and built San Francisco's first jail and masonry buildings. Emery bought Rancho San Jose y Sur Chiquito near Monterey, extracted granite and timber, and constructed the Mare Island navy yards near Vallejo. He macadamized San Francisco's muddy streets and paved Oakland's dusty roads. Emery built the East Bay's first horsecar lines while promoting the Central Pacific's transcontinental railroad. He dredged Oakland's harbor and build Oakland's City Hall. After quarrying 8,000 tons of salt-and-pepper sandstone in British Columbia, Emery raised six hulking Doric columns that supported San Francisco's second mint and "became easily recognized as the foremost contractor and builder of San Francisco."¹

Beyond resource rushes for stone, timber, and other building supplies, Emery reinvested mining profits in metropolitan development and attempted to repurpose extraction enterprises for regional infrastructure. His Amador canal powered Mother Lode quartz mills before he diverted it in a losing bid to supply water to Metropolitan Oakland. Emery's Blue Lakes water company unsuccessfully challenged William Ralston's Spring Valley Water Company for the franchise to supply San Francisco. Emery's grandiose plans for a transcontinental railroad terminated after only twenty-three miles but proved crucial for both the Key Route interurban trolley and ferry system and the Santa Fe's transcontinental line, which finally broke the Southern Pacific's stranglehold on the Bay Region (Figure II.1). Considerable political capital undergirded his enterprises. Emery was an executive member of the San Francisco's second Vigilance Committee, a founding member of Oakland's Mountain View Cemetery Association, and an enduring leader of the Oakland Board of Trade. He helped centralize East Bay capital in the First National Bank of Oakland and the Oakland Home Insurance Company and channeled investment into Metropolitan Oakland industries. In all, Emery's building, boosting, and financing evinced a lucid vision of metropolitan expansion, all of which benefited his tiny speculative suburb.

Emery built cities but he lived in a suburb. In 1858 he paid \$8,000 for Plot 6, a 154-acre tract located on the northern edge of Metropolitan Oakland.² Twenty years later, he paid \$50 to have a lithograph of his grand Italianate villa published in the *Historical Atlas of Alameda County* (Figure II.2).³ Perhaps Emery envisioned Tuscany when designing his Italianate, the earliest and plainest of the Victorian styles. He planted neat fruit orchards and clumps of palm, fir, and eucalyptus trees. Decorative walkways meandered around small gardens and statuary. The asymmetrical floor plan and massing of rectangular components mimicked the piecemeal enlargement of rural homes over generations. The rusticated stone foundation, prominent window hoods, and bracketed cornice suggested "Old World" craftsmanship. Emery's New Hampshire origins likely account for the widow's walk, though the squared cupola and the large finial festooning the two-story carriage house added to a picturesque aesthetic derived from the

¹ "Joseph Stickney Emery," *San Francisco: Its Builders Past and Present*, vol. 2 (San Francisco: The S. J. Clarke Publishing Co., 1913), 239.

² James Miller Guinn, *History of the State of California and Biographical Record of the Coast Counties, California* (Chicago: Chapman Publishing Co., 1904), 1135-36.

³ Thomas Thompson and Albert West, *Historical Atlas of Alameda County, California* (Bicentennial Reprint), (Fresno: Valley Publishers, [1878] 1976), 9.

rambling landscapes of Renaissance Era northern Italy. In all, Emery's Italianate symbolized permanence and elegance on the sparsely settled edge of Metropolitan Oakland.

The villa was certainly fashionable. Introduced to America by eastern architects in the 1850s, Italianate design migrated westward with the Forty-Niners and became a transcontinental architectural fad.⁴ The popularity of Italianate design quickly withered in the east but the terms *Italianate* and *Villa* continued to adorn advertisements for Bay Area homesteads, lots, and dwellings throughout the 1880s. Rather than simply a western extension of design trends, or a lagging remnant of eastern architectural styles, residential architecture served as a powerful marker of Anglo-Californian culture.

Through discourse and design, early boosters and builders invoked a Mediterranean metaphor to define and promote Metropolitan Oakland. "The climate throughout the year is equable, healthy, comfortable, agreeable, invigorating to the invalid and rendering life enjoyable to those in perfect health," the Oakland Board of Trade claimed. "Its atmosphere is pure, and at the same time mild; bracing with an Italian softness."⁵ Oakland mayor William Davies concurred:

The environments of this slope duplicate those of Athens, which is one of the reasons why Oakland is designated as the Athens of the Pacific. This is not a fanciful, but a real resemblance. The hills about Athens and also the Grecian archipelago are one with the hills and bays here. The clouds, the temperature, the sky, the breeze, the landscape, the half shadowed country are substantially the counterpart of ancient Greece. Whenever the Creator casts a kindly handful of sunbeams on old Greece, he, next morning, casts gently another handful over the new Greece—this Athenian slope.⁶

References to Mediterranean climate and Athenian antecedents obscured, if not repudiated, the legacies of Spanish and Mexican sovereignty, property, and culture in the East Bay. Italianate design helped Metropolitan Oakland's developers inscribe an ersatz history on the landscape that served as a gauge of Anglo-American "progress," while tilling the soil for vast real estate speculations.

Although subtle, Emery's fence was perhaps the most evocative element of the villa. Rather than delimiting property or providing privacy, the ornamental fence exposed Emery's house and grounds, creating harmony between street and house, and between public and private. The scene is polite and proper, congenial and leisurely—an idyllic image of a home in a park in a middle landscape between country and city. The lithograph helped Emery advertise freshly platted residential lots on Plot 6, providing a glimpse of his vision for a residential suburb. The

⁴ Joseph Armstrong Baird, Jr., *Times Wondrous Changes: San Francisco Architecture, 1776-1915* (San Francisco: California Historical Society, 1962), x, 16-20; Harold Kirker, *California Architectural Frontier: Style and Tradition in the Nineteenth Century* (Santa Barbara, CA: Peregrine Smith, 1973), vii-ix, 26-27, 64-66, 91; Peirce Lewis, "Common Houses, Cultural Spoor," in *Re-Reading Cultural Geography*, ed. Kenneth Foote, Peter J. Hugill, Kent Mathewson and Jonathan M. Smith (Austin: University of Texas Press, 1994), 101.

⁵ Oakland Board of Trade, *Oakland, California; Issued by the Board of Trade* (Oakland: Oakland Board of Trade, 1886), 1.

⁶ William R. Davies, "Nature and Human Nature," *Oakland Tribune Yearbook*, January 1, 1888, 15-16.

lithograph also revealed his hopes for fortunes from real estate speculation during Metropolitan Oakland's rapid expansion. This vision in 1878, however, proved fictitious.

Ten years later, Emery's villa lots had transformed into factory plots. "Take the San Pablo Avenue cable-cars, and ride as far as you may for five cents," the *Oakland Tribune* suggested,

[t]here you will find the whirl and click and rumble of machinery, drowning the music of lapping waves. A fine settlement had built up on the low, rich lands surrounding the Judson Manufacturing Company's works. Beyond the race track (one of the finest in the country) are the busy stock yards and the varied industries which surround the sale and butcheries of cattle.⁷

No place in Metropolitan Oakland had changed more than early Emeryville, according to another account: "A few years before the place was an unoccupied meadow land of willow thickets and swamp stretches, but was now occupied with numerous factories, stores, markets, hotels and rows of neat cottages. The Paraffine Paint Company was a new establishment then."⁸ With the construction of Judson Manufacturing Company and Paraffine Paint Company, both San Francisco firms, and the clustering of slaughterhouses, packinghouses, wool pullers, tanneries, and fertilizer and glue factories composing the East Bay's Stockyards, Emery's fanciful residential enclave had become an industrial suburb (Figure II.3).

With incorporation in 1896, Emeryville became the first autonomous industrial suburb in the Bay Region. Oakland emerged from San Francisco's shadow and, with surges of capital investment and job creation during 1906, World War I, and the 1920s, became one of the three fastest growing cities in the United States until 1930.⁹ Oakland's economic swell spilled into Emeryville, "the richest small manufacturing city in California" in early 1920s, according to boosters.¹⁰ The number of manufacturers, distributors, and wholesalers doubled between 1911 and 1925, when eighty-six firms operated in Emeryville.¹¹ The aggregate payrolls of Emeryville's companies reportedly expanded from \$1.8 million 1914 to over \$10 million in 1927, an increase of over 450 percent.¹² Spur tracks laced the long, linear blocks of an early industrial park, which helped attract thirty percent, or thirty-eight of Metropolitan Oakland's 123

⁷ "The Suburbs: The Handsome Residences and Picturesque Scene Around Oakland," *Oakland Tribune Yearbook*, January 1, 1888, 63.

⁸ Joseph Eugene Baker, *Past and Present of Alameda County, California*, vol. 1 (Chicago: S.J. Clarke Publishing Co., 1914), 395.

⁹ Richard Walker, "Industry Builds Out the City: The Suburbanization of Manufacturing in the San Francisco Bay Area," in *Manufacturing Suburbs: Building Work and Home on the Metropolitan Fringe*, ed. Robert Lewis (Philadelphia: Temple University Press, 2004), 114.

¹⁰ Alameda County Development Commission, *Alameda County, California: Where Every Prospect Pleases, Where Rail and Water Meet* (Oakland: Curtis-Baum Advertising Service, 1922 [?]).

¹¹ Emeryville Industries Association, *Facts and Factories* (Emeryville: Emeryville Industries Association, 1925).

¹² Wallace Christie, "The Busy City of Emeryville," *Oakland Tribune Yearbook*, January 1, 1914, 64; Ralph Hawley, "Emeryville City has Long List of Industries; Many Nationally Known Corporations Located Here," *Oakland Tribune Yearbook*, January 1, 1927, 133-134.

largest manufacturers, including many national branch plants by 1930 (Figure II.4).¹³ At the height of the Great Depression 137 firms persisted in Emeryville.¹⁴

This snapshot of Emeryville's industries before World War II begs the question: why Emeryville? Why was Emeryville the site of so much industrial capital investment and so many factories' location? At the metropolitan level, Emeryville's location differed very little from neighboring Oakland and Berkeley. Certainly by the 1920s, Emeryville was seamlessly woven into the metropolitan fabric; only invisible political borders separated Emeryville from its neighbors. Regional utilities and transportation systems—Pacific Gas and Electrical Company and the East Bay Municipal Utilities District, the Southern Pacific railroad and Key Route trolley and ferry system—further integrated the city into the metropolitan area. Moreover, a swath of industrial land use blanketed the East Bay shoreline for fifty miles from Hayward in southern Alameda County north towards the Carquinez Straight in Contra Costa County. Yet Emeryville, encompassing just one square-mile, possessed about thirty percent of Metropolitan Oakland's largest factories. Why did a suburb only 1/155th of the collective size of size of Oakland, Alameda, and Berkeley possess such a disproportionately large share of Metropolitan Oakland's industrial capital investment, jobs, and tax revenues?

Neoclassical Explanations

The leaders of Emeryville's earliest manufactures offered one explanation. The logic for selecting Paraffine Paint Company's (hereafter PABCO) two-acre site in Emeryville in 1884 was "simple but practical," a company official recounted four decades later (Figure II.5).¹⁵ He was one of forty-two East Bay industrialists who wrote letters explicating Metropolitan Oakland's advantages, which the Oakland Chamber of Commerce published in *We Selected Oakland*, a promotional booklet soliciting industrial capital investment in 1927. "First, Emeryville was in close proximity to sources of needed raw material and to stable supplies of high-grade labor," he explained. The Emeryville location also gave PABCO easy access to the Bay Region's growing consumer market. Finally, excellent railroads and shipping connections precipitated PABCO's expansion. While company headquarters remained in San Francisco, the Emeryville factory had become one of the largest manufacturing complexes on the Pacific Coast. Upwards of eighty building covered thirty-three acres in Emeryville and exports reached forty countries, a feat attributable to "favorable transportation," the official concluded.

The president of Judson Manufacturing Company (hereafter JMC) agreed. "We are virtually at the center of a large consuming territory and can also readily put our products on board ship for export trade," he explained while considering Emeryville's proximity to three transcontinental railroads and the Port of Oakland.¹⁶ Access to labor, markets, and, most

¹³ Oakland Chamber of Commerce Industrial Department, *Report for School of Business, Columbia University* (Oakland, 29 Dec. 1930).

¹⁴ Emeryville Industries Association, *A Roster of Emeryville Industries*, (Emeryville: Emeryville Industries Association, 1936).

¹⁵ Oakland Chamber of Commerce, *We Selected Oakland, Alameda County California: Being the Statements by Many Nationally-Known Concerns of the Advantages They Enjoy by Operating in the Leading Industrial District of the Pacific Coast*, (Oakland: Oakland Chamber of Commerce, 1927).

¹⁶ *Ibid.*

significantly, transportation accounted for JMC's development into the East Bay's preeminent steel producer by the late 1920s, he surmised.

In reflecting on site selection and forty years of expansion, the leaders of Emeryville's two pioneering firms recapitulated the rudimentary tenets of neoclassical industrial location theory. Keyed by the work of Alfred Weber, neoclassical location theory holds, most generally, that a nested hierarchy of *locational factors* leads firms to optimal—lowest cost, highest profit—factory sites.¹⁷ Foremost is transportation, meaning that all isolated processes of industrial production will first be pulled to places where transportation costs are lowest. The magnetism of advantageous wages creates the first distortion in the transport-oriented pattern of industrialization, whereas the search for cheap rents is a second distortion. Markets, credit, technical capabilities, and other variables that cheapen production costs fall under the masthead of “agglomeration tendencies,” another force subordinate to, but impinging upon, the formative influence of transportation costs on factory location.

Thus, the answer to Weber's basic questions—what causes industries to move?—is the force of transportation nodes, labor pools, ground rents, and local markets pushing and tugging manufacturers to the most optimal manufacturing sites. In the metropolis, core manufacturing zones develop in proximity to ports and depots that minimize transport cost. Access to labor also helps explain the spatial propinquity of numerous small-scale manufacturers. It follows, in broad strokes, that new or expanded transport networks and comparatively cheap rents spur the dispersal of manufacturers from central manufacturing zones, and the creation of industrial suburbs.

Transportation, labor, and other factors exogenous to industrial production certainly influenced factory location. The perishability and sheer bulk or weight of raw materials undoubtedly shaped the geographic patterns of industrial development for some firms and industries. Cheap greenfield sites and access to markets and regional infrastructure—water and power, in addition to transportation—similarly exerted an influence on site selection, investment, and factory construction. Pushed towards the extremes of abstraction, however, neoclassical location theory risks lapsing into transportation determinism—images of factories shuffle across a static plane, bunch at resource extraction sites and break-of-bulk points, flank railroad lines, and swarm at the center of metropolitan markets with little regard to actual people, politics, or property. While not summarily rejecting the influence of transportation development and other locational variables on industrial capital investment, these variables are better understood within a broader political and economic framework of industrial suburbanization and metropolitan expansion. For instance, railroad companies not only enabled industrial dispersal but also acted as land developers and certainly exerted immense political influence, especially in California. For booster-capitalists and landowners, such as Emery, transportation development was foremost an instrument for land speculation. The politics of property development and the imposition of industrial land use necessarily primed the pump for factory location.

The neoclassical focus on *distribution* obfuscates the role of industrial *production* in economic geography. An assumption that cheap transportation, property, and labor necessarily reduce production costs undergirds the neoclassic perspective. Further, this perspective is

¹⁷ Alfred Weber, *Theory of the Location of Industries* (Chicago: University of Chicago Press, [1909] 1929). Also see, for example, Edgar Hoover, *The Location of Economic Activity* (New York: McGraw-Hill Book Co., 1948); Glenn McLaughlin, *Why Industry Moves South: A Study of Factors Influencing the Recent Location of Manufacturing Plants in the South*, (NPA Committee of the South, 1949).

structured by the notion that the growth paths of technologies, firms, and industries are foreseeable or easily anticipated. Entrepreneurs and industrialists are omniscient, it seems. With a thorough understanding of products and production processes *a priori*, they can simply enter a set of variables into a locational calculus and derive the optimal site for factory location. In addition to property development, factors endogenous to industrial production, including technological innovation and competition, best begin to explain industrial suburbanization.

The locational requirements, input allowances, and scope of markets may have been thoroughly devised for the location of a national branch manufacturing plant in the 1920s. But these factors do little to explain the inception of industrial development in Emeryville in the 1880s, when JMC and PABCO became the district's first large manufacturers, anchoring subsequent industrialization.

Manufacturing the Metropolis

Scholars have recently toppled much conventional wisdom concerning North American suburbs. Analysis of suburbanization as a capital accumulation strategy—of the production of suburban landscapes—has tempered ecological and neoclassical theories of metropolitan growth that view suburbanization as solely the natural outcome of rational, atomized decision-making, increasing affluence of consumers, or transportation innovations.¹⁸ Central to this re-conceptualization of North American suburbanization is the recognition that manufacturers often lead the way to the metropolitan periphery, creating mixed communities of factories and families, or industrial suburbs.

According to geographers Robert Lewis and Richard Walker: “Industry does not locate in the city; it helps create the city. Urban expansion is based on the ability of industrialization and capital accumulation to create places at the same time that they create commodities, build factories, raise up a labor force, and introduce new technologies.”¹⁹ That is, urbanization and industrialization have been conjoined, mutually reinforcing processes engendering metropolitan expansion.²⁰ Led by an array of actors and institutions—manufacturers, industrial real estate

¹⁸ Robert Beauregard, *When American Became Suburban* (Minneapolis: University of Minnesota Press, 2006); James Duncan and Nancy Duncan, *Landscapes of Privilege: The Politics of the Aesthetic in an American Suburb* (New York: Routledge, 2004); Robert Fogelson, *Bourgeois Nightmares: Suburbia, 1870-1930* (New Haven: Yale University Press, 2005); Davis Gordon, “Capitalist Development and the History of American Cities,” in *Marxism and the Metropolis*, ed. W. Tabb and L. Sawyers (New York: Oxford University Press, 1984), 113-138; Richard Harris, *Creeping Conformity: How Canada Became Suburban* (Toronto: University of Toronto Press, 2004); Robert Self, *American Babylon: Race and the Struggle for Postwar Oakland* (Princeton, NJ: Princeton University Press, 2003); Richard Walker, “The Suburban Solution: Urban Geography and Urban Reform in the Capitalist Development of the United States,” in *Urbanization and Urban Planning in a Capitalist System*, eds. Michael Dear and Allen J. Scott (London: Methuen & Co., 1977).

¹⁹ Richard Walker and Robert Lewis, “Beyond the Crabgrass Frontier: Industry and the Spread of North American Cities, 1850-1950,” in *Manufacturing Suburbs: Building Home on the Metropolitan Fringe*, ed. Robert Lewis (Philadelphia: Temple University Press, 2004), 21.

²⁰ Richard Harris, *Unplanned Suburbs: Toronto's American Tragedy, 1900 to 1950* (Baltimore: Johns Hopkins University Press, 1996); Greg Hise, *Magnetic Los Angeles: Planning the Twentieth-Century Metropolis* (Baltimore: Johns Hopkins University Press, 1997); Robert Lewis ed., *Manufacturing Suburbs: Building Home on the Metropolitan Fringe* (Philadelphia: Temple University Press, 2004), *Chicago Made: Factory Networks in the Industrial Metropolis* (Chicago: University of Chicago Press, 2008); Paul André Linteau, (Robert Chodos, trans), *The Promoters' City: Building the Industrial Town of Maisonneuve, 1883-1918* (Toronto: J. Lorimer, 1985); Howard

developers, transportation companies, housing builders, suburban governments, city planners, urban reformers, and so forth—the search for profits on the metropolitan periphery fueled the creation of solitary industrial suburbs and the multinodal North American metropolis beginning in the mid-nineteenth century. The dispersal of factories from older urban cores to industrial suburbs was a constituent element of (broad processes) of urban development—economic growth, metropolitan expansion, and suburban balkanization.

In the following chapters, I explore early Emeryville's transformation from a speculative residential suburb into a suburban factory district. Undergirding my inquiry is an understanding of cities and suburbs as mutually constitutive and unified in a single process of metropolitan development—both economic growth and spatial expansion. I focus on two aspects of this process: industrial property development and the endogenous logic of industrial production, or *geographical industrialization*. Perhaps nowhere else in the Bay Region were these processes more clearly expressed than in early Emeryville.

The Politics of Industrial Property

“His public spirit was everywhere recognized,” one historian extolled Emery, “and it became a well known fact that his cooperation could ever be counted upon to further movements for the general good—movements that resulted not only in the present benefactions but in later development.”²¹ Indeed, considering the scope and scale of Emery's projects, he exemplifies the heroic “booster,” most famously depicted by Daniel Boorstin.²² “Here was a new breed,” Boorstin writes, “the community builder in a mushrooming city where personal and public growth, personal and public prosperity intermingled.”²³ Boosters financed canals and ferries, projected trolleys and trains, and built bridges and streets. They funded hospitals and founded historical societies. Upstart newspapers published boosters' fanciful accounts of a town's present prospects, as well as their visions of an idyllic destiny. Pragmatic city governments served at the behest of “representative men,” who fiercely competed with other cities to secure “government handouts,” such as federal land offices, county seats, agricultural colleges, and army arsenals. All these enterprises, however, were secondary. “His commodity was land, whose value rose with population,” Boorstin explains.²⁴ Both boosters' profits and residents'

Nelson “The Vernon Area, California: A Study of the Political Factor in Urban Geography.” *Annals of the Association of American Geographers* 42, no. 2 (June 1952); Becky Nicolaides, *My Blue Heaven: Life and Politics in the Working-Class Suburbs of Los Angeles, 1920-1965* (Chicago: University of Chicago Press, 2002); Graham Taylor, *Satellite Cities: A Study of Industrial Suburbs* (New York: Appleton, 1915); Andrew Theising, *Made in the USA: East St. Louis* (St. Louis: Virginia Publishing, 2003).

²¹ “Joseph Stickney Emery,” 240.

²² Daniel Boorstin, *The Americans: The National Experience* (New York: Vintage Books, 1965), 113-134, 152-68. William B. Ogden, Dr. Daniel Drake, and General William Larimer serve as Boorstin's storied examples of “community builders,” who transformed subdivided lots into Chicago, Cincinnati, and Denver, respectively. Celebratory portraits of William Ralston certainly fit this mold. For example, see George Lyman, *Ralston's Ring* (New York: Charles Scribner's Sons, 1937).

²³ *Ibid.*, 119.

²⁴ *Ibid.*, *Americans*, 117.

prospects depended on the pace and scale of growth. Real estate speculation and private control of public government, in Boorstin's view, necessarily benefited community in light of the growth imperative.

This notion of "community spirit" espoused by boosters and their chroniclers belies the logic of capital accumulation undergirding place promotions, property development, and urban expansion. Rather than Boorstin's ideal magnanimity, the "interfusing of public and private prosperity" expresses a liberal ideology, or a doctrinaire belief that any growth is good growth, thus celebrating the primacy of the free market for determining the form and function of cities.²⁵ There is a distinction between boosters and the residents they putatively serve—a distinction rooted in urban property itself, dividing entrepreneurs seeking speculative gain and residents seeking meaningful community.

Suburban Factories and Urban Growth Machines

The creators of towns and builders of cities strained to use all the resources at their disposal, including crude political clout, to make great fortunes out of place.

John Logan and Harvey Molotch²⁶

Rather than a heroic booster or mythic city-builder, Emery is better understood as a *structural speculator*.²⁷ These speculators are at the core of the "urban rentier" class in urban sociologists John Logan and Harvey Molotch's urban growth machine thesis. Put simply, the growth machine consists of local land-based elites, or "place entrepreneurs," who lead efforts to intensify local economic activity in order to increase property values, or the *exchange value* of urban real estate. As Logan and Molotch put it, "Place entrepreneurs involved in speculative real estate development, or the exchange of places and collections of rents, have the job of trapping human activity at the sites of their pecuniary interest."²⁸ Exchange values from place appear as rent, meaning profits from sales and payments accrued by landlords, realtors, mortgage lenders, real estate layers, title companies, and so forth.

Rentiers align a diverse group of actors and institutions, or "auxiliary players," into their growth projects, including universities, media, museums, theaters, and other "cultural" institutions, as well as labor unions bent on creating new jobs.²⁹ Yet public officials and political institutions are rentiers' indispensable allies because the government is the arena in which stakeholders attempt to mold decisions that regulate land-use, infrastructure projects, and

²⁵ For a discussion of liberalism, see Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (Boston: Beacon Press, [1944] 2001); Sally Razeen, *Classical Liberalism and International Economic Order: Studies in Theory and Intellectual History* (London: Routledge, 1998); Arthur Schlesinger, *The Politics of Hope* (Boston: Houghton Mifflin, 1963); Eric Voegelin, "Liberalism and its History" Mary Algozin and Keith Algozin, trans., *The Review of Politics* 35, no. 4 (October, 1974).

²⁶ John Logan and Harvey Molotch, *Urban Fortunes: The Political Economy of Place* (Berkeley: University of California Press, 1987), 53.

²⁷ *Ibid.*, 29.

²⁸ *Ibid.*

²⁹ *Ibid.*, 75-84.

everything from surveys to deeds sustaining the commodification of land. Despite disparate interests and conflicting agendas among these diverse interests, a growth machine melding private interests and public power is able to forge an alliance focusing on growth as an economic imperative. A liberal doctrine of what Logan and Molotch call *value-free development*—the belief that any growth is good growth—serves as an ideological rallying point for growth, as well.

Equally important is the role of “politics” in managing the inherent contradiction between entrepreneurs seeking enhanced exchange value and residents seeking homes, amenities, communities, and satisfaction of essential needs, or the *use value* of place. Here Logan and Molotch use “politics” in the broadest sense: “The reality of places is constructed through political action, with the term *political* encompassing both individual and collective efforts, through both informal associations and institutions of government and the economy.”³⁰ Both groups seek to harness local government—the legislative, fiscal, and legitimating powers—to protect and pursue their interests. But through class prerogatives, political machinations, government powers, and the ideological armament of value-free development, the growth machine successfully works to generate solidarity among community members around the goal of urban and economic expansion. In doing so, the pursuit of exchange value becomes both the basis of urban development and the pivot of city politics: “...the pursuit of exchange value so permeates the life of localities that cities become organized as enterprises devoted to the increase of aggregate rent levels through the intensification of land use. The city becomes, in effect, a ‘growth machine.’”³¹

The urban growth machine thesis provides no universal model for understanding the politics and practices of urban growth.³² Nevertheless, it offers a conceptual foothold for approaching the development of Metropolitan Oakland in the second half of the nineteenth century. Logan and Molotch’s “political economy of place” puts the politics of property development at the heart of urbanization. Urban growth and transformation is explained largely by the strategies, schemes, and needs of human agents and public/private coalitions, rather than solely by the operations of formal government institutions. Considering the role of rentiers in mediating far-flung sources of capital investment, a focus on the agency of local actors and institutions need not lapse into provincialism. The particularities of *place*, however, deserve a more prominent role in this “political economy of place.”

The explanatory power of the growth machine thesis can be illuminated by applying it to the historical contingencies and geographic contours of Metropolitan Oakland during the second

³⁰ Ibid., 48. Also see Karl Polanyi’s notion of “embedded” economic order in *The Great Transformation*, 147.

³¹ Logan and Molotch, *Urban Fortunes*, 13.

³² On debates about the efficacy of the urban growth machine thesis, see: Kevin Cox and A.J. Mair, “Locality and Community in the Politics of Local Economic Development,” *Annals of the Association of American Geographers* 78, no. 2 (1988); Mark Gottdiener, *The Social Production of Urban Space* (Austin: University of Texas Press, 1985); Mark Gottdiener, Claudia Collins, David Dickens, *Las Vegas: The Social Production of an All-American City* (Malden, MA: Blackwell Publishers, 1999), 5-7; Alan Harding, “Elite Theory and Growth Machines,” in *Theories of Urban Politics*, ed. David Judge, Gerry Stoker, and Harold Wolman (Thousand Oaks, CA: SAGE Publications, 1998), 35-53; Andrew Jonas and David Wilson ed., *The Urban Growth Machine: Critical Perspectives Two Decades Later* (Albany: State University of New York Press, 1999); L. Owen Kirkpatrick and Michael Peter Smith, “The Infrastructural Limits to Growth: Rethinking the Urban Growth Machine in Times of Fiscal Crisis,” *International Journal of Urban and Regional Research* 35, no. 2 (May, 2011); Harvey Molotch, “The Political Economy of Growth Machines,” *Journal of Urban Affairs* 15, no. 1 (1993).

half of the nineteenth century. Logan and Molotch argue that real estate speculation and local politics are mutually constitutive and engender urban (re)development. Yet the politics of land development is also a spatial process, helping shape urban geography and the scope and scale of metropolitan expansion. According to Molotch, the growth machine thesis “grew out of US experience and fits places best where land and buildings are commodities, unfettered by cultural or state policy constraints.”³³ Perhaps nowhere was this better illustrated than in the Bay Region during early statehood. A speculative frenzy and entrepreneurs’ unbridled search for rents in *laissez-faire* property market fueled Metropolitan Oakland’s rapid development.

Property prices fluctuate less because of what entrepreneurs do with their holdings than because of the changing relationship of their land to other places. That is, rent levels are based on the location of a property vis-à-vis other places. Entrepreneurs establish rents according to the “differential” locational advantage of one site over another. Gaining *differential rent* necessarily depends on the fate of other parcels and those who own them. Each property use spills over to other parcels and, as part of these externality effects, crucially influences the exchange value of proximate properties.³⁴

Emery was among a coalition of Metropolitan Oakland place-based entrepreneurs who truly merited the term *structural speculators*, meaning that they endeavored to restructure the property market by changing the relationship of a given place to other places. For Logan and Molotch, this type of capitalist seeks to *create* differential rents by influencing the larger arena of decision making that will determine locational advantages.³⁵ As I discuss below, the bulk of the Metropolitan Oakland was stalked, staked, and subdivided before 1860. This had implications for the operation of Metropolitan Oakland’s early growth regime. Powerful suburban property developers steered local and county government and formed an incipient growth coalition seeking to rapidly build out Metropolitan Oakland in order to incorporate peripheral lands into the metropolitan system, and thus realize differential rents.

In addition to informing and influencing metropolitan politics, Emery and other suburban rentiers actively intervened in, and profited from, the physical build-out of Metropolitan Oakland. This involved financing, building, and boosting the city of Oakland in hopes of inducing population growth and economic prosperity, while simultaneously facilitating metropolitan expansion to incorporate suburban lands into the metropolitan frame. Specifically, metropolitan growth was entrenched in California’s broader resource-intensive economy. Metropolitan land development and building projects were key conduits for reinvestment and diversification of surplus resource profits. Urban entrepreneurs also engaged in resource rushes for building materials and they repurposed extraction enterprises, namely water conveyance systems, to provide metropolitan services. Land-based entrepreneurs constructed other major infrastructure projects and sought lucrative public service franchises for the provision of transportation, water, and gas. All these enterprises had a common dual purpose of deriving private profit from public power while facilitating metropolitan expansion and enhancing the value of suburban lands.

³³ Molotch, “Political Economy of Growth Machines,” 49. Also see Mike Davis, *City of Quartz: Excavating the Future in Los Angeles* (New York: Vintage Books, 1992), 101-110.

³⁴ David Harvey, *The Limits to Capital* (Oxford: Basil Blackwell Publishers, [1982] 1999), 349-57; Logan and Molotch, *Urban Fortunes*, 29-30.

³⁵ Logan and Molotch, *Urban Fortunes*, 30.

These city-building activities certainly involved industrial enterprise. But a recognition of the requisite industrial endeavors for metropolitan development does not lead to an understanding of the creation of industrial space—the provision of industrial property, industrial capital investment, factory localization, and imposition of industrial land use.

Retrofitting the Growth Machine

The formative role of property development, planning, and promotion for industry is overlooked in the growth machine thesis, as well as in other theories concerning the politics of urban growth and metropolitan expansion. Promotion of industrial land, often in conjunction with transportation and utilities projects, proved a key prong in growth strategies and involved investments by not only members of Logan and Molotch's "traditional" growth machine but also by a broader array of ancillary actors and institutions.³⁶ Understanding Metropolitan Oakland's development and the formation of early Emeryville requires a focus on the industrial interests that had a hand in operating the urban growth machine. This involves not only property development on the local scale but also rentiers who mediated the investment of San Francisco industrial capital. Nevertheless, grasping processes concerning industrial property development, industrial capital investment, and the localization of factories requires more than acknowledging the constituent but often overlooked role of industrial interests that helped operate the urban growth machine.

The search for exchange value through the creation of industrial property, and the subsequent imposition of industrial land use, introduces thorny dimensions to more general processes of speculative land development. Pollution and other inimical effects of industrialization were often at odds with, if not antithetical to, the wants and needs of residents. For example, tensions between manufacturers and residents became evident in San Francisco as early as the mid-1850s, when early "zoning" efforts took the form of nuisance indictments.³⁷ Industrialists proposed an ordinance designating a "Manufacturing District" to San Francisco's Board of Assistant Aldermen, or "common council," in 1855.³⁸ Persecuted and "driven from pillar to post" by neighbors, they planned an industrial refuge in an isolated southeastern corner of the city "so remote from the city that no legal question would likely arise as to what might constitute nuisances in the district."³⁹ The Aldermen denied this proposed haven for ironworking and oil refining, butchering and tanning, chandlery and soap boiling, and other noxious

³⁶ For examples of industrial promotions, see Mike Davis, "Sunshine and the Open Shop: Ford and Darwin in 1920s Los Angeles," *Metropolis in the Making: Los Angeles in the 1920s*, ed. Tom Sitton and William Deverell (Berkeley: University of California Press, 2001), 104-111; Greg Hise, "Sixty Stories in Search of a City," *California History* 83, no.3 (2006): 8-26. John Rennie Short, "Urban Imagineers: Boosterism and the Representation of Cities," in *The Urban Growth Machine: Critical Perspectives Two Decades Later*, ed. Andrew Jonas and David Wilson (Albany: State University of New York Press, 1999), 37-54.

³⁷ Roger Lotchin, *San Francisco, 1846-1856: From Hamlet to City* (New York: Oxford University Press, 1974), 11-12.

³⁸ "Common Council," *Daily Alta California*, August 9, 1855, 2.

³⁹ "Common Council," *Daily Alta California*, November 13, 1855, 2. The industrial district was planned for the area south of Mission Creek bounded by Corbett Street, Dolores Street, Mission Creek, and the Bay. *LeCount & Strong's Directory for San Francisco for 1854* (San Francisco: San Francisco Herald, 1854), 162.

industries. The issue endured, particularly in the Mission District, though the Bank Ring partially alleviated the situation when they developed industrial land at Potrero Point, Hunter's Point, and Mission Bay—including the vicinity of the proposed industrial refuge—beginning in the mid-1860s (see Chapter 4).

A key problem confronted by speculative land developers and industrial capitalists was how to reconcile incommensurable land uses in an unbridled property market. Despite the seeming chaotic development in the late-nineteenth century Metropolitan Bay Area, industrial growth coalitions used political intervention, place promotion, and conscious planning to facilitate industrial dispersal. "Location at the suburban fringe and outlying districts has offered the hope of combining the manifest benefits of access to the city and its agglomeration economies with a degree of freedom from the working class, city politics, and contending business interests," Lewis and Walker argue.⁴⁰ The motivations and general logic for industrial suburbanization is straightforward, yet questions remain about the actual processes of industrial land development on the metropolitan periphery, and why and how industrialists selected specific suburban sites.

While manufacturers may invest in land in hopes of realizing speculative gains, they primarily derive their own use value from place. Rather than seeking rents, industrial firms manufacture commodities to accumulate capital.⁴¹ Beyond passively anticipating the physical expansion of the city, spillover effects, and intensification of adjacent land use, suburban industrial property developers realized differential rents when invested capital made land more productive (as soon as invested capital is amortized).⁴² Restructuring of suburban space and creation of industrial property required building *locational assets*—place-based packages of infrastructures, institutions, and practices that induce and accommodate capitalist industrialization and sustain growth over a generation at least, as geographer Richard Lewis defines it.⁴³

A distinct, diverse, and dispersed coalition of actors and institutions formed flexible, often ephemeral alliances in order to facilitate industrial capital investment and factory location in the suburbs. Speculative real estate developers provided land; railroad companies built new tracks and spurs lines; horsecars and trolley developers expedited laborers' journey to work; power and water companies extended their services; local financial institutions provided capital; metropolitan and municipal associations of boosters and businessmen invested political capital; and industrialists worked hand in hand with them all in order to transform vacant suburban lots into productive industrial plots. Locational assets channeled industrial capital investment to the metropolitan edge and then anchored manufacturers in place.⁴⁴ In this way, suburban industrial space stretched the perimeters of industrial territory and proved vital to the industrial base, population growth, and spatial form of Metropolitan Oakland.

⁴⁰ Walker and Lewis, "Beyond the Crabgrass Frontier" 28.

⁴¹ Though firms certainly sought appreciative gains from industrial land...

⁴² David Harvey, *The Limits to Capital* (Oxford: Basil Blackwell Publishers, [1982] 1999), 337; Karl Marx, *Capital: A Critique of Political Economy; Volume III* (New York: International Publishers, 1967), 746.

⁴³ Lewis, *Chicago Made*, 14-17, 271-75.

⁴⁴ *Ibid.*, 47-48, 274; Walker and Lewis, "Crabgrass Frontier," 28,

As I show in Chapter 3, Emery led a coalition of East Bay entrepreneurs in the creation and the capitalization property in early Emeryville, priming the pump for industrial development. When considering factory location, however, the creation of industrial space was a requisite but not a determining factor. Questions remain concerning why certain San Francisco firms eschewed the central manufacturing district and why peripheral factory locations provided competitive advantages. Rather than simply the exogenous placement of railroads and ports, and labor pools and markets, the endogenous dynamics of capitalist industrialization—investment, technology, and competition—lead San Francisco industrialists to early Emeryville.

Geographical Industrialization

The economy is fundamentally a disequilibrium system, geographers Michael Storper and Richard Walker argue.⁴⁵ It is driven to expand and mutate by its own internal rules of accumulation, technological change, and fierce competition. Growth itself, they argue, is produced by the systematic expansion of the forces of production, that is, through industrialization. These essential dynamics of economic growth under capitalism—accumulation (reinvestment), technological innovation, and competition—also help explain the restless geography of industrialization, whether viewed at the national, regional, or metropolitan level. This mutuality of economic growth and territorial development is captured in Storper and Walker's theory of *geographical industrialization*.⁴⁶ Put simply, the basic patterns of industrial location and regional growth—localization, clustering, dispersal, and “center shifting”—are produced by processes indigenous to capitalist industrialization. For the purposes of the following chapter, the key shift involves the flight of industries from industrial clusters, or the process of industrial suburbanization.

Considering the advantages, if not seeming necessities, of spatial propinquity and external economies (see Chapter 2), why would factories disperse from central manufacturing districts? How could suburban locations prove profitable? Urban diseconomies provide one answer. Firms fled high wages and militant labor, expensive rents and tax burdens, and encroaching residents and land use regulations. Locational assets and the creation of industrial property, including new or extended transportation networks, comparatively cheap greenfield sites, and regional infrastructure, such as water and power, no doubt enticed industrialists. By helping shape the contours of the industrial landscape, and by broadening the metropolitan framework in which business leaders made decisions, these “push and pull factors” certainly influenced a firm's decision to locate production facilities in the suburbs. Concessions from ingratiating, entrepreneurial, or corrupt local governments also guided suburban factory location. But again, exogenous and ecological features did not determine industrial location. Without pointing to a single causal factor, an examination of the endogenous dynamics of industrial production—investment and innovation in a fiercely competitive milieu—best begins to explain why certain firms found profitability on the metropolitan edge.

The primary cause of factory decentralization was industrialization itself. The process of technological innovation and market disruption unleashed by capital accumulation precipitates

⁴⁵ Michael Storper and Richard Walker, *The Capitalist Imperative: Territory, Technology and Industrial Growth* (Oxford: Basil Blackwell, 1989), 38, Chapter 3.

⁴⁶ *Ibid.*, 70.

the eruption of new industries and swiftly growing sectors in peripheral venues. According to Lewis and Walker, industrial expansion is in no way a uniform process:

What we see instead are successive eruptions of new industries, embodying new products and new technical bases, and a diverse array of production formats evolving and restructuring over time. Technical change has developed on a variety of material bases in different industries, has moved along divergent industrial (and company) trajectories, and has been altered radically by new discoveries from time to time. This has meant many patterns of initial location, agglomeration, and dispersal, giving North American cities quite distinctive industrial foundations, patterns of uneven spatial expansion of these sectors, and episodic additions of wholly new industries to the mix.⁴⁷

Industrial suburbanization depends upon growth, regardless of whether it emanates from product innovation, process change, labor exploitation, or industry reorganization. In this sense, industrial suburbanization is the spatial expression of the expansion, instability, and differentiation inherent in industrial production under capitalism.

Nevertheless, industrial suburbanization poses a paradox: how can an industry operate and expand in areas where the costs of production are likely to be high—that is, places with inexperienced workers, limited linkages, inadequate infrastructure, underdeveloped local markets, and so forth? Be it the 1950s global south or the late-nineteenth-century U.S. metropolitan edge, peripheral locations are not automatically cheaper sites for production because the conditions that make labor or land inexpensive also make them less productive to use.⁴⁸ How, then, can industrialists sever ties to older industrial centers and agglomeration economies and profitably locate on the metropolitan periphery?

Dynamic firms in new or reorganized industries are able to break away from old centers and existing economies of agglomeration due to both the rapid rates of accumulation and technological innovations. These *windows of locational opportunity*, as Stoper and Walker put it, are moments when the experimental unfurling of new commodities, manufacturing techniques, production systems, or modes of corporate organization release a firm from dependence on external suppliers, serial face-to-face transactions and, therefore, the external economies and advantages of industrial clusters.⁴⁹

In Chapters 4 and 5, I show how JMC and PABCO dispersed from San Francisco to early Emeryville during moments of locational freedom in the early 1880s. Technological innovation, organizational advances, and high rates of investment unleashed their respective creative capacities to develop their own inputs, manufacturing techniques, production processes, and labor supplies. Rather than a foreseeable trajectory of development allowing either firm to select an optimal factory sites, JMC and PABCO show how new and innovative firms plot their own jagged paths of growth and, in doing so, recast metropolitan geography by creating new places.

Under Egbert Judson, JMC formed part of a corporate conglomeration seeking to vertically monopolize all steps of California iron production from mining iron ore in the Sierra to

⁴⁷ Lewis and Walker, “Beyond the Crabgrass Frontier,” 21.

⁴⁸ Stoper and Walker, *Capitalist Imperative*, 73.

⁴⁹ *Ibid.*, 75.

rolling California's first steel ingots in early Emeryville. With proprietary inputs, JMC relied on a new order of efficiency and mechanization, as well as cheap labor, to vertically integrate every step of production for a diverse array of iron goods in Emeryville. Along with dispersing from the core metalworking agglomeration in San Francisco, JMC's import substitution strategy dispensed with San Francisco's metalworkers' storied specialized production of mining machinery. JMC's search for cheap labor also broke away from the powerful sway of San Francisco's labor unions.

As opposed to JMC's novel corporate organization and production processes, pragmatic innovations in "unlocking" California petroleum allowed PABCO to use asphalt, a seemingly valueless petroleum derivative, as input for manufacturing novel paints and building materials. The rapid unfurling of new products and production techniques lead not only to piecemeal vertical integration at the Emeryville factories but also to a new industry and the creation of national and international markets *de novo*. The shift from high explosives to petrochemicals, furthermore, marked a key early diversification of the Bay Region's dynamic chemicals cluster.

Despite dissimilarities between iron and oil, JMC and PABCO shared more in common than corporate headquarters in San Francisco and suburban factories in early Emeryville. Bay Region mining entrepreneurs and financiers who had diversified into mining supplies industries—metalworking and machinery, as well as high explosives (chemicals)—provided capital, corporate organization, and a spatial strategy for accumulation predicated on industrial suburbanization. The creation of each firm was an outcome of the marked centralization of capital and immediate reinvestment from the mid-1860s until the Sawyer decision and exhaustion of the Comstock in the mid-1880s. JMC and PABCO were part of the broad sway of industrial diversification and represent a pivot in California's economic growth: rather than industrial development in the service of natural resource extraction and processing, both firms extracted natural resources in order to create new inputs to feed new Californian industries.

Technological, financial, and organizational ties to California's broader resource-intensive economy led to geographically dispersed production chains. Stemming from iron ore mines and California's first blast furnace in Placer County, and from California's first productive oil well and distillery in Ventura County, each firm created and coordinated integrated regional production systems that circumvented urban agglomerations and instead linked resource hinterlands, San Francisco boardrooms, and suburban Emeryville factories. The new firms capitalized on wide locational choices because specialized natural resource inputs were otherwise unavailable.

At the local scale, innovations in products, manufacturing techniques, and production organization fostered suburban autonomy. Both JMC and PABCO generated their own inputs and created new jobs, often acquired through on-the-job training and practical experience, as opposed to competing for stable quantities of goods and labor power on the market. With intricately integrated production at the Emeryville site, JMC manufactured its own inputs, including novel materials, parts, and machinery. Diversified output required an array of manufacturing platforms and intricate coordination among numerous production units. Labor relations also influenced factory location. A suburban location allowed JMC to draw on the Bay Region's pools of specialized workers and technological assets while simultaneously seeking to circumvent organized labor. Development of an appropriate workforce included the de-skilling of formerly specialized and unionized jobs while realizing new economies of scale and throughput with enhanced mechanization and mass-production techniques. PABCO's breakthroughs in oil refining and asphalt production created not only rapidly evolving products

but also the material base and technological framework for a new industry. Forced to grapple with, and creatively solve, an array of shop floor problems, PABCO generated production technology *in situ*, vertically integrated in piecemeal fashion, and diversified into unanticipated product lines.

San Francisco capital, regional commodity chains, and integrated production enabled JMC and PABCO to seek profitability from suburban factory location. Neither firm faced severe constraints on factory location attributable to natural resource inputs, inter-firm linkages for manufactured goods, or labor mobilization. High capitalization and technological and organization innovations enabled each firm to profit from cheap greenfield sites and new transportation connections.

Both JMC and PABCO largely severed serial ties to kindred firms in the industrial core and, in seeking autonomy, anchored an industrial suburb on the edge of Metropolitan Oakland. Early Emeryville, however, was not simply a satrapy of San Francisco capital. Industrial suburbanization was not a way of disconnecting from, or dispensing with, the industrial core. Instead, Emeryville's pioneering firms were part of the broader dispersal of Bay Region industries. Flows of capital, technology, and management linked San Francisco to early Emeryville and, in doing so, extended the metalworking and chemicals districts into new growth peripheries. The following discussion demonstrates the formative role of industrialization not only in suburban development and the physical expansion of the metropolitan area but also in the creation of integrative metropolitan economies. Emeryville should be understood as a new growth periphery spun-off from the center of activity in San Francisco. For San Francisco industrialists and Bay Region capitalists with a lucid vision of metropolitan development, industrial suburbanization proved both a spatial articulation of industrial dynamism and a geographic strategy for capital accumulation.

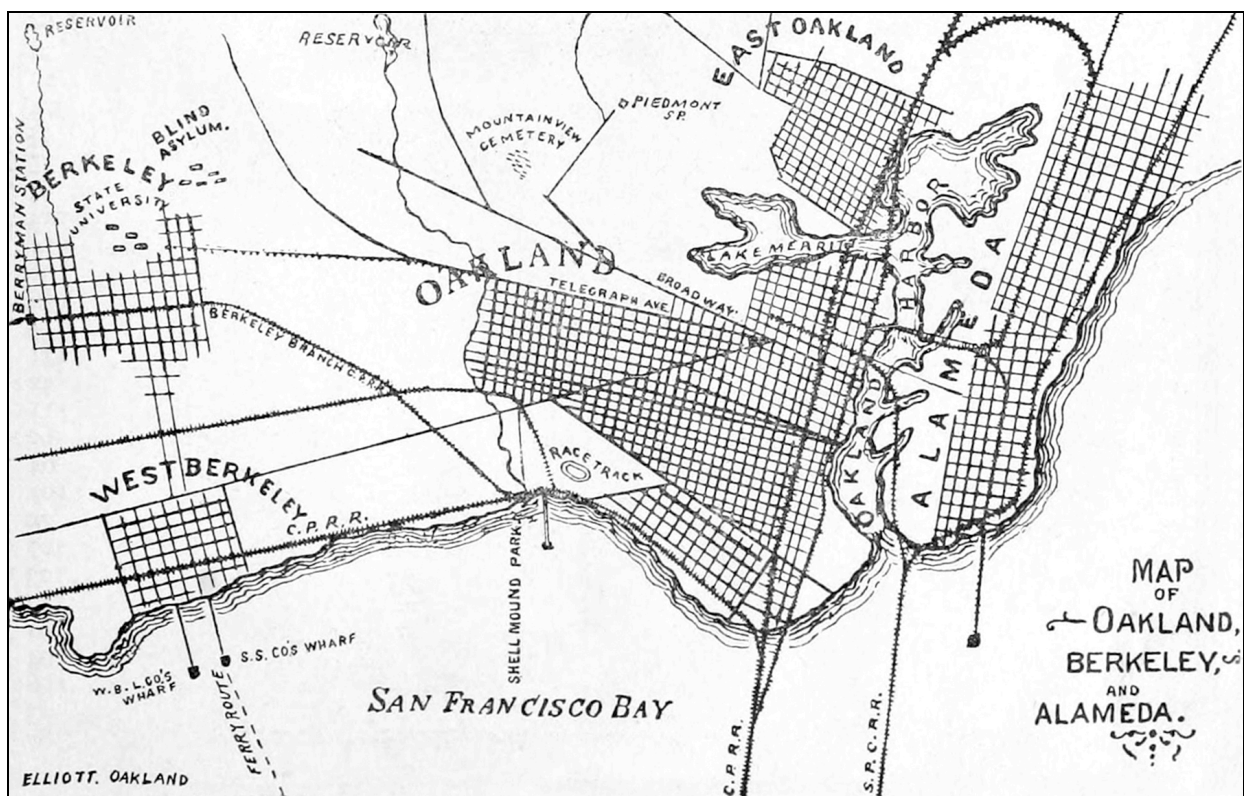


Figure II.1. Metropolitan Oakland, 1885. A number of Emery's projects are depicted, including the Institution for the Deaf and Dumb and Blind, Mountain View Cemetery, Oakland Harbor, and the California & Nevada Railroad, which is illustrated, but not labeled, running east from the "Race Track" (Oakland Trotting Park) and then north parallel to the Central Pacific Railroad ("C.P.R.R."). Source: W. W. Elliot & Co., *Oakland and Surroundings Illustrated and Described, Showing its Advantages for Residence or Business* (Oakland: W.W. Elliot, 1885), 10.



Figure II.2. Emery's Italianate villa on the corner of San Pablo and Park avenues in early Emeryville in 1878. The terminus of his San Pablo Avenue (horsecar) Railroad is depicted on the left, while the Central Pacific's Northern Railway skirts the bay shore. The Oakland Trotting Club and Shell Mound Park are shown in the background, as well. Source: Thomas Thompson and Albert West, *Historical Atlas of Alameda County, California* (Fresno: Valley Publishers, [1876] 1976), 9.

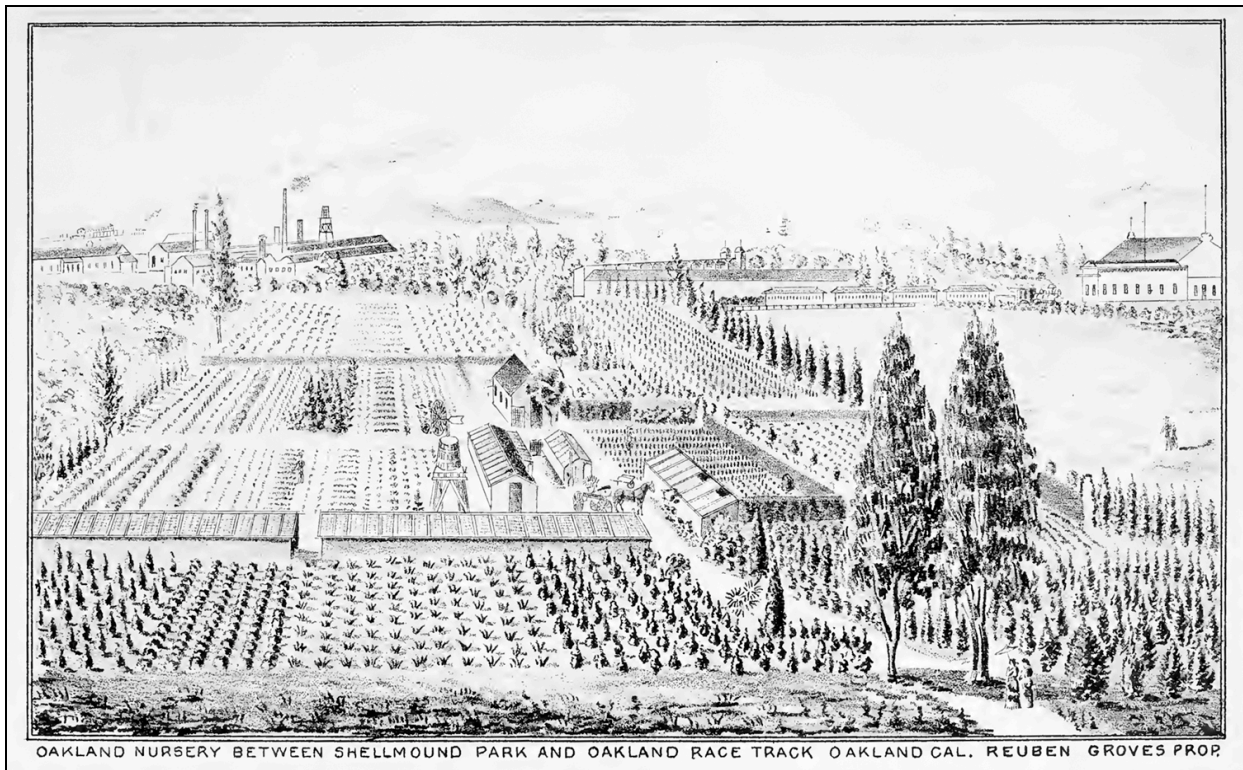


Figure II.3. Factories in the garden. Looking west at a commercial nursery in early Emeryville, with Judson Manufacturing Company in the background and the Oakland Trotting Park on the right. Source: W. W. Elliot & Co., *Oakland and Surroundings Illustrated and Described, Showing its Advantages for Residence or Business* (Oakland: W.W. Elliot, 1885), 10.

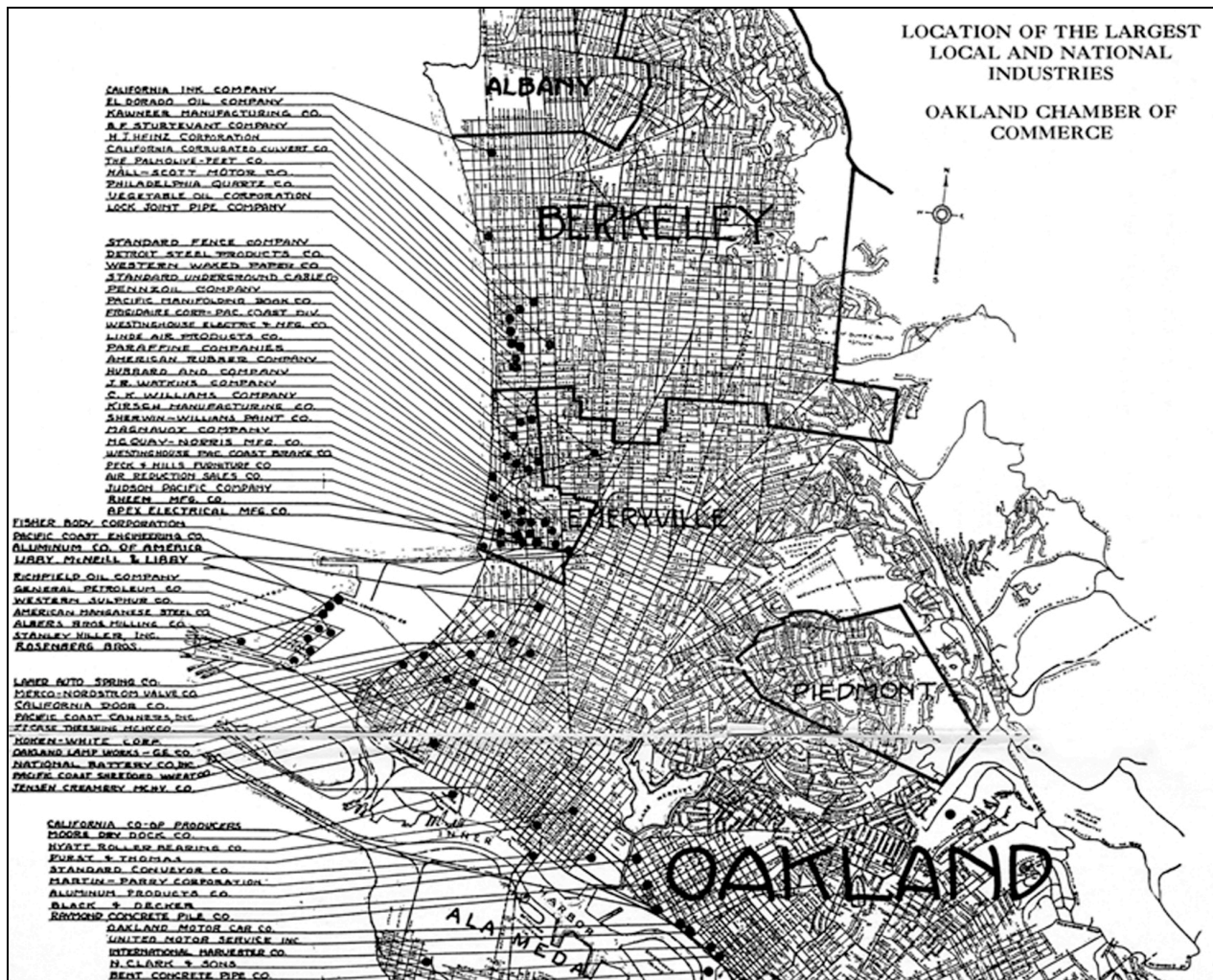
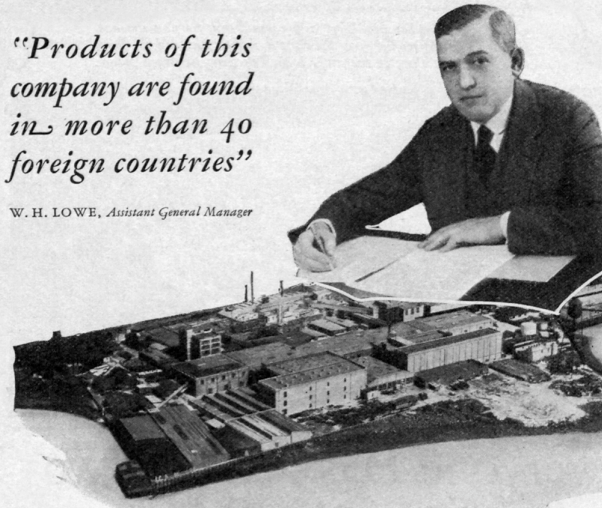


Figure II.4. Emeryville Branch Plants. A portion of the Oakland Chamber of Commerce's map of the largest local and national industries in the East Bay illustrated industrial concentration in Emeryville (center). Source: Oakland Chamber of Commerce Industrial Department, *Report for School of Business, Columbia University* (Oakland, December 19, 1930).

"Products of this company are found in more than 40 foreign countries"

W. H. LOWE, Assistant General Manager



Plant of the Paraffine Companies, Inc.

Oakland's Location Makes Wide Distribution Possible

THE Paraffine Companies, Inc., one of the largest manufacturing units on the Pacific Coast, has found Oakland a most advantageous location for its operations, according to W. H. Lowe, Assistant General Manager. He states:

"In 1884, the present site of the Emeryville (Oakland) plant was first chosen by this institution. The reasons prompting this selection were simple but practical.

"First, was the close proximity to sources of needed raw materials and to stable supplies of high-grade labor.

"Second, it was most advantageously situated in reaching a large and highly-profitable local market.

"Third, the city had excellent rail and water facilities for reaching distant markets.

"The judgment of the company has been thoroughly justified. The products of this company are found throughout the United States and in more than 40 foreign countries. This wide distribution could only have been accomplished with the aid of superior rail and water shipping facilities, which no other industrial district on the Pacific Coast can equal."

**Get the Facts!
Send for
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"We Selected Oakland." The above statement of The Paraffine Companies, Inc., is from only one of many nationally-known concerns which have given their reasons in this booklet for finding the industrial area of Alameda County to be the most advantageous location on the Pacific Coast. A copy will be mailed you for the asking.

A technical industrial report will be prepared for any interested manufacturer on request.

Write Industrial Department

Oakland Chamber of Commerce • Oakland, California

or the Chamber of Commerce of any of the following cities:

Alameda Berkeley
Centerville Emeryville Hayward Irvington Livermore
Newark Niles Pleasanton San Leandro

When writing to OAKLAND CHAMBER OF COMMERCE please mention Nation's Business

Figure II.4. Emeryville's advantages. A PABCO executive reflects on the advantages of Emeryville's (and Metropolitan Oakland's) location. Source: *Nation's Business*, December 1927, 10.

Chapter 4 From Villa Lots to Factory Plots

Greater Oakland

A land rush in San Francisco paralleled the gold rush in the Sierra.¹ “The richest men in San Francisco have made the best portion of their wealth by the possession of real estate,” San Francisco’s chroniclers observed by the early 1850s.² Entrepreneurs coveted East Bay lands and resources, as well. The land rush quickly leapfrogged the bay and Anglo-Californians seized the Peralta’s cattle and crops, felled and milled ancient redwoods, and staked and claimed productive land and promising townsites. Yankee traders Edson Adams and Andrew Moon, along with a young attorney from New York named Horace Carpentier, landed on the shore of Encinal de Temescal in the summer of 1850. They each laid claim to 160 acres of Vicente Peralta’s land grant amid a handful of squatters and sawmills. Backed by a gang of Americans, the trio of squatters coerced a lease from Peralta. Peralta sought help through the new California legal system but the squatters quickly hired Swedish surveyor and city planner Julius Kellersberger to map their consolidated holdings. Kellersberger superimposed a rectilinear grid on Oakland’s shoreline, dividing five square-miles into 224 uniform blocks, with the exception of five blocks allocated for parks and two reserved for civic institutions (Figure 4.1). The streets all measured eighty feet wide except for Main Street (now Broadway), which was 100 feet wide. Each block measured 200 by 300 feet and contained twenty-eight lots, creating a total of 3,276 lots on 323.5 acres of “buildable” land. Then the squatters began hawking lots.³

Through his friend State Senator David Broderick, Carpentier obtained the position of enrolling clerk of the senate. He then filed Kellersberger’s “Complete Map of Oakland” with the Alameda County Recorder’s Office while engineering the passage of a bill creating the town of Oakland. The state legislature incorporated Oakland on May 4, 1852 at the squatters’ behest. With a population numbering under one hundred, the new town’s residents elected Carpentier mayor, who then goaded the town’s board of trustees to grant him the entire waterfront. Carpentier usurped exclusive rights to construct and control wharves, piers, and docks for thirty-seven years. In return, he agreed to build three small wharves and a schoolhouse and to pay the

¹ Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin*, (Berkeley: University of California Press, 1999); Roger Lotchin, *San Francisco, 1846-1856: From Hamlet to City* (New York: Oxford University Press, 1974); Edward Leo Lyman, “The Beginnings of Anglo-American Local Government in California,” *California Historical Society Quarterly* 81, no. 3/4 (2003); Mel Scott, *The San Francisco Bay Area: A Metropolis in Perspective* (Berkeley: University of California Press, 1959).

² Frank Soul’e, John Gihon, and James Nisbet, *The Annals of San Francisco* (New York: D. Appleton and Company, 1854), 500.

³ Hubert Howe Bancroft, *The Works of Hubert Howe Bancroft, Volume XXIV, History of California, Vol. VII, 1860-1890* (San Francisco: The History Publishers, 1888), 476; Peter Bosselmann and Stefan Pellegrini, “Rebuilding the Urban Structure of the Inner City: A Strategy for the Repair of Downtown Oakland, California,” *IURD Working Paper Series, Institute of Urban and Regional Development*, U.C. Berkeley (February 2003), 6; Scott, *San Francisco Bay Area*, 3; Jack Studer, “Julius Kellersberger: A Swiss Surveyor and City Planner in California, 1851-1857,” *California Historical Quarterly* 47, no. 1 (March, 1968): 4, 6.

town two percent of his wharfage receipts.⁴ In this way, the Carpentier junta expropriated, commodified, and marketed the Peralta's land before court or custom determined legal ownership.

While Carpentier, Adams, and Moon swindled, surveyed, and sold Encinal de Temescal, the Peraltas sought legal help. With United States citizenship conferred by the Treaty of Guadeloupe, Vicente Peralta filed claims with the Land Commission in 1852. As the judicial arm of the Land Act of 1851, the Land Commission required claimants to prove the validity of titles granted under Spanish and Mexican law. The Commission functioned for a total five years but individual cases, which were automatically appealed in United States District Courts or the Supreme Court, took an average of seventeen years to resolve. Although more than seventy-five percent of cases were eventually upheld, the Land Commission prolonged agony when speed was of the essence. The Supreme Court confirmed Vicente Peralta's title in 1856 but protracted legal battles had left him bankrupt.⁵ Attorneys' fees and taxes had forced Vicente Peralta and other Peralta brothers to sell most of their land. In doing so, land speculators created the skeletal frame of Metropolitan Oakland.

Speculators bought over 6,000 acres on the eastern shore of an inlet of San Antonio estuary (later Lake Merritt) and platted the village of Clinton in 1853. Immediately to the east, a squatter started a settlement known as San Antonio, consolidated with Clinton, and formed the town of Brooklyn. Across the estuary, two speculators paid Antonio Peralta \$14,000 for Bolsa de Encinal, or the Alameda peninsula. They quickly sold half of the land to a group of San Francisco investors, who platted the town of Alameda in 1853, which was incorporated with about one hundred residents a year later.⁶ Former Texas Ranger John Hays, along with his fellow ranger John Caperton, led this San Francisco contingent. The *Daily Alta* had offered Hays an unctuous welcome in 1850:

To those acquainted with the singularly romantic nature of the Colonel's life and exploits for the last thirteen years—his coolness and daring under the most desperate circumstances—his many hair-breadth saps—his numerous fights with Mexicans and Indians and the great energy of character for which he is distinguished, the popularity he has attained is not at all surprising.⁷

⁴ The "waterfront swindle" raised the curtain on a bitter and protracted legal battle that continued until 1911, when Oakland regained the waterfront. Chris Rhomberg, *No There There: Race, Class, and Political Community in Oakland* (Berkeley: University of California Press, 2004), 26; Scott, *San Francisco Bay Area*, 23-35; Dallas Smythe "An Economic History of Local and Interurban Transportation in the East Bay Cities with Particular Reference to the Properties Developed by F. M. Smith," (Ph.D. diss., University of California, Berkeley, 1937), 6; M.W. Wood, *Alameda County, California* (Oakland: Holmes Book Co., [1883] 1969), 488-90.

⁵ Tomas Almaguer, *Racial Fault Lines: The Historical Origins of White Supremacy in California* (Berkeley: University of California Press, 1994), 12; Leonard Pitt, *Decline of the Californios: A Social History of the Spanish-Speaking Californians, 1846-1890* (Berkeley: University of California Press, [1966] 1998), 95; Robinson, *Land in California*, 106; Wood, *Alameda County*, 486.

⁶ Bancroft, *Works*, 478; Smythe "Economic History," 6; Imelda Merlin, *Alameda: A Geographical History* (Alameda, CA: Friends of the Alameda County Library, 1977), 23-27.

⁷ "Col. Jack Hays," *Daily Alta California*, February 1, 1850, 2. Also see James Greer, *Colonel Jack Hays: Texas Frontier Leader and California Builder* (New York: E.P. Dutton & Company, 1952), 257; William Halley, *The Centennial Year Book of Alameda County, California* (Oakland: William Haley, 1876), 542-43; Robert Utley, "The

Samuel Brannan sought the war hero for San Francisco County Sheriff during the then “present unsettled condition of this already great and growing community.”⁸ With idolatrous affection, the People’s Party candidate was quickly elected and he appointed Caperton as his under sheriff.⁹ The new county sheriff soon became a federal land agent and political profiteer as he leveraged social capital to build a speculative real estate empire in Metropolitan Oakland.

After the first round of East Bay land grabs, President Franklin Pierce appointed Hays as California Surveyor-General. Hays extended the national grid in order to help create the public domain and then documented private land claims as fast as the Federal Board of Land Commissioners approved them. He also moved his residence to Oakland and led a coalition of San Francisco investors who, through a complex succession of mergers, acquisitions, and litigations, cobbled together almost all of the Peraltas’ property north of Lake Merritt—today’s north Oakland, Berkeley, Emeryville, Piedmont, and Albany. In return for over twenty-six square miles of land, Vicente received a total of about \$100,000 and his brother Domingo received \$82,000. Hays appointed Kellersberger as his Deputy Surveyor.¹⁰ Kellersberger had served as Oakland’s first town surveyor and city engineer under Mayor Carpentier. After extending the Humboldt Meridian, Hays gave him a private contract to survey and map the rancho lands and parcel-out ninety-six tracts, ranging from twelve to 330 acres apiece. (Figure 4.2) The interest shares of each investor were translated into actual property with the assignment of tracts in 1856. The Alameda County Recorder’s Office received his “Map of Ranchos of Vicente and Domingo Peralta” and then issued deeds based on the partitions.¹¹

Hays quickly vacated his U.S. Surveyor office and went to work building and boosting Metropolitan Oakland. He projected the Oakland Steam Ferry, Wharf, and Railroad Company, as well as a railroad leading from San Antonio Creek through Oakland, to a wharf with ferry connections to San Francisco. When Hays commenced work on the railroads, real estate prices reportedly increased by fifty percent (before increasing exponentially when the Central Pacific Railroad selected Oakland as its western transcontinental terminus in 1869). He donated land and led the “removalists” in their quest to relocate the state capital to Oakland in 1858 and helped make Oakland the county seat. He was instrumental in creating the Oakland Gas Lighting Company, which began service in 1866 and enhanced property values. Hays sold

Texas Ranger Tradition Established: Jack Hays and Walker Creek,” *Montana: The Magazine of Western History* 52, no. 1 (Spring 2002).

⁸ A circular quoted in “Local Intelligence: A Reminiscence of the Good Old Times,” *Daily Alta California*, May 15, 1868, 1.

⁹ Greer, *Jack Hays*, 264; Soul’e et al., *Annals*, 269-272.

¹⁰ Greer, *Jack Hays*, 291; William Halley, *Centennial Year Book*, 543; Studer, “Julius Kellersberger,” 8-9.

¹¹ Beth Bagwell, *Oakland: The Story of a City* (Oakland: Oakland Heritage Alliance [1982] 1996), 32-37; Joseph Baker, *Past and Present of Alameda County, California*, vol. I, (Chicago: S.J. Clarke Publishing Co., 1914), 359; Peter Thomas Conmy, *The Beginnings of Oakland, California, A.U.C.* (Oakland: Oakland Public Library, 1961), 34; Greer, *Jack Hays*, 283-85; Halley, *Centennial Year Book*, 451-52; George Pettitt, *History of Berkeley* (Berkeley: Alameda County Historical Society, 1976), 12; Scott, *San Francisco Bay Area*, 33; Smythe “Economic History,” 6; Jack Studer, “The First Map of Oakland, California: An Historical Speculation as Solution to an Enigma,” *California Historical Society Quarterly* 48, no. 1 (March 1969), 64; Wood, *Alameda County*, 333-35.

prodigious lots leading north from the downtown area, helping create Oakland's main commercial thoroughfare on Broadway between 1853 and 1866. Hays also helped create and manage two of Oakland's early banks, the Union National Bank and the Union Savings Bank. While developing central Oakland, Hays simultaneously sought rents on the periphery. He contracted with the College of California, later University of California, and sold or bonded land in Oakland and Berkeley, as well as 150,000 acres of agricultural land.¹²

The story of Oakland's formation and the "waterfront swindle" is well known. According to planning historian Mel Scott, "Oakland is the classic example of the shady real-estate operation brought off at a time when rancho owners seemed rather helpless in the face of trespassers, squatters, and conniving attorneys."¹³ Yet the original town of Oakland encompassed a scant five square miles, while the unincorporated area of Alameda County mapped by Kellersberger was slightly larger than Manhattan. Between 1853 and 1856, real estate speculators subdivided over 9,000 lots in Metropolitan Oakland, equaling the total number of lots created during the subsequent thirteen years.¹⁴ Although a glut of lots and "clouded" titles hampered property sales well into the 1860s, a coalition of land-based entrepreneurs emerged in the 1850s, grasping political power in Oakland and Alameda County while facilitating metropolitan expansion in order to incorporate suburban lands into the metropolitan frame.

Through speculative real estate development, Hays and Caperton helped facilitate the immediate entry of a coalition of suburban rentiers who steered politics in Oakland and Alameda County, orchestrating metropolitan expansion in hope of realizing fortunes from differential rents on the periphery. In doing so, this incipient metropolitan growth regime laid bare the links between public power and private profit in the speculative metropolis. Francis Kittredge Shattuck, George Blake, John Dwinelle, and Reverend Henry Durant all served as Oakland Mayor between 1859 and 1874, and held other city and Alameda County offices. Shattuck, for example, served on the Oakland City Council throughout the 1860s and as an Alameda County Supervisor almost continuously from 1857 to 1875. He was also Republican candidate for California senator in 1869. Durant was instrumental in creating the College of California, later the University of California, Berkeley. This group of Berkeley's "pioneers" engaged in massive real estate speculation around the University in conjunction with boosting Berkeley and building out Metropolitan Oakland. Specifically, they platted the College Homestead Association, a new town site designed with the help of Fredrick Law Olmstead around the Berkeley campus and sold lots to help finance construction of campus buildings.¹⁵

¹² Greer, *Jack Hays*, 301-10, 340-41, 345; Halley, *Centennial Year Book*, 139; "Our Sacramento Correspondence," *Daily Alta California*, April 8, 1858, 1; "Incorporations," *Sacramento Daily Union*, June 18, 1869, 2.

¹³ Scott, *San Francisco Bay Area*, 33.

¹⁴ Smythe "Economic History," 8.

¹⁵ *Directory of the Township and the City of Oakland, Together with the Townships of Brooklyn and Alameda, For the Year 1869* (Oakland: B.F. Stillwell, 1869), 17-20; Greer, *Jack Hays*, 307-8; Halley, *Centennial Yearbook*, 511, 541; Henry Langley, ed. *A Directory of the City of Oakland and the Town of Alameda, For the Year Ending December 31st, 1874* (Oakland: Henry G. Langley Publisher, 1874), 30-4; George Pettitt, *Berkeley: The Town and Gown of It* (Berkeley: Howell-North Books, 1973), 20-25, 44; Wood, *Alameda County*, 717-18; "Pioneers Life Closes Sadly," *San Francisco Call*, September 10, 1898, 13.

Hays, Emery, and Shattuck, et al. formed an incipient metropolitan growth coalition that used political power in order to facilitate metropolitan expansion and thus, to enhance the value of suburban lands. Yet, questions remain concerning the actual processes and practices of metropolitan expansion. In addition to seeking rents, they undertook several strategies for profitable city-building, all involving lucrative government contracts and the potential for private profit from public funds. Strategies to enhance property values through capitalizing the core and building out to the suburbs included resource rushes, infrastructure projects, and public service franchises. Finally, Metropolitan Oakland's early growth coalition crystallized through quasi-public institutions, particularly the Oakland Board of Trade.

Building Metropolitan Oakland

Emery bought Plot 6 in 1858, moved to early Emeryville and undertook his "greatest achievement."¹⁶ According to one aggrandizing account, "He was one of the first to realize the commercial possibilities of the eastern side of the bay, and went to Washington."¹⁷ There he leveraged the first federal government appropriations for improving Oakland's harbor with the help of a friend, James G. Blain, who subsequently served in Congress and as Secretary of State before corruption earned him the sobriquet "The Continental Liar" during his losing presidential bid against Grover Cleveland.¹⁸ With a \$14,000 contract funded by private capital and Alameda County bonds, and machinery and oversight provided by the U.S. Navy, Emery dredged San Antonio channel to create permanent shipping lanes for Oakland Harbor (later the Port of Oakland). "We are truly rejoiced to know this work is now under way," one newspaper stated while considering potential ferry and railroad connections. "It will prove a public benefit of no ordinary kind, and will also increase the value of real estate in Oakland one hundred per cent."¹⁹

Emery had spent ten years mastering stonecutting in Baltimore before migrating to California in 1850, where he immediately found work as superintendent for the construction of San Francisco's first county jail.²⁰ After a failed stint in the gold fields, Emery returned to a smoldering San Francisco and, in the wake of the fire of 1851, he found no difficulty in obtaining work as an expert stone-cutter and contractor.²¹ *Contractor*, in this context, connoted not only construction but also the provision of building materials. Enormous demand for materials to build the "instant city" sent Emery up and down the Pacific Coast discovering and extracting natural resources.

Emery's initial search went only one mile into the San Francisco Bay where, in the spring of 1851, he created California's first quarry on Yerba Buena (Goat) Island and extracted stone

¹⁶ "Joseph Stickney Emery," *San Francisco: Its Builders Past and Present*, vol. 2 (San Francisco: The S. J. Clarke Publishing Co., 1913), 239.

¹⁷ "Emeryville Mourns for its Founder," *San Francisco Chronicle*, January 24, 1909, 32.

¹⁸ Edward Crapol, *James C. Blaine: Architect of Empire* (Wilmington, DE: Scholarly Resources Inc., 2000).

¹⁹ Quote from "Removing the Obstruction," *The California Farmer and Journal of Useful Sciences*, July 22 1859, 5; Halley, *Centennial Year Book*, 141; "Oakland Bar," *Daily Alta California*, July 29, 1859, 2.

²⁰ "Joseph Stickney Emery," 237-38.

²¹ *Ibid.*, 238.

for the foundation of John Parrott's building on the corner of California and Montgomery streets in San Francisco. He also developed quarries on Angel Island, which Parrot held for about three years before the federal government took charge of the island.²²

Emery's rush on building materials expanded south to Monterey County. With partner Abner Bassett, Emery purchased Rancho San Jose y Sur Chiquito, a stretch of coastline from Carmel River south to Palo Colorado Canyon, close to 9,000 acres in all (including contemporary Point Lobos State Park).²³ Sixty men worked in the granite quarries owned by the firm of Bassett & Emery in 1854, furnishing a large quantity of stone for the United States Government.²⁴ Emery also extracted oak and pine timber to build the seawalls and the first dock at the Mare Island Navy yards near Vallejo.²⁵

Winter rains on San Francisco's dirt streets rendered mud that bedeviled pedestrians, horses, and carriages. "This is not a town, it is a quagmire; it is chaos... San Francisco literally floats on an ocean of mud," as one French observer put it.²⁶ According to Herbert Asbury's colorful account, the mud at Clay and Kearny streets, in the heart of the town, became so deep and thick that a wag posted, "This street is impassable; not even jackassable."²⁷ Bags of Chilean flour, empty tobacco boxes, barrels of spoiled provisions, and derelict mining equipment composed a makeshift sidewalk on the busiest sections of Montgomery Street.²⁸ In the early 1860s, Emery and Egbert Judson began competing with plank road companies when they created the San Francisco Stone Breaking and Macadamizing Company. The new company quarried "hard blue stone" on Yerba Buena Island, to which Judson held a tenuous title. Advertisements touted the company's "stone crushing machine," which ran daily for the road paving enterprise under contract with both city government and private parties.²⁹

In the late 1860s, the rush on stone extended north where Emery found an "inexhaustible" supply of building stone on tiny Newcastle Island next to Vancouver Island in British Columbia, Canada.³⁰ He leased the Vancouver Coal Company's Newcastle Island

²² Ibid., 238.

²³ *Annual Report of the Commissioner of the General Land Office for the Fiscal Year Ending June 30, 1880* (Washington, DC: Government Printing Office, 1881), 439.

²⁴ "Stone Quarries," *Sacramento Daily Union*, December 15, 1858, 4.

²⁵ Henry Barrows and Luther Ingersoll, *A Memorial and Biographical History of the Coast Counties of Central California* (Chicago: The Lewis Publishing Company, 1893), 347; James Guinn, *History of the State of California and Biographical Records of Coast Counties, California* (Chicago: Chapman, 1904), 1136.

²⁶ Etienne Derbec, *A French Journalist in the California Gold Rush: The Letters of Etienne Derbec*, A. P. Nasatir ed. (Georgetown, CA: Talisman Press, 1964), 87.

²⁷ Herbert Asbury, *The Barbary Coast: An Informal History of the San Francisco Underworld* (New York: Thunder Mountain Press, 1933), 13.

²⁸ Theodore Hittell, *History of California*, vol. 3 (San Francisco: N.J. Stone & Company, 1897), 339.

²⁹ "Notice to Property Owners," advertisement in *Daily Alta California*, August 30, 1862, 2; "Stonebreaking Company," advertisement in *Daily Alta California*, November 20, 1863, 1; "San Francisco Macadamizing and Stone-Breaking Company," advertisement in *Daily Alta California*, December 24, 1863, 1; "Supreme Court Decisions," *Sacramento Daily Union*, August 28, 1865, 3.

³⁰ "From Victoria (V.I.)," *Sacramento Daily Union*, October 23, 1869, 4

Quarry and extracted 8,000 tons of sandstone for the construction of San Francisco's second mint. Emery erected six thirty-two-foot stone columns made of solid "free stone." Each column weighed about thirty-two tons, cost \$5,000, and connoted officialdom and permanency on the corner of Mission and Fifth streets.³¹

Emery profited from government construction contracts, as well. Municipal bonds paid for the \$12,000 contract awarded to Emery for supplying stone and masonry work for Oakland's city hall in 1868.³² He secured state and county contracts worth over \$60,000 to furnish stone for the Institution for the Deaf and Dumb and Blind in Alameda County.³³ And Emery spun off several kindred construction businesses. With the Asphalt Paving Company of California, Emery diversified his road building business. Other spin-offs from Emery's contracting and construction enterprises included the Oakland Dredging Company, the Manhattan Marble Company, which used gypsum to manufacture artificial marble, and the Western White Lead Works, which manufactured inputs for paint production.³⁴

Public Services, Political Powers, and Private Profits

Oakland is now increasing rapidly and steadily in population, and dwellings are going up in every direction with a rapidity that indicated general confidence in a prosperous future. Of course this rapid growth must be attributed mainly to the topographical beauty, and the healthfulness of the locality and its contiguity to the commercial center of the State... Yet with all these natural advantages, dealers in real estate find it necessary to improve property and construct avenues and streets, and use every means their ingenuity can suggest to increase the value and attractions of their lots in order to secure purchasers. Among the artificial means thus employed, probably none has been more successful, or paid a better return on the capital invested, than street-railroad enterprises.

Oakland Daily Tribune, 1876³⁵

On March 23, 1868, Carpentier transferred his control of the Oakland harbor to the recently formed Oakland Waterfront Company, whose officers included Carpentier himself, Oakland Mayor Samuel Merritt, and Leland Stanford, President of the Central Pacific Railroad.

³¹ Jan Peterson, *Black Diamond City: Nanaimo, The Victorian Era* (Surrey, Canada: Heritage House Publishing, 2002), 138; "A Successful Work," *Daly Alta California*, October 16, 1872, 1.

³² Baker, *Past and Present*, 367; Wood, *Alameda County*, 663.

³³ E. H. Pardee, "Report of the Committee on Public Grounds and Buildings on the Institution for the Deaf, Dumb, and Blind," *Appendix to Journals of State and Assembly of the Nineteenth Session of the Legislature of the State of California, Volume II* (Sacramento: T.A. Springer, State Printer, 1872), 3.

³⁴ Langley, *A Directory of the City of Oakland*, 23; "Incorporations," *Sacramento Daily Union*, December 19, 1872, 3; "Artificial Marble," *Pacific Rural Press*, February 1, 1873, 72; "Turning Gypsum in Marble," *Daily Alta California*, May 20, 1873, 1; "Incorporations," *Sacramento Daily Union*, August 30, 1879, 2; "Incorporations," *Sacramento Daily Union*, December 9, 1879, 3.

³⁵ Cited by Smythe, "Economic History," 34.

The next day, for the price of five dollars, the Oakland Waterfront Company sold five hundred acres of bay frontage and two strips of land for the rights-of-way to the Western Pacific Railroad, an affiliate of the Central Pacific. Capitalizing on Oakland's location on the mainland side of the Bay, the railroad chose it as the West Coast terminus for its new transcontinental line and agreed to spend at least \$500,000 on terminal facilities within the following three years. In May 1869, the Central Pacific joined the Union Pacific at Promontory, Utah, linking California by rail with the rest of the nation. By November, the first overland passenger train had arrived in Oakland.³⁶

The selection of Oakland for the Central Pacific terminus—ferries transported cars to San Francisco—made Oakland the unequivocal center of the East Bay. The city boomed but its government failed to keep pace. Early local government made up for its lack of fiscal and administrative resources by granting monopoly franchises to private corporations to meet the city's infrastructural and service needs. Under this arrangement, "public service" corporations supplied the initial capital investment and organization and were in turn granted the rights to provide public services for a profit. In Oakland, private companies supplied water, power, and public transportation. While the Southern Pacific ultimately dominated Oakland politics, early franchises to operate horsecar lines created a significant nexus between suburban property development and political power, while inducing metropolitan expansion.

Emery served as an inaugural board member and early president of the Oakland Railroad Company, which created Oakland's first horse car line in 1869. From Broadway and Seventh Street in Oakland, the line ran up Telegraph Avenue to the Temescal District about a mile east of Emery's landholdings, and eventually to Shattuck's real estate and the new College of California in Berkeley. As I discuss below, the second component of the Oakland Railway Company system, the San Pablo Railroad Company, linked Plot 6 directly to downtown Oakland.³⁷

The state legislature changed laws relating to franchises in 1870, giving incorporated municipalities and counties the right to grant franchises lasting a maximum of twenty-five years. In Oakland, this opened the floodgates for an inundation of franchise and rampant speculation; entrepreneurs often secured franchises in advance of actual projection of street railways, and sold them to bona fide promoters. Shattuck quickly capitalized on the new opportunities.

Shattuck, who served as an Alameda County Supervisor and City of Oakland Councilman, spearheaded the second horsecar railroad corporation in Metropolitan Oakland in 1870. With franchises granted by the City of Oakland and Alameda County Supervisors, the new "Tubbs Line" traveled from Fruitvale Avenue to the southern end of Adeline Street in Oakland, then along Shattuck to University Avenue in Berkeley, connecting to the new University of California, the College Homestead, and other Shattuck landholdings. Four years later, Shattuck and Durant helped create the Berkeley Ferry and Railroad Company, which provided direct ferry service to San Francisco from a pier at the foot of University Avenue, coupled with a horse car line running up University Avenue to the new campus. Finally, Shattuck led a group of Berkeley rentiers who gave the Western Development Company, a subsidiary of the Central Pacific Railroad, the right-of-way and land for a depot located between Center Street and University Avenue, as well as twenty additional acres of land and \$20,000 in cash. The Berkeley Branch Railroad Company initialed a steam railroad directly from Oakland

³⁶ Bagwell, *Oakland*, 51; Richard Orsi, *The Sunset Limited: The Southern Pacific Railroad and the Development of the American West, 1850-1930* (Berkeley: University of California Press, 2007); Rhomberg, *No There There*, 26; Scott, *San Francisco Bay Area*, 48-49.

³⁷ Smythe "Economic History," 19-20; "The Railroad Litigation," *Daily Alta California*, November 12, 1871, 1.

Point on the Northern Railway to Stanford Avenue in early Emeryville, and then along Adeline Street and Shattuck Avenue to University Avenue in 1876.³⁸ In all, local landowners and entrepreneurs, rather than specialized transportation developers, built early horse car lines and trolley systems in Metropolitan Oakland. Rather than fares or other operating revenue, the nascent transportation system served foremost as an instrument to increase land values and sell suburban lots.

Petitions for water franchises nearly kept pace with those for horsecar routes. “Indeed the formation of water companies for the supply of the citizens of San Francisco and Alameda Counties with water would appear to become a popular amusement in the year 18[6]6,” according to one historian.³⁹ Emery, Shattuck, and Oakland Mayor Dwinelle incorporated the Amador Water Company with \$1 million in capital stock in 1866 and proposed to supply Metropolitan Oakland with water diverted from the Amador and Livermore valleys. The Oakland and Alameda Water Company likewise petitioned Oakland’s City Council for a franchise to tap Temescal Creek and supply the city. Other upstart water companies, such as College Water Company, followed in quick succession.⁴⁰

Ultimately Anthony Chabot won the franchise; his Contra Costa Water Company reduced Temescal Creek to a trickle in order to supply Metropolitan Oakland.⁴¹ A hydraulic mining pioneer and engineer, Chabot designed and developed municipal water systems in San Francisco (his San Francisco City Water Works merged with Spring Valley Water Company), San Jose, Vallejo, and Napa.⁴² Yet the Contra Costa Water Company was his most extensive system, as well as one of Oakland’s most powerful franchise corporations.

Chabot constructed a reservoir, Lake Temescal, and ran a main two miles down Telegraph Avenue to Broadway; auxiliary branches totaled upwards of 40,000 feet of pipes in 1869.⁴³ Five years later, Chabot dammed San Leandro Creek five miles south of Oakland, creating a catchment reservoir, Lake Chabot, served by thousands of acres of watershed. By 1883, 133 miles of water pipes laced metropolitan Oakland, delivering seven million gallons per day to roughly 6,000 residents.⁴⁴

The Contra Costa Water Company quickly emerged as one of Oakland’s most powerful franchise monopolies and then consolidated seven competitors by 1900, when Oakland residents paid more to the company for water than they did in property taxes to the city.⁴⁵ Although the

³⁸ Smythe, “Economic History,” 17, 22, 28-29.

³⁹ Wood, *Alameda County*, 649-50.

⁴⁰ Halley, *Centennial Year Book*, 649-50; Edgar Hinkel and William McCann, *Oakland 1852-1938: Some Phases of the Social, Political and Economic History of Oakland, California, Volume Two* (Oakland: Works Progress Administration, 1939), 624.

⁴¹ Wood, *Alameda County*, 649-50; Bagwell, *Oakland*, 130-142, 178; Scott, *San Francisco Bay Area*, 50.

⁴² Sherwood Burgess, *The Water King: Anthony Chabot, His Life and Times* (Davis, CA: Panorama Publishing Co., 1992).

⁴³ Wood, *Alameda County*, 650.

⁴⁴ Baker, *Past and Present*, 400.

⁴⁵ Rhomberg, *No There There*, 31.

Oakland city council set the rates, the water company allegedly determined who sat on the council. “By all accounts the company charged high rates for muddy water of doubtful purity,” according to historian Sherwood Burgess.⁴⁶ Chabot returned a fraction of the profits to the city through his philanthropic endeavors. Yet the water monopoly, as well as his charities aiding Metropolitan Oakland, cannot be disentangled from his real estate and industrial interests. Chabot developed Highland Park (near present Highland Hospital) and owned 160 acres on the east shore of Lake Chabot. He projected and invested in iron, paper, the energy industries, and was Vice President of the Judson Manufacturing Company, which sat at the mouth of Temescal Creek.⁴⁷

Constructing and contracting had led Emery up and down the Pacific Coast discovering, extracting, and processing natural resources for building materials. Beyond these resource rushes, Emery tapped into California’s broader resource-intensive economy, partnering with Metropolitan Oakland builders and Bank Ring financiers to not only reinvest mining profits in urban systems but also to divert water conveyance systems from Sierra mines towards Bay Region cities in hopes of securing service franchises.

With Abner Bassett of the Monterey County quarrying enterprise, Emery in 1861 built one of the early quartz mills on the Comstock Lode.⁴⁸ Located in the Flowery district near the famed Gould and Curry Mine, sixteen stamps at the Bassett Mill pulverized argentiferous ore before the partners sold out to the Suncook Mill and Mining Company.⁴⁹ Emery expanded the scope of operation and scale of investment in 1873 as president of the Amador Canal and Mining Company, “one of the great mining interests of California,” according to State Mineralogist Rossiter Raymond.⁵⁰ Along with Thomas Bell of the Bank of California and Giant Powder Company, Emery consolidated the properties of a half dozen old canal and ditch companies in the early 1870s, during the revalorization of derelict quartz mines and ditch companies in California.⁵¹ The Amador Canal Company’s sixty-six mile system tapped the Blue Lakes and the North Fork of the Mokelumne River in order to supply water to mines in the Mother Lode (Sutter Creek, Jackson, Amador, Drytown, etc). Owing to the increasing scarcity of timber, charcoal fuels became too expensive for profitable mining of large volumes of lower grade ore. The canal company supplied water for turning waterwheels at sixteen quartz mining operations, as well as for hydraulic mines, copper mines, smelters, and foundries in the heart of the Mother

⁴⁶ Sherwood Burgess, “Oakland’s Water War: Competing Private Utilities Bring Water—and Chaos—to Oakland in the 1890s,” *California History* 64, no. 1 (Winter 1985): 35.

⁴⁷ Hinkel and McCann, *Oakland*, 130.

⁴⁸ Barrows and Ingersoll, *History of the Coast Counties*, 347.

⁴⁹ Mary Ansari, *Comstock Place Names: The Names of Store County, Nevada* (Reno: Camp Nevada, 1986), 2; A.D. Hodges, *Amalgamation at the Comstock Lode, Nevada* (New York: American Institute of Mining Engineers, 1890), 20; “New Mining Incorporations,” *Daily Alta California*, July 12, 1863, 1.

⁵⁰ Rossiter Raymond, *Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains* (Washington D.C.: Government Printing Office, 1874), 79.

⁵¹ Robert Kelley, *Gold vs. Grain: The Hydraulic Mining Controversy in California’s Sacramento Valley; A Chapter in the Decline of the Concept of Laissez Faire*, (Glendale, CA: The Arthur H. Clark Company, 1959).

Lode.⁵² Further, the Amador Canal and Mining Company powered the planing mills and floated the timber and lumber for Emery's Amador Lumber Company, incorporated in 1876 with \$5 million in capital. The firm eventually amassed over 8,200 acres of timberland in Amador and El Dorado counties.⁵³

In 1875, Emery attempted to use the Amador Canal and Mining Company to supply San Francisco but lost to the Spring Valley Water Company monopoly.⁵⁴ Emery and Alvinza Hayward then incorporated the Blue Lakes and San Francisco Water Company in a losing bid to furnish San Francisco and vicinity with water from Blue Lakes, Alpine County, and from the Mokelumne River and its tributaries in Alpine, Amador, and Calaveras counties.⁵⁵ Around 1892, the Blue Lakes Water Company consolidated Amador and Blue Lakes properties with the intent of providing water to Oakland. Although the city authorized a bond issue and completed surveys for a daily supply of 17.5 million gallons of water, stringencies of the 1893 depression halted the \$3.5 million project.⁵⁶ Nevertheless, these water conveyance systems ultimately provided services to the Bay Region, and passed through multiple owners before being consolidated by de Sabla in 1904 as some of the final pieces in Pacific Gas and Electric Company's interconnected, synchronized hydroelectric electric power network blanketing the Sierra Nevada and serving the entire Northern California market.⁵⁷

The Industrial Growth Machine

It has been said many times, with gentle derision, that Oakland is but the bedchamber of San Francisco, but she is becoming ambitious to outgrow this reputation, and has done much within the past few years, by the liberal

⁵² Emery invested heavily in Amador County quartz mining operations, including Sutter Creek Gold Mining Company, Gover Mining Company, and Grass Valley Queen Gold Mining Company. "Mining Incorporations," *Daily Alta California*, May 16, 1888, 7; "Mines and Mining," *San Francisco Chronicle*, June 15, 1888, 3; "New Incorporations," *San Francisco Call*, August 7, 1890, 6.

⁵³ "Incorporations," *Daily Alta California*, November 7, 1876, 1; *United States Annual Mining Review and Stock Ledger; Part II: Pacific Coast* (New York: The Mining Review Publishing Co., 1879), 169; Conservation Commission of the State of California, *Report of the Conservation Commission of the State of California, January 1, 1913*, (Sacramento: State Printing, 1912), 433; "Pacific Coast Items," *Sacramento Daily Union*, July 12, 1878, 1.

⁵⁴ San Francisco Board of Supervisors, *San Francisco Municipal Reports for the Fiscal Year 1874-5, Ending June 30, 1875* (San Francisco: Spaulding & Barto, Printers, 1875), 613-723; George H. Mendell, *Report on the Various Projects for the Water Supply of San Francisco, Cal.: Made to the Mayor, the Auditor, and the District Attorney, Constituting the Board of Water Commissioners* (San Francisco: Spaulding & Barto, Stream Book and Job Printers, 1877); J.S. Emery and F.M. Brown, "An Offer from the Amador Canal and Mining Company to Fill the Bill for \$10,245,000," *San Francisco Chronicle*, May 4, 1875, 3.

⁵⁵ William Irelan, *Eighth Annual Report of the State Mineralogist* (Sacramento: State Printing, 1888), 97; "Incorporations," *Sacramento Daily Union*, November 15, 1877, 3.

⁵⁶ Randall Ellis, "The Story of Electra, Recalled to Memory by the Recent Destruction of the Famous Boarding-House," *Pacific Service Magazine* 6, no. 11 (April 1915), 342-43.

⁵⁷ Ellis, "Story of Electra," 343; James Williams, *Energy and the Making of Modern California* (Akron, OH: University of Akron Press, 1997), 180-82.

encouragement of manufacturing establishments, to almost give faith in her confident prophecy, that she is destined to become a great manufacturing center.

*Second Biennial Report of the Bureau of Labor Statistics of the State of California, 1877*⁵⁸

The loose coalition of suburban politicians who sought to build out Metropolitan Oakland evinced class prerogatives and common strategies for realizing differential rents. The consolidation of a Metropolitan Oakland growth regime furthermore occurred in an institutional context, primarily through membership in quasi-public organizations, such as the Oakland Board of Trade. Metropolitan Oakland's rentiers certainly resembled the "traditional" growth machine described by Logan and Molotch. Envisioning, planning, and promoting industrial development, however, was an early and enduring issue in Metropolitan Oakland.

Three years after the Central Pacific reached Oakland, a group of prominent Bay Region capitalist-boosters, including Emery and Oakland Mayor (1869-70) John B. Felton, published *The Railroad System of California: Oakland and Vicinity*.⁵⁹ Along with laudatory descriptions of the Southern Pacific and Central Pacific railroads, as well as Oakland's sparkling prospects, the text includes the promoters' grandiose vision of Metropolitan Oakland's industrial destiny.

The Central Pacific railroad cut through the heart of Oakland, then west to the end of Seventh Street, and out to ferry connections on the "long wharf," which jutted 11,000 feet into deep water. Twelve railroad tracks laced the wharf, which included a passenger depot, rows of warehouses, and outdoor storage for 40,000 tons of grain. Three docks accommodated the largest steamers and clippers afloat on the Pacific Coast, as well as the Central Pacific's massive freight ferry, which carried sixteen loaded train cars and up to three hundred cattle on each forty-minute trip to San Francisco, at a clip of up to 2,560 tons per day.⁶⁰

Industrial plans centered on the shoreline, where the city of Oakland's "claims to the water front were exchanged for guarantees of metropolitan portensions. Master minds were employed; grand conceptions were developed; great things have been accomplished; and greater things are in progress," according to the railroad boosters.⁶¹ Manufacturing prospects hinged on the Central Pacific's 350-acre tidelands "reserve," which would include a frontage of nearly a half-mile on a shipping channel. The Central Pacific had secured a "large track of hilly ground where it can obtain, *ad libitum*, earth and gravel for filling purposes."⁶² (Figure 4.3) The boosters envisioned a massive wharf laced with spur lines giving manufacturers immediate access to both shipping and the Central Pacific's trunk line.

Emanating from the waterfront manufacturing district and transportation hub, the boosters' vision of industrial expansion included linking Metropolitan Oakland to the resource

⁵⁸ John Enos, *Second Biennial Report of the Bureau of Labor Statistics of the State of California for the Years 1885 and 1886* (Sacramento: State Office, 1887), 161.

⁵⁹ *The Railroad System of California: Oakland and Vicinity* (San Francisco: J.H. Carmany & Co., 1871), 9-10; Halley, *Centennial Year Book*, 511.

⁶⁰ *Ibid.*, 9-10.

⁶¹ *Ibid.*, 15-16.

⁶² *Ibid.*, 5.

hinterland. In doing so, they sought to create an incipient industrial axis along the East Bay shoreline. According to the boosters, this proposed branch from Oakland to Tracy “is the solution to a State problem. Our most extensive wheat-districts, and our coal-mines, *will have a level road to the sea.*”⁶³ In 1876, Oakland’s City Council awarded Charles Crocker a highly contested franchise to build and operate a railroad along the East Bay’s shoreline. The resulting Northern Railway, a thinly veiled subsidiary of the Central Pacific, reached Shellmound in Emeryville in 1876. At the same time, under the name of the Berkeley Branch Railroad Company, a line was built from Shellmound, via Stanford Avenue, Adeline Street and Shattuck Avenue a little over three miles to University Avenue in Berkeley, thus opening-up Shattuck’s promising suburban community around College of California. The main line of the Northern Railway skirted the East Bay shoreline connecting Metropolitan Oakland to California’s foremost wheat shipping hub at Port Costa on the Carquinez Straight, then to Tracy in the Central Valley. Trains bound for Sacramento and beyond connected with the train ferry *Solano* at Port Costa, the largest car transfer steamer of its kind in the world. In 1888, the Northern Railway consolidated with ten other lines forming a four-hundred-mile system.⁶⁴

Metropolitan Oakland’s growth coalition assumed an institutional coherence through quasi-public organizations and private financial institutions, both serving to centralize political, social, and economic capital. Emery was one of twelve founding members of Oakland most venerated organization, the Mountain View Cemetery Association (1863). For four decades, he served as trustee, director, and president, along with Shattuck and Chabot, who were members, as well.⁶⁵ The association secured and dedicated in perpetuity under state law two hundred acres in the north Oakland foothills and then hired esteemed landscape architect Fredrick Law Olmstead—after he designed Central Park in New York City and helped plan Golden Gate Park in San Francisco—to design the cemetery, seeking a sophisticated and autonomous identity for both Metropolitan Oakland and its boosters.⁶⁶

The inaugural directors of the Oakland Board of Trade (1886) provide a seeming model of Logan and Molotch’s urban growth machine—they included Oakland’s mayor and a former mayor, both listed as “capitalists,” the publishers of the Oakland *Daily Enquirer*, and the presidents of Oakland’s two leading banks, including Volney Moody, president of the First National Bank of Oakland.⁶⁷ By 1889, Emery and Shattuck helped reorganize the flagging organization, as well as inaugurating a movement to create a state board of trade, of which

⁶³ *Railroad System of California*, 6.

⁶⁴ Scott, *San Francisco Bay Area*, 66; John Signor, *Southern Pacific’s Western Division* (Wilton, CA: Signature Press, 2004), 3; Thomas J. Vivian, *The Commercial, Industrial, Agricultural, Transportation, and other Interests of California: Being a Report on that State for 1890 Made to S. G. Brock, Chief of the Bureau of Statistics, Treasury Department*, (Bureau of Statistic, Treasury Department, 1891), 132.

⁶⁵ The cemetery also created a niche market for a new tombs and headstones for Emery’s Amador County Marble Company. “Emeryville Mourns for its Founder,” *San Francisco Chronicle*, January 34, 1909, 32; “Joseph Stickney Emery,” 239.

⁶⁶ *Railroad System of California*, 41; Halley, *Centennial Year Book*, 60; “Mountain View Cemetery,” *Daily Alta California*, January 21, 1872, 1; “Oakland Items,” *Daily Alta California*, January 9, 1884, 8.

⁶⁷ Oakland Board of Trade, *Oakland, California; Issued by the Board of Trade* (Oakland: Oakland Board of Trade, 1886), 1.

Emery became Alameda County's delegate.⁶⁸ The foremost goals of the Oakland Board of Trade embraced industrial development at a metropolitan scale.

For instance, the first purpose noted in their articles of incorporations included fostering, encouraging, and developing the manufacturing and home industries of Oakland and its suburbs. The board also codified policies seeking to induce industrial capital investment along with striving "to increase the wealth, industries, influence, trade, and population of the city of Oakland and its vicinity."⁶⁹ According to another early Oakland Board of trade publications:

Choicest Locations For Manufacturing Enterprises, ample room and, if required, sites combining railroad facilities with wharfage for sea-going vessels. To manufacturers of stable goods of every description and especially to those who wish to erect cotton and woolen mills or foundries, or desire to make furniture, wagons, carriages, agriculture implements, cutlery, shears or any and all articles into which leather, wood and iron enter as an important material, her citizens extend a hearty welcome, and through the Board of Trade, offer substantial aid and co-operation.⁷⁰

According to Moody, president of the Board's manufacturing committee, "Capital for legitimate enterprises is abundant, and the rate of interest is unusually favorable to the borrower." He promised that, "...the people of Oakland would welcome and assist, to the utmost of their ability, all persons who may possess the enterprise and knowledge which are needed to establish and maintain successful manufacturing enterprises."⁷¹

Finally, members of Metropolitan Oakland's growth coalition (and Board of Trade) centralized capital and channeled investment into Metropolitan Oakland enterprises. Emery, Shattuck, and Judson variously served as directors of Moody's bank from the 1880s to the mid-1890s, and funneled capital into Oakland's leading manufacturers including California Iron and Steel Company, Judson Manufacturing Company, both controlled by Egbert Judson.⁷² Similarly, Oakland Home Insurance Company, Emery, Judson, and Shattuck, and Moody led the "capitalists who have large sums of money invested in [Oakland]" who created the Oakland Home Insurance Company.⁷³

⁶⁸ Baker, *Past and Present*, 398; *Oakland, Alameda, and Berkeley City Directory, 1889-1890* (San Francisco: F.M. Husted Publisher, 1889), 38.

⁶⁹ G. W. Calderwood and G. T. Loofbourow, *Oakland: "Athens of the Pacific": Facts and Figures of Alameda County* (Oakland: G. T. Loofbourow, 1896), 96.

⁷⁰ *Oakland, California; Issued by the Board of Trade*, 1.

⁷¹ W. W. Elliot & Co., *Oakland and Surroundings Illustrated and Described, Showing its Advantages for Residence or Business* (Oakland: W.W. Elliot, 1885), 146.

⁷² "Incorporations," *Sacramento Record-Union*, January 3, 1880, 5; "The Oakland Home Insurance Company" (Ad.), *Blue and Gold, Published by the Junior Class of the University of California*, 1884; "Death Calls an Aged Pioneer of California," *San Francisco Call*, March 21, 1901, 9.

⁷³ Quote from "On Solid Ground," *San Francisco Call*, October 1, 1893, 17. Elliot, *Oakland and Surroundings*, 107; "It Will Not Fail," *San Francisco Chronicle*, September 30, 1893, 16.

Boosting and building Metropolitan Oakland certainly involved industrial enterprise, such as the provision of public services and transportation infrastructure. But these requisite industrial endeavors for metropolitan expansion did not lead to the creation of industrial space—the provision of industrial property, industrial capital investment, factory localization, and imposition of industrial land use.

From Villa Lots to Factory Plots

Oakland's callow "city of homes" promotions blossomed into the Greater Oakland Movement by the 1870s.⁷⁴ If San Francisco was the "Paris of the West," Oakland sought to become the "Athens of the Pacific," not merely a "City of Homes" but also "A City of Schools, Churches, of Intelligence, Esthetic Taste and High Standards of Morality."⁷⁵ "Crime in Oakland is at its minimum and morality is at its maximum," Oakland mayor Williams Davies proclaimed.⁷⁶ While weaving together themes of Mediterranean antecedents and moral superiority, the "Athens of the Pacific" trope helped Oakland's developers capitalize on the city's propinquity to San Francisco while demarcating a distinctive urban realm of their own.

Within the East Bay metropolis, "Greater Oakland" possessed a second, overlapping meaning as the boosters' quest for permanence became a design for dominance. Metropolitan Oakland's population increased 548 percent between 1860 and 1870 and another 230 percent by 1880, when Alameda County's population reached 69,976 residents.⁷⁷ Oakland's landowners and burgeoning population required services, which in turn required tax revenues. "Greater Oakland" referred not only to a moral superiority but also to the imperative of territorial expansion through the annexation of both cities and unincorporated districts, as well as numerous consolidation plans to create the city and county of Oakland. During the Central Pacific railroad boom, Oakland annexed adjacent northern territory and the town of Brooklyn, growing from less than five square miles to more than eleven in 1872.⁷⁸

Oakland's expansion reconfigured the relative location of Emery's Plot 6, enhancing its advantages. The Northern Railway ran along the shore, linking Metropolitan Oakland to the resource hinterland and augmenting access to deepwater shipping lanes. After the 1872 annexations, Oakland's northern boundary cut through the southeast corner of Plot 6 and the

⁷⁴ Cf. Robert Self, *American Babylon: Race and the Struggle for Postwar Oakland* (Princeton, NJ: Princeton University Press, 2003). California Taxpayers' Association, "Proceedings of a meeting of the taxpayers of Oakland, held at Dietz Hall, April 1st, 1876" (San Francisco: J. Winterburn & Co, 1876), Oakland Miscellany, 1865-1936, The Bancroft Library, University of California, Berkeley; Baker, *Past and Present*, 405; William Warren Ferrier, *Berkeley, California: The Story of the Evolution of a Hamlet into a City of Culture and Commerce*, (Berkeley: Author, 1933), 146.

⁷⁵ "Oakland Homes," *Oakland Tribune Yearbook*, January 1, 1890, 8.

⁷⁶ William R. Davies, "Nature and Human Nature," *Oakland Tribune Yearbook*, January 1, 1888, 17.

⁷⁷ Smythe "Economic History," 34.

⁷⁸ The northern area stretched from the original northern boundary to the Encinal Line (36th Street). Harland, Bartholomew, and Associates, *A Proposed Plan for a System of Major Traffic Highways, Oakland, California; For the Major Highway and Traffic Committee of One Hundred* (Oakland: The Committee, 1927), 24.

subdivision of early Emeryville's large tracts heralded incorporation into the expanding metropolitan land market.

Speculation, Transportation, and New Suburban Space

After organizing the Oakland Street Railroad Company and building Oakland's first horsecar line, Emery sought to link Plot 6 directly to downtown Oakland. He became president of the company in 1871 and then joined Edson Adams to form the San Pablo Avenue Railroad Company, the second component of the Oakland Street Railway Company's system. The new horsecar line traveled north from Broadway and Telegraph Avenue in downtown Oakland two and one-half miles on San Pablo Avenue to Emery's Italianate villa at Park Avenue, where it branched west towards the bay.⁷⁹ As one of Oakland's founders, Adams likely facilitated the franchise for the new horsecar railway but Emery invested the capital, according the *Oakland Transcript*:

Mr. Emery has built the road and put it in good working order at an expense of some \$24,000. He is bound to reap the reward of the expenditure, not only in the profits of the road, but what is of far more importance to him, the enhanced value of the property he owns along the line of the road. Such men as Mr. Emery are not only desirous of succeeding, but they will build up for themselves wealth and fame.⁸⁰

Horsecar service in 1871 and Northern Railway steam train connections five years later precipitated a real estate boom in early Emeryville. Emery imposed a rectilinear street grid on Plot 6, subdividing 154 acres into 537 relatively uniform residential lots, as well as 15 larger

⁷⁹ The line was originally slated to reach the northern boundary of Alameda County. "San Pablo Street Railroad Company," *Sacramento Daily Tribune*, June 4, 1873, 3; Bagwell, *Oakland*, 157; Smythe "Economic History", 20; Wood, *Alameda County*, 243-44; "The Railroad Litigation," *Daily Alta California*, November 12, 1871, 1; "San Pablo Street Railroad Company," *Sacramento Daily Tribune*, June 4, 1873, 3.

⁸⁰ Quoted by Emeryville Historical Society, *Early Emeryville Remembered: Historical Essays & Photographs; Compiled and Edited by the Emeryville Historical Society* (1997), 177. In 1873, the Oakland Street Railway and San Pablo Avenue Railroad companies consolidated under the former's name. Control of the system remained in the hands of Emery and associates until 1885, when they sold it to Comstock millionaire and Pacific Rolling Mill's leader James Fair. Fair reinvestment mining profits in a railroad from Alameda to Sacramento, proposed to travel through Oakland on Broadway and Telegraph Avenue. He converted the San Pablo horsecar line to a cable car route (the Oakland Cable Railroad) in hopes of placating residents pitted against constructing another steam railroad through the heart of Oakland. Fair, however, was forced to liquidate his holdings in 1887 and the cable line was acquired by the Pacific Improvement Company, controlled by Crocker, Huntington, and Hopkins of the Southern Pacific Railroad. The cable care lines were converted to an electric trolley operated by the Oakland Traction Company (Key Route system) beginning in 1899. Erle Hanson, "California and Nevada Railroad," *Western Railroader* 21 (1958), 3-15; *The System of Wire-Cables Railways for Cities and Towns* (New York: The National Cable Railway Company, 1887), 45.

commercial lots adjacent to San Pablo Avenue.⁸¹ In all, land developers subdivided 900 lots between 1870 and 1879, 45 percent of the all the initial subdivisions in Emeryville (Figure 4.4).⁸²

The platting of lots was an anticipatory activity, occurring in advance of demand, sales, or actual building. The uncertainties and risks inherent in land speculation fostered standardization in lot design; when land becomes a speculative commodity, clarity, simplicity, and legal acceptability of boundaries become even more important.⁸³ A grid layout offered simplicity in property surveying, recording, and subsequent transfers. Within early Emeryville's subdivided plats, streets providing access to lots were laid out either parallel or perpendicular to San Pablo Avenue. Streets were generally created within each plat, as opposed to along boundary lines in order to maximize the number of lots that could be subdivided. Undeveloped tracts of land, however, separated subdivided parcels and block designs within each parcel differed; several distinct and isolated grids emerged, representing different strategies of real estate speculation.

Corporate "Homestead Associations" proliferated in the Bay Area during the 1860s, embodying one strategy to profit from subdividing large, suburban landholding—often chunks of Mexican land grants. After an association's officers bought and subdivided a piece of land outside of the settled area, shareholders typically bought in with an initial fee or deposit of \$10 to \$100, and paid monthly installments of \$10. When the appropriate sum was collected, the member received title to a lot.⁸⁴ About 170 of these corporations operated in San Francisco during the 1860s, while approximately twenty-five "homestead associations" are evident among other speculative subdivisions in Thompson & West's 1878 maps of Metropolitan Oakland (Oakland, early Emeryville, Alameda, and Berkeley).⁸⁵ In addition to subdividing Plot 6, Emery was a trustee of the Oakland Homestead Association, located less than a mile north of Plot 6 (see Figure 4.4). The Oakland Homestead Association divided a sixty-acre tract into half-acre lots, selling shares for \$180, payable in monthly installments. The lots proved a great investment within five years, though by the late 1870s, slaughterhouses and holding corrals occupied the "homesteads."⁸⁶

During the 1870s, developers began a new practice of real estate development, *speculative building*. Entrepreneurial land developers, architects, and contractors built houses on subdivided lots *before* seeking buyers, rather than simply offering lots.⁸⁷ San Francisco

⁸¹ Thomas Thompson and Albert West, *Historical Atlas of Alameda County, California* (Bicentennial Reprint), (Fresno: Valley Publishers, [1878] 1976), 65, 100-01.

⁸² Symth, "Economic History," 8.

⁸³ Eldor Pederson, "Land Subdivision, Land Speculation, and Urban Form: An Essay on Urban Morphology," (Ph.D. dissertation, University of California at Berkeley, 1974), 9.

⁸⁴ Anne Bloomfield, "The Real Estate Associates: A Land and Housing Developer of the 1870s in San Francisco," *Journal of the Society of Architectural Historians* 39, no.1 (March 1978), 16.

⁸⁵ Bloomfield, "Real Estate Associates," 16; Horatio Stoll, "Growth and Development of the Mission," *Daily Alta California*, July 18, 1908, 10; Thompson and West, *Historical Atlas of Alameda County*.

⁸⁶ Wood, *Alameda County*, 644; "By Telegraph to the Union," *Sacramento Daily Union*, July 22, 1864, 2; "Pacific Slope Intelligence," *Daily Alta California*, May 5, 1868, 2.

⁸⁷ Anne Bloomfield, "Real Estate Associates," 16.

architects Johnston & Moore developed a block of eight three-story “modern style” houses on O’Farrell and Mason streets in 1869.⁸⁸ Six blocks to the west, another builder advertised six two-story houses. The following summer, twenty-four cottages served by horsecar hit the market near the Mission Delores. A new horsecar line also served “Tuckerville” or “Tuckertown,” a block of forty semidetached, bay-windowed cottages located near Washington and Octavia streets in the Western Addition, financed by prominent jeweler J.W. Tucker and built by David Farquharson, architect of the Bank of California headquarters.⁸⁹ Yet one firm overshadowed all other San Francisco builders, The Real Estate Associates, which claimed to have built more detached houses than any other person or company in the U.S. during the early 1870s. The firm assembled and subdivided cheap tracts served by horsecars on San Francisco’s periphery, primarily in the Mission District and Western Addition. The Association built more than one thousand Italianate homes of varying sizes and prices and created comprehensive suburban neighborhoods, which were quickly enveloped in San Francisco’s expanding urban fabric.⁹⁰

The Central Land Company was to Oakland what The Real Estate Associates was to San Francisco, according to the *Daily Alta*.⁹¹ The Oakland firm “strives to aid the efforts of the laborer, by selling him a homestead and erecting a suitable dwelling, to be paid for in such a manner as may be most convenient.”⁹² During their first five months of operation in 1874, they built and sold twenty-five “attractive cottages” and disposed of eighty lots on the installment plan on their fifty-acre subdivision near Telegraph and San Pablo avenues.⁹³ Further out on San Pablo Avenue, the “beautiful suburb” of Klinknerville (now Oakland’s Golden Gate district) emerged just one-half mile north of Plot 6.⁹⁴

After creating a successful rubber stamp manufacturing firm in San Francisco, Charles Klinker moved to Metropolitan Oakland in 1878 and, during the subsequent fifteen years, acquired a fourteen-acre dairy farm and built more than fifty houses, “disposing of them as fast as they were erected.”⁹⁵ He also acquired two thousand front feet of San Pablo Avenue and built Klinkner’s Hall on the northeast corner at the intersection of Klinkner Avenue (now 59th Street). The three-story gothic building contained shops on the first floor and a public hall and forty-two

⁸⁸ Henry Langley, *The San Francisco Directory for the Year Commencing 1869* (San Francisco: Henry G. Langley, Publisher, 1869), 21.

⁸⁹ James R. Smith, *San Francisco’s Lost Landmarks* (Sanger, CA: Word Dancer Press, 2005), 25; “Spengers Part; To Seek Divorce,” *San Francisco Call*, October 30, 1910, 30.

⁹⁰ Bloomfield, “Real Estate Associates,” 16.

⁹¹ “Oakland Observations,” *Daily Alta California*, May 14, 1875, 1.

⁹² Alonzo Phelps, *Contemporary Biography of California’s Representative Men* (San Francisco: A.L. Bancroft and Company, Publishers, 1881), 150.

⁹³ “Oakland Observations,” *Daily Alta California*, May 14, 1875, 1.

⁹⁴ *The Bay of San Francisco: The Metropolis of the Pacific Coast and its Suburban Cities*, vol. 2 (Chicago: Lewis Publishing Company, 1892), 524.

⁹⁵ James Miller Guinn, *A History of the State of California and Biographical Record of Oakland and Environs*, vol. 2 (Los Angeles: Historic Record Company, 1907), 640.

offices and apartments on the upper floors.⁹⁶ Despite prosecution for possession of “vile” literature and stamps, manufacturing and circulating counterfeit coins, and conducting Oakland lotteries, Klinkner was hailed as a community builder.⁹⁷ He lobbied for a branch post office and raised funds to extend the San Pablo Avenue horsecar line, “greatly increasing the value of property in the neighborhood of Klinknerville.”⁹⁸ Klinkner helped finance a gas works furnishing two thousand gaslights and he provided a playfield for the Klinkner Baseball Club, which was later enclosed and rechristened as Klinkner’s Recreation Grounds and became home to the Alameda Cricket Club.⁹⁹

In the 1880s, real estate agents touted the stretch of San Pablo Avenue bisecting Klinknerville and Plot 6, then known as Emery District, as the most fashionable suburb and the most favored locality in Oakland. San Pablo Avenue was “the most prominent thoroughfare running out of Oakland,” they claimed.¹⁰⁰ A key selling point for lots was proximity to the “beautiful residences” of Emery and his neighbors, as well as nearby trolley and train connections.¹⁰¹ Many of these homeowners convened on February 15, 1884, for the second meeting of a club called “Our Neighbor.” Emery chartered special cars on his trolley line for the Friday evening social, a night of dinner and dancing at the residence of C.S. Chamberlain on San Pablo Avenue.¹⁰² Members of Our Neighbor soon planned the Emery School District and Board of Education, and then financed a school in 1885 built on land donated by Emery.¹⁰³

The Emery District was an elegant residential enclave seemingly with all the makings of a classic “streetcar suburb.”¹⁰⁴ These neighbors, however, consisted of industrialists and local landowners united in an effort to transform vacant lots on Plot 6 in productive factory plots. Emery’s neighbor John Shepard, for instance, was Egbert Judson’s partner in an array of chemicals and explosives enterprises. Another member of Our Neighbor, AC Dietz, was an oil entrepreneur who owned an oil refinery and gas works nearby in west Berkeley. Beyond a residential community defined by location or status, Our Neighbors helped compose the local

⁹⁶ *The Bay of San Francisco*, 524.

⁹⁷ “Suppressing Vice,” December 2, 1886, 2; “Lack of Jurisdiction,” *Daily Alta California*, November 6, 1887, 7; “In Trouble Again,” *Daily Alta California*, April 17, 1890 7.

⁹⁸ *The Bay of San Francisco*, 525.

⁹⁹ P. David Sentence, *Cricket in America, 1710-2000* (Jefferson, NC: McFarland & Company, 2006), 148; “Home Items,” *Light, Heat and Power* 4, no. 14 (November 1, 1888), 474.

¹⁰⁰ “Auction Sales,” *Daily Alta California*, June 4, 1886, 3.

¹⁰¹ “Auction Sales,” *Daily Alta California*, November 22, 1889, 3.

¹⁰² “Our Neighbors,” *Daily Alta California*, February 18, 1884, 7.

¹⁰³ “Emeryville’s School System,” *Emeryville Herald*, December 6, 1929, 17.

¹⁰⁴ Robert Fishman, *Bourgeois Utopias: The Rise and Fall of Suburbia* (New York: Basic Books, 1987); Dolores Hayden, *Building Suburbia: Green Fields and Urban Growth, 1820-2000* (New York: Vintage Books, 2003); Kenneth Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985); John Stilgoe, *Borderland: Origins of the American Suburb* (New Haven: Yale University Press, 1988); Sam B. Warner, Jr., *Streetcar Suburbs: The Process of Growth in Boston, 1870-1900* (Cambridge: Harvard University Press, 1962).

coalition of industrialists who in 1882 invested in the Judson Horse Nail Company, which quickly reorganized into Judson Manufacturing Company (see Chapter 5).¹⁰⁵ Chamberlain was the superintendent of the Judson nail works.

Emery had sold three acres of valuable shoreline on Plot 6 to Egbert Judson for \$5 in 1882, and then contributed another six acres in 1884 in hopes of enticing more industrial capital investment. These concessions, according to one federal government reporter, “were considered much more favorable than any promise on the other side of the bay, and so the Oakland people secured several industries that ought to have been located at San Francisco.”¹⁰⁶ Real estate developers began hawking lots for speculators to build workers’ housing. One advertisement offered fifty-one lots, claiming that, “Being in the immediate neighborhood of the Judson Nail Works, where hundreds of men are constantly employed, making small houses in demand and paying far more interest than the savings bank, the property must rapidly enhance in value.”¹⁰⁷

The implantation of the Judson factory, Emery hoped, would initiate industrial development on the shoreline of Plot 6. Gifts of industrial land, however, were only one facet of a larger plan. Along with the Emery’s Oakland Railroad Company, which provided trolley service, and the Southern Pacific’s steam trains, Emery began building the California & Nevada Railroad, a narrow-gauge line with transcontinental aspirations. With steam trains, trolleys, and ferries converging on Plot 6, Emery planned to transform early Emeryville into a regional industrial district and transportation hub rivaling the Southern Pacific’s Port of Oakland.

Emery’s Transcontinental Terminus

Emeryville is the logical center of Oakland, and with the new ferry and car lines coming together here the tide of traffic and improvement will be turned our way, and ten years will see a solid city from Oakland’s limit to Berkeley.

San Francisco Call, 1898¹⁰⁸

In the early 1880s, Emery embarked on a grandiose plan to transform early Emeryville from Oakland’s suburb to the metropolis’ center. His California & Nevada Railroad (C&N) sought to open up the Bay Region’s resource hinterland and to connect to a transcontinental system. The C&N terminus and trestle for transbay ferry service on Plot 6 would create commodious industrial space and yield prodigious speculative gains. During the 1880s and ’90s, Plot 6 became the rally point for Metropolitan Oakland boosters bent on breaking the Southern Pacific Railroad’s stranglehold on Bay Region rails and waterways, as well as on Oakland’s harbor area, where “the octopus” had prevented competition and public improvements (the Central Pacific railroad became the Southern Pacific in 1885).

The C&N incorporated in 1881 with a capital stock of \$2.5 million and during the next fifteen years it was controlled primarily by Emery, who leveraged his land and political capital as

¹⁰⁵ “Oakland Manufacturers,” *Pacific Rural Press*, June 17, 1883, 493.

¹⁰⁶ Quote from Thomas J. Vivian, *Interests of California*, 402; “Real Estate Transfers,” *Daily Alta California*, June 13, 1882, 2; “Emeryville Mourns for its Founder,” *San Francisco Chronicle*, January 24, 1909, 32.

¹⁰⁷ “Auction Sale,” *Daily Alta California*, April 14, 1883, 3.

¹⁰⁸ “Pledge their Support to the New Ferry,” *San Francisco Call*, October 16, 1898, 16.

president, and Captain John “Denver” Smith, who helped finance and build the rails.¹⁰⁹ In Colorado, Smith had applied California’s mode of resource-intensive regional development and rapid reinvestment in urban and commercial systems. He made fortunes from quartz mining and milling, then invested in Denver real estate, and developed that city’s first municipal water system and woolen, planing, and flouring mills. His Denver Pacific Railway reached Cheyenne, Wyoming and his Denver & South Park Railroad opened the Leadville mining district before Jay Gould acquired both lines during the Union Pacific’s transcontinental push.¹¹⁰ With profits from Rocky Mountain plunder and reinvestment, Smith moved to Oakland in the early 1880s with a scheme to build a narrow gauge railroad to the intermountain West.

With the first blow of the pick at the groundbreaking ceremony in Emeryville on September 9, 1881, one C&N official claimed that the new line “was destined to relieve our shippers and producers in the near future from the oppressive charges and exactions now imposed upon by the broad-gauge railroad men.”¹¹¹ C&N leaders plotted a narrow gauge railroad and telegraph line in direct competition with the Southern Pacific along the East Bay shoreline. From a terminus near Yerba Buena and San Pablo avenues on Plot 6, the line ran north through Berkeley to San Pablo in Contra Costa County. The road then veered east (near contemporary Richmond), skirting the East Bay hills through the El Sobrante Valley, then transected rich agricultural lands from Bryant (Orinda) to Livermore before debouching into the San Joaquin Valley. The C&N approached the Sierra Nevada via the Sonora Pass and headed to the flourishing mining camp of Bodie, near the Nevada border in Mono County. Once across the state line, C&N promoter’s planned to link with the Carson & Colorado Railroad (later the Denver & Rio Grande) in Candelaria, Nevada, or perhaps another line in Salt Lake City, Utah, en route to the ultimate objective of completing a transcontinental line (Figure 4.5).¹¹²

C&N hired Chinese labor contractors and “celestial camps” soon advanced northward from early Emeryville, leaving in their wake steel rails made by the San Francisco’s Pacific Rolling Mills. C&N officials banked on opening-up the Bay Region’s resource hinterland and delivering natural resources to East Bay markets and manufacturers. The fifteen-mile stretch between San Pablo and Walnut Creek provided access to fifty thousand acres of agricultural land under cultivation in the eastern Coast Range foothills. C&N expected an annual freight of 150,000 tons of wheat and 30,000 tons of hay from the Livermore Valley alone. C&N planned to transport fresh produce directly to Oakland’s Lusk Cannery, the largest fruit-packing firm in the West. C&N also anticipated traffic from the Corral Hollow (near Tracy) and Mt. Diablo coal mining districts, and later planned to extend the railway south in order to carry coal from Emery’s land in Monterey County. After inking a ten-year contract with the Oakland Rock Company, the C&N built a 3,000-foot spur track and tramway to haul rubble from the company’s quarry and rock-crushing plant to Metropolitan Oakland, where it was used for macadam and concrete. The Emeryville Brick Company fired fifty thousand bricks during the

¹⁰⁹ Erle Hanson, *The True Story of the California and Nevada Railroad* (Northampton, PA: R&S Printers, 1988), 1; “The California and Nevada,” *San Francisco Chronicle*, October 26, 1881, 4.

¹¹⁰ Hanson, *True Story*, ix, 22, 59; George Hilton, *American Narrow Gauge Railroads* (Stanford, CA: Stanford University Press, 1990); “A Denver Pioneer Dies in Oakland,” *San Francisco Chronicle*, November 16, 1895, 7.

¹¹¹ “The Narrow Gauge,” *Livermore Herald*, September 15, 1881, 2.

¹¹² Hanson, *True Story* 1, 21-22; “The Railroads,” *Daily Alta California*, 22 Sep. 1881, 2; “A New Overland Road Begun,” *San Francisco Chronicle*, March 20, 1884, 2.

early 1890s using San Pablo clay delivered by the C&N. Judson's Giant Powder Company and the cluster of chemicals and explosives manufacturers in Contra Costa County also provided lucrative opportunities for transporting explosives.¹¹³

Beset by financial struggles, by 1891 the C&N's tracks reached only from early Emeryville to Bryant Ranch (in today's Orinda), a distance of twenty-three miles (Figure 4.6). Although freight provided some income, revenue came primarily from land promoters, who leased the C&N in order to run "excursion trains." For sixty or seventy-five cents a ticket, families and religious and fraternal organizations, such as the Catholic Ladies Aid Society and Grocery Clerks Association of San Francisco, took daytrips on the C&N for picnics and dancing, or hiking and fishing at Lafayette Park in today's El Cerrito and Oak Grove near El Sobrante. Yet selling residential lots at far-flung speculative real estate developments was the underlying purpose of such excursions. Metropolitan Oakland entrepreneurs formed the Coast Range Development Company and leased the C&N for \$650 per month. Excursion trains stopped at Peralta Park in Berkeley, a 60-acre chunk of Domingo Peralta's rancho held by William Ralston before A.M. Curtis' Peralta Park Hotel Company built a sixty-bedroom, twenty-bathroom Moorish-style resort, as well as an exclusive residential neighborhood. The train also stopped at Olinda, a speculative town platted by Ezra Barrett's California Improvement Company consisting of roughly fifty residential lots and commercial sites flanking the C&N tracks (today's Sherwood Forest district of El Sobrante). The line terminated at Bryant Ranch, where Andrew Jackson Bryant, former two-term mayor of San Francisco (1875-79), hawked residential lots.¹¹⁴

Like the developers of Metropolitan Oakland's early horsecars, cable cars, and trolleys, the entrepreneurs who leased the C&N sought to link peripheral lands to the metropolitan core and expand the suburban frontier in their search for speculative gains. The value of the C&N, however, lay not in steel rails or excursion contracts but instead in its properties and franchises. C&N leaders sank considerable economic and political capital into multiple franchises and three primary assets: the right-of-way from the town of San Pablo, through Berkeley, to Plot 6 was the best and perhaps only viable entry into the Bay Region; the terminal land on Plot 6, known as the Yerba Buena corridor, provided access from San Pablo Avenue to the San Francisco Bay; and the ferry trestle, where Emery held a franchise for a ferry service, possessed the potential to vie with the Southern Pacific for transbay passenger and freight services.¹¹⁵

Unable to sell bonds or attain credit in the Bay Region, Emery traveled east in the mid-1880s, endeavoring to place bonds with capitalists in New York, Boston, and London. He met with no luck.¹¹⁶ An array of developers and coalitions scrambled for Emery's C&N property while he struggled financially during the late-1880s.

¹¹³ Hanson, *True Story*, 2, 4, 19, 23, 27, 29-30, 38, 42; "Berkeley," *Livermore Herald*, October 12, 1881, 2; "The California and Nevada," *San Francisco Chronicle*, October 26, 1881, 4; "Hunting for Coal," *San Francisco Chronicle*, December 29, 1890, 10; "Miscellaneous," *Pacific Rural Press*, January 27, 1894, 74.

¹¹⁴ Hanson, *True Story*, 8, 14, 19, 23, 27, 30, 33-34; Pettitt, *Berkeley*, 27, 29; "The Eastern Shore," *Daily Alta California*, March 25, 1888, 8; "Among the Railroads," *Daily Alta California*, April 1, 1888, 2; "New Incorporations," *Sacramento Daily Union-Record*, March 28, 1888, 3.

¹¹⁵ "The California and Nevada," *San Francisco Chronicle*, June 11, 1884, 3; "Oakland Railroads," *San Francisco Chronicle*, September 30, 1885, 3.

¹¹⁶ "To Walnut Creek," *San Francisco Chronicle*, August 19, 1887, 6.

Under the auspices of the Oakland Board of Trade, Emery and Moody spearheaded the incorporation of the Oakland Terminal Company in 1887 and sought to raise \$30,000 to extend the railroad to Walnut Creek.¹¹⁷ In addition to bonding seventy-five acres of Emery's tidelands on the western edge of Plot 6 (valued at \$120,000), they bonded a four-hundred-acre "basin" consisting of tidelands between Plot 6 and the Southern Pacific's Oakland Harbor property to the south.¹¹⁸ Simultaneously, rumors about negotiations between the C&N and Atchison Topeka & Santa Fe railroad flourished in the media. The Santa Fe sought a terminus for the transcontinental route via Los Angeles. Beyond their entry to the Bay Region, the prospects of C&N's East Bay right-of-way, terminal, and wharf and ferry franchise was "by far the easiest and most profitable route for the Atchison Company if they want to cross the bay."¹¹⁹ Such rumors engendered a speculative real estate boom. Emery sold thirty-two lots on Plot 6 for a total of \$40,000; corner lots sold for up to \$1,500.¹²⁰ Questions concerning ownership of the "basin," however, temporarily derailed the Oakland Terminal Company's plan.¹²¹

John "Denver" Smith, several San Francisco capitalists, and a cadre of former Atchison, Topeka & Santa Fe railroad officials soon formed the Pacific Construction and Improvement Company; Emery owned ten percent of the company's stock and donated five shoreline acres to the cause. They leased the C&N, sought funds for extending the line to Salt Lake City, and renewed efforts to develop a freight and passenger ferry from the C&N wharf to San Francisco. Rumors that California's attorney general sought to take back the Oakland's waterfront, however, stalled the plan.¹²²

Emery added a new element to railroad and ferry plans in 1893. He began extending the pier into deep water on 1,400 feet of pilings in hopes of connecting ferries to not only C&N trains but also northern Oakland's electric railway system.¹²³ This iteration of the metropolitan transportation system—a regional steam railroad, an electric interurban streetcar network, the Yerba Buena corridor terminal and ferry connections, and industrial property—formed the kernel of Francis Marion "Borax" Smith's storied Key Route System.

¹¹⁷ "Railroad Talk in Contra Costa," *Sacramento Daily Record*, June 16, 1887, 1; "Oakland; Movement for Extending the California and Nevada Railroad," *Daily Alta California*, June 19, 1887, 4; "Oakland," *Daily Alta California*, June 25, 1887, 4.

¹¹⁸ Hanson, *True Story*, 12; "Oakland Improvements," *Daily Alta California*, August 11, 1887, 1.

¹¹⁹ "Across the Bay," *San Francisco Chronicle*, July 3, 1887, 5.

¹²⁰ "The Eastern Shore," *Daily Alta California*, September 4, 1887, 8.

¹²¹ Hanson, *True Story*, 13, 15; "The California and Nevada," *San Francisco Chronicle*, June 11, 1884, 15.

¹²² Hanson, *True Story*, 33-4; "Oakland News," *San Francisco Chronicle*, March 29, 1889, 5; "New Incorporations," *Daily Alta California*, September 23, 1890, 2; "From Across the Bay," *San Francisco Call*, September 11, 1892, 3; "Along the Rail," *San Francisco Call*, February 6, 1892, 3; "Over in Oakland," *San Francisco Call*, July 9, 1893, 6.

¹²³ "The Next Ferry," *San Francisco Chronicle*, June 15, 1893, 12.

The Key To Metropolitan Expansion

After accumulating a fortune from mining borax in Death Valley, Smith arrived in Oakland in 1891 and began fashioning an empire built on interlocking investments in real estate, transportation, and water. He began by consolidating independent electric streetcar lines in Metropolitan Oakland, a system characterized by “too many roads that lead nowhere and too few that lead to somewhere,” as the *San Francisco Chronicle* put it.¹²⁴ Emery’s Plot 6 became the “somewhere” in Smith’s plans to create a new Bay Region transportation hub. Considering C&N’s antecedent activities, as well as the Central Pacific’s waterfront project, Smith’s plan was not necessarily visionary or even novel. Nevertheless, the scale of Smith’s operation and the efficacy of his corporate maneuvering created one of the nation’s grand metropolitan transportation systems, and enabled the Santa Fe railroad to break the Southern Pacific’s hold on the Bay Region.

Under contract with Emery, Smith acquired the rights to the C&N’s right-of-way, Yerba Buena terminal, and wharf and waterfront properties. He consolidated C&N assets with his interest in four electric trolley companies and incorporated the Oakland and San Francisco Terminal Company with a \$1.5 million capital stock in 1893.¹²⁵ Smith leveraged the Oakland Board of Trade, who attempted to raise \$225,000 in stock subscriptions from Metropolitan Oakland residents. In return, the new firm planned to complete the wharf and provide ferry service to San Francisco, expand the electric street railway system, extend the C&N to Walnut Creek, and then connect the C&N in the San Joaquin Valley with one of several transcontinental railroads then being projected in California.¹²⁶ Smith planned to link together these elements—regional steam trains, East Bay streetcars, and transbay ferries—creating an integrated transportation system centered on early Emeryville, which would challenge the Southern Pacific. In addition to handling through and commuter traffic, Smith expected to transport fruit and truck crops to the metropolitan area.¹²⁷

The Oakland Board of Trade anticipated precipitous population growth, as well as an immediate increase in land values throughout the city. Yet the prospects for industrialization were not lost on the boosters: “The future possibilities to commerce in the inauguration of a warehouse system and to manufacturing industries by the opening up of available sites for factories are beyond estimate in value to the city.”¹²⁸ Smith’s plans sparked another real estate boom in the vicinity of Plot 6 and San Pablo Avenue, which was touted as the “the backbone of the city” and the East Bay analogue of San Francisco’s Market Street.¹²⁹

¹²⁴ “Oakland’s Maze,” *San Francisco Call*, December 20, 1892, 3.

¹²⁵ Baker, *Past and Present*, 86; Smyth, “Economic History,” 67-68; “Articles of Incorporation,” *San Francisco Chronicle*, November 7, 1893, 5.

¹²⁶ “New Opposition,” *San Francisco Call*, January 12, 1894, 10; “The Opposition,” *San Francisco Call*, January 17, 1894, 8; “Another Ferry,” *San Francisco Call*, January 20, 1894, 3.

¹²⁷ Smyth, “Economic History,” 93; “Smith’s New Wharf,” *San Francisco Chronicle*, October 16, 1893, 10; “Prospects of A Competing Ferry Service Across the Bay,” *San Francisco Call*, March 30, 1897, 5.

¹²⁸ “The Opposition,” *San Francisco Call*, January 17, 1894, 8.

¹²⁹ “Auction Sales,” Advertisement, *San Francisco Call*, May 14, 1893, 6.

Smith, however, abruptly cancelled the plan and then left for London to raise capital.¹³⁰ He returned and acquired C&N property, including about two hundred acres in Emeryville, from Emery for \$150,000 and, with Frank Havens, created the Realty Syndicate in 1895, ostensibly to raise cash for the transportation system but also as a corporate umbrella for assembling a single, consolidated system.¹³¹ The plan included consolidating rattletrap street-railway companies into a unified and modern interurban electric railway system; completing the C&N wharf for a transbay train and ferry system linking Metropolitan Oakland and San Francisco; and developing warehouses, factory sites, and docks at the “basin” between the C&N trestle and the Oakland Pier of the Southern Pacific to the south.¹³² Plot 6 was both a key and a kernel for the Realty Syndicate’s plan. As one Realty Syndicate official tersely stated, “We have the property, capable of enormous development; we have the street railroads to assist in their development, and we own the water front which will enable us to have a direct line to San Francisco.”¹³³

In 1898, boosters trumpeted Smith’s new ferry: “the day is now at hand when the Southern Pacific Company must go up against a hard formation that will give its nervous system a horrible shock—one that means the dividing of one of its best money-making fields—the breaking of its most iron-bound monopoly.”¹³⁴ C&N property proved essential for Smith’s incipient Key Route system: “Emeryville forms the natural traffic center for the present and future travel from these great sections, and it is proposed to so adjust their street car line as to deliver passengers at that point from all sections covered by their systems.”¹³⁵ The resulting transportation system was known as the Key Route because its geography resembled an old-fashioned key—the bow of the key represented Oakland, Piedmont, and Berkeley, while the stem signified the mainline channeled through Emeryville, and out the trestle to the Pier Terminal and ferry slips, symbolized by the key’s pin and bit.¹³⁶

The system was also the “key” to Metropolitan Oakland’s development as it ultimately served the Realty Syndicate land speculations. As one senior executive later testified, the relationship of the Key System and the Realty Syndicate was “very similar to the relation between two pockets in the same man’s trousers.” By 1900, the Realty Syndicate owned thirteen thousand acres of East Bay residential property and thousands of acres of commercial and industrial land. (Figure 4.7) Smith and Havens merged the Contra Costa Water Company and several others with their own People’s Water Company, capitalized at \$20 million in 1906. By 1911, the Realty Syndicate owned \$10 million worth of real estate and, having acquired and consolidated fourteen independent streetcar companies, owned \$8 million more in traction

¹³⁰ “He Bought a Railroad in Five Minutes,” *San Francisco Call*, December 5, 1895, 16.

¹³¹ George Hildebrand, *Borax Pioneer: Francis Marion Smith* (San Diego: Howell-North Books, 1982), 157.

¹³² *Ibid.*, 154-55.

¹³³ “New Fast Ferry Service to Connect with Oakland,” *San Francisco Call*, October 6, 1898, 1.

¹³⁴ *Ibid.*

¹³⁵ *Ibid.*

¹³⁶ Vernon Sappers, *From Shore to Shore: The Key Route* (Oakland: Peralta Associates Publisher, 1948), 1.

company stock.¹³⁷ Nevertheless, Smith had not abandoned plans for a transcontinental steam railroad.

Rumors that Smith was acting as an agent for the Santa Fe were confirmed in 1901, when the Santa Fe authorized its subsidiary, the Oakland & East Side Railway Company, to buy the C&N's eleven-mile right-of-way from Point Richmond to Emeryville from the Realty Syndicate.¹³⁸ Bay Region capitalists, including Havens of the Realty Syndicate, helped compose the directorship of the new firm.¹³⁹ Then, in October 1902, as Smith frantically tried to complete his ferry pier and build a concrete culvert beneath the Southern Pacific railroad tracks, the Syndicate conveyed ten blocks of Emery's Plot 6 to the Santa Fe for the nominal price of only \$1 per lot. In addition to increased passenger and freight services and increased land values, Smith planned ferry service as a joint project with the Santa Fe, in that the Key Route would operate the ferries and connect with Santa Fe trains at a depot and transport their cars to the pier with electric cars. The property gave the Santa Fe a four-hundred-foot-wide swath fronting Yerba Buena Avenue from San Pablo Avenue to the San Francisco Bay shoreline. The property provided the Santa Fe space for terminal facilities, depots, yards, and the like, mirroring the Key Route's terminal shops, car houses, and central station.¹⁴⁰ (Figure 4.8) The Santa Fe also acquired "irregular piece of property" extending from the Key Route pier north to Egbert Judson's Manufacturing Company, which gave the railroad access to the bay and rights to fill in the waterfront for nearly a mile to the government bulkhead.¹⁴¹ Referring to the relations between the Realty Syndicate and the Santa Fe, the press claimed, "The exact relations of the two companies to each other are immaterial to the plans as they affect Oakland. The plans are large enough to satisfy the most enthusiastic boomer, no matter by whom carried out."¹⁴²

The first train from Point Richmond reached Emeryville on March 14, 1904, finally consummating Emery's, Smith's, and other Metropolitan Oakland promoters' visions of transforming Emeryville into a Metropolitan transportation hub. At the local scale, the Realty Syndicate bisected Emery's Plot 6, dividing it into two elongated termini stretching from San

¹³⁷ The trolley facet of the Key Route was initially named the Oakland, San Francisco and San Jose Railroad Company. Hildebrand, *Borax Pioneer*, 164; Rhomberg, *No There There*, 31; Hinkel and McCann, *Oakland*, 30-34.

¹³⁸ Atchison, Topeka, and Santa Fe Railway Company, *Eighth Annual Report of the Atchison, Topeka, and Santa Fe Railway Company, for the Year Ending June 30, 1903* (New York: C.G. Burgoyne, 1903), 21.

¹³⁹ "Santa Fe May Run to Oakland," *San Francisco Chronicle*, March 5, 1902, 7.

¹⁴⁰ The Key Route's pier rested on pilings that reached into the bay to a line even with the Southern Pacific's Long Wharf and endured until the mid-1930s, when it was incorporated into the approach for San Francisco-Oakland Bay Bridge. The Santa Fe also secured a key strip of land along Fortieth and Adeline streets to connect to the Yerba Buena corridor. "Oakland Wants the Santa Fe," *San Francisco Chronicle*, March 6, 1902, 7; "Oakland City Council," *San Francisco Chronicle*, May 20, 1902, 7; "Terminal for the Santa Fe Road," *San Francisco Chronicle*, October 2, 1902, 7; "Santa Fe Buys its Yard Room," *San Francisco Call*, October 2, 1902, 9; "Santa Fe Railroad Company Completes Plans for Reaching the Water Front at Emeryville," *San Francisco Call*, December 14, 1902, 47.

¹⁴¹ "Big Tract of Land Purchased by the Santa Fe," *San Francisco Call*, July 20, 1903, 7.

¹⁴² "Santa Fe Railroad Company Completes Plans for Reaching the Water Front at Emeryville," *San Francisco Call*, December 14, 1902, 47.

Pablo Avenue to the shoreline. Spatial propinquity allowed for the unfettered flow of freight between the two terminals on spur tracks (Figure 4.9).

Locational Assets and Commodious Industrial Space

If there is any one thing more than another which will assist in the industrial development of a community or a part of a community, that thing is a regularly organized and highly developed terminal.

New York City Merchants Association, 1913.¹⁴³

Transportation development—the Oakland Street Railway Company, the C&N Railroad, the Key Route and the Santa Fe—is generally seen as an end in itself but is better understood within a broader political and economic context. That is, the broader implications and effects of transportation development in early Emeryville pertain directly to speculative industrial real estate development and industrial capital investment. Beginning with Joseph Emery’s C&N, Egbert Judson’s Manufacturing Company, and the Oakland Board of Trade’s promotions, coalitions of private actors and public institutions linked property, industry, and transportation in their efforts to simultaneously develop Emeryville and Metropolitan Oakland.

In addition to his initial visions of an articulated trolley network, a transbay ferry system, and steam railroad connections converging on Plot 6, the fourth element of Marion Borax Smith’s grand design entailed a Terminal Port Project. Under the Key Route’s franchise, he possessed the rights to use one thousand feet of fairway on each side of the ferry trestle. Further, he bought some 340 acres of tidelands known as Key Route Basin, which extended along the shoreline south from Plot 6 to the Southern Pacific’s Long Wharf. Smith planned to fill the tidelands and construct a system of docks, switching tracks, and factory and warehouse sites.¹⁴⁴

Transportation companies themselves clustered in Emeryville and initiated significant industrial land use on Plot 6. The C&N built its shops on Plot 6 and planned to manufacture its own rolling stock, with the exception of engines. In addition to its powerhouse, the Key Route conducted bodywork, woodwork, electric wiring, and painting—everything except manufacturing motors—for the construction of electric streetcars at its shops on Plot 6. The Santa Fe became one of Emeryville’s largest industrial property developers when it constructed its freight depot, loading yards, and passenger station in 1902.¹⁴⁵ Other firms certainly capitalized on new transportation connections for warehousing, distribution, and other logistics. Yet, the early initiation of industrial land use with the Judson Manufacturing Company and the

¹⁴³ “Two Great New Terminals for Queens Borough,” *Greater New York, Bulletin of the Merchant’s Association of New York* 2, no. 30 (July 28, 1913): 6.

¹⁴⁴ The Key Route Basin is now Oakland’s Outer Harbor. Hildebrand, *Borax Pioneer*, 145-45, 188-89.

¹⁴⁵ Emeryville Industries Association, *Facts and Factories* (Emeryville: Emeryville Industries Association, 1925); Hanson, *True Story*, 2, 48; Sanborn Fire Insurance Map, Berkeley, vol. 2, 1903 and 1911, Oakland vols. 1 and 3, 1903, 1911; “Oakland,” *Daily Alta California*, September 23, 1890, 5; “Pledge to Support the New Ferry,” *San Francisco Chronicle*, October 16, 1898, 10; “Santa Fe Purchase,” *New York Times*, October 2, 1902, 4; “Twenty New Cars Being Constructed by Key Route,” *Oakland Herald*, April 30, 1906, 7; “Factories Hum in Every Section of Emeryville,” *Oakland Herald*, May 26, 1906, 10.

active intervention in the property market by transportation companies were the foremost factor in industrial development.

In the wake of the San Francisco earthquake and conflagrations and the forced dispersal of many San Francisco factories and branch plants, industrial land developers primed Emeryville for the “reception of the fugitive mercantile life of the devastated metropolis.”¹⁴⁶ Less than one month after the earthquake, the Southern Pacific Railroad acquired land on the northern edge of Plot 6 and planned to build extensive freight yards, warehouses, passenger and freight depots, and switches and spur tracks connecting to industrial sites and the Santa Fe freight depot.¹⁴⁷ Transportation companies not only facilitated factory location but also actively intervened in the creation of an industrial property market. All along the Yerba Buena corridor, the Realty Syndicate built spur lines and sidings, and in some cases warehouses. They helped orchestrate the relocation of a second Griffen & Skelley cannery in Emeryville at the foot of Plot 6, directly across the Southern Pacific tracks from the Judson Manufacturing Company. Further, the Realty Syndicate built warehouses on their property to induce industrial capital investment.¹⁴⁸ According to the *Oakland Herald*, the mouthpiece for the Realty Syndicate, “Before the ashes of their ruined plants fairly cooled some of the biggest concerns made arrangements to resume business in Emeryville, and their new buildings are going up as fast as men and material can be secured.”¹⁴⁹

American Rubber Manufacturing Company built a factory and branch business office on Plot 6 and manufactured capital goods for an array of resource processing industries. American Rubber made belts, conveyors, hoses, dredger sleeves, hoses for petroleum production and processing, as well as roll coverings for cotton, woolen, and paper mills, and for seeding and sorting dried fruit and vegetables.¹⁵⁰ Nearby, the C.R. Winslow Rubber Company rushed to finish a branch warehouse and shipping depot, while the Santa Fe built a new spur track to the Gorham Rubber Company’s new warehouse, which they built on land leased by the Realty Syndicate.¹⁵¹

¹⁴⁶ Quote from “Electric Plant for Emeryville,” *San Francisco Chronicle*, April 27, 1906, 2. Within a month or so of the earthquake and fires, the *Relief Business Directory* listed names and addresses of roughly four thousand San Francisco firms and businessmen who relocated in Metropolitan Oakland (or relocation within San Francisco). *Relief Business Directory*, May, 1906 (Berkeley: Beecher & Pike, 1906), The 1906 San Francisco Earthquake and Fire Digital Collection, The Bancroft Library, University of California, Berkeley.

¹⁴⁷ “Freight Yards at Emeryville,” *San Francisco Call*, May 4, 1906, 8; “Emeryville Enjoys Era of Prosperity,” *Oakland Herald*, 19 May, 1906, 17; “Rival Roads Battle for Old Race Track,” *San Francisco Chronicle*, July 18, 1911, 4.

¹⁴⁸ “Warehouses of Great Companies Are Being Built at Emeryville,” *Oakland Herald*, May 12, 1906, 11; “Emeryville Enjoys Era of Prosperity,” *Oakland Herald*, May 19, 1906, 17; “Rubber Factory Added to New Industries,” *Oakland Herald*, May 22, 1906, 2; “Factories Hum in Emery Section of Emeryville,” *Oakland Herald*, May 26, 1906, 10; “Realty Business is Brisk in Emeryville” *Oakland Herald*, June 4, 1906, 9; “Builders Busy on Property in Emeryville,” *Oakland Herald*, June 9, Jun 1906, 14-5.

¹⁴⁹ “General Electric Company Rushing Work at Emeryville,” *Oakland Herald*, April 28, 1906, 8.

¹⁵⁰ Evarts Blake, *Greater Oakland, 1911: A Volume Dealing with the Big Metropolis on the Shores of the San Francisco Bay* (Oakland: Pacific Publishing Company, 1911), 215; “Rubber Factory Added to New Industries,” *Oakland Herald*, May 22, 1906, 2.

¹⁵¹ “Emeryville Enjoys Era of Prosperity,” *Oakland Herald*, May 19, 1906, 17.

Two of the biggest electrical firms in the U.S. fled San Francisco and created branch plants, skilled jobs, and high value-added production in Emeryville. Westinghouse Electric Supply Company of East Pittsburgh, Pennsylvania, built a two-story, fireproof warehouse with connections to the Santa Fe terminus, and started building an addition as soon as they completed the first building.¹⁵² After negotiating with the Realty Syndicate, General Electric Company of Schenectady, New York, acquired a large piece of Realty Syndicate land near the Santa Fe terminus. The largest manufacturers of electric supplies in the world built a new factory, shipping depot, and a mammoth, 106,400 square-foot warehouse that looked “more like an exposition building than a warehouse,” according to the booster press.¹⁵³ While creating commodious industrial space in Emeryville, the Realty Syndicate touted Smith’s Port Terminal project. According to the *Oakland Herald*:

The Realty Syndicate is not only selling and leasing its land on easy terms to business men looking for new locations for warehouses and manufacturing plants; it is going to make those locations so valuable in the near future that the owners will have every inducement to remain in Emeryville permanently, with all that means to the growth and prosperity of the town. The improvement of the water-front, on which work has already begun, and which will be pushed to completion as fast as men and money can do it, means a deep-water harbor for Emeryville and the bringing together of ship and car in a combination that offers shipping facilities that it would be hard to duplicate anywhere.¹⁵⁴

A diverse array of industries and several specialized manufacturing complexes had located in Emeryville by 1911 and the Realty Syndicate’s industrial property development and promotion of Plot 6 continued throughout World War I (Figures 4.10 and 4.11). Smith’s Terminal Port Project never materialized but visions of shoreline development continued to fuel industrial property development in Emeryville throughout the 1920s. Similarly, antecedent patterns of public/private initiatives to build the transportation, infrastructure, and other locational assets required to produce new industrial space continued in Emeryville.

Most famously represented by the Bush Terminal in Brooklyn, New York, the terminal port emerged as a prominent industrial element of the urban landscape and a key early planning devise for metropolitan economic development. “In its highest form, such a terminal is really an industrial area fed by railroads at the rear and by vessels in the water front,” according to New

¹⁵² “Warehouses of Great Companies Are Being Built at Emeryville,” *Oakland Herald*, May 12, 1906, 11; “Realty Business is Brisk in Emeryville,” *Oakland Herald*, June 4, 1906, 9; “Builders Busy on Property in Emeryville,” *Oakland Herald*, June 9, 1906, 14-15.

¹⁵³ Quote from “Electrical Co. Gets Location,” *Oakland Herald*, April 27, 1906, 12, “Electric Plant for Emeryville,” *San Francisco Chronicle*, April 27, 1906, 2; “Emeryville Enjoys Era of Prosperity,” *Oakland Herald*, May 19, 1906, 17; “Factories Hum in Every Section of Emeryville,” *Oakland Herald*, May 26, 1906, 10; “Realty Business is Brisk in Emeryville,” *Oakland Herald*, June 4, 1906, 9.

¹⁵⁴ Quote from “Emeryville Enjoys Era of Prosperity,” *Oakland Herald*, May 19, 1906, 17. The Terminal Project was reintroduced several times, especially after the City of Oakland issued bonds in 1909 to fund Key Route improvements. Werner Hegemann, *Report on a City Plan for the Municipalities of Oakland & Berkeley* (Oakland: The Kelley-Davis Co., 1915), 36, 38-9; Scott, *San Francisco Bay Area*, 153.

York City engineer William Barney in 1915.¹⁵⁵ The terminal port encompassed a series of specialized individual terminals—one or a series of piers—such as a transshipment or import-export terminal, a “city terminal” for perishable foodstuff, a passenger terminal, a “city-railroad terminus” to separate local transportation services from waterfront activities, and a passenger terminal.¹⁵⁶ Significantly, the model terminal port included an industrial terminal housing an array of manufacturers.

Eight companies operated twelve private terminals in the New York City Port District by 1920.¹⁵⁷ These firms specialized in creating industrial space. For example, the Degnon Realty and Terminal Company advertised “a new industrial city” at Long Island City in Queens, directly across the East River from Manhattan.¹⁵⁸ In addition to shipping and rail links, the company subdivided eighteen city blocks, served by alternating streets and spur lines, which created sites for about 100 large industries, as well as nine blocks of housing slated to accommodate up to twenty thousand workers and their families. Degnon built factories as ordered by tenants, including the Loose-Wiles Biscuit Company, which occupied one of the largest factories of the World War I Era (860,000 square-feet).¹⁵⁹ For Barney, “Such industrial centers are, in reality, model terminal cities within or adjacent to the city itself, but not so interwoven with the general activities as to cause expansive congestion in handling in and out raw goods and manufactured articles.”¹⁶⁰

In addition to creating industrial space and, in some cases, custom buildings, industrial terminal developers engaged in speculative building and industrial incubation. The New York Dock Company, for instance, advertised uniform spaces for manufacturing in five industrial loft buildings at their terminal in Brooklyn.¹⁶¹ Terminal companies often built one loft unit at a time. They were typically four-stories high and totaled about 85,000 square-feet, which typically

¹⁵⁵ William Barney, “The Modern Terminal Port,” *Annals of the American Academy of Political and Social Sciences* 59 (May 1915): 248.

¹⁵⁶ Barney, “Modern Terminal Port,” 247-50. Planners also advocated autonomous administrative bodies to govern terminal projects, providing one precursor to the Public Authority governmental institution; see Robert Caro, *The Power Broker: Robert Moses and the Fall of New York* (New York: Vintage Books, 1974).

¹⁵⁷ The New York Dock Company owned the Atlantic, Baltic, and Fulton terminals in Brooklyn; the Bush Terminal Company’s massive terminal included eight piers, two modern loft buildings, and 118 warehouses in South Brooklyn; the Arbuckle Brothers’ Jay Street Terminal in was also located Brooklyn; the Brooklyn Eastern District Terminal Company operated Pidgeon Street, Queens Borough, Warren Street, and an eponymous terminals; the American Dock Company’s and the Pouch Terminal Company each owned a terminal on Staten Island. New York, New Jersey Port and Harbor Development Commission, *Joint Report with Plan and Recommendations* (Albany: J.B. Lyon Company, Printers, 1920), 137-38; Brooklyn League Committee on Industrial Advancement, *Brooklyn: A National Center of Commerce and Industry* (New York: Author, 1914), 35-7.

¹⁵⁸ Advertisement, *New York Times*, April 6, 1915, 18.

¹⁵⁹ “Two Great Terminals for Queens Borough,” *Greater New York, Bulletin of the Merchant’s Association of New York* 2, no. 30 (July 28, 1913): 6.

¹⁶⁰ Barney, “Modern Terminal,” 253.

¹⁶¹ Advertisement, *New York Times*, November 14, 1912, 5.

housed twelve small manufacturers.¹⁶² A. Person Hoover explained that such lofts provided generic factory space and modern equipment, as well as energy, heat, lighting, and elevators to small industrial firms with limited capital.¹⁶³ The Bush Terminal was the exemplar terminal port. It encompassed two hundred acres, seven 1,400-foot-long piers, 25 miles of railroad track, and 130 warehouses. Further, 250 manufacturers occupied 3.5 million square-feet in Bush's ten loft units (Figure 4.12).¹⁶⁴

When Progressive legislation halted racetrack gambling in 1911, the Key Route and the Southern Pacific fought for Emeryville's horseracing track, which was soon known as the Mee Estate.¹⁶⁵ The Key Route flaked the one-hundred-acre tract on the south and the Southern Pacific railroad tracks skirted it on the west. The Southern Pacific prevailed and railroad engineers began surveying the rights-of-way for spur tracks and platting industrial subdivisions in 1914. With the prospect of industrial development, land value on the Mee Estate skyrocketed to \$4,000 per acre.¹⁶⁶ The plan for an East Bay terminal port also increased land values.¹⁶⁷ According to the *Oakland Enquirer*:

With the conversion of the Emeryville track into an immense manufacturing district the improvement will give Central and Western Oakland a great boost and add immensely to the importance of that section as an industrial center. It will help largely to complete the scheme for the development of the west waterfront and with its accessibility to both water and rail transportation promises to be a most inviting place for the location of industrial enterprise.¹⁶⁸

Henry Ford accelerated plans for industrial development on the Mee Estate. During his visit to the Bay Area in 1916, he reportedly sought to purchase the former racetrack site in order

¹⁶² A. Pearson Hoover, "The Industrial Terminal and its Relation to the City Plan," *The City Plan* 8, no. 1 (April 1917): 6.

¹⁶³ *Ibid.*, 4-5.

¹⁶⁴ *Ibid.*, 9.

¹⁶⁵ "Rival Roads Battle for Old Race Track," *San Francisco Chronicle*, July 18, 1911, 4; "Racetrack Property Assessment Reduced," *San Francisco Call*, July 23, 1911, 23.

¹⁶⁶ "Racetrack May Be Cut Up," *Oakland Enquirer*, January 13, 1914, 1, 3.

¹⁶⁷ Smith's Key Route Industrial Terminal, Lieutenant Colonel Thomas Rees' Harbor Plan, and the Berkeley Terminal were among the massive East Bay waterfront plans developed between the opening of the Panama Canal and World War II. Wells Drury, "The Bush Terminal," *The Campanile Weekly* 1, no. 9 (November 9, 1913), 6, 14-15; Hegemann, *Report on a City Plan*, 26-40; Scott, *San Francisco Bay*, 150; Office of City Engineer to Mayor and Council of the City of Berkeley, January 27, 1913, Carton 10, File 38, City of Berkeley Collection, The Bancroft Library, University of California, Berkeley; "Big harbor Improvement Proposed," *San Francisco Call*, May 17, 1913, 1; "Plans for Oakland's Waterfront," *Pacific Maritime Review*, 10, no. 6 (June 1913), 24-25; "Harbor Needs," *The Campanile Weekly* 1, no. 11 (December 13, 1913), 2; "School and Harbor Bonds," *The Campanile Weekly* 2, no. 14 (January 3, 1914), 9, 19.

¹⁶⁸ "Racetrack May Be Cut Up," *Oakland Enquirer*, January 13, 1914, 1, 3.

to build a factory to rival his immense Detroit plant.¹⁶⁹ According to one account, Emeryville's city council feared Ford's inevitable autocratic control of their municipality and immediately passed ordinances facilitating the rapid development and subdivision of the Mee Estate. New streets slated to crisscross the site, as the story goes, and rendered the former racetrack nonviable for a long and linear dimension required for mass production at a Ford automobile factory.¹⁷⁰

A coalition consisting of representatives of the Mee Estate, Emeryville officials, the Southern Pacific, and real estate developer Walter Leimert, who later developed "modern communities" in Baldwin Hills and Leimert Park in Los Angeles, continued to develop the industrial tract, which was marketed variously as the Emeryville Industrial Tract, the Emeryville Terminal Tract, and the Oakland Terminal. By the early 1920s, they had installed two miles of concrete roads, one mile of Southern Pacific and Santa Fe spur tracks, fifteen thousand feet of curb, water mains, electric lights, and a sewer system (which emptied into Temescal Creek).¹⁷¹ A quasi-public institution known as the Emeryville New Industries Committee planned the first unit in a factory complex largely modeled after the New York industrial terminal lofts. They sought to construct a one-story, 122,000 square-foot industrial incubator, which they would rent to manufacturers in units as small as 10,000 square feet.¹⁷² According to one trade journal, eighty feet of parking space, sidewalks, and lawn would front each unit of the buildings, whereas eighty feet of spur tract would link-up in the rear. Heavy concrete loading platforms would add to the unfettered and level flow of material and merchandise from car to factory or from warehouse to motor truck.¹⁷³ According to Southern Pacific promotions, Emeryville's industrial park constituted:

One of the most significant Easy Bay development projects now under way, from the standpoint of manufacturers and distributors planning to locate in this section, is the Oakland Terminal, planned for the Emeryville Industrial Tract by the Mee Estate, owners of the property. Here, but ten minutes ride from Oakland's business center, plants, warehouses and offices will be built on a lease basis for manufacturers and distributors desiring to locate in the East Bay.¹⁷⁴

¹⁶⁹ "Henry Ford Pays Visit to San Francisco," *San Francisco Chronicle*, September 14, 1916, 8. "California Industrial Review," *Sausalito News*, November 4, 1916, 5. Ford eventually located his plant in Richmond, California.

¹⁷⁰ Anne Marie Ferraris, "Emeryville Grew Up With Business," *Emeryville Industries Association Bulletin*, June 1966.

¹⁷¹ California Public Utilities Commission, California Railroad Commission, "Decision No. 7801," *Decisions of the Railroad Commission of the State of California, Volume XVIII, April 1, 1920 to October 131, 1920* (Sacramento: State Printing Office, 1921), 424-29; Wallace Christie, "Emeryville: A City of Low Taxes and Remarkable Growth," *Oakland Tribune Yearbook*, January 1, 1921, 90; Advertisement, *San Francisco Chronicle*, January 15, 1920, 18; Greg Hise, *Magnetic Los Angeles: Planning the Twentieth Century Metropolis* (Baltimore: The Johns Hopkins University Press, 1997), 14-22.

¹⁷² "Emeryville Shows Gain as Industrial Center," *San Francisco Chronicle*, 19 Jan 1921, A46.

¹⁷³ "Oakland Downtown Realty Sales Total \$1,000,000," *San Francisco Chronicle*, January 8, 1922, 7; "Emeryville Building New Industrial Plants," *The Building Review*, 22, no. 1. (July 1922): 11.

¹⁷⁴ "Tidings From Territorial Divisions, East Bay Division," *Pacific Service Magazine* 14, no. 2, (July 1922): 60.

While plans for the industrial lofts and factory incubators did not materialize, the industrial park perpetuated Emeryville's industrial market, industrial capital investment, and localization of thirty-eight of Metropolitan Oakland's 123 largest manufacturers, including many national branch plants by 1930.¹⁷⁵

From Emery's gift of land to Egbert Judson to creation of the Emeryville Industrial Terminal on the Mee Estate, the restructuring of suburban space and creation of industrial property required building *locational assets*—place-based packages of infrastructures, institutions, and practices that induce and accommodate capitalist industrialization and sustain growth over a generation at least.¹⁷⁶ A succession of distinct and diverse coalitions of actors and institutions formed flexible, often ephemeral alliances in order to facilitate industrial capital investment and factory location in Emeryville. Locational assets channeled industrial capital investment to the metropolitan edge and then anchored manufacturers in Emeryville.¹⁷⁷ In this way, Emeryville stretched the perimeters of metropolitan industrial territory and proved vital to the industrial base, population growth, and spatial form of Metropolitan Oakland.

Emery, Judson, Hays, Shattuck, et al., and the Oakland Board of Trade formed a distinct coalition seeking to build central Oakland while expanding the Metropolitan East Bay in order to realize differential rents. This metropolitan growth coalition filled the gap between the Carpentier and Southern Pacific alliance and the Realty Syndicate, followed by the Mike Kelley political machine, and Joseph Knowland, Earl Warren, the downtown business elite.¹⁷⁸ Further, the Emery coalition helps illuminate the significance of metropolitan development well before the post-World War II Metropolitan Oakland Area Program (and Henry Kaiser).¹⁷⁹

¹⁷⁵ Oakland Chamber of Commerce Industrial Department, *Report for School of Business, Columbia University* (Oakland, 29 Dec. 1930).

¹⁷⁶ Lewis, *Chicago Made*, 14-17, 271-75.

¹⁷⁷ Lewis, *Chicago Made*, 47-48, 274; Richard Walker and Robert Lewis, "Beyond the Crabgrass Frontier: Industry and the Spread of North American Cities, 1850-1950," in *Manufacturing Suburbs: Building Home on the Metropolitan Fringe*, ed. Robert Lewis (Philadelphia: Temple University Press, 2004), 28.

¹⁷⁸ Gayle B. Montgomery and James W. Johnson, *One Step from the White House: The Rise and Fall of Senator William F. Knowland* (Berkeley: University of California Press, 1998); Leo Katcher, *Earl Warren: A Political Biography* (New York: McGrall-Hill, 1967); Rhomberg, *No There There*; Earl Warren, *The Memoirs of Earl Warren* (Garden City, N.Y.: Doubleday, 1977).

¹⁷⁹ Cf. Self, *American Babylon*.



Figure 4.1. Julius Kellersberger's "A Complete Map of Oakland." Source: Werner Hegemann, *Report on a City Plan for the Municipalities of Oakland & Berkeley* (Oakland: The Kelley-Davis Co. 1915).



Figure 4.2. “Map of the Rancho of Vicente & Domingo Peralta: Containing 16970.68 acres” 1856. Kellersberger plotted ninety-six tracts, ranging from twelve to 330 acres apiece in the area now covered by north Oakland, Berkeley, Emeryville, Piedmont, and Albany. Emery’s Plot 6 is circled in red. The original Town of Oakland grid is depicted, as well. Julius Kellersberger, (San Francisco: Lith. Britton & Rey, 1856). From The Bancroft Library, University of California, Berkeley.

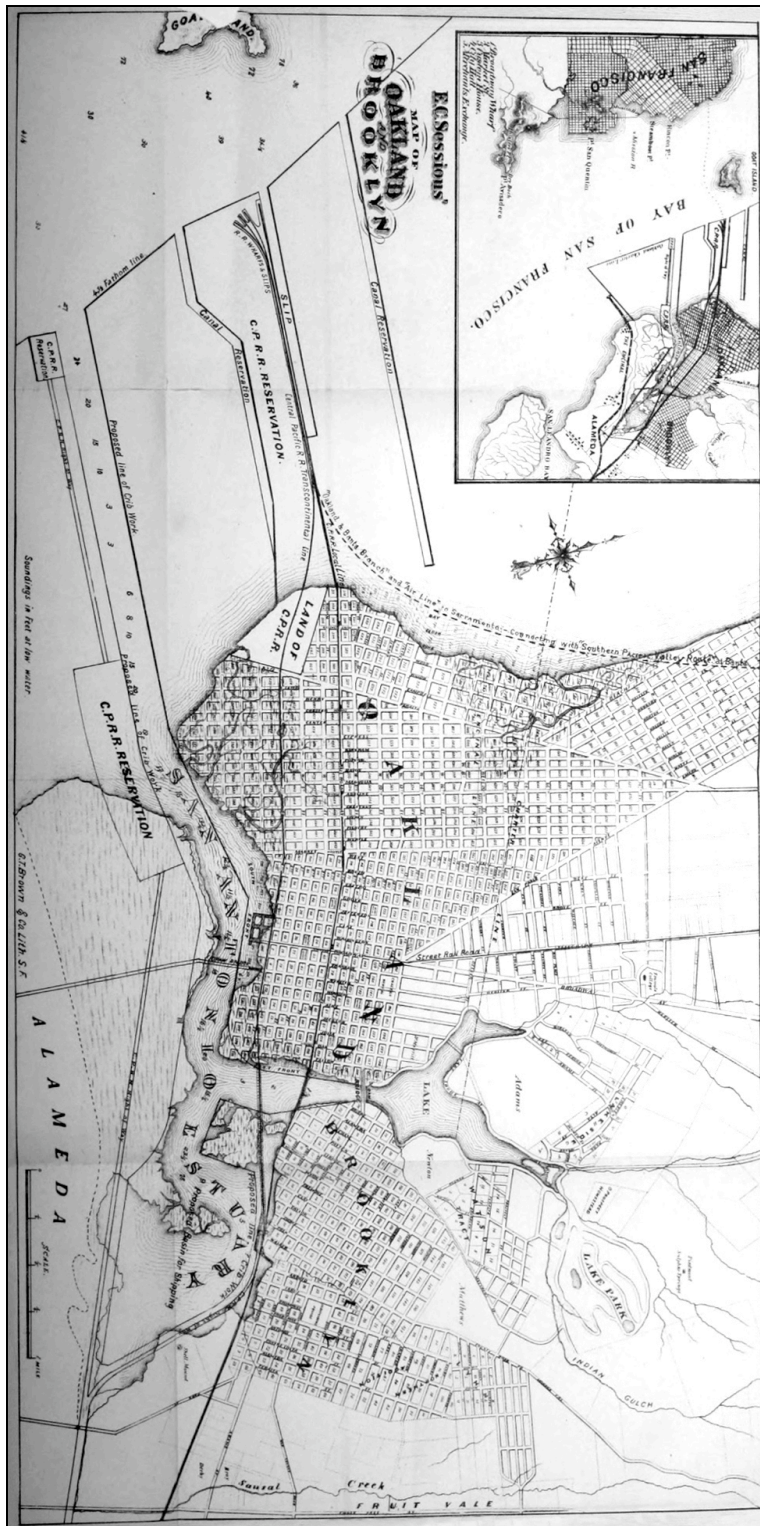


Figure 4.3. Visions of industry. The Central Pacific Railroad Company's plans, including extensive wharfs for industry on CPRR "reservations." Source: *The Railroad System of California: Oakland and Vicinity, State University, etc.* (San Francisco: J.H. Carmany & Co., 1871).

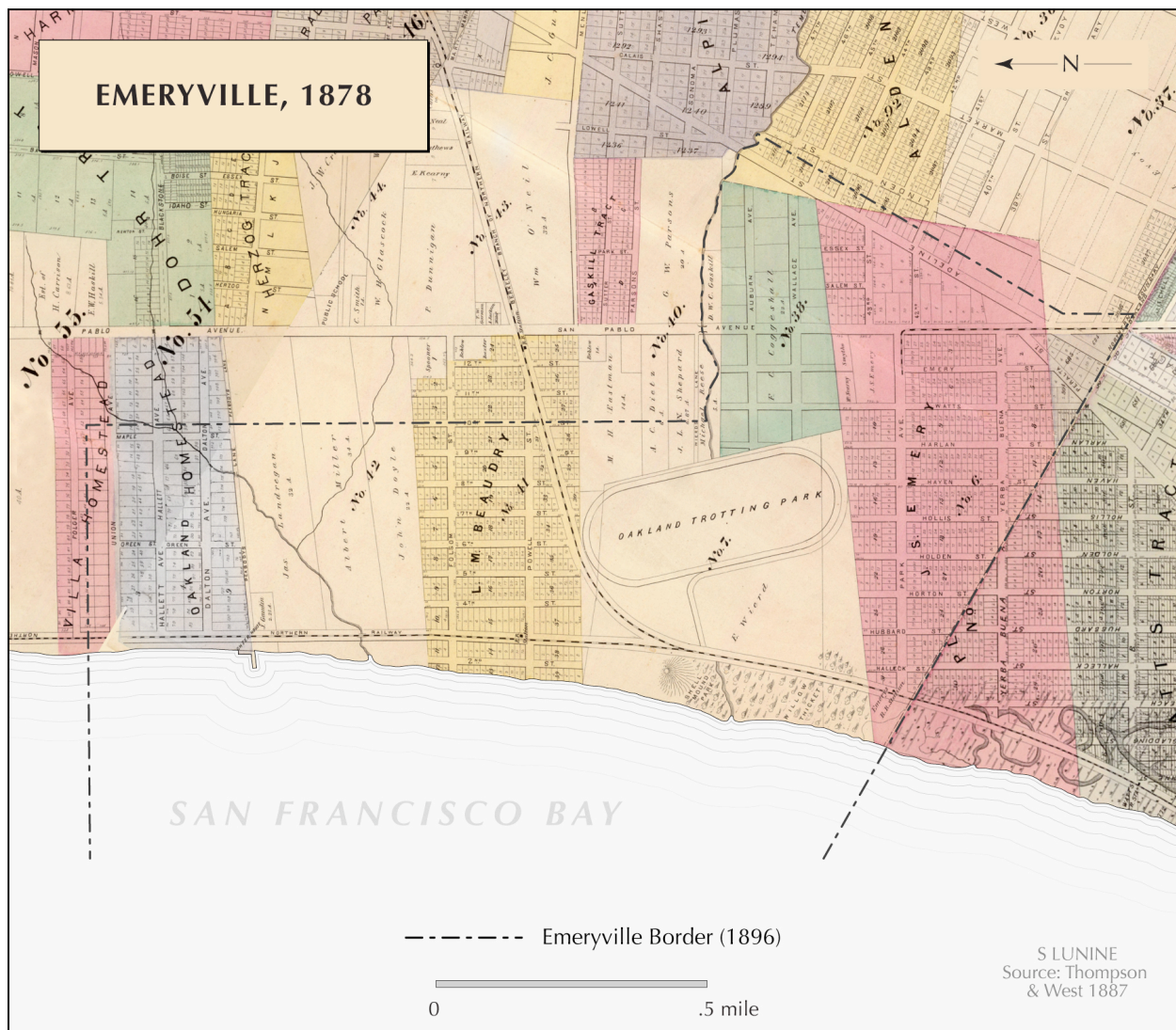


Figure 4.4. Subdivisions in early Emeryville. Emery's Plot 6 is highlighted in pink on the right, while the Oakland Homestead Association is on the left in blue. Source: composite from Thomas Thompson and Albert West, *Historical Atlas of Alameda County, California* (Fresno: Valley Publishers, [1876] 1976).



Figure 4.5. “Map Showing the California and Nevada Railroads and its Extensions and Connections,” 1882. From its terminus on Emery’s Plot 6, the C&N sought to become a transcontinental (narrow-gauge) railroad. G. W. & C. B. Colton & Co. New York, 1882. Source: Library of Congress, American Memory, Digital ID: g4301p rr003600 <http://hdl.loc.gov/loc.gmd/g4301p.rr.003600>.

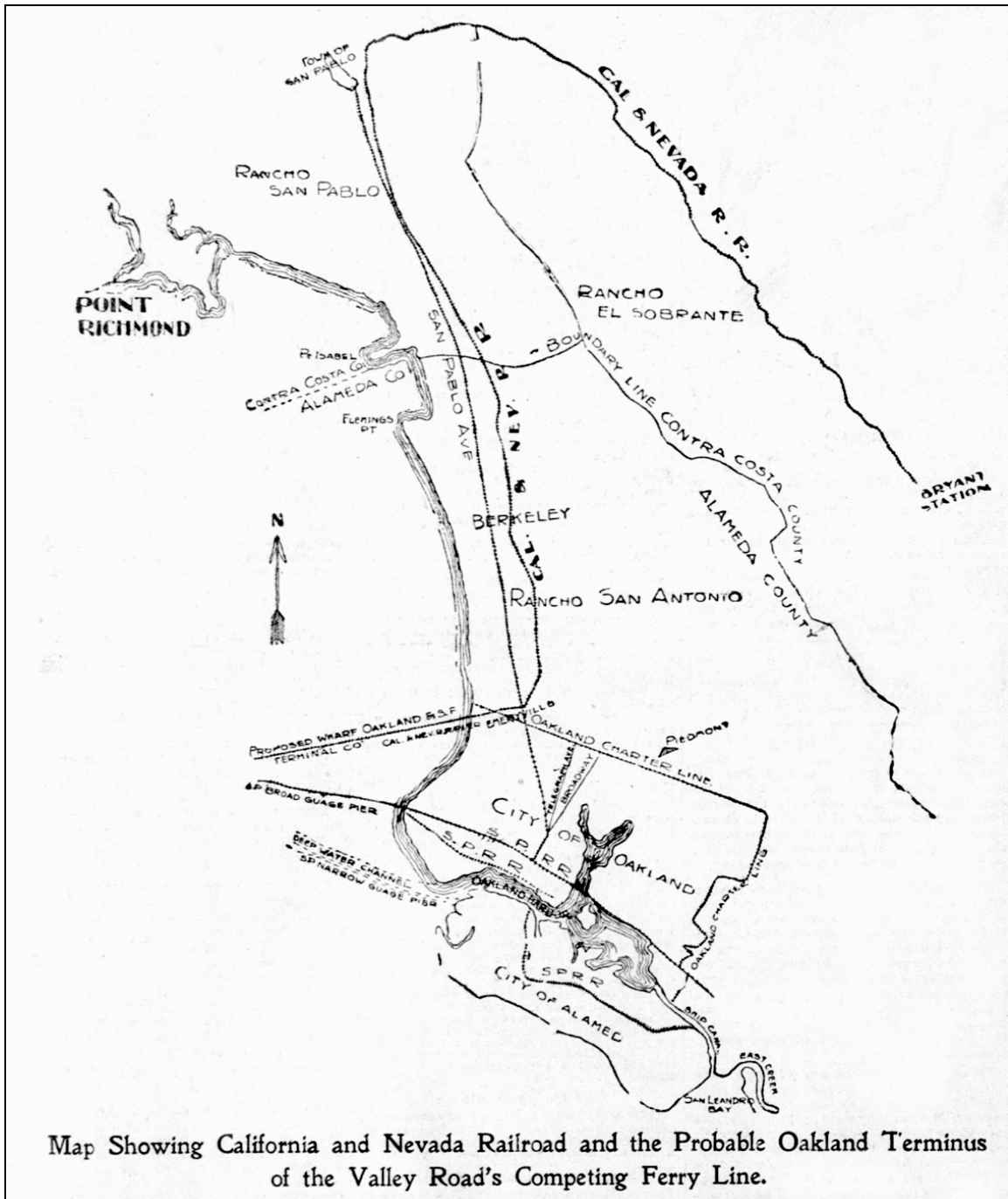


Figure 4.6. "The streak of rust." After a decade of building and boosting, the California & Nevada Railroad stretched only twenty-three miles from Plot 6 in early Emeryville to Bryant Station in contemporary Orinda. Emery's projected wharf is depicted, as well. Source: "Prospects of a Competing Ferry Service Across the Bay," *San Francisco Call*, December 20, 1892, 3.

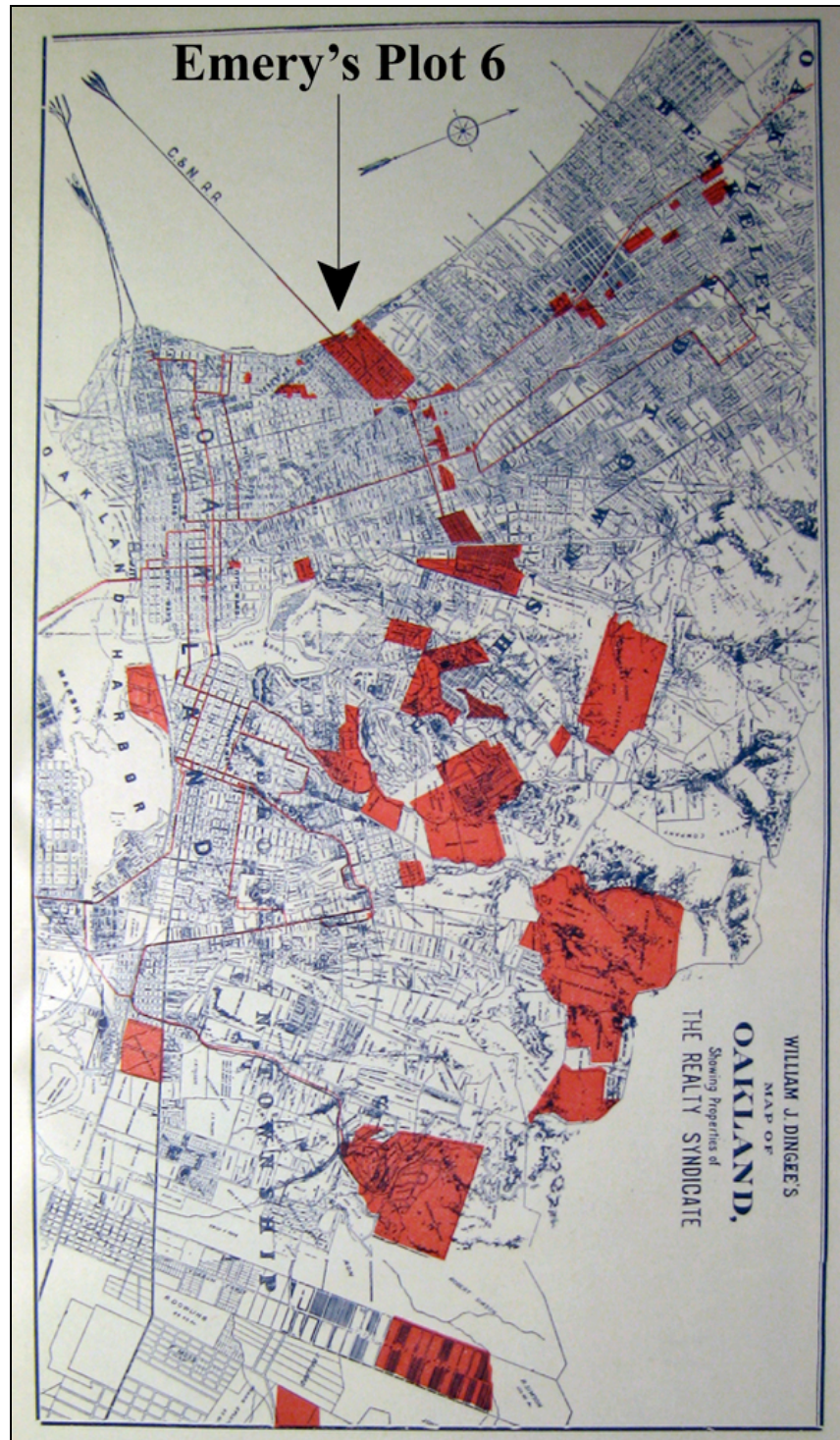


Figure 4.7. “Real Estate and Electric Railways of the Realty Syndicate.” The Realty Syndicate advertised Villa Sites and Residence Lots valued at close to \$1.5 million but also developed industrial land. The C&N wharf is depicted jutting into the bay from Emery’s Plot 6 (top center). Note on Emery’s land and industrial vs. residential prospects. Source: Key System Transit Company, *Year Book and Annual Report, For the Year Ended December 31, 1925*.



Figure 4.8. The Santa Fe's freight yards along Yerba Buena Avenue, c.1914. Source: California Photo Views.

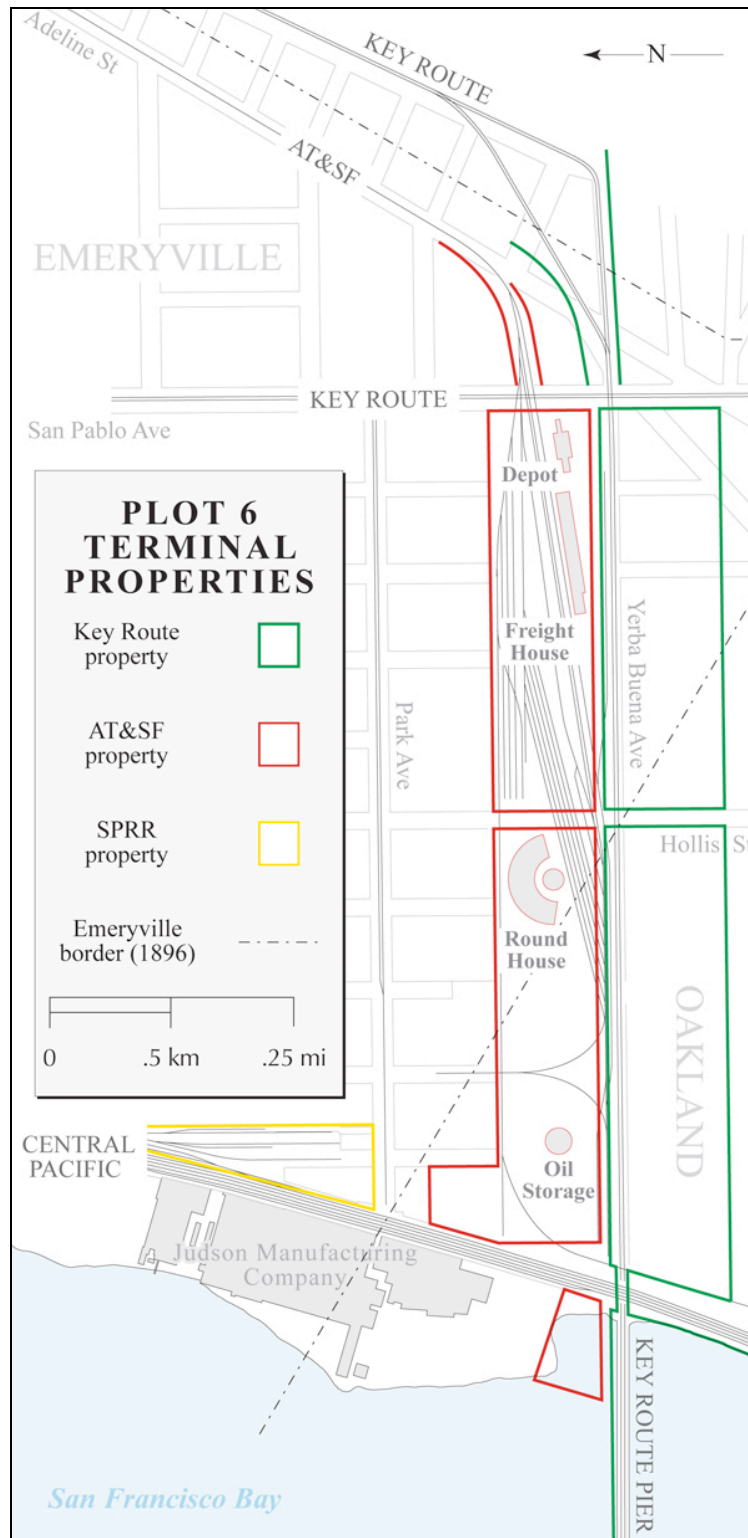


Figure 4.9. Plot 6 terminals. Santa Fe's round house (and wharf) never materialized but its passenger depot and freight house made Emeryville a western terminus of the second transcontinental railroad to reach the Bay Region and helped prime the pump for industrial land use in Emeryville. Map by author.

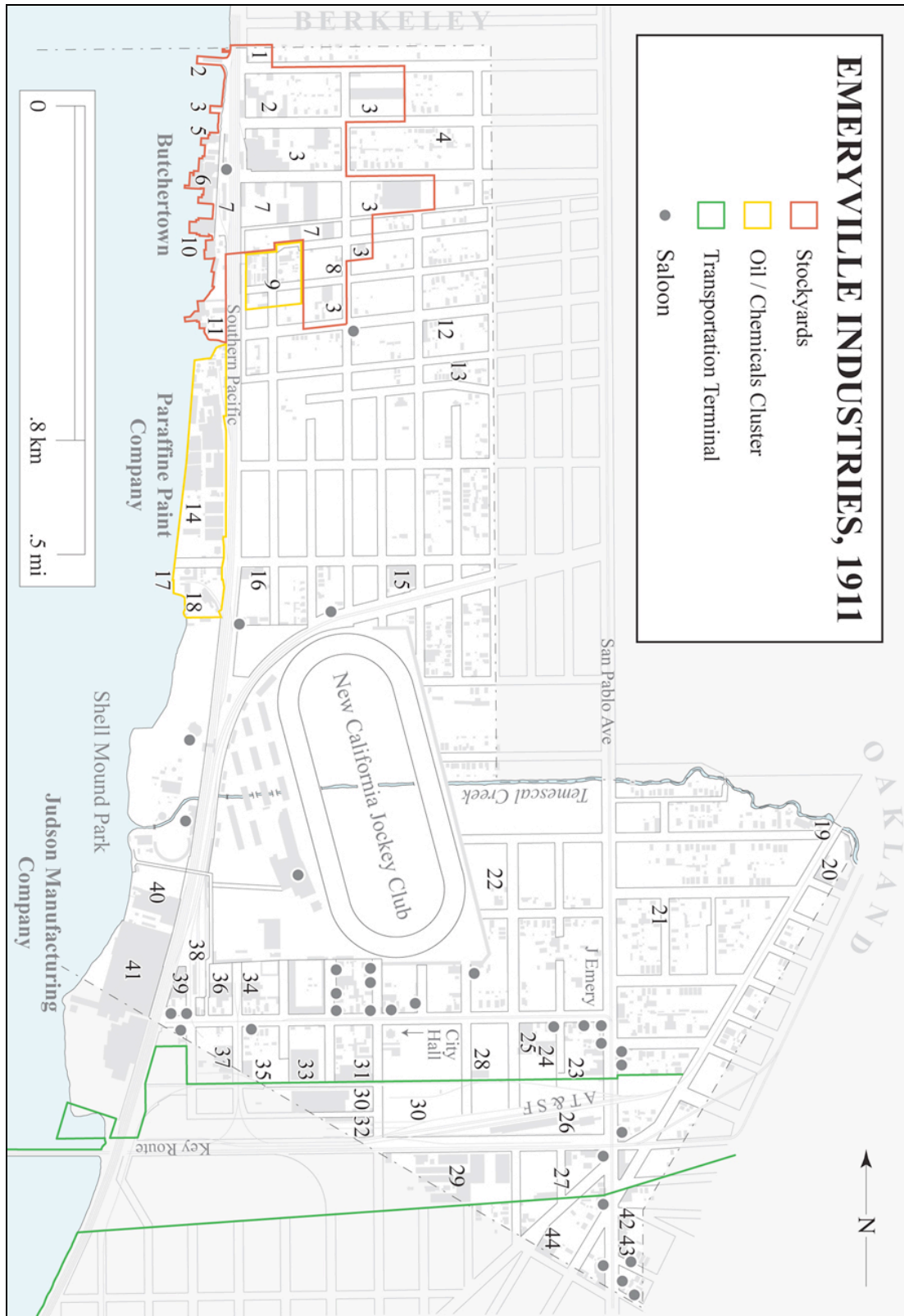


Figure 4.10. Emeryville industries, 1911. An array of industries, as well as several distinctive industrial complexes, clustered in Emeryville. Map by author, following Sanborn Fire Insurance Maps, Berkeley vol. 2, 1911, Oakland vols. 1 and 3, 1911. *Continued on the following page...*

FOOD

Meat Packing

2. T. W. Cordor's Tannery and Wool Pullery
3. Oakland Meat and Packing Company
4. California Soap Factory
5. B. W. Alden (Miller & Lux)
6. U. M. Slater
7. Grayson-Owens Packing Co
10. F Crames & Co
11. Bayle, LaCoste & Co (fertilizer and byproducts)
16. Wright Tannery

Fruit & Vegetable Processing

40. Griffen & Skelley Co
33. American Can Co

METALS & MACHINERY

30. Oakland Traction Co (Key Route) shops
41. Judson Manufacturing Company
43. Machine Shop

WOOD PRODUCTS

Lumber

1. H.W. Taylor's Lumber Yard
23. Terminal Lumber Company
24. Emeryville Planning Mill

Furniture & Fixtures

8. Western Furniture Company
34. Walter S. Mackay Furniture Co (wholesale and warehouse)

36. Peck & Hill Furniture Co (wholesale and warehouse)
39. F.M. Umphred & Sons Furniture Co (wholesale and warehouse)

Printing & Publishing

15. Pacific Manifold Book Co

CHEMICALS

17. Western Carbonic Acid Gas Co

PETROLEUM

9. Capitol Refining Company
14. Paraffine Paint Co
18. Union Oil of California

RUBBER

25. American Rubber Co

ELECTRICAL

Transmission & Distribution Equipment

31. Westinghouse Electric Co

Industrial Apparatus & Household Appliances

1. Prest-O-Lite Co (acetylene lamps)

Communications Equipment

30. Western Electric Co (telephone apparatus)

BUILDING MATERIALS & CONSTRUCTION

20. Hutchinson Construction Co (paving contracting)
21. Cement block factory

LOGISTICS

26. Atchinson, Topeka & Santa Fe Railroad freight depot & yards
27. Warehouses
28. Hay & grain storage
32. American Fuel Co coal yards
38. South Pacific Railroad freight depot & yards

LAUNDRY PLANTS

12. Pioneer Wet Wash Landry
13. Result Laundry Co
44. New Method Laundry Co

MISCELLANEOUS

19. Green houses
43. Rothschild & Haydenfelt jewelry manufacturing and wholesaling

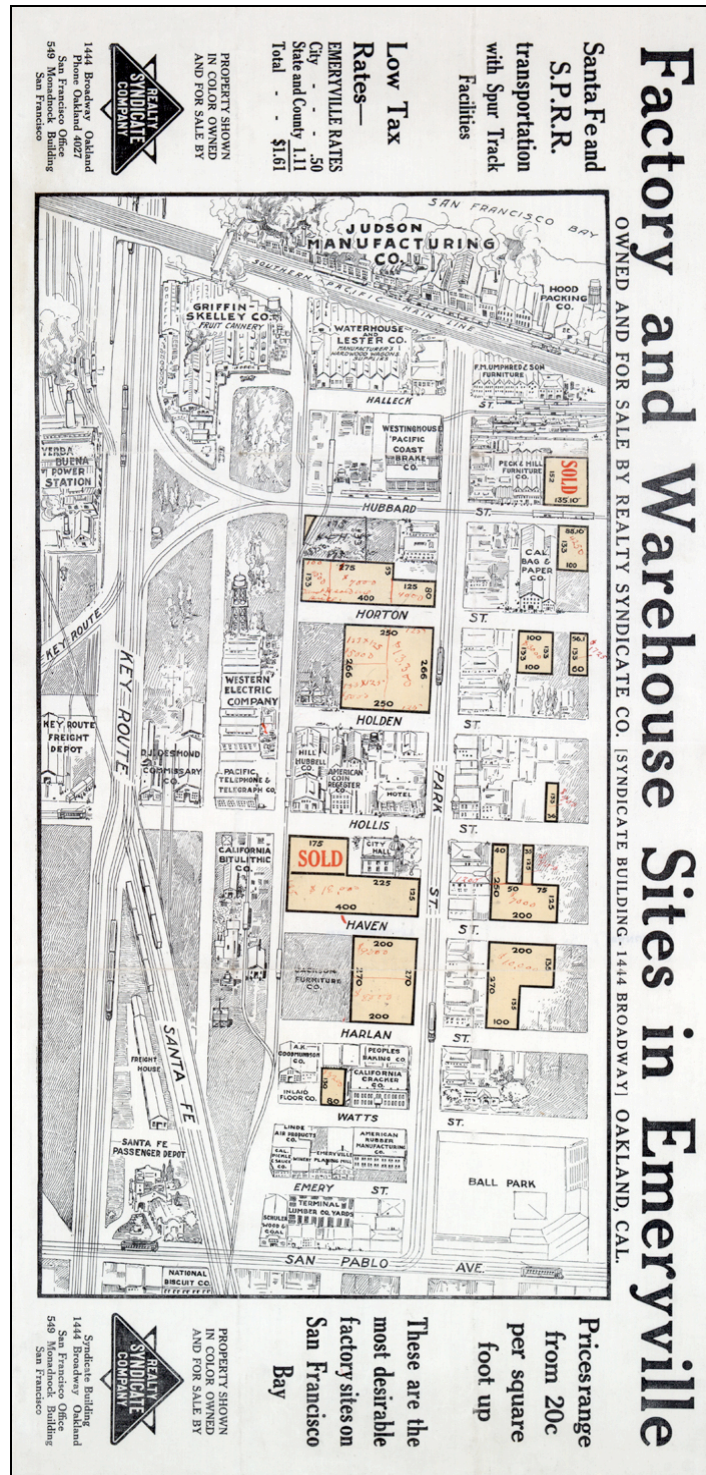


Figure 4.11. Realty Syndicate industrial property on Plot 6, c. 1914. The lines of the Santa Fe railroad and Key Route trolley are depicted on the left (south), while the realty Syndicate marketed lots on Park Avenue. The Oakland Oaks baseball park occupies the site of Joseph Emery's Italianate villa, whereas the Santa Fe passenger depot was formerly the terminus of Emeryville's San Pablo Avenue horse car line and the C&N Railroad. Source: California Cultures, The Bancroft Library, University of California, Berkeley.

How 200 Concerns Boosted Their Eastern and Export Business

THERE are more manufacturing establishments, more manufacturing capital and greater value represented in manufactured products, in New York CITY alone than in any ENTIRE STATE in the Union, except one.

New York's bank clearings are more than *six times* greater than of any other American city—because the country's business is done in New York. And the business is done in New York because the railway and steamship lines focus here—because the paths of industry, of commerce, of business activity throughout the world, find a common meeting place in this great metropolis.

What are you doing, Mr. Manufacturer, Mr. Wholesaler, Mr. Distributor, to get your share of this enormous trade—and take advantage of the unparalleled trade handling facilities and stupendous MONEY VALUE of New York as an operating base for YOUR business?

What are you doing to profit by the strategic position of New York as the central point in the wealthy, easily reached, prolific Eastern market—a market which, if you operated from New York, would bring 27% of the buying population of the United States within 100 miles of your door? Consider, too, the export and import advantages to be gained by such a location, New York City alone carrying on half the total foreign commerce of the United States.

New York is the hub of the commercial world and the industrial hub of New York is BUSH TERMINAL. In this mammoth community over 200 progressive business concerns (some of them in the ten-million dollar class) have plants for manufacturing, assembling, warehousing or distributing, first because of the value they find in a New York location, and second, because Bush Terminal offers them, *in one spot*, every facility and every economy to take 100% advantage of that location.

BUSH TERMINAL buildings are new, modern, fairly appointed, fire-proof. In them you can rent as much space as you need—or as little—divided to suit your needs. You can have all the space on one floor or on several floors, as your business requires. You have room to expand. You can get just what power, light, heat and water you need, paying only for what you use.

All railroads and coastwise steamship lines run virtually to your door. You receive goods on your own floor and shipments are loaded on cars direct from your own elevator. You get freight *in motion at once*, without the expense of hauling or cartage or delay of intermediate handling.

Your equipment and merchandise are safeguarded by a million-dollar sprinkler system and other modern fire protection. Insurance rates here are only 10 to 20 cents a hundred. Compare this with what you are now paying. Some tenants save enough on insurance and carting alone to practically *pay their rent*, as compared with former quarters.

Labor supply is plentiful—with living accommodations nearby and reasonable in cost. In Bush Terminal buildings employees have maximum daylight, up-to-date

sanitary arrangements—everything that can make for perfect working conditions.

WE want to give you the full details about the Bush Terminal plan—how for the first time it makes locating in New York easy, simple and economical.

We want to co-operate with you in getting at the FACTS concerning New York as a location for your business—for you want us and we want you only if it is to YOUR advantage.

We will make a careful investigation and tell you frankly whether New York as an operating base would **SAVE MONEY** for you; whether it would reduce handling and transportation costs, thus setting **BIGGER PROFITS** on your present business; whether it would simplify your buying and selling operations, thus enabling you to build **MORE BUSINESS**—Eastern, Export or Import; whether it would enable you to make quicker deliveries and clinch business by giving better service to your customers; whether it would bring you closer to raw material sources and **CUT MANUFACTURING COSTS**.

This service is open to any concern, big or little. It costs nothing and entails no obligation.

To Business Men—A Valuable Book Picturing and Describing Bush Terminal Facilities in Full.

A request on your firm letterhead, signed by an official, will bring a copy free. BUSH TERMINAL COMPANY, 100c Broad St., New York

BUSH TERMINAL



Figure 4.12. An advertisement for the Bush Terminal, Brooklyn, New York. Industrial lofts are depicted in the background. Source: *Collier's*, May 2, 1914, 23.



Figure 4.13. A bird's eye view of Emeryville in the late 1920s. The Yerba Buena transportation corridor leading to the Key Route trestle is immured by industrial property, including the expansive new industrial park. Note Emeryville's large industrial tracts vis-à-vis the surrounding residential lots. Source: Emeryville Historical Society.

Chapter 5

Iron, Exploitation, and Integration at Judson Manufacturing Company

W.W. Morrow opened the Sixteenth Industrial Exposition of the Mechanical Institute of San Francisco with a spectacular proclamation. “The pleasant duty devolves upon me to make the announcement of an event of more importance to the people of this coast than the result of an election or the birth of a prince,” he claimed on August 2, 1881. “And yet it is indeed the birth of a king that I am called to proclaim to you, a king wielding an influence more potent than gold, and bearing in his hands the scepter of an absolute power.” He continued:

In order that the advent of this new dynasty may be properly recorded in the annals of the state, let us notice with some particularity that at four o’clock Sunday morning, April 24th, 1881, the first iron ever made in California was run from the furnace. The event took place in Placer County, and the locality is named Hotaling, in honor of the well-known San Francisco Merchant, who, with Irving M. Scott and Egbert Judson, were the founders of this enterprise... As the supply of ore, fuel, and other materials required is practically inexhaustible, the manufacture of pig-iron may now be considered a permanent business in this State. The king has been duly installed. Long live the king!¹

The California Iron Company (CIC) sat on the throne. Through a private co-partnership, Judson, Scott, and Hotaling invested immense capital in iron ore deposits and mining operations, in Sierra timberland and charcoal kilns, and in California’s first blast furnace capable of smelting iron ore and making pig iron—the rigid cast iron ingots used to produce wrought iron and steel inputs for manufacturing everything from a tack to a battleship.

Pig iron was the product of smelting iron ore with a flux, usually limestone, and a high-carbon fuel, typically coke but also charcoal in regions lacking coal. When foremen tapped the furnace, molten iron flowed through a central trough, oozed into thin lateral channels, and then pooled in molds. The branching configuration of the molds, with individual ingots perpendicular to the central channel, resembled a litter of piglets nursing from a sow. Once cooled and hardened, workers simply broke off each ingot from the thinner channels, hence the term “pig iron.” Hard, impure, and consequently of little use, founders re-melted pig iron in a “puddling furnace” to oxidized carbon and render malleable iron, known as wrought or merchant iron, that was suitable for molding, casting, and rolling into bars and sheets. More technically advanced open hearth and Bessemer steel production processes also relied on pig iron inputs.²

State Mineralogist Henry Hanks’ praise gushed along with the molten iron poured from CIC’s furnace during his visit to Hotaling:

The sluggish stream, slowly forming itself into rough pigs, is the precursor of other iron industries yet to be established, such as the manufacture of California

¹ “Progress in Science and the Arts,” *Engineering and Mining Journal* 32, no. 7 (August 13, 1881): 107.

² Pig iron, wrought iron, and steel were the three kinds of iron commonly used in the 1880s; the different states of iron depended principally on carbon content. Albert Fay, *A Glossary of the Mining and Mineral Industry*, (Washington, D.C.: Government Printing Office, 1947), 509; Henry Hanks, *First Annual Report of the State Mineralogist, from June 1, 1880, to December 1, 1880* (Sacramento: State Office, 1880), 29.

steel rails for future railroads, steam engines, rolling mills, iron ships, mining machinery and tools, great guns for the defense of our coast, Bessemer converts, and countless articles of iron made in California workshops, giving employment to our citizens. The ubiquitous hoodlum disappears, and his place is filled by the busy nail-cutter and the industrious mechanic of the future...³

For Hanks, indigenous iron production was essential for California's progress. CIC was poised to wrest a monopoly on home production of a basic input for the Bay Region's legendary metalworking and machinery industries, and thus assuage their dependence on imported pig and scrap iron. In doing so, CIC could address California's biggest perceived challenge to autonomous regional development, a scarcity of basic industrial inputs, while creating new circuits for surplus capital investment, keying industrial diversification, and propelling job creation, population growth, and multiplier effects.

Iron, Agglomerations, and Imports

There is no country where so much money and effort has been expended in so short a time in experimenting with, and perfecting, the various machines used in mining; and although it may be said that there has been a great waste of material and money in the headlong, blundering way in which the progress has been made, it must be admitted that the result on the whole is more satisfactory than it would probably have been by this time, if every problem had been then subject of slow and careful deliberation.

Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains, 1870⁴

Along with the dramatic speculative opportunities offered by mining, realty, and commerce, California's first great manufacturing industry commenced with the gold rush and flourished as the handmaiden of resource extraction. Irish immigrants James, Michael, and Peter Donohue founded California's first ironworks, Union Iron and Brass Foundry, in a tent on Montgomery Street in San Francisco in 1849. They charged \$1 per pound for the first castings made on the Pacific Coast, parts of shafts for ocean propeller weighing 400 pounds. Such rates, however, generated meager profits "at a time when labor and material commanded fabulous prices," as Hubert Bancroft put it.⁵ Yet San Francisco's disasters soon proved a blessing for the brothers. A succession of conflagrations between 1849 and 1851 wrecked safes, stoves, and building materials but created an unexpected supply of scrap iron that helped offset the exorbitant cost of imported iron. Using the smokestack of a dismantled steamer for a furnace, a pair of antiquated blacksmith bellows for a blaster, and other motley equipment, master machinist Peter

³ Henry Hanks, *Second Report of the State Mineralogist of California, from December 1, 1880, to October 1, 1882* (Sacramento: State Office, 1882), 199.

⁴ Rossiter Raymond, *Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains* (Washington, D.C.: Government Printing Office, 1870), 471-72.

⁵ Hubert Howe Bancroft, *Chronicles of the Builders of the Commonwealth: Historical Character Study*, vol. 1 (San Francisco: The History Company, Publishers, 1891), 443.

Donohue quickly branched out into ship repairs, mining equipment, custom machinery, steam boilers, and iron and brass castings. With voracious demand for ironwork, old iron costing up to \$20 per ton sold for as much as \$400 once melted, formed, and cast at UIW.⁶

The Donohue's prospered and soon fled the congestion and high rents in Portsmouth Square, relocating UIW to Happy Valley and creating the kernel of San Francisco's metalworking and machinery district (Figure 5.1). Initially named for sunshine, shelter, and springs, perhaps one thousand tents filled the shallow valley by in 1849. A scourge of dysentery and cholera followed torrential rains and quickly belied the name of San Francisco's first "important suburb."⁷ Straddling Mission Street between First and Third streets, Happy Valley soon emerged as the city's first working class enclave.⁸ By 1853, "A stranger could walk blindfolded through San Francisco's Happy Valley and know that it was the manufacturing district of the city," the *San Francisco Herald* reported.⁹ Puffing steam, clanking hammers, whirling wheels, stamping pistons, cracking axles, roaring furnaces, and groaning bellows created a deafening cacophony but proclaimed enterprise without respite, as the reporter described it. The *Herald* counted six principal foundries (capable of melting and casting iron) clustered around UIW on First and Mission streets, while the *Annals of San Francisco* documented a total of thirteen foundries and machine shops in the city.¹⁰ These metalworking firms designed and manufactured stamp mills, amalgamators, and other mining machinery; steam engines and boilers; equipment for steamboats and ships; cast iron building materials; and machinery for San Francisco's earliest breweries and saw and flour mills.¹¹

When the Donohues received a franchise to light San Francisco's streets in 1852, UIW began manufacturing specialized castings, machinery, and pipes. The first gas distilled from a shipment of Australian coal flowed into the mains two years later as the San Francisco Gas Company began illuminating streets, stores, workshops, and San Francisco's prosperous hotels, restaurants, and residences. Donahues' gas plant helped entrench Happy Valley as the West's

⁶ Bancroft, *Chronicles*, 443-44; Benjamin Lloyd, *Lights and Shades in San Francisco* (San Francisco: A.L. Bancroft & Co., 1876), 311; Roger Lotchin, *San Francisco 1846-1856: From Hamlet to City* (New York: Oxford University Press, 1974), 65; "Union Foundry" advertisement, *Daily Alta California*, September 26, 1850, 3.

⁷ Frank Soul'e, John Gihon, and James Nisbet, *The Annals of San Francisco* (New York: D. Appleton and Company, 1854), 302.

⁸ Mel Scott, *The San Francisco Bay Area: A Metropolis in Perspective* (Berkeley: University of California Press, 1959), 29.

⁹ Quoted in "San Francisco Summary," *Sacramento Daily Tribune*, June 11, 1853, 3. The foundries included: Union Iron Works at the corner of First and Mission streets; Eagle Iron Works on Fremont Street near Market Street; Alta Foundry on Market Place facing Battery Street; Vulcan Foundry on First and Mellus streets; Pacific Iron Foundry on First Street; and the Sutter Iron Works on Rincon Hill. Brass Foundry and Lock Factory, Brass and Bell Foundry, Phoenix Iron Works, Excelsior Iron Works, San Francisco Iron Works, San Francisco Novelty Works soon followed. *LeCount & Strong's San Francisco City Directory for the Year 1854* (San Francisco: San Francisco Herald, 1854), 159; *Master Hands in the Affairs of the Pacific Coast; Historical, Biographical and Descriptive: A Resume of the Builders of Our Material Progress* (San Francisco: Western Historical and Publishing Co., 1892), 250.

¹⁰ Frank Soul'e, et al., *Annals*, 492.

¹¹ *City Directory for the Year 1854*, 159; *Master Hands*, 250; "Vulcan Foundry and Machine Works" advertisement, *Daily Alta California*, October 29, 1851, 3.

first industrial district. Docks fitted with coalbunkers soon jutted into the shrinking remnant of Yerba Buena Cove and off of Rincon Point. Lumberyards, flourmills, and assorted workshops clustered, as well. A thicket of smokestacks hung a halo of pollution on the South of Market district, while tarry residue coated, permeated, and poisoned people, property, and the bay. Happy Valley soon earned a new nickname, Tar Flat.¹²

“San Francisco is not merely a commercial city,” the *Daily Alta* claimed a decade later. “It is already building up a large business in mechanical industry; and in this latter respect it is the first city on the shores of the Pacific.”¹³ Despite expensive wages and iron and coal imports, the *Alta* valued the annual output of San Francisco’s seven chief foundries at about \$1.5 million. Mining machinery constituted the bulk, particularly equipment for Comstock silver mills. The foundries produced myriad amalgamating pans and a total of 1,800 stamp mills, which sold for \$200 apiece and typically included a steam engine order. The crushing capacity of these mills represented an increase of 350,000 tons over the previous year, as well as an anticipated \$10.5 million boost in mining profits, according to the booster press. A significant portion of machinery, about twenty percent according to the *Alta*’s estimates, was slated for export to Mexican gold mines as Bay Region capitalists pushed the resource frontier further south.

By the end of the 1860s, San Francisco possessed at least thirteen foundries with furnace capacities ranging from six to thirty-five tons of melted iron. Along with thirty machine shops, the city’s ironworking industries collectively employed 3,000 workers.¹⁴ The dynamic machinery and metalworking complex produced a dizzying array of pumps, pipes, mills, elevators, dredges, engines, boilers, hoists, derricks, nozzles, and drills that literally forced gold, silver, and other resources out of the earth.¹⁵ “At present time, there is no other single branch of manufacturing in California in which even one-half as much labor and capital is employed as in the several departments of iron working,” according to one observer in the late 1860s.¹⁶

Beyond outfitting California’s prospecting corporations, by 1870 San Francisco manufacturers shipped mining machinery and equipment to Nevada, Idaho, Oregon, Washington, Colorado, Arizona, and North Carolina. California machinery, as well as thousands of tons of iron bars, sheets, pipes, and castings, had also reached British Columbia, Mexico, Nicaragua, Bolivia, and Australia. Exports to China and Japan soon followed.¹⁷

San Francisco’s ironworks quickly branched out along with California’s resource-intensive economy, and with diversification came specialization among firms. In addition to renowned mining machinery and boilers and engines, San Francisco firms manufactured an array

¹² Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin*, (Berkeley: University of California Press, 1999), 249-250; Soul’e, et al., *Annals*, 302.

¹³ “The Foundry Business of San Francisco,” *Daily Alta California*, May 27, 1863, 1.

¹⁴ Another twenty-nine metalworks had located in other California and Nevada cities, including Sacramento, Nevada City, Marysville, Stockton, and Sonora. J. Ross Brown, *Mineral Resources of the States and Territories West of the Rocky Mountains*, (Washington, D.C.: Government Printing Office, 1868), 226-27.

¹⁵ Richard Walker, “California’s Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940,” *Annals of the Association of American Geographers* 91, no. 1 (March, 2001): 185.

¹⁶ Titus Cronise, *The Natural Wealth of California* (San Francisco: H.H. Bancroft & Company, 1868), 609-610.

¹⁷ Brown, *Mineral Resources*, 228; Hanks, *Second Report*, 193; Rossiter Raymond, *Statistics*, 472.

of iron goods. The Etna, Empire, and Vulcan foundries manufactured diverse machinery, everything from a coffee-roaster to a locomotive. City Iron Works made sugar mills for Sandwich Island (Hawaii) plantations. Franklin Foundry produced the engines driving the *San Francisco Evening Bulletin's* printing presses. Pacific Iron Foundry cast custom machinery for the first rolling mill in the West. Atlas Iron Works manufactured agricultural equipment. The California, Fulton, and Miner's foundries made building materials, including the architectural castings for the first state capital buildings at Sacramento. Jackson Foundry cast iron stoves, including the ranges used by all the better hotels, as well as ornamental railings and other "light and fancy goods."¹⁸

Nevertheless, UIW remained the bellwether of San Francisco's iron industries and grew spectacularly under the leadership of Irving Scott. Peter Donohue had traveled to Baltimore, Maryland, on his way to England in 1860. After ordering machinery from a New York City iron works to take back to California, he hired Scott, then a mechanical engineer for a Baltimore firm, to deliver the machinery and superintend its construction in California. So impressed with the young man's genius for mechanics and invention, Donohue persuaded Scott to move to San Francisco to serve as the UIW's master draftsman. After a stint designing quartz machinery at Miner's Foundry, then the leading mining machinery producer in the West, Scott returned to UIW as superintendent. Peter Donohue sold out to Scott and several partners in 1865 and Scott supervised the plant for the next forty years. "We carried on in the business of repairing steamships," Scott reminisced:

The natural industry of the country was mining, and the Union Iron Works were interested in it, particularly the "Comstock Lode," for which we made machinery. During the development of mining, I turned almost all of my attention to perfecting mining machinery and devices which proved of great importance.¹⁹

Demand from the Comstock Lode made UIW the West's paramount foundry for engineering and manufacturing mining and metallurgical machinery. "Whether for the mining of ores, for hoisting them to the surface, for conveying them to the mills, for crushing and amalgamation, for separating the bullion, for melting it into bars, here have been supplied, for these and other processes, the models, designs, and drawings which are to-day the standards of the world," according to Bancroft.²⁰ UIW accounted for nearly one-half of the \$4.7 million output from San Francisco manufacturers and city's 1,200 foundry operatives, he continued.²¹ Scott claimed that his firm produced as much as ninety percent of the big, expensive, and innovative hard rock mining equipment and quartz mills used on the Comstock Lode, much of it personally designed by Scott.²²

¹⁸ Brown, *Mineral Resources*, 227.

¹⁹ "Irving M. Scott: Builder of Some of America's Best Battleships," *The Successful American*, February, 1901, 64.

²⁰ Bancroft, *Builders*, 458-59.

²¹ *Ibid.*, 460.

²² *Ibid.*, 446; Brechin, *Imperial San Francisco*, 126; Alonzo Phelps, ed, *Contemporary Biography of California's Representative Men* (San Francisco: A.L. Bancroft & Co., 1881), 161-62; "Irving M. Scott," 64; "Great Shipbuilder's Remarkable Career is Brought to a Sudden End," *San Francisco Call*, April 29, 1903, 1.

Known as Happy Valley, Tar Flat, and, more generally, South of Market, San Francisco's machinery and metalworking district crystallized near Rincon Hill. The specialized ensemble of workplaces absorbed large investments, while the value of output grew spectacularly, reaching \$6 million by the early 1880s.²³ A more comprehensive definition of the metal working trades, accounting for all metal working and machinery industries, San Francisco's machinery agglomeration employed upwards of 35,000 workers in the 1880s(Figure 5.2).²⁴

Industry Rolls to Potrero Point

Under Ralston, the Bank of California derived fortune and infamy from domination of the Comstock mines and mastery of the San Francisco 'Change. San Francisco rapidly became the nation's western financial pole as capital was centralized in the hands of the Bank Ring and reinvested in an array of Pacific Coast extraction enterprises. Bank Ring members sought to strengthen San Francisco's role as the hub of Pacific Coast commercial and transportation systems, as well. Under the lash of demand for mining machinery, transportation equipment, and building supplies, the Bank Ring devised and financed a new magnitude of industrial enterprise. Comstock profits centralized in the Bank of California led to finance capital and a wave of industrial expansion from the mid-1860s until the mid-1870s, which required the creation of new industrial space.

Expensive ground rents, congestion, residential and commercial encroachment, and nuisance land use ordinances certainly pushed industrial capital investment away from the older South of Market industrial core. A new scale of industrial production and space-extensive manufacturing required larger plots of land and expansive water access. But beyond "push factors" and ecological elements of manufacturing dispersal, members of the Bank Ring evinced a coherent strategy of industrial decentralization predicated on building locational assets and creating new industrial space. An alliance of Bank Ring financiers, quickly joined by the leaders of the Central Pacific Railroad, facilitated the southward flight of San Francisco industries through the creation of a new industrial district.

Real estate developers sold few lots in the city's first suburban subdivision, Potrero Nuevo, in 1849.²⁵ Isolation and inaccessibility, rather than demand, continued to preclude settlement at Potrero Point, a rugged promontory also known as Point San Quentin, throughout the late 1850s (Figure 5.3). Industrial capital investment keyed the development of Potrero Point in the mid-1860s. After several false starts, Peter Donohue convinced the state legislature, the press, and, in turn, the voters of San Francisco, San Mateo, and Santa Clara counties to approve subsidies for his San Francisco & San Jose Railroad. Entering San Francisco through San Bruno to the south in 1864, the line terminated at the tidelands and marshes along Rincon Point and Mission Bay, just north of Potrero Point. The new railroad was seemingly preordained to become the final link in the heralded transcontinental transportation system. The marshes, once

²³ Thomas J. Vivian, *The Commercial, Industrial, Agricultural, Transportation, and other Interests of California: Being a Report on that State for 1890 Made to S. G. Brock, Chief of the Bureau of Statistics, Treasury Department*, (Bureau of Statistic, Treasury Department, 1891), 376.

²⁴ Walker, "Golden Road," 185.

²⁵ John Townsend and Cornelius de Boom laid out Potrero Nuevo in 1849, Scott *The San Francisco Bay Area*, 26.

filled, would provide the city's best locale for construction of the major facilities needed to bring quantities of raw material to burgeoning industries. In combination with existing and proposed wharfage for ore and grain carriers, lumber ships, and other freighters, the anticipated railhead would create an ideal setting for industry at Potrero Point.²⁶

The mystique of the rails undoubtedly induced industrial capital investment at Potrero Point. Yet a wave of Bank Ring investment orchestrated the early industrialization of southeastern San Francisco. Ralston and D.O. Mills had helped finance the new railroad, while Scott designed and built California's first heavy locomotive for the line, the "California" (a smashing success capable of traveling sixty-seven miles per hour).²⁷ Then the Bank Ring's first factory at Potrero Point served not only as an anchor for the incipient industrial node, but also for industrial expansion throughout the Bay Region.

Bay Region metalworkers and machinists required basic iron inputs. The Bank Ring channeled resource profits into California's first rolling mill. Incorporated in 1866 with a \$1 million capitalization, Pacific Rolling Mills Company (PRMC) promised to be the foundation for industrial expansion and diversification in the Bay Region. According to the *Daily Alta*:

The most prominent enterprise, in a manufacturing sense, hitherto undertaken in California is the establishment of the Pacific Rolling Mill, which, when completed will render the people of California and the Pacific Coast independent of the East, and "the rest of mankind," for supplying rails, bars, and other forms of iron indispensably required in industrial pursuits.²⁸

Rigid and impure pig iron, along with imported scrap iron, represented only an intermediate step in the iron production process. At PRMC's puddling furnace, workers would re-melt and agitate pig and scrap iron in order to oxidize carbon. Laborious stirring of purified iron rendered soft "puddle balls." The semi-molten iron was hammered, squeezed, or processed by heavy machinery until it became homogeneous and malleable wrought iron suitable for selling, molding, casting, or drawing into bars and sheets at the rolling mill.²⁹ PRMC promised to buoy San Francisco's manufacturers of mining equipment, resource processing machinery, transportation equipment, and capital goods.

The constellation of California's most powerful capitalists who invested in PRMC helps illuminate the imperative of indigenous iron production. Bank Ring stalwarts, including William Ralston, D.O. Mills, and Alvinza Hayward, were soon joined by "Irish Silver Kings" James Flood and James Fair.³⁰ William Alvord sold his hardware importing firm in order to help finance and supervise the construction of PRMC, and then served as its president during the

²⁶ William Bullough, *The Blind Boss and His City: Christopher Augustine Buckley and Nineteenth-Century San Francisco* (Berkeley: University of California Press, 1979), 33-34; Laurence Shoup, *Rulers and Rebels: A People's History of Early California, 1769-190* (New York: iUniverse Books, 2010), 175.

²⁷ Brechin, *Imperial San Francisco*, 126; Judson Pacific-Murphy Corporation, *A Romance of Steel in California* (San Francisco: Clavering Press, 1946).

²⁸ "Local Intelligence," *Daily Alta California*, October 7, 1867, 1.

²⁹ Fay, *Glossary*, 509; Hanks, *First Annual Report*, 29.

³⁰ Vivian, *Interests of California*, 401.

subsequent two decades. A Gold Rush entrepreneur and hardware merchant, Alvord emerged as one of San Francisco's preeminent financiers as a director of the Pacific Insurance Company and an original incorporator of the Bank of California. He helped make visible the link between Bank of California's *haute finance* and political power in San Francisco and the West. Soon after he was elected Republican mayor of San Francisco (1871-73), Alvord became a director of the Bank and subsequently its vice president and then president in the wake of Ralston's death and Mills' resignation (in 1875). Following Ralston's template, Alvord was a powerful booster-capitalist, serving as a San Francisco Park Commissioner and Police Commissioner, as well as prominent member of elite civic institutions including the San Francisco Art Association and California Academy of Sciences. He was a leading financier through not only the Bank of California but also as president of the San Francisco Clearing House, director of the Security Savings Bank and California Title Insurance Trust Company, and chairman of the local board of directors of the London, Liverpool and Globe Insurance Company. Alvord helped perpetuate the rapid reinvestment of resource profits for the expansion of resource plunder by serving as president of the Alaska-Treadmill Gold Mining Company, Alaska-Mexican Gold Mining Company, and Ralston's Spring Valley Water Company.³¹

Not only was Ralston an early director of the firm and one of its largest stockholders but he also included Leland Stanford in PRMC's financing and leadership, making California's first rolling mill, in effect, a joint venture between the Bank Ring and the Southern Pacific Railroad.³² After engineering gifts of land from the federal government while the Central Pacific Railroad's leader and California's governor (1862-3), Leland Stanford sought state largess to aid enterprises ancillary to railroad construction. Iron rails selling for \$90 per ton at eastern rolling cost California railroad companies \$140, he claimed. This sixty-five percent increase due to transportation costs did not include expenses incurred by transshipment and transport from San Francisco to Sacramento. Worse yet, Civil War era "high war risks" threatened to increase transportation rates almost threefold.³³ A legislative act in 1866 designed to foster local manufacturing of railroad equipment authorized the state to sell PRMC coveted submerged lots and tidelands at Potrero Point for \$300 an acre, only one-tenth the market value. "The site of these mills has been well chosen, being in what must shortly become one of the great manufacturing quarters of the city," as one observer put it.³⁴ In return, PRMC was required to construct a rolling mill capable of manufacturing a minimum of fifty tons of "railroad iron" per month within three years (by April 1869). After the initial grant of eight acres, PRMC eventually acquired about fifty acres, some of which were submerged land adjacent to the site.³⁵

³¹ Theodore Hittell, *William Alvord*, (San Francisco: California Academy of Sciences, 1905); William Issel and Robert Cherny, *San Francisco, 1865-1932: Politics, Power, and Urban Development* (Berkeley: University of California Press, 1986), 28, 32; "William Alvord Dies in this City," *San Francisco Call*, December 22, 1904, 3.

³² Shoup, *Rulers and Rebels*, 190, 193.

³³ Central Pacific Railroad Company, *Answers to the Central Pacific Railroad Company Submitted by Leland Stanford, President, at San Francisco, Cal., July 28th and 29th, 1887; To the Communication of the United States Pacific Railway Commission Dated, New York, May 12th, 1887* (H.S. Crocker & Co., 1887), 187.

³⁴ Cronise, *Natural Wealth*, 610-11.

³⁵ The PRMC site was initially bound by Butte, Maryland, Shasta, and Massachusetts streets, and later extended west from Maryland between 20th and 23rd streets. Gerald Nash, *State Government and Economic Development: A History of Administrative Policies in California, 1849-1933* (Berkeley: Institute of Governmental Studies,

PRMC excavated the steep shoreline and filled the bay with 60,000 cubic yards of earth, creating a level factory site and a waterfront expanse close to 2,000 feet long. The firm ordered firebrick and clay from New York and Liverpool, coal from Australia, and arranged to collect scrap iron throughout the Pacific Coast and England. Over one thousand tons of old iron soon sat on the company's wharf as PRMC began melting and rolling about fifteen tons of metal a day, transforming scrap iron that cost \$12 per ton into the first merchant and railroad iron manufactured on a significant scale in California, which sold for \$75 per ton. Additionally, the mills made "Every variety of shafting, including all sizes of steamboat shapes, cranks, pistons, connecting rods, &c. Car and locomotive axles and frames, and hammered iron of every description and size," according to an early advertisement.³⁶

Although the mills failed to aid the Central Pacific in its race to meet the Union Pacific at Promontory, Utah, PRMC rolled the first rails on the Pacific Coast for the Oregon Central Railroad in 1869, along with machined spikes, bolts, and screws. Other early contracts included seventy tons of iron rods measuring up to thirty feet long for the Pacific and Marysville Railroad's bridges and melting prodigious horse shoes to supply U.S. Navy with iron for ship repair at the Mare Island drydocks. By the 1870s, thirteen furnaces roared day and night as PRMC rolled thirty tons of bar iron per day and cast iron rails, piston rods, locomotive cars and equipment, railroad spikes, bolts, and rivets, steamboat driveshafts, connecting rods, and hammered iron of every description. Daily wages for PRMC's 200 employees ranged from \$1.50 for boys, about fifty of whom worked in the bolt shop, to \$7 for experienced mechanics. British importers remained the chief suppliers of scrap and discarded railroad iron while the mill's daily expenses for Australian bituminous coal reached \$475.³⁷

PRMC manufactured the rails, yokes, switches, and massive turntables for the first commercial cable car line, Andrew Hallidie's Telegraph Hill Cable Road. A.S. Hallidie & Company had made screens for quartz and flour mills, sieves, riddles, bird cages, fenders, fire guards, and other wire products used in households, mines, and factories.³⁸ In 1868, Hallidie invented a wire ropeway for transporting rich ores in California and Comstock mines. The technology behind his aerial trams found novel applications in San Francisco, unleashing a new wave of real estate speculation and rent extraction on San Francisco's formerly inaccessible hilltops. With braided wire cables manufactured at Hallidie's North Beach wireworks, the cable cars soon climbed Nob Hill and ran past the homes of "Big Four" Central Pacific Railroad associates. Intrigued with the cable cars' technical and financial success, Stanford, Charles

University of California, 1964), 59; Judson Pacific-Murphy Corporation, *Romance of Steel*; "Local Intelligence," *Daily Alta California*, October 7, 1867, 1; "Laws of California," *Sacramento Daily Union*, April 16, 1868, 2; *The Statutes of California Passed at the Seventeenth Session of the Legislature, 1867-8* (Sacramento: State Printer, 1868), 432; "Risdon Iron and Locomotive Works," *San Francisco Call*, December 15, 1901, 70.

³⁶ Quote from Henry Langley, *The Pacific Coast Business Directory for 1867* (San Francisco: Henry G. Langley Publisher, 1867), xvi; Cronise, *Natural Wealth*, 610-11; Frederick Hackett, *The Industries of San Francisco: Her Rank, Resources, Advantages, Trade, Commerce, & Manufacturers* (San Francisco: Payot, Upham & Co, 1884), 57; Judson Pacific-Murphy Corporation, *Romance of Steel*.

³⁷ John Hittell, *The Commerce and Industries of the Pacific Coast of North America* (San Francisco: A. L. Bancroft & Co., Roman & Company, 1882), 683; Judson Pacific-Murphy Corporation, *Romance of Steel*; "California Manufacturers: The Pacific Rolling Mills," *San Francisco Chronicle*, November 5 1869, 3.

³⁸ California Wire Works Company succeed Hallidie & Co. in 1882.

Crocker, and Mark Hopkins, secured a franchise from the San Francisco Board of Supervisors in 1876 to build the California Street Cable Railroad Company between Kearny and Fillmore streets. PRMC manufactured rails and equipment for the new line and another four cable car outfits during the 1870s. Although they sold their holdings in 1884, it was the Big Four's entry into the streetcar business (which later proved so pivotal to the development of Los Angeles).³⁹

PRMC was one of many San Francisco metalworking and machinery outfits bolstered by the Bank Ring. In addition to Ralston and Mills, an alliance including Lloyd Tevis, Samuel Butterworth, McLane, Alvord, and Luning financed industries that, in many cases, directly benefited from PRMC inputs.⁴⁰ After financing the expansion of Scott's Union Iron Works and the Vulcan Iron Works, in 1868 the Bank Ring incorporated the Risdon Iron and Locomotive Works, with \$1 million worth of capital stock. Its first board of trustees included John Risdon (Giant Powder), Tevis, McLane, Butterworth, and Alvord, which, like PRMC, brought together men associated with the Bank of California and the Central Pacific Railroad.⁴¹ While continuing to specialize in engines and boilers, the Risdon Works quickly diversified into mining equipment.⁴² Yet the bulk of the Bank Ring's new industrial investment clustered in the vicinity of PRMC (Figure 5.4).

Workers began excavating the rocky shoreline at Hunter's Point and "reclaiming" the adjacent tidelands in order to create the California Dry Dock Company's gigantic graving dock for repairing damaged sea-going vessels in 1866.⁴³ Ralston and Nicholas Luning, who had joined the bank's board of directors in 1866, helped incorporate San Francisco and Pacific Sugar Refinery, capitalized at \$800,000. The new refinery occupied the largest buildings in the state and shipped raw sugar and syrup throughout the West.⁴⁴ A Bank Ring coalition including Luning, Bell, Butterworth, Hayward, and Tevis incorporated the City Gas Company and built a

³⁹ Brechin, *Imperial San Francisco*, 65; California Wire Works, *The Mechanical Miners' Guide Issued by the California Wire Works, Successor to A. S. Hallidie, Manufacturers of Wire and Wire Rope and the Four Pointed Steel Barb Fence Wire* (San Francisco: California Wire Works, 1882); William Friedrichs, *Henry E. Huntington and the Creation of Southern California* (Columbus, OH: Ohio State University Press, 1992), 31; Andrew Hallidie, "Invention of the Cable Railroad," in *Overhead Wires for Street Railroad Service: Views Expressed by the Mayors of Cities Where They are in Operation*, (Melrose, MA: Melrose Journal Job Print, 1890), 54; Hittell, *Commerce and Industries*, 425-26, 668; Edgar Kahn, "Andrew Smith Hallidie," *California Historical Society Quarterly* 19, no. 2 (June, 1940): 144-156; Walker, "Industry Builds Out the City," 98; "Obituaries," *The Iron Trade Review* 67, no. 18 (October 28, 1920): 1225.

⁴⁰ Alvord invested in conjoined transportation projects and Potrero Point industries; he was a director of the United Railroads of San Francisco, the Spreckels and Western Sugar Refining Company, and Shelby Smelting and Lead Works. Theodore Hittell, *William Alvord*, (San Francisco: California Academy of Sciences, 1905); William Issel and Robert Cherny, *San Francisco, 1865-1932: Politics, Power, and Urban Development* (Berkeley: University of California Press, 1986), 28, 32; "William Alvord Dies in this City," *San Francisco Call*, 22 Dec 1904, 3.

⁴¹ Laurence Shoup, *Rulers and Rebels*, 193; "The Risdon Iron and Locomotive Works," *Daily Alta California*, March 1, 1869, 6.

⁴² Advertisement, *Sacramento Daily Union*, December 15, 1868, 4.

⁴³ Incorporated in 1867, trustees included Lloyd Tavis, William Ralston, Samuel Butterworth, and Charles McLane. Lyman, *Ralston's Ring*, 83-84; "The Second Grand Enterprise of Our City," *Daily Alta California*, August 19, 1867, 1. "Incorporations," *Daily Alta California*, September 1, 1867, 1.

⁴⁴ Lyman, *Ralston's Ring*, 57; Shoup, *Rulers and Rebels*, 193.

large modern gas manufacturing plant at Potrero Point in 1869 in hopes of undercutting the lucrative public service monopoly held by Donohue's San Francisco Gas Company.⁴⁵ In 1872, Ralston's Union Pacific Silk Manufacturing Company possessed twelve tons of customized machinery in its new, bayside factory. Through contracts with two New York City dry goods houses, the company had \$50,000 worth of imported silk dyed, wound, and waiting to be made into colored silk ribbons. The company built one hundred new houses for its workforce of two hundred and their families.⁴⁶

With industrial diversification came spatial expansion, and areal differentiation. After leapfrogging to Potrero Point, industry spread out rapidly from the old South of Market core, forming a reasonably continuous swath of industrial land use along San Francisco's eastern shoreline. An industrial crescent formed between North Beach and Hunter's Point to the south, though a discernable degree of areal specialization by industrial sector was evident beginning in the late-1860s (Figure 5.5). Machinery manufacturers continued to cluster near Rincon Hill, located just a half mile southeast of where Market Street terminated at the bay. Foodstuff manufacturers and luxury goods industries lined the shoreline north of Market Street to Black Point. South of Rincon Point, lumber and wood products grouped along Mission Creek on filled portions of Mission Bay. Located at the marshy inlet at the mouth of Islais Creek, San Francisco's Butchertown separated the Potrero Point iron district from maritime services located on Hunter's Point, about six miles south of Rincon Point as the crow flies.⁴⁷

PRMC undoubtedly rendered a "valuable service to all our industries," according to Hanks.⁴⁸ In addition to supplying inputs to California industries, PRMC was the only competitive check against imports on the iron market.⁴⁹ Nevertheless, California manufacturers had "suffered materially through long neglect to produce at home this article of prime necessity," Hanks concluded.⁵⁰ The San Francisco Bay Area's legendary metalworking and machinery industries relied on imported iron inputs—pig and scrap iron that could be melted and rolled, wrought bars and sheets ready for casting, or rails ready for laying—and suffered from attendant market vagaries in supply, price, and the like.

"An Article of Prime Necessity"

Iron fueled California's resource intensive economy. From gold pans to quartz mills, and from shovels to hydraulic monitors, mining companies' demand for machinery and equipment mushroomed well into the 1880s. The importance of iron extended to other resource extraction industries, particularly through the ever-increasing demand for agribusiness inputs—everything from hoes to harvesters and from barbed wire to windmills. Urban gas works and water

⁴⁵ Shoup, *Rulers and Rebels*, 217; "Incorporations," *Sacramento Daily Union*, February 18, 1869, 4.

⁴⁶ Lyman, *Ralston's Ring*, 83; "Union Pacific Silk Manufacturing Company," *Daily Alta California*, November 8, 1872, 1.

⁴⁷ Walker, "Industry Builds Out the City, 97-98.

⁴⁸ Hanks, *Second Annual Report*, 194.

⁴⁹ *Ibid.*

⁵⁰ *Ibid.*

conveyance companies required innumerable miles of iron pipes to illuminate cities, feed hydraulic monitors, and plumb the state. Transportation industries—shipbuilding and other maritime services, as well as engines, equipment, and rails for horsecars, cable cars, trolleys, and, of course, steam railroads—likewise consumed prodigious iron. A reliance on iron building materials began with statehood, when frequent conflagrations forced San Francisco’s merchants to adopt metal building materials for warehouses and stores. Consumer demand for iron goods soared, as well. Between 1850 and 1880, California’s population increased more than eightfold, boosting demand for mundane durable goods, such as stoves, horseshoes, and nails. Further, manufacturers required capital goods, including steam engines, turbines, boilers, and furnaces in order to make foodstuffs, cigars, shoes, and the like. “Few countries consume so much iron in proportion to their population as California, notwithstanding this metal has here always commanded extra high prices,” Hanks claimed in 1884.⁵¹

Every piece of iron melted in the mills, cast in the foundries, assembled in the machine shops, and employed in the mines and manufactories came to California on ship or rail. Even the bar iron rolled by the PRMC began with imported scrap and pig iron inputs. Considering California’s demand for finished iron goods in 1854, State Geologist Josiah Dwight Whitney speculated, “It would require the whole amount of gold which we produce to pay for the iron we consume, if it was all imported in the manufactured state.”⁵² By 1863, San Francisco’s seven chief foundries collectively consumed about fifteen tons of iron per day, amounting to roughly 5,000 tons at an annual cost of \$180,000, according the *Daily Alta*.⁵³ By the 1870s, California iron industries consumed an average of 14,000 tons of pig iron per year and almost as much bar and sheet iron. With the price of pig iron on the San Francisco market averaging \$30 per ton, and scrap and wrought iron averaging at least three times as much, average annual expenditures on imported iron reached roughly \$1.35 million in 1880, a cumulative total of about \$40 million since statehood. Consumption of pig iron continued to expand, reaching a yearly average of 18,000 tons during the 1880s.⁵⁴

Receipts from the San Francisco customs district show fluctuating expenditures on iron imports, which, as I discuss below, were linked not only to demand but also to California’s wheat trade and broader trends in global resource markets.

⁵¹ Henry Hanks, *Fourth Annual Report of the State Mineralogist, for the Year Ending May 15, 1884* (Sacramento: State Office, 1884), 235.

⁵² J. D. Whitney, *Geological Survey of California, An Address Delivered Before the Legislature of California at Sacramento, Mar. 12, 1861* (San Francisco: Towne & Bacon, Book, Card and Fancy Job Printers, 1861), 23.

⁵³ One ton of coal was used for three tons of iron. “The Foundry Business of San Francisco,” *Daily Alta California*, May 27, 1863, 1.

⁵⁴ Brown, *Mineral Resources*, 227; Hanks, *Second Annual Report*, 193-94; Vivian, *Interests of California*, 402.

	1860	1870	1875	1880	1881	1882
Pig Iron	\$14,852	\$186,926	\$208,406	\$35,338	\$149,586	\$111,338
Scrap Iron	\$716	\$35,317	\$99,485	\$93,672	\$17,592	\$90,894
Rolled Bars	\$27,453	\$350,143		\$56,360	\$98,804	\$96,125
Railway Bars	\$45,025	\$243,907	\$120,103	\$1,132	\$232,334	\$1,746,219
TOTAL	\$88,046	\$816,293	\$427,994	\$186,502	\$498,316	\$2,044,576

Chart 4.1. Value of iron products imported into the San Francisco customs district.⁵⁵

Firms in European countries, particularly England and France, exported the bulk of iron to California before the Civil War. After the war, San Francisco firms increasingly relied on Australian and U.S. manufacturers in the east and the Pacific Northwest. Freight costs increased the price of both European and Eastern U.S. pig iron imports by as much as forty percent.⁵⁶

Sheer demand combined with high transportation costs, incessant price fluctuation, and the inconsistency of iron imports created a spectacular opportunity for any California firm able to mine iron ore and smelt and transport pig iron to Bay Region markets. The potential for regional iron production had long been acknowledge and anticipated:

Notwithstanding the consumption of iron has always been large in this State and the raw material expensive, no smelting works or forges have yet been erected to extract the metal from the ore, or for its further preparation for the uses of the foundry and other branches of the mechanic arts. Yet, as large deposits of the ores of this metal of excellent quality, and favorably situated for working, exist in many parts of the State, it is reasonable to suppose that works for smelting the ores and forging the pig metals into blooms will soon be erected.⁵⁷

Gold prospectors from Pennsylvania discovered iron flakes speckling the American River in the early 1850s.⁵⁸ Miners soon followed trails of iron dust to “boulders” of iron ore cropping out of a ledge near Clipper Gap in Placer County, about forty miles northeast of Sacramento.⁵⁹ With favorable results from a San Francisco assayer, miners’ plans to build a furnace and smelt

⁵⁵ Vivian, *Interests of California*, 1102.

⁵⁶ Oregon firms produced 95,000 tons of pig iron (1874-1894) and Washington accounted from 25,000 (1881-1889). “History of Pig Iron Manufacture on the Pacific Coast,” *Washington Historical Quarterly* 7, no. 3 (July, 1926): 170; R.C. Gosrow, “Notes on Iron Ore Smelting in California,” *Chemical and Metallurgical Engineering* 27, no. 10 (September 6, 1922): 490; “Union Iron Works, California: Statement of Irving M. Scott,” *Report of the Select Committee on Ordnance and War Ships, with an Appendix* (Washington: Government Printing Office, 1886), 431.

⁵⁷ Cronise, *Natural Wealth*, 609.

⁵⁸ Thomas Thompson and Albert West. *History of Placer County, California* (Oakland: Pacific Press Publishing House, 1882), 207.

⁵⁹ “Iron Ore,” *Sacramento Daily Union*, December 8, 1857, 1.

pig seemed feasible in the late 1850s. The *Sacramento Daily Union* excitedly announced, "From the convenient location of the ore it can be put down at the furnace at small cost, and wood for the manufacture of charcoal is found in abundance in the immediate vicinity."⁶⁰ Along with the discovery of coal beds at Mt. Diablo and near Oroville, the new iron ore deposit renewed boosters' hopes of economic expansion during the downturn precipitated by exhausted placer deposits. "With coal and iron in abundance, and easily worked, California, with truth, could be pronounced the richest, in mineral wealth of any country on the globe," the press surmised.⁶¹

Despite favorable prospects, capital flight to the Comstock Lode, prohibitive expenses, and fear of foreign competition precluded the considerable investment required for mining iron ore and smelting pig iron in Placer County. Indeed, Whitney's forecast in 1861 was bleak:

That California, or any other portion of the Pacific slope, will soon be independent of the rest of the world for her supplies of iron, is hardly to be expected, however much it might be desired. With the high prices of labor and capital ruling in this region, it would require the deposits of ore to be situated in the most extraordinarily favorable manner, with regard to fuel and a market, to be made available.⁶²

Just four years later, however, Whitney radically revised his assessment. He investigated the Placer County strike and documented an iron ore vein measuring over thirty-feet thick. More important, the projection of the Central Pacific Railroad, including a station just 3.5 miles away at Clipper Gap, shifted the relative location of the ore strike. The deposit became California's most important because it was the most convenient.⁶³ "With the present prices of fuel and labor, it is not easy to say how soon California will be able to manufacture her own iron; but this locality is, perhaps, more favorably situated than any yet discovered in the State for trying the experiment," Whitney concluded.⁶⁴

Several companies quickly conducted this experiment. Robinson, Brown & Co. purchased the mine, as well as 1,500 acres from the Central Pacific Railroad in May 1866.⁶⁵ After assays in San Francisco and Boston, the firm reincorporated as Iron Mountain Company, seeking a capital of \$500,000 in order to develop mines and to hire Coffee, Risdon & Co. to build a blast furnace.⁶⁶ The new company also sought government subsidies for pig iron production through a Placer County assemblyman's "Act to encourage iron mining." The act, however, failed in legislature and miners again abandoned the operations.⁶⁷ "The parties

⁶⁰ "Iron Ore," *Sacramento Daily Union*, December 8, 1857, 1.

⁶¹ Ibid.

⁶² Whitney, *An Address*, 25.

⁶³ Brown, *Mineral Resources*, 223.

⁶⁴ Cited by Hanks, *Fourth Annual Report*, 234.

⁶⁵ Brown, *Mineral Resources*, 223.

⁶⁶ Ibid.; Gosrow, "Notes on Iron Ore," 490; "Incorporations," *Sacramento Daily Union*, December 21, 1869, 2.

⁶⁷ Gosrow, "Notes on Iron Ore," 490-491; Thompson and West. *History of Placer County*, 207.

interested in the enterprise, being men of limited capital, are not prepared to conduct the operations on a scale to insure success. It would be to the benefit of the State if capitalists would take hold of the business,” J. Ross Brown recommended in 1868.⁶⁸ It would take another decade for California capitalists to invest sufficient funds to profit from the Clipper Gap strike.

Members of the Bank Ring simultaneously sought to exploit another promising California iron deposits in the late 1860s, illuminating a direct link between Bank Ring industrial development and California’s natural resource inputs. Nicholas Luning, a banker and real estate developer alleged to have never caught gold fever or speculated in stocks, had joined the board of directors of the Bank of California’s in 1866. Luning was subsequently “connected with nearly every movement of magnitude which tended to build up the city of San Francisco,” including PRMC, San Francisco and Pacific Sugar Company, and Ralston’s Union Insurance Company.⁶⁹ In 1869, he helped incorporate the Sierra Iron Company, with a \$1.2 million capital stock. The new corporation bought 800 acres in the Gold and Mohawk valleys in Sierra and Plumas counties, near Downieville, in hopes of mining ore and smelting pigs. After visiting the site, acclaimed German Geographer Baron F. Von Richthofen reported:

Your mines consist altogether of magnetic ores, the same from which the celebrated Swedish and Russian iron is manufactured. A total amount of ore which may be extracted from the different deposits, by quarrying, I estimate at about 1,400,000 tons—average yield, from forty-five to fifty percent. Even the removal of the ore next to the surface will be the work of a generation.⁷⁰

The Sierra Iron Company quickly sought concessions from Congress for an additional 10,000 acres of timberland, as well as for railroad right-of-ways.⁷¹

According to the *Daily Alta*, Sierra Iron Company leaders had already fielded offers from San Francisco gas and water companies seeking cast iron pipes. These firms consumed about 3,000 tons of pipes during the previous years, while gas and water companies in other California towns accounted for another 1,500 tons. At \$63 per ton, California firms had paid New York importers \$279,000 for iron pipe. The Sierra Iron Company ambitiously and optimistically figured to smelt iron ore and cast pipes for a total of \$35 per ton, which constituted a “public benefit,” as the *Alta* would have it, enabling California “to retain here millions of dollars now exported annually for heavy iron and steel.”⁷²

Luning and the Bank Ring had more specific and strategic plans for iron pipe production. By the late 1860s, Peter Donahue’s San Francisco Gas Company was one of the largest and most lucrative public service monopolies in the West. The annual rate of return on a \$6 million capital

⁶⁸ Brown, *Mineral Resources*, 224.

⁶⁹ Quote from Henry Hall, ed., *America’s Successful Men of Affairs: A Contemporaneous Biography* (New York: The New York Tribune, 1896), 518-520; Shoup, *Rulers and Rebels*, 193.

⁷⁰ Cited by Hanks, *Second Annual Report*, 195; Raphael Pumpelly, *Report on the Mining Industries of the United States (Exclusive of Precious Metal), With Special Investigations into the Iron Resources of the Republic and into the Cretaceous Coals of the Northwest* (Washington: Government Printing Office, 1886), 493-96.

⁷¹ “Incorporated,” *Sacramento Daily Union*, August 18, 1869, 2; “The Sierra Iron Works,” *Daily Alta California*, December 26, 1869, 2.

⁷² “The Sierra Iron Works,” *Daily Alta California*, December 26, 1869, 2.

reached close to fifty-five percent by 1869, thanks to the San Francisco Board of Supervisors, who allegedly accepted bribes for setting high gas rates, all at the expense of everyday consumers, according to Shoup.⁷³ In April 1869, a Bank Ring coalition including Luning, Bell, Butterworth, Hayward, and Tevis incorporated the City Gas Company capitalized at \$1.5 million. They built a large modern gas manufacturing plant at Potrero Point intending to undercut the San Francisco Gas Company and wrest control of the public service monopoly.⁷⁴

For the Sierra Iron Company, the profitability of supplying iron pipe to San Francisco hinged on transportation costs. Despite rich ore, timber, and water resources, the remote location of the deposits precluded their commercial value. An anticipated freight cost of \$20 per ton of iron for the eighty-mile wagon trip to Truckee and the Central Pacific Railroad made regional production of iron pipes too expensive to compete with imports. Sharp competition between the two gas firms culminated with a compromise in 1873, when the two rivals merged, forming the San Francisco Gas Light Company, which became the most lucrative gas monopoly in the West.⁷⁵

South Chicago Meets the Mother Lode

I will state further, from intimate knowledge of the subject, that we can supply any demand that may be made from any source whatever for charcoal iron.

Irving Scott, referring to CIC pig iron production during testimony before congress in 1884⁷⁶

“The modern blast furnace,” Hanks explained, “is a marvel of scientific and mechanical skill, which seems to have reached a state near to perfection.”⁷⁷ Completed in 1880, the CIC furnace was the first and only furnace capable of smelting iron ore in California (Figure 5.6). It was “as complete and perfect as can be made by united capital and skill,” Hanks wrote.⁷⁸ In this case, Bay Region capital formed a union with skill from iron districts in upstate New York and the Great Lakes region.

Judson, Irving, and Hotaling invested over \$82,000 in the furnace, a significant amount considering that CIC was a privately held company, or “co-partnership,” rather than a public corporation.⁷⁹ As opposed to Judson’s chemicals riches or Scott’s metalworking fortunes, Anson Parsons Hotaling’s wealth came from commerce. He failed in the gold fields but parlayed a

⁷³ Shoup, *Rulers and Rebels*, 217; “Incorporations,” *Sacramento Daily Union*, February 18, 1869, 4.

⁷⁴ Ibid.

⁷⁵ Hanks, *Second Annual Report*, 196; “The Sierra Iron Works,” *Daily Alta California*, December 26, 1869, 2; Shoup, *Rulers and Rebels*, 217.

⁷⁶ “Statement of Irving M. Scott,” 425.

⁷⁷ Hanks, *Second Annual Report*, 197.

⁷⁸ Ibid., 197.

⁷⁹ California Iron and Steel Company, *Prospectus of the California Iron and Steel Company* (San Francisco: The Bosqui Engraving and Printing Co., 1882), 5; “Stocks and Mines,” *Daily Alta California*, October 19, 1880, 2; “A Proposed Industry,” *Sacramento Daily Union*, July 21, 1882, 3.

wine and liquor business, founded in 1853 at the corner of Sansome and Jackson streets in San Francisco, into wholesale liquor empire, trans-bay freighting business, and an import and export firm linking San Francisco to Australian colonies, South Pacific islands, and Russian outposts on the Bering Sea by the late 1870s. In 1880, he added the company town of Hotaling in Placer County to his cache of real estate holdings in Portland, Seattle, and Spokane, San Francisco and California's "principal counties," especially Marin, where his bank in San Rafael "may be said to control the financial affairs of that section."⁸⁰ Nestled in a beautiful grove, the town of Hotaling presented a "cozy-like appearance," according to one newspaper depiction.⁸¹ Neat rows of workers' houses straddled 100-foot wide streets and CIC owned a general store and built a school.⁸² Although A.P. Hotaling's participation in extraction industries was largely as an investor—he also invested heavily in California quicksilver mines—with the first "blast" of the new furnace in April 1880, Hotaling's eponymous company towns became synonymous with California iron production, however briefly.

Although located in the heart of the Mother Lode, the blast furnace embodied East Coast ingenuity and Chicagoland implementation. It was built by an engineer from Rochester, New York, based on technology that had been vetted in South Chicago iron mills. The California version was a two-thirds scale duplicate of a blast furnace built in 1873 on the Menominee River, which forms the boundary between Michigan's Upper Peninsula and Wisconsin.⁸³ Nevertheless, the Hotaling furnace created a powerful vortex drawing vast resources into its towering shaft and transforming a broad swath of Sierran forest into wallow for pig iron production. Judson, Scott, and Hotaling invested over \$400,000 in land, machinery, bridges, flumes, and roads in order to develop over twelve square-miles of Sierran woodlands, an area over one-half the size of Manhattan (Figure 5.7). Each "charge" of the furnace required 800 pounds of iron ore, thirty pounds of limestone flux, and 500 pounds of charcoal, which rendered about 400 pounds of pig iron.⁸⁴

Seventy-five smelters and furnace men worked around the clock while loggers, charcoal burners, teamsters, woodchoppers, and iron and limestone miners added to a workforce reaching upwards of 400 at the seasonal height of production. CIC miners bored a 250-foot shaft into a thick vein of hematite iron ore located near the furnace and dug another shaft reaching 150 feet into a body of magnetite ore. They quarried flux from a limestone ledge located just a few hundred feet from the furnace. CIC miners also exhumed white saccharoidal marble "suited for

⁸⁰ His estate was worth between \$7 and \$10 million in 1900. Joseph Baker, *Past and Present of Alameda County, California*, vol. I (Chicago: S.J. Clarke Publishing Co., 1914), 140, 311; *A Review of the Commercial, Financial, and Mining Interests of the State of California and the Entire Pacific Slope for the Year 1876* (San Francisco: John H. Carmany & Company, 1877), 137; *The Builders of a Great City: San Francisco's Representative Men; The City, Its History and Commerce*, vol. 1, (San Francisco: San Francisco Journal of Commerce Publishing Co., 1891), 214. "Death of One of California's Millionaires," *San Francisco Call*, February 17, 1900, 12.

⁸¹ "The Pacer County Iron Mines," *Sacramento Daily Union*, May 28, 1883, 2.

⁸² "Stocks and Mines," *Daily Alta California*, October 19, 1880, 2.

⁸³ Hanks, *Second Annual Report*, 197; Thompson and West, *History of Placer County*, 208.

⁸⁴ California Iron and Steel Company, *Prospectus*, 5; Hittel, *Commerce and Industries*, 312; "Statement of Irving M. Scott," 432.

building and ornamental purposes” but more valuable as flux.⁸⁵ In the absence of coal and coke, CIC relied on charcoal; timberland composed the bulk of CIC’s property. Dispersed, “inferior timber” that was spared by mining companies was suitable for charcoal production.⁸⁶ CIC owned dispersed parts of sections from the publicly surveyed land granted to the Central Pacific Railroad, which were located away from the foothills and streams where mining and water companies annihilated forests to build flumes. CIC loggers felled oak, fir, and spruce, then flumed and hauled timber to six or eight charcoal camps located up to eight miles from the furnace. At each camp, a cluster of conical or “beehive” charcoal kilns, each twenty-eight feet high and roughly the same diameter, converted timber into prodigious charcoal stocks. CIC built several bridges and over thirty miles of road to connect a total of twenty-six kilns to Hotaling.⁸⁷

CIC’s blast furnace occupied the south end of the 30,000 square-foot smelting works in Hotaling. Workers carted iron and flux to the ore room, where a twenty-horsepower Eclipse rock-breaking machine crushed up to sixty tons of iron ore and limestone into plum-sized chunks each day.⁸⁸ Workers filled buggies with ore, flux, and charcoal, then loaded the carts onto a compensating elevator counterbalanced by a water tank. As water drained into a flume, the material ascended forty-seven feet to the top of the firebrick and sheet iron shaft. “Topmen” fed the ore, flux, and fuel into the furnace, and then the blast commenced.⁸⁹

A 135-horse power engine funneled 4,000 cubic feet of air pressure per minute into nearly fifty-six tons of iron pipes lining a firebrick chamber known as the “hot-blast oven.” The labyrinthine pipes fed hot air through five tuyeres, or hollow truncated metal nozzles embedded in the masonry of the chamber’s cylindrical hearth. The ore, charcoal, fuel, and limestone gradually melted and descended down the furnace shaft. As heavy, reduced iron settled in the crucible, a thin smokestack towering over the works emitted colorful flames that illuminated “the surrounding country like a beacon of promise to the hopeful and industrious.”⁹⁰

With the founder’s call to “top off,” a foreman hammered a long iron bar through a clay plug at the base of the crucible. A slow stream of molten iron flowed down a channel, or “runner,” carved into the elongated, sloping hearth. Aided by gravity, workers guided the incandescent stream into a shallow canal formed on the floor of the works with fine sand hauled from quartz mill tailings along the Bear River. At intervals of six feet, secondary channels branched-off at right angles, terminating in molds where the molten iron pooled, looking like monster piano keys. Fifteen minutes later, workers tore the cool pig iron ingots from their smoldering casts, then weighed, graded, piled, and stored them for shipping. Each pig weighed around ninety pounds and measured about three-feet long with lateral grooves every nine inches

⁸⁵ Quote from Hanks, *Second Annual Report*, 199; Fletcher Hamilton, *Report XVII of the State Mineralogist: Mining in California During 1920* (Sacramento: California State Printing Office, 1921), 452.

⁸⁶ “Statement of Irving M. Scott,” 425.

⁸⁷ Hanks, *Second Annual Report*, 199; Hittell, *Commerce and Industries*, 312; Hamilton, *Report XVII*, 452; California Iron and Steel Company, *Prospectus*, 5; “The Placer County Coal Mines,” *Sacramento Daily Union*, May 28, 1883, 2; “Statement of Irving M. Scott,” 425.

⁸⁸ “A Proposed Industry,” *Sacramento Daily Union*, July 21, 1882, 3.

⁸⁹ This description is drawn from Henry Hanks, *Second Annual Report*, 197-99; Hittell, *Commerce and Industries*, 311-313; Thompson and Albert, *History of Placer County*, 208-211.

⁹⁰ Thompson and West, *History of Placer County*, 209.

indicating where they should be broken for the founder's furnace. Finally, the foreman inserted a new plug in the crucible and the entire eight-hour process began anew.

According to Hittel, the Hotaling product bore a tensile strength of 8 to 15 tons making it up to five times stronger than common Scotch iron. "It has taken 16 blows to fracture a pig of California pig-iron, while a piece of Scotch iron of the same dimensions yielded at one blow from a sledge-hammer in the same hand," he boasted.⁹¹ The market helped legitimize the veracity of Hittel's claim; in 1881, CIC pig iron sold for around \$35 for ton in San Francisco, up to \$10 more than imports.⁹²

CIC supplied pig iron to the Union Iron Works and at least eight other foundries in San Francisco. Mother Lode foundries in Grass Valley, Dutch Flat, and Virginia City used it, too. The Central Pacific Railroad used Placer pigs for making wheels and axles at its Sacramento rolling mills, while David Lester & Company in New Tacoma, Washington Territory, used it to manufacture parts for the Northern Pacific Railroad. The Benicia Agricultural Works combined Clipper Gap pigs with Scotch iron in hopes of achieving the perfect combination of rigidity and durability for plows and other agricultural equipment.⁹³ The Pacific Rolling Mill Company had experimented with metals from England, Pennsylvania, and the Pacific Northwest, but found their best result for steel production using CIC products, a chauvinistic and solicitous Scott reported while seeking congressional appropriations for his San Francisco enterprises.⁹⁴

At a cost averaging \$20 per ton, CIC manufactured about 5,000 tons between April 1881 and September 1882, enough to supply roughly one-third of California's consumption of pig iron and earn a profit of around \$40,000.⁹⁵ Nevertheless, the firm faced challenges:

Although the operations in the field were consigned to seemingly competent hands, the company did not wholly escape the blunders and mishaps which at the outset are so apt to attend ventures of this kind. Some of the work, owing perhaps to lack of proper supervision or planning, proved so defective as to necessitate extensive repairs, and, in some cases, entire rebuilding, within a very short time after they were finished.⁹⁶

A fire destroyed the Hotaling works during its second year of operation in 1882 and CIC soon folded.⁹⁷

⁹¹ Hittel, *Commerce and Industries*, 312.

⁹² Gosrow, "Notes on Iron Ore Smelting," 491; Hanks, *Fourth Annual Report*, 238.

⁹³ The other San Francisco foundries included Industrial Iron Works, Golden State and Miners' Iron Works, Pacific Iron Works, Occidental Foundry, Mechanics Foundry, Aetna Iron Works, National Iron Works, City Iron Works. California Iron and Steel Company, *Prospectus*, 9, 13-14; Gosrow, "Notes on Iron Ore Smelting," 491; Hamilton, *Report XVII*, 453; Hittel, *Commerce and Industries*, 312.

⁹⁴ "Statement of Irving M. Scott," 424.

⁹⁵ Gosrow, "Notes on Iron Ore Smelting," 491.

⁹⁶ Hanks, *Fourth Annual Report*, 237-38.

⁹⁷ "Smelting Works Burned," *Sacramento Daily Union*, September 11, 1882, 2.

An Ironclad Monopoly

With the casting of California's first pig iron in Placer County in 1881, the California Iron Company created a monopoly on regional production of an indispensable input for the Bay Region's legendary metalworking and machinery industries. When Judson, Scott, and Hotaling reorganized CIC a year after the Hotaling fire, they looked beyond increasing the capacity of their blast furnace. No longer satisfied with simply supplying crude iron ingots to Scott's Union Iron Works and other Pacific Coast metalworkers, they envisioned a vertical monopoly encompassing everything from mining iron ore to milling steel, and from rolling wrought iron to mass-producing nails. According to the new corporation's prospectus:

The California Iron and Steel Company was incorporated for the purpose of utilizing the iron deposits of this coast, and to keep the money at home now annually sent to foreign countries to purchase pig iron, bar iron, plate iron, cut nails and steel ingots. All of these branches it is the intention of this Company to establish upon this coast.⁹⁸

At a rolling mill planned for "a suitable location at or near San Francisco," Hotaling pig iron would be re-melted and alloyed with Scotch pigs or scrap iron in a puddling furnace, then rolled into wrought iron bars and sheets. Beyond competing with imports on Bay Region markets, California Iron and Steel Company (CI&SC) would feed a steady supply of iron into its nail mill and "meet the requirements of this coast where 246,400 kegs are annually imported, and not a single pound manufactured here."⁹⁹ Along with hardware and agricultural equipment factories, a mill capable of making California's first steel ingots and castings was the most ambitious element of CI&SC's vision. With a regional production system linking the Placer County blast furnace to Bay Region factories, and downstream diversifications flowing from iron ore, to pig iron, to wrought iron, to hardware, agricultural machines, and steel, CI&SC's import substitution strategy truly merited the term "home industry." The State Mineralogist agreed. CI&SC leaders "are all men of large wealth," Hanks claimed. "As their sagacity in divining the future of the State has rarely ever been at fault, these heavy ventures may be construed into omens favorable to our industrial future."¹⁰⁰

CI&SC's plan intrigued Sacramento boosters, as well. "The erection of cast-steel works would be the most successful and assured enterprise ever inaugurated here," according to one newspaper editorial.¹⁰¹ Lighter, stronger, and more durable, steel was supplanting wrought iron throughout the eastern U.S. and Europe. Regional demand for railroad tracks, mining and agricultural equipment, and machine components guaranteed instant fortunes for California's

⁹⁸ California Iron and Steel Company, *Prospectus*, 5.

⁹⁹ *Ibid.*, 10.

¹⁰⁰ Quote from Hanks, *Second Annual Report*, 200; California Iron and Steel Company, *Prospectus* 2, 5, 9-10, 13-14; Gosrow, "Notes on Iron Ore Smelting," 491; Hamilton, *Report XVII*, 453; Hittel, *Commerce and Industries*, 312; "The Pacer County Iron Mines," *Sacramento Daily Union*, May 28, 1883, 2.

¹⁰¹ "Bessemer Steel Works," *Sacramento Daily Union*, July 12, 1882, 3.

first steel manufacturer. And the formative role of industrialization in metropolitan development was not lost on the boosters:

Another result that may be safely predicted would be the erection of various manufacturing establishments in our midst, thereby increasing our population, the value of real estate, and in the same ratio reducing taxation and increasing our ability to maintain our city in its integrity in every way. It would increase the value, also, of lands in the vicinity, by affording a larger market for country produce.¹⁰²

Leaders of the Sacramento Board of Trade convened a town meeting on July 20, 1882, and CI&SC's directors proposed a deal. The iron magnates promised to build the steel works in the capital provided that Sacramento residents invest \$150,000 in CI&SC stock. Pressure increased with the announcement that Scott had held a meeting in Oakland and made a similar pitch to East Bay business leaders. The "Ironmaster" favored Oakland as the location for the new plant but "admitted that the advantages of Sacramento were such that it was simply a question as to which town first takes up the offer of the company."¹⁰³

The directors of CI&SC chose neither Sacramento nor Oakland for the location of their steel mill. Instead, they acquired land immediately north of Oakland's border, adjacent to the Judson Horse Nail Company in an unincorporated section of Alameda County known as Emery Station. Judson created his eponymous firms in 1881, capitalized at \$.5 million, with the aim of manufacturing an array of nails and files, pulleys and hangers, and agricultural equipment, and thus completing several of the production units of CI&SC's grand design. During construction, Judson reorganized JHNC and reincorporated it as Judson Manufacturing Company, which included the rolling mill envisioned by CI&SC, as well as a new vice president, Anthony Chabot.¹⁰⁴

CI&SC's search for concessions and attempts to induce competition between Sacramento and Oakland indicated a lack of constraints on factory location. Given proprietary inputs, vertical integration, and little need for metropolitan linkages, the politics of property development, as opposed to agglomeration economies or simply transportation costs, helped dictate JMC's site selection. Early Emeryville's residents led the coalition of East Bay citizens who bought shares of JHNC stock. Joseph Emery gave Judson a factory plot located between the Northern Railroad line and the bay, near the terminus of his fledgling California & Nevada Railroad (see Chapter 3).¹⁰⁵ JMC was an autonomous corporation, rather than a CI&SC subsidiary, but inter-firm boundaries proved porous. Judson was the largest stockholder in both firms, and production at both the steel works and rolling mill would rely on Hotelling pig iron

¹⁰² Ibid.

¹⁰³ "A Proposed Industry," *Sacramento Daily Union*, July 21, 1882, 3.

¹⁰⁴ Hittell, *Commerce and Industries*, 675-76; "Incorporations," *Sacramento Daily Union*, October 12, 1881, 3.

¹⁰⁵ "Real Estate Transfers," *Daily Alta California*, June 13, 1882, 2; "Oakland Manufacturers," *Pacific Rural Press*, June 17, 1883, 493.

inputs.¹⁰⁶ With the rolling mill feeding other JMC production units and CI&SC's adjacent steel mill fulfilling CI&SC's grand vision, Emeryville was primed to become an incipient East Bay metalworking agglomeration.

Convicts, Children, and Technological Assets

Emeryville, however, was JHNC's second location. Judson initiated his ironworking enterprise with a labor force of sixty convicts working behind the walls of San Quentin Prison across the bay in Marin County. Scarcity, high wage rates, and militant unions, as well as the technical expertise of San Francisco's skilled workforce, characterized labor conditions in nineteenth century California. The search for low wages and spatial and political insulation from San Francisco's labor unions factored into industrial dispersal. From convicts to children to the open shop, exploiting cheap sources of labor figured heavily into JMC's organization and locations on the metropolitan edge. It was not, however, simply the existence of cheap labor pools that drew JMC to peripheral locations. On-going innovations in mechanization and manufacturing technique, as well as advances in the organization of production, enabled JMC to exploit new, vulnerable workers.

Judson's San Quentin Prison enterprise came at the end of California's despicable experiments with privatizing the state's penal system and contracting convict labor. The pecuniary interests of both public officials and private contractors resulted in wretched conditions for prisoners, corruption among officials, systemic inefficiency, and pervasive "free labor" protests. It was "a festering sore on the body politic," as Hittell put it.¹⁰⁷

California's prison system was privatized through the lease system from 1851 to 1861. James Estell and Mariano Guadalupe Vallejo paid \$100,000 for the rights to exploit convict labor for ten years. In return, the two political profiteers assumed all responsibility for quartering and feeding California's state prisoners.¹⁰⁸ Vallejo reneged on the lease after a losing bid to make his eponymous city the state capital. Estell quickly found new partners, including John Hays and John Caperton (see Chapter 3), and formed a public corporation, the San Francisco Manufacturing Company, in order to capitalize on convict labor. With a sublease on the contract to work prisoners, Hays and Caperton converted a ship, the *Waban*, into California's first prison and commenced accepting prisoners from California's six county jails before selection of a state prison site. They set a chain gang of lesser prisoners to cutting and grading San Francisco's muddy streets and then towed the ship to Angel Island, where they put convicts to work in a quarry (presumably in Joseph Emery's). When the state purchased Point San Quentin, Estell moved prison operations there and worked convicts in his new brickyard. He claimed that the contract permitted him to employ the convicts wherever, and at whatever labor, he found

¹⁰⁶ Hittell, *Commerce and Industries*, 675-76; "Oakland Manufacturers," *Pacific Rural Press*, June 17, 1883, 49; "Incorporations," *Sacramento Daily Union*, October 12, 1881, 3; "Oakland Manufacturers," *Pacific Rural Press*, June 17, 1883, 493.

¹⁰⁷ Theodore Hittell, *History of California*, vol. 4, (San Francisco: N.J. Stone & Company, 1898), 188-19.

¹⁰⁸ In the wake of San Francisco's first vigilance committee, "An Act Providing for Securing the State Prison Convicts" accompanied a newly promulgated penal code on April 25, 1851. California adopted the lease system, a method commonly used in the Midwest and South, of awarding contracts to private individuals to run prisons or exploit prison labor.

profitable. Accordingly, jobs initially ranged from prisoner gangs working on ranches to individuals serving as domestic servants. Estelle also sent unaccompanied “trustees” to run errands in San Francisco.¹⁰⁹

To limit expenses, a parsimonious California legislature planned for a population of only fifty prisoners at San Quentin. Yet prisoners already outnumbered the cells 300 to 48 when Estelle finished building the first prison structure, known as “the Stones.”¹¹⁰ Convicts experienced deplorable living conditions under Estell’s management. Four prisoners—ranging from fourteen year-old youths to hardened adult criminals—shared each cell, resulting in only fifteen square-feet of living space per prisoner without the benefit of adequate lighting, ventilation, or sanitary facilities. Many convicts went barefoot, dressed mainly in coarse wool blankets. Rotting codfish and bread made from vermin-infested flour made San Quentin’s meals a punishment in itself. Estell’s guards worked long hours for low wages and engaged in rampant alcohol abuse and systemic sexual assault of female prisoners. Even the threat of flogging—up to 160 strokes with a rawhide strip—failed to deter escape attempts. Twenty of the sixty prisoners aboard *Waban* broke out and upwards of fifteen percent of all prisoners escaped from San Quentin between 1851 and 1858, according to state reports.¹¹¹ Affluent prisoners bribed Estell for pardons and differential treatment.¹¹²

Capricious use of state prisoners, fears concerning escapes, and Estell’s malfeasance precipitated state intervention. With the San Francisco Manufacturing Company in grave financial trouble due, in part, to Estell’s inability to control a surfeit of convicts, Estell likewise sought relief from his contract responsibilities.¹¹³ After a brief but disastrous interval of state control in 1855, resulting in new state prison officials “second to none in their ability to make away with public funds,” Estell renewed his contract under increased state oversight and with \$120,000 per year in state funding.¹¹⁴ By 1856, Estell advertised San Quentin’s seven new workshops, 1,800 square-feet each, as well as blacksmiths, cabinetmakers, carpenters, coopers,

¹⁰⁹ Shelley Bookspan, *A Germ of Goodness: The California State Prison System, 1851-1944* (Lincoln, NB: University of Nebraska Press, 1991), 2; Lucile Eaves, *A History of California Labor Legislation* (Berkeley: University Press, 1910), 351; James Greer, *Colonel Jack Hays: Texas Frontier Leader and California Builder* (New York: E.P. Dutton & Company, 1952), 282; Clare McKanna, Jr., “The Origins of San Quentin, 1851-1880,” *California History* 66, no. 1 (March, 1987): 49-50.

¹¹⁰ The brick rectangular building contained two rows of twenty-four cells on the second floor and an undifferentiated first floor, measuring 170 by 28 feet.

¹¹¹ “Report of the Joint Committee on State Prison Affairs,” *Appendix to Assembly Journals of the Ninth Session of the Legislature of the State of California* (Sacramento: John O’Mera, State Printer, 1858), 6-7; McKanna estimates that no less than 547 prisoners escaped before 1861, see “Origins of San Quentin,” 53.

¹¹² Bookspan, *A Germ of Goodness*, 7; Eaves, *California Labor Legislation*, 351; McKanna, “Origins of San Quentin,” 50-52; “Report of the Joint Committee on State Prison Affairs,” *Appendix to Assembly Journals of the Ninth Session of the Legislature of the State of California* (Sacramento: John O’Mera, State Printer, 1858), 6-7; “General Notices,” *Daily Alta California*, January 8, 1854, 2; “California Legislature,” *Sacramento Daily Union*, January 28, 1854, 1; “Law Report,” *Daily Alta California*, August 15, 1854, 2.

¹¹³ Bookspan, *A Germ of Goodness*, 9-11.

¹¹⁴ Eaves, *History of California Labor Legislation*, 353.

joiners, machinists, ship carpenters, shoemakers, stone cutters, tailors, tanners, and wheelwrights among the swelling prison population.¹¹⁵

Along with anti-coolie vitriol and agitation for child labor laws, labor unions mobilized in protest of the lease system, creating an enduring issue in labor politics, especially during economic downturns. An article presented to the Mechanics' Institute in February 1857 claimed that convict labor was absorbing, or greatly injuring, the furniture, hat, cask, and stonework industries. Public funds fostered private profits for Estelle and manufacturers to the detriment of "free mechanics."¹¹⁶ By 1861, agitation against convict labor assumed greater force and focus. The coopers of San Francisco organized a protective association to combat unfair competition from convict-made goods, resolving:

That we resort to all legal means in our power to prevent the authorities from carrying out their designs for the enrichment of heartless capitalists and our degradation and ruin; and we pledge ourselves to maintain this organization and to leave nothing untried to effect our object, viz., the prevention of convicts in opposition to industrious mechanics.¹¹⁷

A Mechanics' League formed in 1861 and joined the Anti-Coolie Association in pledging candidates for the legislature who vowed to enact laws to protect workers against convict and Chinese labor. The state finally intervened, though the league quickly disintegrated after the elections.¹¹⁸

California leaders next implemented a contract system for exploiting convict labor. That is, from 1861 to 1882, convict labor was either used to improve prison property or sold to contractors, who installed their own machinery and paid a foreman to manage prisoners in the San Quentin shops. While brick making remained the most profitable endeavor, every stage of California's early industrial development was represented in the shops. Convicts made leather, saddles and harnesses; hats and clothing; shoes and boots; woodwork including furniture, sashes, doors, and barrels; and iron goods, including wagons and agricultural implements.¹¹⁹

The workforce at San Quentin numbered 600 by 1872, when the yearly output of convict cabinetmakers reached a value of as much as \$200,000 and that of imprisoned shoemakers totaled \$50,000.¹²⁰ Such competition forcibly renewed organized labors' efforts to restrict the use of convict labor and to prohibit the sale of prison-made goods.¹²¹ Considering that the state paid 40 cents per convict each day, just one-sixth the average wage received by workmen, labor

¹¹⁵ Advertisement, *Daily Alta California*, October 21, 1856, 3.

¹¹⁶ Eaves, *History of California Labor Legislation*, 354.

¹¹⁷ *Daily Herald*, 18 Jul 1861, quoted by Ira Cross, *The History of the Labor Movement in California* (Berkeley: University of California Press, 1935), 31.

¹¹⁸ Cross, *History of the Labor Movement*, 31.

¹¹⁹ Eaves, *History of California Labor Legislation*, 355-57.

¹²⁰ Cross, *Labor Movement*, 134; "Our Industrial Interests," *The California Farmer*, February 1, 1872, 6.

¹²¹ Cross, *Labor Movement*, 134.

leaders reasoned that “The favored few who have the labor of these prisoners are, from the low price at which they get the labor, enabled to offer their goods at such low rates as to effectually prevent other dealers from manufacturing, who, otherwise, would employ hundreds of men.”¹²²

Judson signed one of the last state contracts before the Trades Assembly’s agitation led to Article X, Section 6 of the new state Constitution, ratified in 1880, which abolished the contract system of prison labor, pending expiration of all existing contracts on January 1, 1882. Thereafter, convicts would be employed only for the benefit of the state.¹²³ With iron inputs supplied by CI&SC, Judson set sixty prisoners to work in San Quentin shops making horse nails and an array of hardware.¹²⁴ JHNC’s most heralded commodity was the California Victor Mower, “The first and only mower made on this coast.”¹²⁵ According to one advertisement, “The CVM is specially constructed for use on this coast for heavy crops, and does its work on rough ground or smooth, sidehill or bog, and it is well made of the best material.”¹²⁶ With California iron inputs, California convicts manufactured equipment specialized for California agribusiness (Figure 5.8).

With his contract for prison labor set to expire, the search for new sources of cheap labor influenced Judson’s decision to relocate and expand JHNC in early Emeryville. Specifically, he aimed to use children instead of convicts for certain job tasks while maintaining a spatial and political buffer from San Francisco’s stronghold of organized labor.¹²⁷ The advantages of suburban location, however, involved more than just the existence of cheap labor pools or the relocation of old job and extant production practices. Innovations in production technique and advances in mechanization altered job tasks and de-skilled formerly specialized trades. The formative role of labor relations in factory location became evident soon after JMC began operating. Nail-makers, who had averaged between \$9 and \$18 per day for piecework, went on strike over wages reductions caused by new machinery, a “self-feeder” for mass production of nails.¹²⁸ After fruitless negotiations, “the company put on its bold face and set green hands to work” consisting of many boys and girls.¹²⁹ Labor requirements and production technologies coevolved over time and facilitated industrial dispersal.

JMC’s suburban location in Emeryville created a buffer from organized labor but also allowed the firm to benefit from elements of agglomeration economies, such as the Bay Region’s

¹²² “Our Industrial Interests,” *The California Farmer*, February 1, 1872, 6.

¹²³ Despite the new Constitution, private parties continued to profit from prison labor. Convicts continued to manufacture the same products that had been made under the old contract system, and the private contractors, to whom the prisoners had previously been farmed out, were given the privilege of furnishing the materials, hiring and paying foremen, and purchasing the finished goods. Cross, *Labor Movement*, 134-35.

¹²⁴ Hittell, *The Commerce and Industries*, 675-76; “Coast Iron and Steel Industry II,” 303.

¹²⁵ “Victor Mowing Machine,” advertisement, *Pacific Rural Press*, March 24, 1883, 276.

¹²⁶ “The Judson Manufacturing Company,” *Pacific Rural Press*, May 26, 1883, 480.

¹²⁷ Irving Scott had also championed the “inalienable rights of boys to learn trades” during a 1869 strike by UIW mechanics. Phelps, *California’s Representative Men*, 163-64.

¹²⁸ “Home Industries,” *San Francisco Chronicle*, January 1, 1886, 8.

¹²⁹ *Ibid.*

specialized workers, technological assets, and other interdependencies. Many of the design principles for JMC's factories, as well as manufacturing techniques, were gleaned from Pacific Rolling Mill Company.¹³⁰ Napoleon "The General" Beaugard was the first "roll-turner" on the Pacific Coast. He designed and installed PRMC's trains of rolls and furnaces before using the same designs to build JMC's rolling mill. Many of JMC's workmen had likewise learned their trade at PRMC.¹³¹ JMC's amassing of discrete production units similarly conformed to the San Francisco firm's organization of production. PRM's industrial complex was comprised by a half-dozen discrete manufacturing units, each "a large manufacturing industry in itself."¹³² The complex included puddling mills for converting pig and scrap iron into wrought iron; rolling mills; open-hearth steel furnaces; a forging department; blacksmith shops; hardware factories for bolt, nut, and railroad spike production; a coil chain factory; a pattern shop; and a box factory.¹³³ Nevertheless, PRM relied on imported pig and scrap iron inputs. While labor relations provided an impetus for JMC's peripheral location, the advantages of suburban autonomy are best understood in terms of vertical integration and product diversification at the Emeryville site.

Integration and Diversification

Ponderous engines, curious machines, blazing furnaces and ingenious tools occupy their proper places; and one may watch a mass of rough iron come in one door and follow it through the various processes until it goes out another in the form of nails, tacks, hardware, agricultural implements, or any of the various products of the place.

Pacific Rural Press, May 16, 1883.¹³⁴

A *Pacific Rural Press* reporter marveled at the rapid construction and massive scale of JMC's new factory complex in May 1883, less than one year after workers broke ground in Emeryville. "Within the past few months there has grown up on the shores of the San Francisco bay, one of the largest manufacturing establishments on the Pacific coast, and which would do credit to much older communities than our own," he announced proudly.¹³⁵ To illustrate his point, the newspaper published a detailed lithograph along with its promotional description, one of the many celebratory accounts of JMC peppering Bay Region newspapers during the spring. Although stylized, the illustration provides a relatively accurate depiction of the JMC factory

¹³⁰ The PRMC's organization and operation was unique in the West, though common among modern industrial complexes in the nation.

¹³¹ Robert Hatton, "Pacific Coast Rolling Mill: A Historical Sketch, Part II," *Pacific Maritime Review* 16 (July, 1919): 127-30.

¹³² Hackett, *The Industries of San Francisco*, 57.

¹³³ Ibid.

¹³⁴ "The Judson Manufacturing Company," *Pacific Rural Press*, May 26, 1883, 480.

¹³⁵ Ibid.

complex, a \$750,000 investment in constructing and equipping twenty-nine brick and cast iron buildings perched on piers above the tidelands (Figure 5.9).¹³⁶

The scale of the complex was matched only by the array of products manufactured “under one roof”: wrought iron bars, plates, and sheets, as well as custom iron castings and machine components, for JMC’s factories, San Francisco firms, and Bay Region markets; Victor Mowers, Beauregard’s harrows, Storm King Windmills, Judson Rabbit-Proof Fences, wheelbarrow wheels, winepress screws, and barn door hangers, rails and rollers for California’s farmers and ranchers; files, sledges, and tuyere irons for blacksmiths and machinists; and nails, tacks, screws, and washers demanded in both households and workshops.¹³⁷ This distinctive juxtaposition of integration and diversification was not lost on the reporter:

That such an establishment could have been created in so short a space of time, and be all in thorough running order with a variety of goods on sale, was in itself a matter of surprise. But when, on examination, there was found to be so well devised a system of conducting business in each of the various branches—and there are many—it was seen that exceptional executive ability had been one of the main causes of so rapid a development; and that practical hard sense pervaded the whole institution.¹³⁸

With numerous production units collectively encompassing an array of manufacturing techniques, JMC sent Hotaling pig iron inputs through every stage of production for diverse commodities.

New products and production processes required novel equipment and machinery, which JMC produced in-house. As one observer put it, “There are many ingenious machines in the works, not a few of which have no duplicate in any other factory.”¹³⁹ JMC constructed its own shops and factories, and designed its own patterns and machinery. Rather than relying on specialized suppliers, JMC workers cast machine components in the foundry, made forgings in the blacksmith shop, and assembled equipment for other JMC manufacturing units in the machine shop.¹⁴⁰

Production of all JMC commodities started in the rolling mill, the third constructed in California. Upwards of 6,000 tons of coal per year, principally sulfur-free “Bulli” coal from Australia, powered the steam engines and, in turn, the blast furnace and rollers. In addition to

¹³⁶ Hacket, *Industries of San Francisco*, 59.

¹³⁷ Hacket, *Industries of San Francisco*, 59, 61; “The Judson Manufacturing Company,” *Pacific Rural Press*, May 26, 1883, 480; Advertisement, *Pacific Rural Press*, May 13, 1884, 546; Advertisement, *Pacific Rural Press*, January 31, 1891, 105; *Oakland Daily Transcript, Special Edition*, January 20, 1887, 17, cited by Edgar Hinkel and William McCann, *Oakland 1852-1938: Some Phases of the Social, Political and Economic History of Oakland, California, Volume Two* (Oakland: Works Progress Administration, 1939), 831-832.

¹³⁸ “The Judson Manufacturing Company,” *Pacific Rural Press*, May 26, 1883, 480.

¹³⁹ Fred Hacket, *Industries of San Francisco*, 59.

¹⁴⁰ M.W. Wood, *History of Alameda County, California* (Oakland: Holmes Book Co., [1969] 1883), 766-67; “The Judson Manufacturing Company,” *Pacific Rural Press*, May 26, 1883, 48; “The Judson Works,” *Daily Alta California*, December 30, 1883, 4.

CI&SC pig iron, JMC hoarded scrap iron, which served as ballast on European and east coast wheat traders' ships before being unloaded on JMC's pier. In order to reduce iron scrap into suitable sizes, JMC designed, manufactured, and mounted Brobdingnagian shears capable of cutting "an elephant into mince meat."¹⁴¹ Weighing 18 tons, they were touted as among the largest iron-cutting shears in the nation.¹⁴² JMC smelted Clipper Gap pig iron to remove impurities and alloyed it with scrap iron in order to forge wrought iron blooms. In the rolling mill, two sets of rollers squeezed the blooms through "contrivances for producing every variety of merchantable, round, square, and flat bar and band iron" for other JMC production units, custom orders, and Northern California markets.¹⁴³

JMC developed mass-production technology for import substitution of basic iron durable goods. "Though nails are a necessity of every well-ordered community, it took California many years to inspire her capitalists with enough courage to undertake their manufacture," according to a federal report.¹⁴⁴ Between 1853 and 1855 alone, San Francisco received 244,447 kegs of imported nails.¹⁴⁵ Thirty years later, proprietary raw materials, specialized machinery, and cheap labor enabled new economies of scale and throughput for mass-production of standardized nails and effective import substitution in the face of "the great Eastern Monopoly."¹⁴⁶

In the nail mill's "pickling room," workers bathed iron sheets measuring up to thirty-six square-feet in acid to remove particles of oxidized iron. Hand-fed shearing machines then reduced the sheets to strips. Workers rapidly clamped strips on long rods, struggling to keep pace with hand-fed nail machinery. Little time was lost with automatic feeders capable of cutting four strips of iron simultaneously into 35,000 nails per hour. Dozens of machines churned out hundreds of varieties of nails, everything from two-inch clout nails to miniscule tacks, reportedly the smallest produced in the U.S. After heating and coating to protect against rust, a process known as "blueing," workers polished an average of two tons of nails each day.¹⁴⁷

Although smaller-scale, JMC's file factory followed the nail mill's model of vertical integration and mechanization. Blacksmiths shaped and tempered iron before feeding it to four

¹⁴¹ *Oakland Daily Transcript, Special Edition*, 20 Jan. 1887, 17, quoted by Edgar Hinkel and William McCann, *Oakland 1852-1938*, 831-832.

¹⁴² Hacket, *Industries of San Francisco*, 59; "Oakland Items," *San Francisco Chronicle*, May 5, 1883, 3; "The Judson Manufacturing Company," *Pacific Rural Press*, May 26, 1883, 480; "The Judson Works," *Daily Alta California*, December 30, 1883, 4.

¹⁴³ Quote from *Oakland Daily Transcript, Special Edition*, 20 Jan. 1887, 17, cited by Hinkel and McCann, *Oakland 1852-1938*, 831; Hanks, *Fourth Annual Report*, 239; James Swank, *A History of Iron in All Ages, and Particularly in the United States From Colonial Times to 1901* (Philadelphia: The American Iron and Steel Association, 1901), 346; Wood, *History of Alameda County*, 767; "The Judson Manufacturing Company," *Pacific Rural Press*, May 26, 1883, 480; Judson Manufacturing Company advertisement in *Pacific Rural Press*, March 24, 1883, 276.

¹⁴⁴ Vivian, *Interests of California*, 402.

¹⁴⁵ *Ibid.*

¹⁴⁶ "The Judson Manufacturing Company," *Pacific Rural Press*, May 26, 1883, 480.

¹⁴⁷ Hacket, *Industries of San Francisco*, 59; Wood, *History of Alameda County*, 767-68; "The Judson Manufacturing Company," *Pacific Rural Press*, May 26, 1883, 480; "The Judson Works," *Daily Alta California*, December 30, 1883, 4; "The Eastern Shore," *Daily Alta California*, December 4, 1888, 8.

cutting machines with a collective capacity of around 150 files per day. Workers used cushioned steam hammers, grindstones, and other equipment for making files in a wide variety of coarseness, cut, and size, which “supplied a want long felt by workers of wood, brass and iron this side of the Rocky mountains.”¹⁴⁸

Every facet of small batch production of standardized California Victor Mowers occurred in the Emeryville plant. Foundrymen molded and cast iron supplied by the rolling mills, while carpenters shaped other components in the wood shops. The main components and 101 smaller parts were transferred to the California Victor Mower Works, a “large room is so arranged that the various parts of the mower are placed in certain positions ready to the hand, so they can all be readily brought together to make the perfect machine.”¹⁴⁹ Workers hand assembled up to ten mowers per day, which were then finished in the JMC’s paint shop, packed in boxes made in JMC’s woodshop, and sealed with JMC’s nails. JMC sold approximately 1,000 Victor Mowers in 1883.¹⁵⁰

Suburban autonomy helped foster immediate success. JMC lead all Metropolitan Oakland manufacturers in value of output and its stock appreciated by sixty percent by the end of its first year of operation.¹⁵¹ JMC paid roughly 400 workers a monthly average of \$18,000 in wages and quickly spun-off a nail mill in southern California.¹⁵² Suburban autonomy, vertical integration, and mass production technology helped create a burgeoning “home industry” and, beyond import substitution, fired the ambitions of Bay Region boosters:

It will be, perhaps, an unpleasant surprise for Eastern folks, who look upon California as an outlying place, useful only for the production of cheap wheat and garden truck, to be met in the near future with the competition of a San Francisco firm that not only supplies home demands, but actually dares to ship agricultural implements to Chicago.¹⁵³

Such success came as no surprise to the Sacramento Board of Trade. “It seems to be the misfortune of our city that the moneyed men will not invest in enterprises that in other cities never have to go begging,” one booster lamented when considering the missed opportunity for a CI&SC factory location.¹⁵⁴

¹⁴⁸ Quote from “The Mechanics’ Fair,” *San Francisco Chronicle*, September 18, 1883, 8; Wood, *History of Alameda County, California*, 767; “The Judson Manufacturing Company,” *Pacific Rural Press*, May 26, 1883, 480.

¹⁴⁹ “The Judson Manufacturing Company,” *Pacific Rural Press*, May 26, 1883, 480.

¹⁵⁰ Wood, *History of Alameda County*, 766-7; “The Victor Mower,” *Pacific Rural Press*, March 4, 1882, 158; “The Judson Works,” *Daily Alta California*, December 30, 1883, 4.

¹⁵¹ Baker, *Past and Present of Alameda County*, 392.

¹⁵² “Home Manufacturers,” *Pacific Rural Press*, April 26, 1884, 399; “The Nail Factory Project,” *Los Angeles Times*, June 18, 1887, 4.

¹⁵³ JMC’s corporate office was located in San Francisco.

¹⁵⁴ “Works Once Offered Us,” *Sacramento Daily Union*, May 12, 1884, 2.

Emeryville's Incipient Agglomeration

CI&SC built its steel mill on a site adjacent to JMC in 1883, yet the two discrete corporations shared more than spatial propinquity.¹⁵⁵ Both relied on Hotaling pig iron inputs and Judson had become president of each firm by 1884.¹⁵⁶ Local media referred to the CI&SC steel works as “a branch of the Judson company” and the firms collectively employed a workforce of 355 in Emeryville and another 160 employees at Hotaling.¹⁵⁷ Sanborn Fire Insurance maps published in 1889 depict an incipient metalworking cluster on early Emeryville's shoreline (Figure 5.10). The mill's puddling house, furnaces, coke warehouse, and other facets of steel production were located just yards north of JMC's massive factory complex. Also shown on the maps, superimposed on the depiction of the steel mill, are the words, “NOT IN OPERATION.” Despite high capitalization and burgeoning regional markets, CI&SC's production chain inextricably linked the fate of the steel mill to that of the Placer County works, and therefore to the vagaries of California's global resource-intensive economy.

CI&SC produced over 5,000 tons of pig iron before the fire destroyed the Hotaling works during its second year of operation in 1882. After rebuilding, production peaked at 5,200 tons in 1883 but declined by over fifty percent during the following year when fluctuations in the price of iron forced Judson to shut down the furnace, stockpile charcoal, and wait for the market to improve. “There is more ore in sight at the bottom of the shaft than ever before in the history of the mine, and it is better than when prospected on the surface,” Scott reported in 1884.¹⁵⁸ But CI&SC reignited the furnace in 1886 only in order to consume accumulated stocks of iron ore and 400,000 bushels of charcoal, which yielded 1,750 tons of pig iron. By May, CI&SC management ordered its laborers to vacate the workers' housing and then closed the furnace forever. CI&SC poured a total of almost 15,000 tons of pig iron worth close to \$265,000 (in 1940 dollars) between 1881 and 1886. in Placer County¹⁵⁹ But despite CI&SC's capacity, indigenous iron production became prohibitively expensive. Rather than a lack of demand or a scarcity of raw materials, California's booming agribusiness sector quenched the furnace.

Bonanza wheat heralded the “agrarian turn” in California's economic growth. California's earliest Anglo-American farmers cultivated wheat and, after the stunning collapse of the cattle economy and looming insecurity in the mines, output grew spectacularly. Yearly wheat production grew from 7.5 million bushels in 1860 to 20 million bushels in 1870.

¹⁵⁵ Baker, *Past and Present of Alameda County*, 391.

¹⁵⁶ American Iron and Steel Association, *Directory to the Iron and Steel Works of the United States* (Philadelphia: American Iron and Steel Association, 1884), 72.

¹⁵⁷ “The Judson Works,” *Daily Alta California*, December 30, 1883, 4.

¹⁵⁸ “Statement of Irving M. Scott,” 425.

¹⁵⁹ Joseph Daniels, “History of Pig Iron Manufacture on the Pacific Coast,” *Washington Historical Quarterly* 7, no. 3 (July, 1926): 175; Henry Symons, “California Mineral Production and Directory of Mineral Producers for 1941,” *California State Division of Mines Bulletin 122* (Sacramento: California Division of Mines and Geology, 1941), 45; Vivian, *Interests of California*, 402; C.G. Yale, “Iron on the Pacific Coast,” *Mineral Resources of the United States; Calendar Year 1885*, (Washington, D.C.: Government Printing Office, 1886), 19, 197-98; *The Builders of a Great City: San Francisco's Representative Men; The City, Its History and Commerce* vol. 1 (San Francisco: San Francisco Journal of Commerce Publishing Co., 1891), 215; “Coast News,” *Daily Alta California*, April 26, 1886, 7.

California twice led all states in production during the 1870s before peaking at over 40 million bushels in 1884, when wheat fields covered well over 2 million acres.¹⁶⁰

Trade that had developed during the Civil War expanded exponentially. Upstart grain ports lined the northern shore of Contra Costa County in response to the new magnitude of production and trade. Founded with the completion of the Northern Railway in 1879, Port Costa quickly became the greatest grain port in the world. Sacks of San Joaquin Valley wheat packed immense warehouses on wharves stretching for a mile along the shoreline. A welter of masts formed as east coast and European importers awaited trains to deliver up to 100 carloads of wheat per day, while as many as 500 carloads waited on the siding at the height of California's harvest. Before filling trading vessels' holds with wheat, longshoremen unloaded ballasts consisting of tons of pig iron, scrap iron, and old steel rails (as well as cargos of coal and coke, which helped supply energy for manufacturers before hydroelectric power and petroleum).¹⁶¹

As wheat flooded out into the Pacific, imported pig iron inundated Bay Region markets. Imports at San Francisco trebled, totaling nearly 80,000 tons between 1881 and 1885. Prices plummeted by roughly thirty percent during the glut, dropping from a high of \$35 per ton in 1881 to a low of \$22 in 1885.¹⁶² Serving as requisite ballast, the cost of shipping iron from Europe to the Bay Area was only nominally higher than that of transporting pigs from Hotaling. Changes in California's mining sector contributed to the glut, as well. Litigation culminating with the Sawyer decision in 1884 dealt a massive blow to California's hydraulic mining industry, just as production from the Comstock Lode waned. Diminished demand for mining machinery from San Francisco's specialized metalworking industries reduced consumption of iron inputs.

Cheap pig and scrap iron undoubtedly aided JMC and similarly diversified, or flexible, metalworking firms, such as the upstart Pacific Iron and Nail Company in Oakland and the Union Iron Works and Pacific Rolling Mills collaborative shipbuilding enterprise at Potrero Point (discussed below). CI&SC's corporate organization and vertically integrated production chain, however, linked the fortunes of the Emeryville mill to that of the parent company's mining and smelting operations at Hotaling. Failures traveled downstream from Hotaling to Emeryville. Severely indebted by 1885, CI&SC was "a sadly embarrassed corporation" after failing to payoff bond issues on mortgaged property two years later.¹⁶³ CI&SC directors ousted Judson by 1888, the same year advertisements published in the *Daily Alta* hailed prospective buyers:

To Foundrymen! For rent. The Property & Machinery of the California Iron and Steel Co. at Emery's Station. The works are almost new and comprise one 20-ton Steam Hammer, five Steam Engines, four Platform Scales, several Furnaces;

¹⁶⁰ Scott, *San Francisco Bay Area*, 73; Richard Walker, *The Conquest of Bread: 150 Years of Agribusiness in California* (New York: The New Press, 2004), 32. The most comprehensive and incisive analysis of California's wheat industry is George Henderson's *California and the Fictions of Capital* (New York: Oxford University Press, 1999).

¹⁶¹ JMC and other firms' production of agricultural machinery further strengthened links with agricultural enterprise.

¹⁶² Heavy importation of scrap iron, used in lieu of pig iron, similarly hurt CI&SC.

¹⁶³ "A Lively Meeting," *Daily Alta California*, June 16, 1887, 8.

Concrete Foundry Floor, 10x150; abundant supply of Water and Tanks, together with a very large inventory of Tools, etc., etc.¹⁶⁴

Close to 10,000 acres of CI&SC property in Placer County also hit the market.¹⁶⁵ Conversely, by the time of CI&SC's demise, JMC's led all East Bay manufacturers in terms of value of output and trailed only the California Cotton Mills in fixed capital investment.¹⁶⁶

Ships, Steel, and the American Plan

In 1880, a weary Irving Scott accepted James Fair's invitation for a round-the-world cruise. Scott had long held businesses relations with the "Silver King," particularly concerning the engineering and production of mining machinery.¹⁶⁷ Fair had supplanted Alvord as the guiding force behind PRMC. "In February of 1880 I left San Francisco on a trip of pleasure and observation, and my special attention was drawn to the manufactures of iron and steel," Scott recounted. "The next prominent object of my travel was to examine the tools and other appliances of the manufactures of the different parts of the world, for the purpose of erecting in San Francisco one of the most complete plants in the world."¹⁶⁸ Scott observed Europe's leading metalworking firms including: iron and steel production at Schneider & Co in Le Creusot, France; steel munitions manufacturing at Krupp in Essen, Germany; and shipbuilding enterprise at Clyde Scotchmen in Aberdeen, Scotland.¹⁶⁹ He also noted the role of government funding for military-industrial production in these European countries. Upon returning to San Francisco, Scott claimed that "in all the countries I visited I saw no manufacture of steel or iron, which, with the money to pay for it and the time to construct it, I would hesitate to attempt."¹⁷⁰ And he did not hesitate, immediately collaborating with Fair in hope of transforming UIW into a singular shipbuilder set afloat by federal government subsidies.¹⁷¹

¹⁶⁴ Advertisement in *Daily Alta California*, September 17, 1888, 4.

¹⁶⁵ Judson interests retained roughly one-third of CI&SC properties in both Emeryville and the Sierra. A branch of Central California Canneries occupied the Emeryville site by 1903, while Giant Powder Company, of which Judson was a director, built a black powder factory on a portion of the Placer County site, the rest of which was used for fruit production. "California Iron and Steel," *Daily Alta California*, February 8, 1888, 4; "Across the Bay," *San Francisco Call*, September 6, 1890, 7; "Real Estate," *Daily Alta California*, September 18, 1890, 2; Advertisement in *Daily Alta California*, September 21, 1890, 4; "Heavy Judgment," *Sacramento Record-Union*, March 10, 1893, 1.

¹⁶⁶ S.G. Brock, *Report on the Internal Commerce of the United States for the Year 1890: Part II of Commerce and Navigation* (Washington, D.C.: Government Printing Office, 1891), 388.

¹⁶⁷ Bancroft, *Builders of the Commonwealth*, 460; Brechin, *Imperial San Francisco* 127; Phelps, *Contemporary Biography*, 162.

¹⁶⁸ "Statement of Irving M. Scott," 426.

¹⁶⁹ Ibid.; "Irving M. Scott," *The Foundry*, Nov, 1869, 111-12.

¹⁷⁰ "Statement of Irving M. Scott," 426.

¹⁷¹ Bancroft, *Builders of the Commonwealth*, 461.

San Francisco long served as the garrison of the U.S. West. With military installments constructed during the 1850s at the Presidio in San Francisco and at Mare Island and Benicia on the Carquinez Strait in Napa County, the U.S. positioned itself for domination of the Pacific Rim. Officially, the nation needed an adequate military presence in California to protect the mines of its new possession from envious powers and its immigrants from the natives. The miners would, in return, provide the revenues needed for that presence, “mining, mechanization, metallurgy, money, and the military all found their headquarters in the city so rapidly growing beside the Golden Gate,” as Brechin puts it.¹⁷²

The future looked bright for the West Coast weapons industry in the 1880s when Navy Secretary William C. Whitney planned to construct a “new navy,” later known as the “White Navy,” designed to catch up with the increasingly frantic and expensive arms race occurring among the colonial powers of Europe. Scott sought federal financing for his private warship production, as the Bay Region became the Pacific Coast launch pad for U.S. military domination, capitalist penetration, and territorial expansion.¹⁷³

For Scott’s UIW, the shift in structure also entailed a shift in location. No longer listed among the directors of CI&SC, Scott purchased thirty-two acres of land at the foot of 20th Street, adjoining the PRMC, and built a shipyard on the Potrero Point site in 1883. In Washington, DC, Scott “cultivated associations with military men, politicians, bankers, and the press, essential for any successful arms merchant.” The connections paid off, for in 1886 he secured the contract for the armored cruiser *Charleston*.¹⁷⁴

The *Charleston* was only the first of many lucrative government contracts that made the UIW among the most successful and productive shipyards in the country. By 1891, Scott boasted that his plant was among the most complete in the world, covering twenty-five acres of land and employing thirteen hundred men. It then constituted one of San Francisco’s largest industrial operations and was a mainstay of the city’s economy.¹⁷⁵ Yet it was not only a space-extensive, waterfront site or funding from the capital that helped him create one of the great shipbuilding companies in the country, but also linkages with Fair’s PRMC.

PRMC’s superintendent, Patrick Noble, had also taken a trip. He had visited iron and steel mills in upstate New York, St. Louis, Missouri, and Alleghany, Bethlehem, and Pittsburgh, Pennsylvania, where he “watched closely, said little, came home with a diary filled with data on the production, efficiency of furnaces, drawings of machinery, and hundreds of other facts relating to production of steel.”¹⁷⁶ During the tour, Noble also sparked an enduring relationship with Andrew Carnegie, with whom he consulted over time concerning proposed extensions or betterments of PRMC, most significantly for steel production. Guided by Wellman, Seaver, Morgan Company, an early eastern open hearth steel producer, Noble designed and constructed

¹⁷² Brechin, *Imperial San Francisco*, 124.

¹⁷³ Ibid., 128; Judson Pacific-Murphy Corporation, *Romance of Steel*.

¹⁷⁴ Brechin, *Imperial San Francisco*, 127; “Irving M. Scott: Builder of Some of America’s Best Battleships,” 64.

¹⁷⁵ Gray Brechin, *Imperial San Francisco*, 127-28.

¹⁷⁶ Judson Pacific-Murphy Corporation, *Romance of Steel*.

the West's first steel plant.¹⁷⁷ Feeding English pig iron, Spanish iron ore, and Pacific Coast scrap iron into a thirty-ton open-hearth steel furnace, PRMC produced the first steel on the Pacific Coast on July 15, 1884.¹⁷⁸ Scott then had a highly polished steel slab three feet square by six inches thick—a product of PRMC—shipped to Washington, DC as evidence of the capability of California industry before winning the contract to build the cruiser *Charleston*.¹⁷⁹ PRMC's workforce of 8,000 soon churned out steel casting and forging weighing up to ten tons; steel rails; railroad car and locomotive axles and frames; steamboat shafts, cranks, pistons; ships' knees, chains, and anchor stocks; and a long list of minor articles such as spikes, bolts, screws, rivets, and the like.¹⁸⁰ Nonetheless, a great portion of PRMC work fueled UIW's shipbuilding enterprise.¹⁸¹

Leaders of the PRMC joined Scott in soliciting shipbuilding subsidies in the early 1880s. Patrick Nobel, Oct 16, 1884: "This company will be glad to co-operate with the Government in the manufacture of steel for heavy ordnance and armor-plate, and are ready to erect the necessary plant (Figure 5.11)."¹⁸² PRMC subsequently produced massive steel castings and forgings for parts and equipment used for the *Charleston* and many other war ships built at the Union Works, including a 27,000-pound rudder and the famous battleship *Oregon*.¹⁸³

After merging with Pacific Axel Company in 1889, Atlas Iron Works moved from Mission Street to the Potrero and began building a new iron works between the PRMC and UIW in order to build steam schooners.¹⁸⁴ PRMC's Noble served as the new firm's president as the spatial relations and industrial linkages between metalworking and shipbuilding entangled at Potrero Point, which was increasingly referred to as San Francisco's "mill district."¹⁸⁵

The federal government vastly expanded the navy before moving half its WWI fleet to the Pacific. It was, in part, a continuation of Scott's work on behalf of the Union Iron Works, Grey Brechin argues:

¹⁷⁷ Open hearth steel production was far slower than the Bessemer process but allowed for a larger capacity and greater quality control.

¹⁷⁸ American Iron and Steel Association, *Directory to the Iron and Steel Works*, 180; Swank, *Iron In All Ages*, 418, 425.

¹⁷⁹ Judson Pacific-Murphy Corporation, *Romance of Steel*.

¹⁸⁰ American Iron and Steel Association, *Directory to the Iron and Steel Works*, 180; W.H.L. Corran, *Langley's San Francisco Directory For the Year Commencing May, 1887* (San Francisco: Francis, Valentine & Co. Printers, 1887), 4; Hackett, *Industries of San Francisco*, 57; Hanks, *Fourth Annual Report*, 240; Swank, *Iron In All Ages*, 418, 425; Vivian, *Interests of California*, 376.

¹⁸¹ "Some of the Shops of San Francisco," *American Machinist* 15, no. 25 (June 23, 1892): 4.

¹⁸² "Letter from the Pacific Rolling Mill Company," *Report of the Select Committee on Ordnance and War Ships, with an Appendix* (Washington: Government Printing Office, 1886), 345.

¹⁸³ Judson Pacific-Murphy Corporation, *Romance of Steel*; Vivian, *Interests of California*, 401; "Statement of Irving M. Scott," 423, 429; "San Francisco and Vicinity," *Sacramento Daily Union*, April 20, 1887, 4.

¹⁸⁴ "The Atlas Iron Works," *Daily Alta California*, July 28, 1889, 1.

¹⁸⁵ "Flames in a Foundry," *San Francisco Call*, November 8, 1892, 2.

The umbilical cord that Irving Murray Scott had forged to the U.S. Treasury by procuring a contract for the *Charleston* in 1886 had engorged over the years until the Golden State's economy, and the growth of its cities, depended heavily on an uninterrupted flow of military appropriations from Washington, D.C.¹⁸⁶

Neither Pacific Rolling Mill Company nor Union Iron Works, however, remained intact to benefit from WWI militarization.

Financial difficulties stemming from the mismanagement of PRMC after James Fair's death in 1887 were compounded when Carnegie dumped cheap steel on the Bay Region during the 1893-'96 depression. Federal expenditures for warship production declined sharply in 1897, ruining the firm. "It had the capital but lacked the brains" according to one anonymous PRMC trustee.¹⁸⁷ Creditors liquidated PRMC just before mobilization for the Spanish American War reinvigorated the coast's metalworking and shipbuilding industries.¹⁸⁸ Noble retained PRMC's machinery and name, and reorganized the firm into a structural fabricating outfit located at 17th and Mississippi streets in the Potrero.¹⁸⁹

UIW also met a most unfortunate demise. Just months before his unexpected death in 1903, Scott sold San Francisco's oldest and most venerated manufacturer to a shadowy New York trust bent on forming a national shipbuilding monopoly to procure government contracts. "Floated on a sea of waterlogged bonds and fraud," as Brechin puts it, "the United States Shipbuilding Company soon floundered and sank, sending San Francisco's proudest industry into receivership."¹⁹⁰ To the dismay of San Franciscans, Charles Schwab bought it at firesale auction and UIW became a unit of the Bethlehem Steel empire.

Risdon Iron and Locomotive Works (RI&LC) had been dealing in dredges and hydraulic pipes and pumps, as well as engines and boilers, before UIW changed hands.¹⁹¹ In 1900, the firm retooled and shifted its focus to shipbuilding.¹⁹² RI&LC absorbed PRMC, including its thirty-two acres with 1,700 feet of waterfront at Potrero Point, a \$500,000 expense.¹⁹³ Along with the new property, RI&LC secured \$3 million in order to renovate the site into one of the most complete ship building plants in the nation. Plans included five branches: shipbuilding,

¹⁸⁶ Brechin, *Imperial San Francisco*, 169-170.

¹⁸⁷ "Rolling Mills To Be Closed," *San Francisco Call*, May 18, 1898, 9.

¹⁸⁸ PRMC was Liquidated in order to pay off creditors, primarily the Fair estate and D.O. Mills. "Rolling Mills To Be Closed," *San Francisco Call*, May 18, 1898, 9.

¹⁸⁹ Judson Pacific-Murphy Corporation, *Romance of Steel*; "Rolling-Mills Shaken Up," *San Francisco Call*, April 21, 1896, 5.

¹⁹⁰ Brechin, *Imperial San Francisco*, 169-170.

¹⁹¹ Lloyd, *Lights and Shades*, 314.

¹⁹² "Big Rival to the Union Iron Works," *San Francisco Call*, March 27, 1900, 5;

¹⁹³ "Quiet in Realty Circles," *San Francisco Call*, May 6, 1900, 32.

marine engineering, mining machinery, structural ironwork, and miscellaneous engine and machine work (Figure 5.12).¹⁹⁴

San Francisco's pioneering metalworking firms foundered but JMC flourished. The plant covered fifteen acres by 1911 and its yearly payroll for 450 employees topped \$200,000 (Figure 5.13).¹⁹⁵ Despite losing CI&SC's pig iron inputs, the suburban Emeryville location fostered advantages. Vertical integration, in-house generation of key inputs, and myriad production platforms enabled flexibility and seamless diversification as JMC retooled during broad shifts in California's economy. Contracts for custom machinery, or capital goods, supplanted hardware production. JMC made power looms for the San Diego Iron and Nail Company in Southern California and dredging machines for gold mining companies in Alaska.¹⁹⁶ Miles of barbed wire fence, as well as trolleys and hoists to transport cattle from railcars to Miller & Lux's slaughterhouses, attested to the increased importance of agribusiness inputs.¹⁹⁷ Yet a fundamental shift occurred with diversification into structural iron and steel fabrication, when JMC used purchased steel ingots for California's urban and industrial development.

"The company is now in position to do almost any work related to iron and steel, from turning out twisted steel bar for reinforced concrete walls to the heaviest structural steel for building purposes," a booster reported in 1911.¹⁹⁸ A new structural iron plant lorded over the rolling mill, foundry and machine shops, and a bolt factory refashioned from the nail mill.¹⁹⁹ JMC fabricated all the structural iron and steel for many of Oakland's early twentieth century monumental buildings including Capwell's department store, the Oakland Bank of Savings, the YMCA, and the new City Hall, which, at 3,600 tons, was hitherto among the largest structural steel contracts in the West.²⁰⁰ JMC also spun-off the California Bridge Company in 1888, which operated within JMC's factory complex. A workforce of 250 fabricators built an average of forty bridges annually, which were shipped and assembled throughout California and the West, before JMC acquired full control of the firm.²⁰¹

During WWI, JMC finally realized CI&SC's original vision of East Bay steel production. JMC once again decided on vertical integration, investing \$100,000 in a 30-ton open hearth

¹⁹⁴ "Risdon Iron and Locomotive Works," *San Francisco Call*, December 15, 1901, 70.

¹⁹⁵ R. E. Fisher, "An Old Established California Industry: The Judson Manufacturing Company," *Pacific Service Magazine*, 8, no. 6 (November 1916): 221-22.

¹⁹⁶ Evarts Blake, *Greater Oakland, 1911: A Volume dealing with the Big Metropolis on the Shores of the San Francisco Bay* (Oakland: Pacific Publishing Co, 1911[?]), 139; Fisher, "Established California Industry," 221; "Wire and Nail Mill," *Los Angeles Herald*, December 6, 1888, 5.

¹⁹⁷ General Correspondence, carton 24, folder 222, Miller and Lux 1869-1965, The Bancroft Library, University of California, Berkeley.

¹⁹⁸ Blake, *Greater Oakland*, 136.

¹⁹⁹ Fisher, "Established California Industry," 222; Sanborn Fire Insurance map, Oakland, vol. 3, 1911, Sheet 327.

²⁰⁰ Blake, *Greater Oakland*, 136; Fisher, "Established California Industry," 223-4.

²⁰¹ Hinkel and McCann, *Oakland 1852-1938*, 832; "Bridges and Canals," *Engineering News and American Railway Journal* 20 (August 4, 1888): 97; "The Eastern Shore," *Daily Alta California*, October 4, 1889, 8; "Their Third Failure," *San Francisco Call*, January, 9 1891, 2.

furnace and then added two more by 1920. JMC received scrap metal and ores from “a thousand and one sources,” including Arizona, New Mexico, and Texas, as well as California and Nevada.²⁰² JMC’s yearly capacity soon reached 54,000 tons, composed primarily of standardized ingots measuring eight square-inches and five feet long. High grade steel was put through the newly electrified rolling mill for making steel bars for the general market, as well as long strips of sheet steel, which as drilled and riveted to form columns and beams in the 60,000 square-foot structural steel works. In addition to ingots used in the rolling mill, JMC cast large ingots up to thirty inches in diameter and weighing up to 20 tons in weight for forging purposes (Figure 5.14).²⁰³

With reinvestment in production came intensification of the labor regime. JMC’s union busting had continued throughout the 1890s, when managers discharged union members on petty charges and replaced them with nonunion laborers, recruited iron workers in Pennsylvania, Alabama, and Montreal, Canada, and hired scabs during frequent strikes.²⁰⁴ Then, on Thursday, October 21, 1920, employees found the plant shut down when they arrive for their morning shift.²⁰⁵ Posters on the foundry gates advised all workers to register if they desired to continue working for JMC (Figure 5.15). When the plant reopened the following Monday, JMC’s general manager explained, “The workmen have signed contracts to work under the American plan and we expect no trouble. Hereafter, there will be no discrimination between union and non-union labor at our plant.”²⁰⁶ The pledge by employees to never join or support a union, known as the “yellow dog contract,” signaled the imposition of the American Plan in the East Bay metalworking industries.²⁰⁷

After the Armistice blasted the American Federation of Labor’s hopes for labor reform, employers linked the open-shop drive with Americanism by dubbing it the American Plan. The implication, then, was that employees and trade unions resisting the American plan stand for something anti-American. Gaining traction after the National Association of Manufacturers

²⁰² “Coast Iron and Steel Industry II,” 306.

²⁰³ Fisher, “Established California Industry,” 222-24; Judson Pacific-Murphy Corporation, *Romance of Steel*; “Coast Iron and Steel Industry II,” 303, 306.

²⁰⁴ “The Emeryville Strike,” *San Francisco Chronicle*, November 29, 1890, 3; “Oakland News,” *San Francisco Chronicle*, December 11, 1890, 3; “Oakland News,” *San Francisco Chronicle*, December 12, 1890, 3; “Oakland News,” *San Francisco Chronicle*, December 15, 1890, 3; “The Trades Council,” *San Francisco Chronicle*, January 3, 1891, 2; “Labor Tidings,” *San Francisco Call*, February 4, 1891, 2; “Oakland News,” *San Francisco Chronicle*, 4 Feb 1891, 8; “Federated Trades,” *San Francisco Chronicle*, February 14, 1891, 10.

²⁰⁵ “Oakland Foundry Closes; To Reopen on the American Plan,” *San Francisco Chronicle*, October 21, 1920, 6.

²⁰⁶ “Judson Foundries Resume Operation on American Plan,” *San Francisco Chronicle*, October 26, 1920, 7.

²⁰⁷ Or, the worker was accorded the right to “belong” to a labor union but the contract specified that he “will not have any dealings, interviews, or communications with officers, agents, or members of any labor union in relation to the conditions of employee’s present employment or in regard to the terms and conditions of this contract.” “Autocratic ‘Associated Employers’—Their Aims,” *American Federationist*, 29, no. 7, (July, 1922): 498.

²⁰⁷ Robert Dunn, *The Americanization of Labor: The Employees Offensive Against Trade Unions*, (New York: International Publishers, 1927), 19; Philip Taft, *Organized Labor in American History* (New York: Harper & Row, 1964), 212-29, 361-71.

crushed the industrial strike wave of 1919, nationwide promotional offices undergirded a concerted employer attack on the growing labor movement. Under the guise of extending democracy and creation of equal opportunity, the American Plan sought to preclude unions from attaining collective bargaining and helped prune union membership below prewar levels in the mid-1920s, as federal judges once again levied injunctions against workers with the temerity to strike.²⁰⁸ After relying on debased convicts and cheap children, JMC became the first plant in the East Bay to adopt the American Plan, which had been imposed in the shipyards for several months.²⁰⁹ The initial shutdown affected over 800 workers; “In the West this action is looked upon as the first gun in the attack upon labor unions and in favor of the ‘open shop,’” according to a *New York Times* supplement.²¹⁰

The late 1920s also marked a restructuring of the Bay Region metalworking agglomeration. JMC merged its structural fabricating department with the PRMC. By combining PRMC’s fabricating plant in San Francisco and the fabricating, crane, bolt, and rivet departments of JMC at Emeryville, the new Judson-Pacific Company became the largest fabricating firm in the West.²¹¹ JMC’s open hearth furnaces and rolling mills continued as the Judson Steel Corporation, by then the oldest rolling mill on the Pacific Coast.²¹²

The Judson-Pacific Company handled many of the largest Western projects, including the approach structures and portions of the main spans of the Golden Gate Bridge, the gigantic hoists in the intake towers of Boulder Dam, the Pacific Telephone and Telegraph Building, many buildings on the campuses of UC Berkeley and Stanford University, and exhibit buildings for the 1939 Exposition on Treasure Island. Judson-Pacific also provided structural steel for the San Francisco-Oakland Bay Bridge, a New Deal project skirting the Emeryville factory site. Yet Judson-Pacific was not the only manufacturing concern in Emeryville; Judson-Pacific’s structural steelwork was coated with aluminum paint developed by Emeryville’s second pioneering manufacture, the Paraffine Paint Company.

²⁰⁸ Dunn, *Americanization of Labor*, 19; Michael Kazin, “Doing What We Can: The Limits and Achievements of American Labor Politics,” *New Labor Forum*, no. 5 (Fall-Winter, 1999): 25; “Autocratic ‘Associated Employers,’” 487.

²⁰⁹ “Oakland Foundry Closes; To Reopen on the American Plan,” *San Francisco Chronicle*, October 21, 1920, 6.

²¹⁰ *Midweek Pictorial*, November 23, 1920.

²¹¹ Don Partridge, “Two Steel Companies in Merger,” *Los Angeles Times*, January 29, 1928, F10; “West Coast Combine in Steel Made,” *Los Angeles Times*, January 22, 1928, B10.

²¹² Judson Pacific-Murphy Corporation, *Romance of Steel*.



DONAHUE'S
UNION IRON AND BRASS FOUNDRY,
 (THE FIRST ESTABLISHED IN THE STATE,)
 CORNER OF FIRST AND MISSION STREETS,
 HAPPY VALLEY,
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QUARTZ CRUSHING AND AMALGAMATING MACHINERY,
MILL IRONS,
 And CASTINGS of every description, made to order.

STEAMBOAT REPAIRING,
BOILER MAKING,
TURNING AND FINISHING,
 EXECUTED WITH DISPATCH.

STEAM ENGINES
 AND
BOILERS,
 CONSTANTLY ON HAND AND FOR SALE.

5.1. An early advertisement for California's first foundry, the Donohue brothers' Union Iron and Brass Foundry, later Union Iron Works under Irving Scott. Source: *The San Francisco Directory for the Year 1852-53* (San Francisco: James M. Parker, 1852), 30.

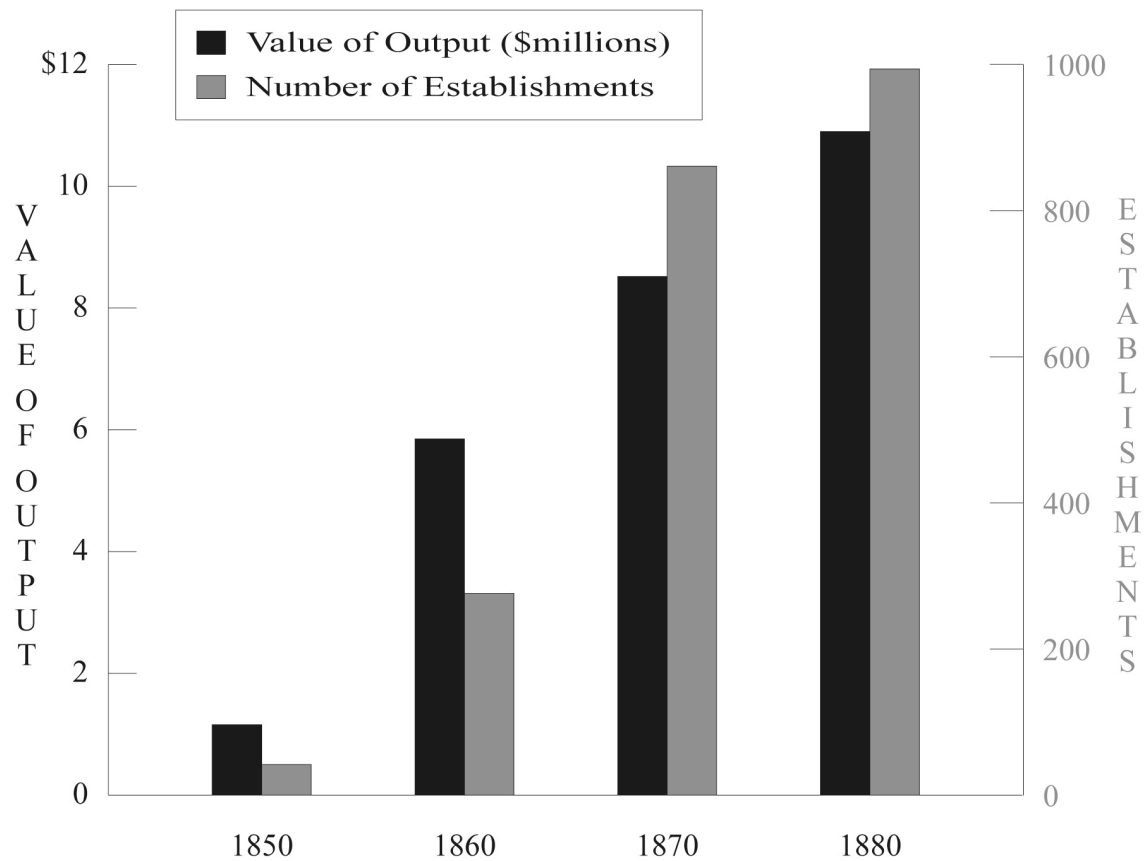


Figure 5.2. The growth of California's iron industries according to David St. Clair's calculation of "California Iron Working Trades." Data includes all iron working categories drawn from *U.S. Census of Manufacturers*, 1850, 1860, and 1880, and *U.S. Population Census*, 1870. Data from: David St. Clair, "The Gold Rush and the Beginnings of California Industry," *California History* 77, no. 4 (1998/99): 203.

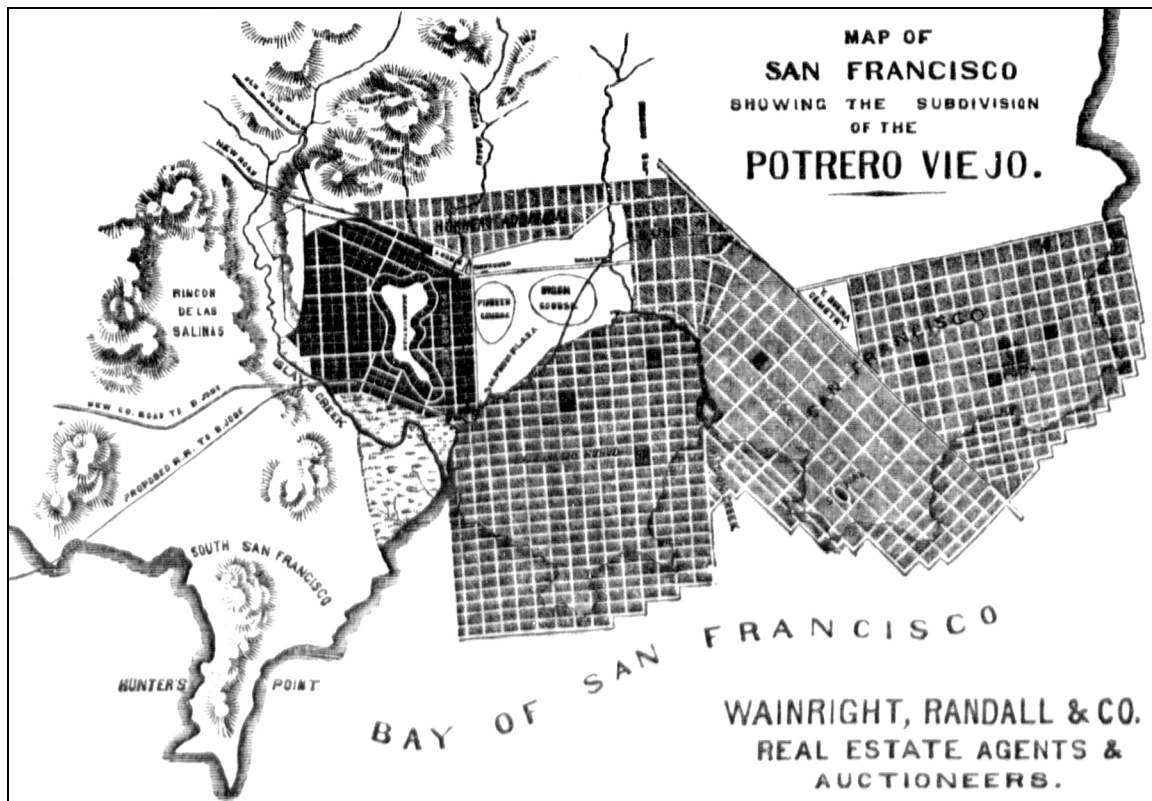


Figure 5.3. The residential subdivision of Portero Viejo, 1857, the name of which was derived from the antecedent Mexican land grant, *Rancho Rinco de Las Salinas Y Potrero Viejo*. Beginning with *Puerto Nuevo* in 1849, residential real estate development schemes for Potrero Point failed. Peter Donohue's SF&SJ Railroad opened up the district for industrial capital investment and factory location in the mid-1860s. Source: Advertisement, *Daily Alta California*, June 21, 1857, 1.

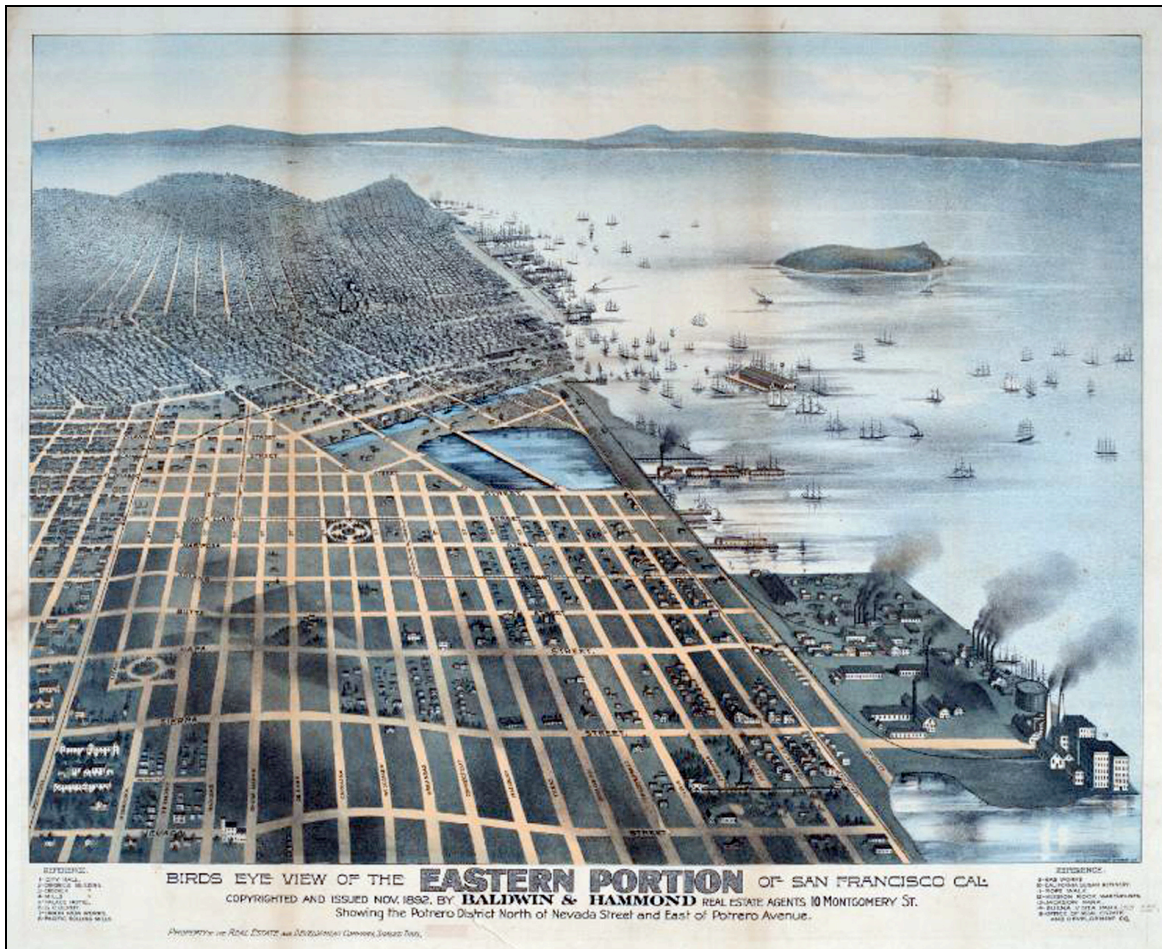


Figure 5.4. “Bird’s Eye View of the Eastern Portion of San Francisco Cal.,” 1892. Looking north at the Potrero District beyond Nevada Street and east of Potrero Avenue. The Bank Ring’s Pacific Rolling Mill Company, Union Iron Works, San Francisco Gas Works, and California Sugar Refinery sit on bayfill. Immediately north is the filled Mission Bay, including Central Basin, China Basin, and the Southern Pacific Railroad depot. Undeveloped residential blocks remain while the dense South of Market industrial district near Rincon Hill and downtown San Francisco fill the background. Source: Robert B Honeyman, Jr. Collection of Early Californian and Western American Pictorial Material, The Bancroft Library, University of California,

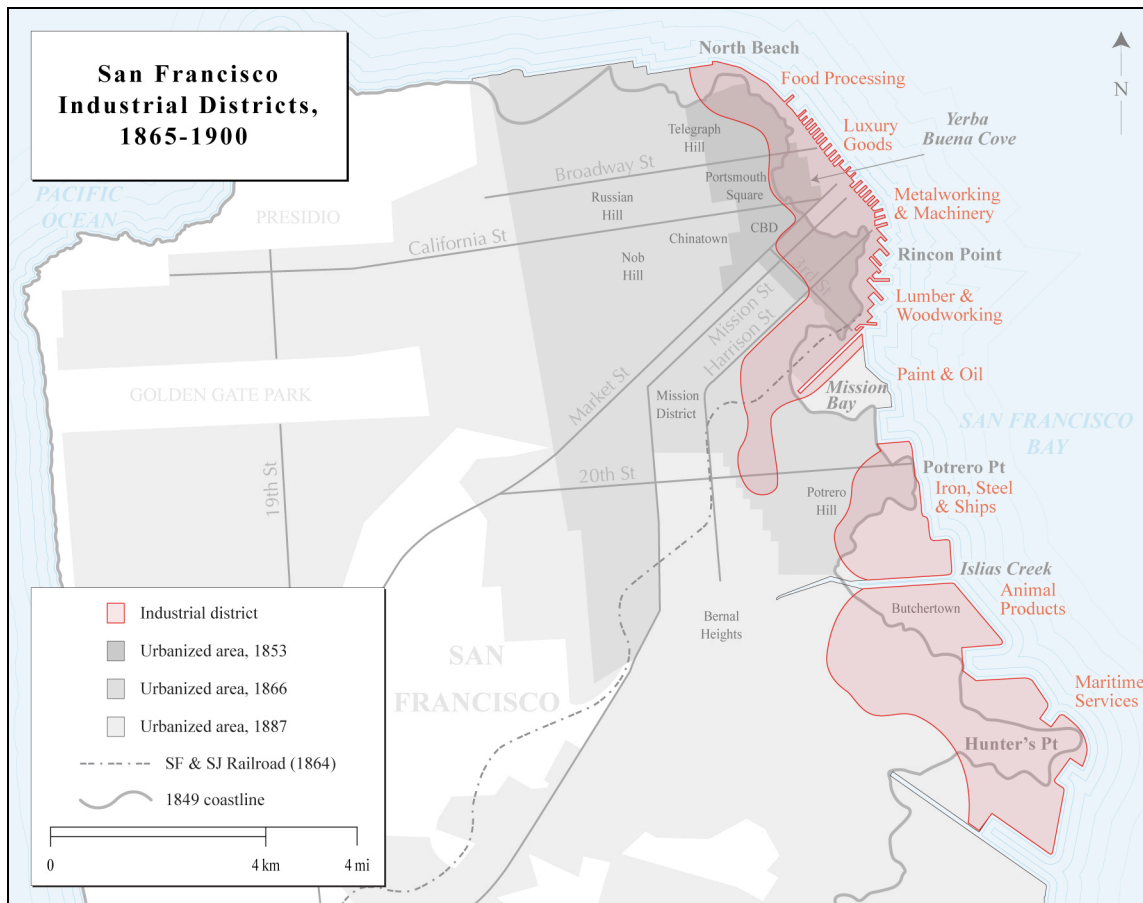


Figure 5.5. San Francisco's industrial districts. Emanating from the core metalworking and machinery cluster south of Market Street near Rincon Point, industry expanded along San Francisco's waterfront. Areal differentiation by industrial sector became evident starting in the 1870s. "Urbanized area" indicates the spatial extent of San Francisco's street grids. Map by author, following Richard Walker, "Industry Builds Out the City: The Suburbanization of Manufacturing in the San Francisco Bay Area," in *Manufacturing Suburbs: Building Work and Home on the Metropolitan Fringe*, ed. Robert Lewis (Philadelphia: Temple University Press, 2004), 99.

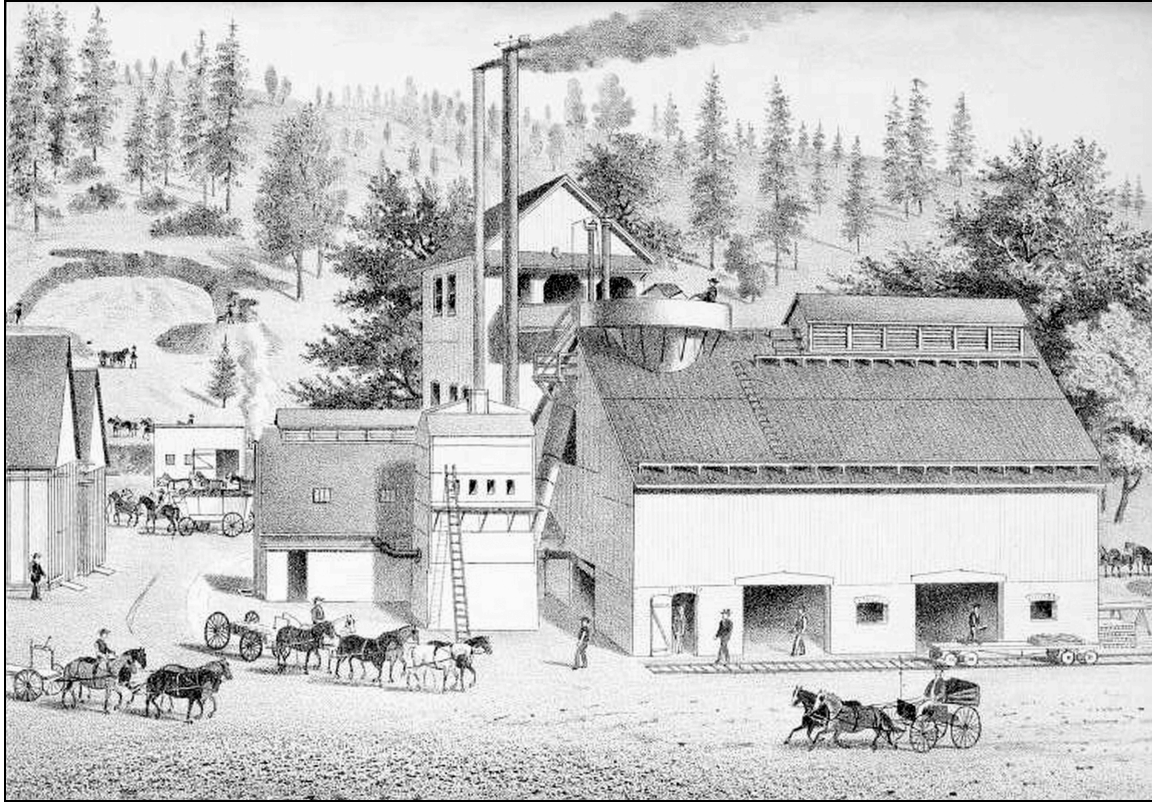


Figure 5.6. The California Iron & Steel Company's Hotaling works in Placer County, including California's first blast furnace capable of smelting iron ore. Colorful flames emanating from the smokestacks "light up the surrounding country like a beacon of promise to the hopeful and industrious." One iron ore mine is depicted in the background, as well. Source: Thomas Thompson and Albert West, *History of Placer County, California* (Oakland: Pacific Press Publishing House, 1882), 208.

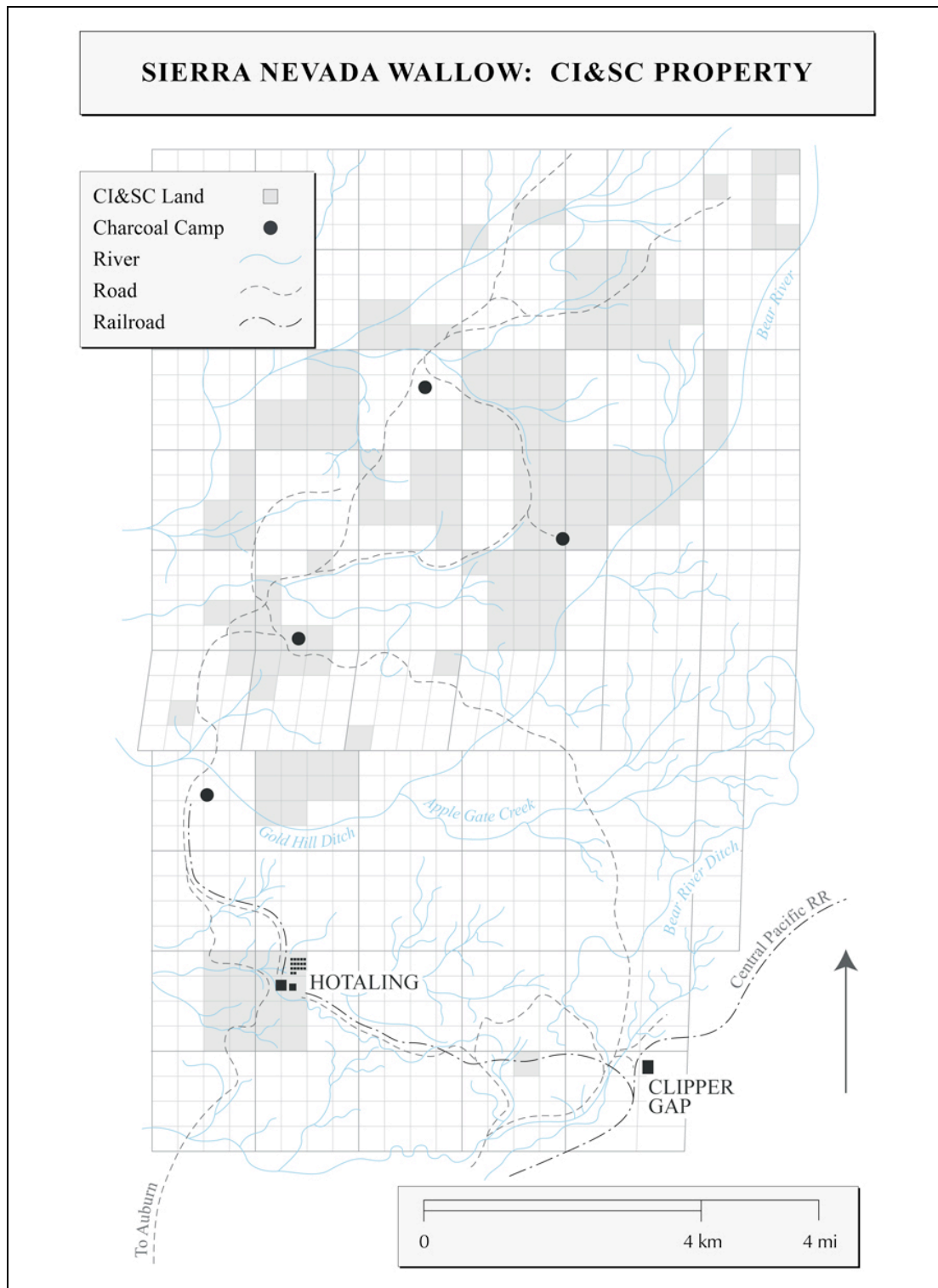


Figure 5.7. California Iron and Steel Company's property encompassing over twelve square miles. The rectilinear grid denotes sections of ranges (Public Land Survey System) originally granted to the Southern Pacific Railroad. Map by author following California Iron and Steel Company, *Prospectus of the California Iron and Steel Company* (San Francisco: The Bosqui Engraving and Printing Co., 1882).

THE CALIFORNIA VICTOR MOWER.

The Only Mowing Machine Made on the Coast.

SIMPLICITY AND GREAT STRENGTH COMBINED.

We ask those wishing to purchase machines this season to examine the Victor, as we believe it superior to any machine made.

Superior, because it has compound draft attachment which divides the draft of the team between the main driving power and finger-bar; it lessens the draft of the finger-bar upon the ground, giving increased power to the cutting apparatus.

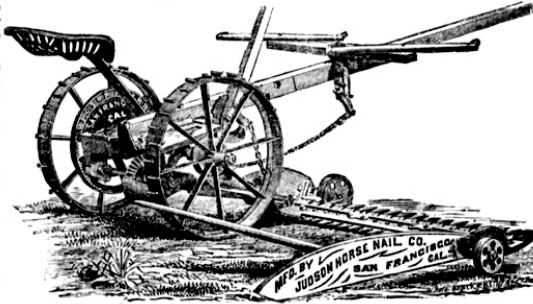
It has a very simple gearing, placed in such a manner as to be entirely out of the way of the driver, and enabling him to see at a glance all of its working parts; the gears are enclosed, so as to exclude dirt.

The main frame and gearing are so balanced on the driving wheels that there is no side craft or weight upon the horses.

The lifting lever is within easy reach of the driver; by this the finger-bar can be raised for passing stones, stumps and trees without stopping the cutting apparatus, or cramping the pitman or knife.

To regulate the height of cut and lessen the friction upon the ground there is a small wheel, placed at each end of the finger-bar, arranged so as to adjust this bar from one to six inches in height.

This machine will follow the undulations of the ground, passing bogs and stones without injury.



The adjustable seat is so arranged that the driver can keep the machine in proper balance at all times.

The finger-bar can be raised to a perpendicular position for moving from one field to another, the driver not leaving his seat.

The pitman and crank head are protected by the main shoe, so as to fully shield it from cut grass, stones and other obstructions.

The main shoe and finger-bar are connected to the vibrating frame, so as to form an independent duplex joint; this is a novel feature in this machine and is used in no other.

By attaching the vibrating frame with main frame below the main axle, so as to get a direct draft on the finger-bar, which makes a perfect floating cutting apparatus.

The hinge connection is of a very strong nature, braced in its bearings so that the finger-bar is always at right angles with the gearing. This is a source of great annoyance to the owners of other machines.

REPAIRS ALWAYS IN STOCK.

Two knives, two guards, screw, wrench and oil-can sent with each machine.

Send for Catalogue. Agents Wanted in every Locality. Manufactured by

THE JUDSON HORSE NAIL CO.,

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SAN FRANCISCO.

Figure 5.8. The Judson Horse Nail Company's Victor Mower—specialized agricultural equipment for Central Valley agriculture manufactured by California convicts at San Quentin Prison. Source: *Pacific Rural Press*, March 25, 1882, 222.

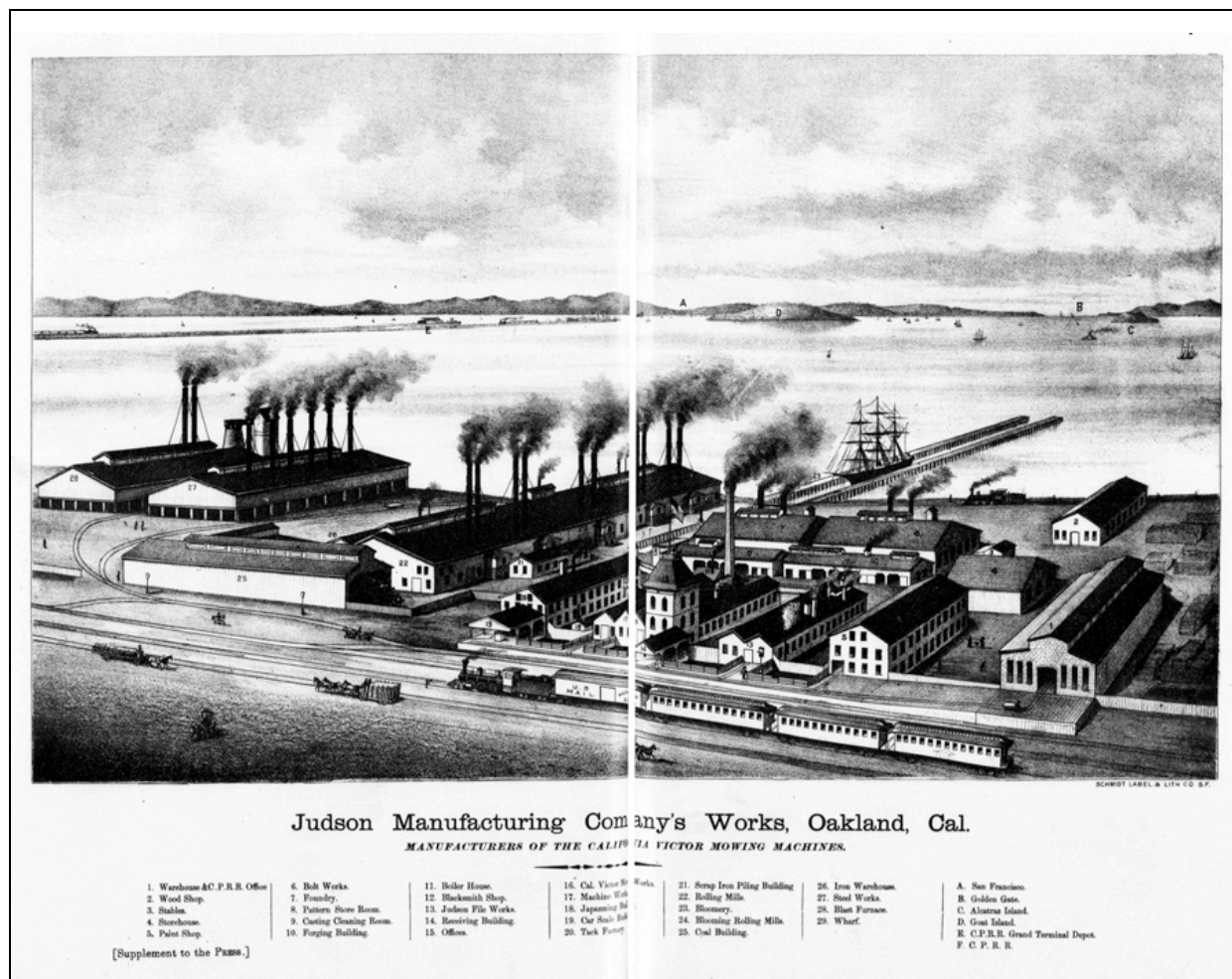


Figure 5.9. A stylized depiction of the Judson Manufacturing Company on the shoreline of Emery's Plot 6 in early Emeryville. The illustration denotes dozens of autonomous production units composing the manufacturing complex. Source: "The Judson Manufacturing Company," *Pacific Rural Press*, May 26, 1883, 480.

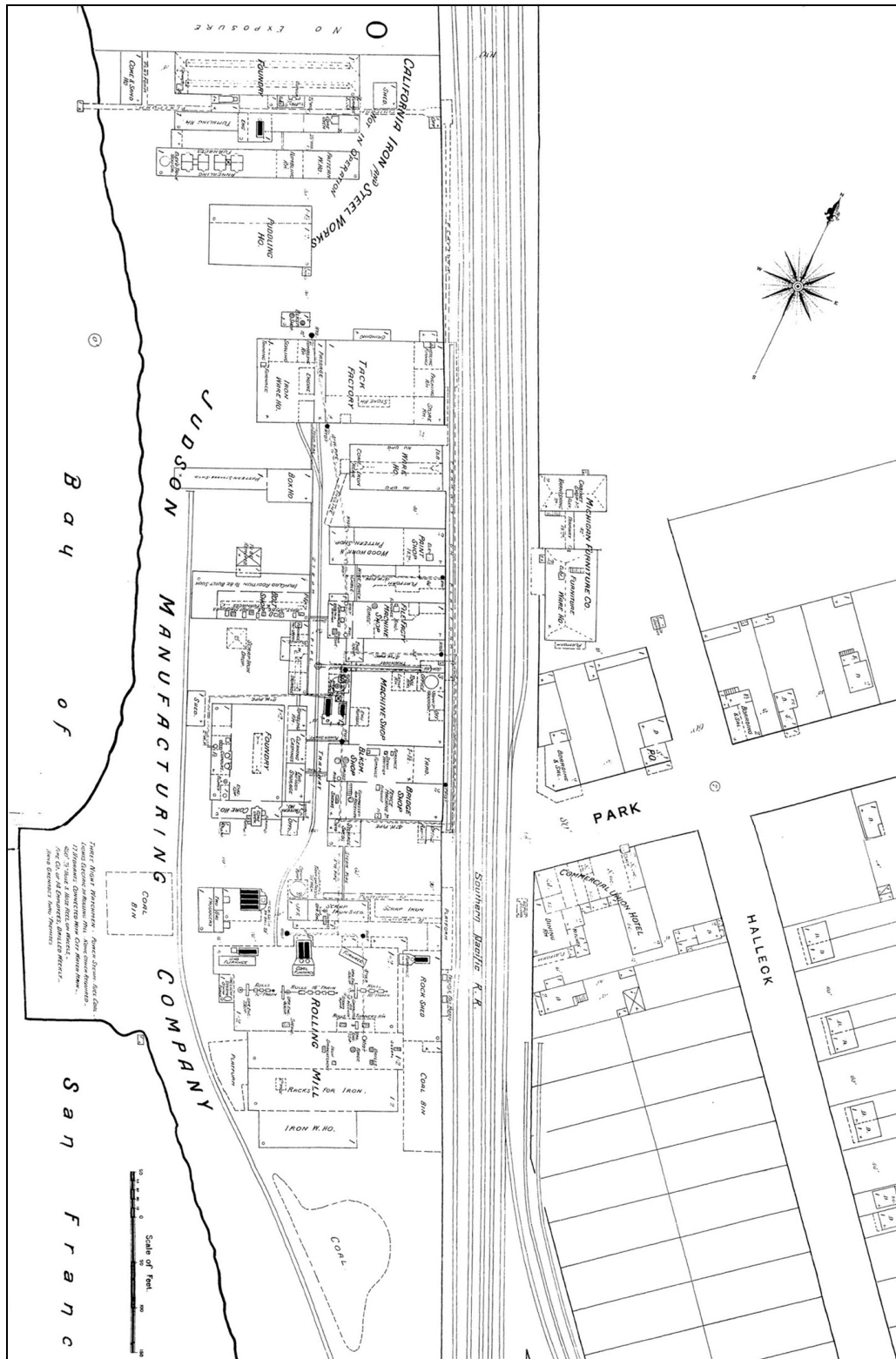


Figure 5.10. Emeryville's Incipient Iron Agglomeration. The California Iron & Steel Company's defunct steel mill is depicted only yards north of Judson Manufacturing Company's massive industrial complex at the foot of Park Avenue in early Emeryville in the late 1880s. Source: Composite from Sanborn Fire Insurance Maps, Oakland, vol. 3, 1889, Sheet 25J.

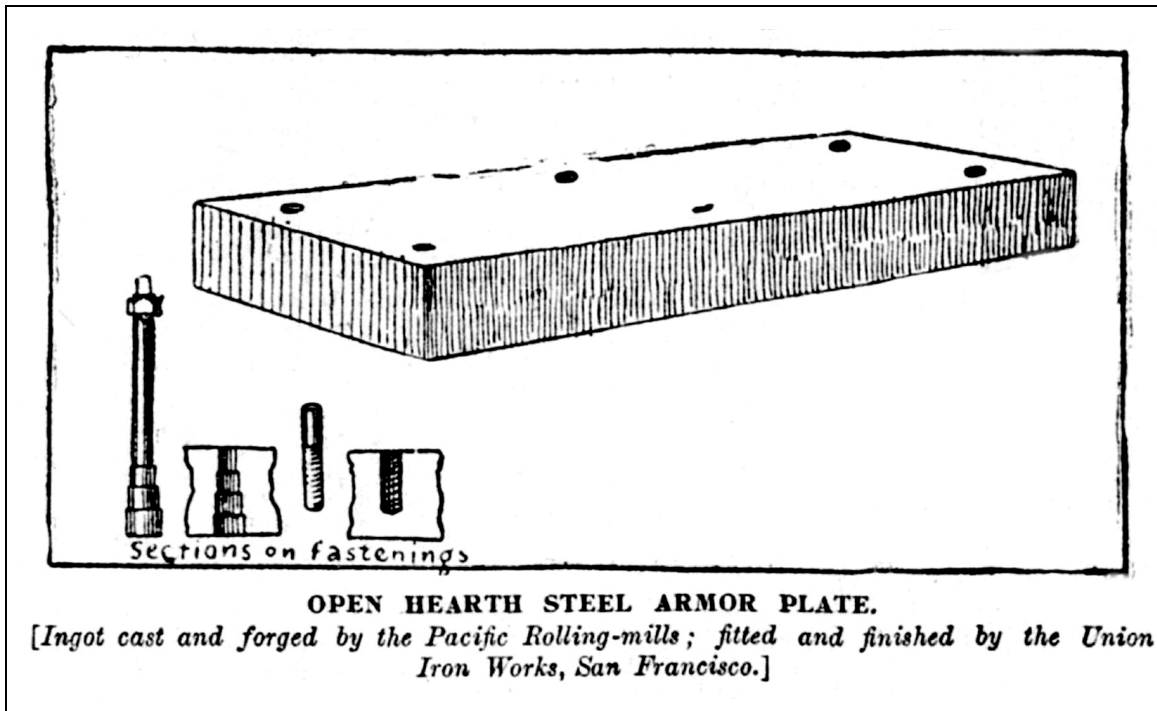


Figure 5.11. Navy munitions made at Potrero Point. Armored plate was one element of the PRMC and UIW collaboration first anticipated by Patrick Noble while soliciting federal government contracts in 1884. Source: "The First Armor Plate," *San Francisco Call*, December 22, 1895, 28.

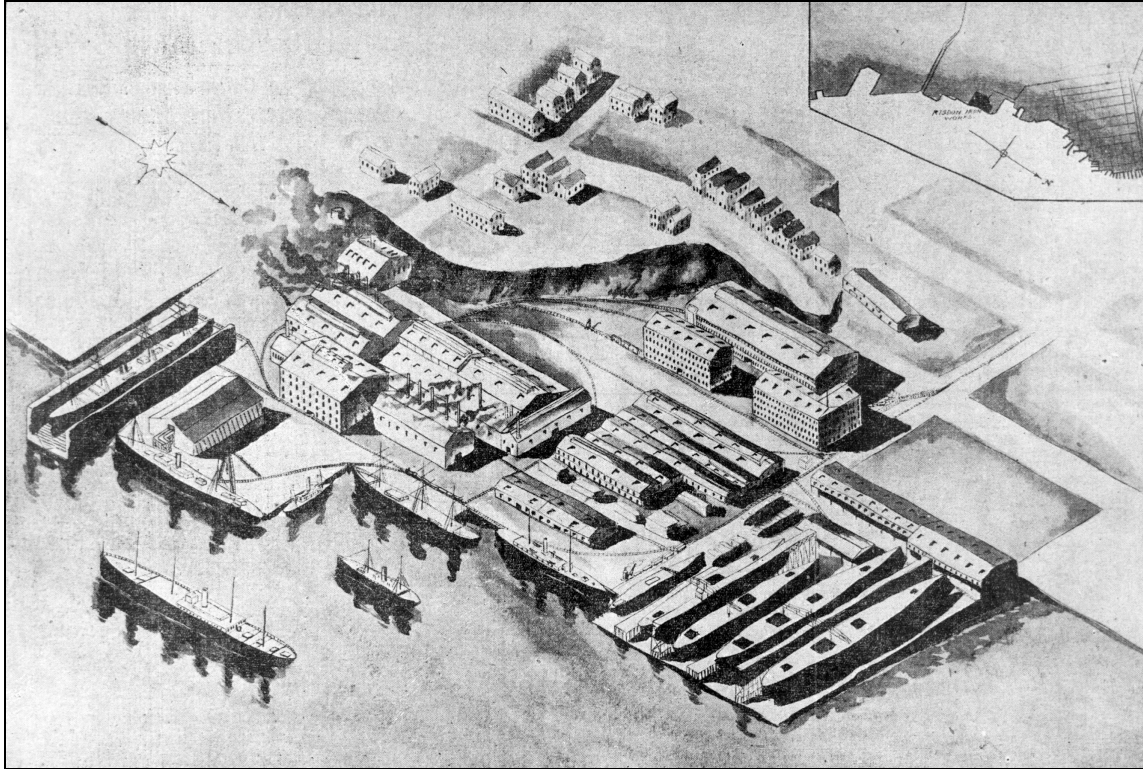


Figure 5.12. Risdon Iron and Locomotive Works at Potrero Point, 1901. Risdon absorbed PRMC and its Potrero Point property before being acquired by J.P. Morgan's U.S. Steel Company in 1911. Source: "Risdon Iron and Locomotive Works," *San Francisco Call*, December 15, 1901, 70.



Figure 5.13. Judson Manufacturing Company expanded southward using slag as bayfill. Source: Emeryville Historical Society.



Figure 5.14. Skilled labor casting molten iron at Judson Manufacturing Company (or bolt works?). Source: Emeryville Historical Society.



Figure 5.15. Judson Manufacturing Company shutdown. According to one source, JMC was the first shop in the West to close down and reopen up under the American Plan, which affected over 800 workers. "In the West this action is looked upon as the first gun in the attack upon labor unions and in favor of the 'open shop.'"

Source: *Midweek Pictorial*, November 1920 (clipping from author's collection).

Chapter 6

Oil, Innovation, and Expansion at Paraffine Paint Company

The conversion of a ramshackle barn into a paint factory heralded the arrival of early Emeryville's second manufacturer. The Paraffine Paint Company (PABCO) bought a two-acre shoreline site located just north of Judson Manufacturing Company in 1884. PABCO, however, made no products containing paraffine, the yellowish byproduct of Pennsylvania petroleum. Instead, the corporation's name helped shield their patents and surreptitious production techniques for transforming asphalt, a seemingly useless derivative of California petroleum, into novel waterproof paints and building materials. PABCO's technological innovations created not only new commodities but also a new industry and national and international markets *de novo*, well before California led the world in oil production during the celebrated "Black Gold Rush."

By the 1930s, PABCO had become "by far the largest group of building industries in the western half of the United States," according to a Dean Witter prospectus.¹ The makeshift paint works had grown into a "modern \$10,000,000 factory" employing 1,500 workers.² The industrial complex covered twenty-eight acres of bayfill, and PABCO owned a total of 175 acres of Emeryville's shoreline. PABCO's paint, roofing, and floor divisions manufactured upwards of 6,000 individual products while diversification into paper-based agribusiness supplies accounted for about one-half of the firm's profits (\$3 million in 1929). Eighty buildings comprised Emeryville's "Plant #1," the flagship of a multinational conglomeration consisting of seventeen subsidiary firms and 55 manufacturing plants.³

PABCO was a product of California's first oil boom and bust in the 1860s and two subsequent decades of speculation and experimentation on California's viscous crude. New technology, new products, and rapidly evolving manufacturing techniques required few serial face-to-face transactions or spatially proximate suppliers. Instead, myriad unknowns inherent in novel technology and a rapidly unfurling industry structured PABCO's location and growth—unknowns in the pace and direction of growth and in innovation adoption and market expansion. A short horizon and unforeseeable growth trajectory resulted in a piecemeal process of vertical integration and nimble diversifications, as the Emeryville factories became the launch pad for a new international industry.

Green Oil and Black Gold

If oil men want to talk of wild-catting, excitements, rushes, fake companies, etc., in the California oil field they ought to go back to the state's first oil excitement in 1864 or thereabouts.

Pacific Oil Reporter, c. 1900⁴

¹ Dean Witter & Company, *The Paraffine Companies, Inc.* (New York: Dean Witter and Company. 1936).

² E.F. Seagrave, "East Meets West," *Port of Oakland Compass* 12, no. 2 (February, 1938): 3.

³ Leib-Keyston & Company, *The Paraffine Companies Inc.: A Story of Paint* (San Francisco, 1926); Seagrave, "East Meets West," 3, 12, 16.

⁴ Cited by Lionel Redpath, *Petroleum in California: A Concise and Reliable History of the Oil Industry of the State* (Los Angeles: Lionel V. Redpath, 1900), 10.

Five years after the discovery of petroleum at Titusville precipitated an epochal oil boom, and camphene and kerosene distillates of “rock oil” supplanted candles for lighting, Pennsylvania capitalists fomented California’s first oil boom. Thomas Scott was Vice-President of the Pennsylvania Railroad, reputedly the world’s largest company on the eve of the Civil War. Along with his personal factotum and protégé, Andrew Carnegie, Scott realized dazzling profits from speculations on Oil Creek wells near Titusville in 1859. A \$40,000 investment in the Columbia Oil Company immediately returned dividends worth \$1 million to its principal backers.⁵ Columbia Oil became one of Pennsylvania’s most successful early oil ventures and Scott became a venture capitalist of note, as well as a preeminent railroad executive. While managing Union Army transportation and logistics as Lincoln’s Assistant Secretary of War, Scott sent a party to investigate mineral resources along a proposed Texas & Pacific Railroad route from Marshall, Texas to San Diego.⁶ Scott’s representatives arrived in California in 1864, just as wartime trade disruptions made eastern oil prices skyrocket.⁷

Titusville fortunes had already inspired prospectors to hunt for oil throughout California. Between 1861 and 1865, wildcatters sank wells in the Mattole Valley in Humboldt County and tunneled into Sulphur Mountain in Santa Barbara County (later Ventura County). The Adams Petroleum Company drilled eighty-seven feet before aborting their well at San Pablo Creek in Contra Costa County and the Buena Vista Petroleum Company muddled through tarry seepages in Kern County before abandoning their distillery. Shallow pits and spring-pole mines pocked coastlines and valleys in Colusa, Marin, San Mateo, Santa Barbara, and Santa Clara counties, while Colonel E. D. Baker sank \$65,000 into a well near Wilshire Boulevard and Hoover Street in Los Angeles.⁸

California wildcatters tapped no “gushers” but oil scarcity on the East Coast and prospects of Pacific Coast fuel and illuminating industries enticed Scott. He purchased California’s first promising oil strikes on Rancho Ojai before amassing over 275,000 acres,

⁵ Pennsylvania Railroad president J. Edgar Thompson also benefited from the investment. On the economic and political power of the Pennsylvania Railroad, as well as Thomson and Scott’s role in Carnegie’s Pittsburgh steel empire, predecessor to JP Morgan’s U.S. Steel Company, see: Andrew Carnegie, *Autobiography of Andrew Carnegie* (Boston: Houghton Mifflin Company, 1920), 63; Albert Churella, *The Pennsylvania Railroad, Volume I: Building an Empire, 1846-1917* (Philadelphia: University of Pennsylvania Press, 2013); David Nasaw, *Andrew Carnegie* (New York: Penguin Books, 2006), 54-89; William Sipes, *The Pennsylvania Railroad: Its Origin, Construction, Conditions, and Connections* (Philadelphia: The Passenger Department, 1876); James Ward, “Power and Accountability on the Pennsylvania Railroad, 1846-1879,” *The Business History Review* 49, no. 1 (Spring, 1975): 57-59.

⁶ Gerald Nash, *State Government and Economic Development: A History of Administrative Policies in California, 1849-1933* (Berkeley: Institute of Governmental Studies, University of California, 1964), 102.

⁷ William Hutchinson, *Oil, Land and Politics: The California Career of Thomas Robert Bard*, vol. 1 (Norman, OK: University of Oklahoma Press, 1965), 43-44; S.F. Peckham, “Petroleum in Southern California,” *Science* 23, no. 575 (February 9, 1884): 74-75; Gerald White, *Formative Years in the Far West: A History of Standard Oil Company of California and Predecessors Through 1919* (New York: Appleton-Century-Crofts, 1962), 7.

⁸ Alfred Howe Davis, “The Romance of California Oil: Before the Gusher Era, In Two Parts, Part I,” *Overland Monthly and Out West Magazine*, February, 1913, 13, 15; Redpath, *Petroleum in California*; Walter Stalder, “A Contribution to California Oil and Gas History,” *California Oil World*, November 12, 1941; Ted Sutter, “California’s Oil,” *American Petroleum Institute Quarterly* 18 (April, 1948): 4; William Lord Watts, *Oil and Gas Yielding Formations of California*, California State Mining Bureau, Bulletin No. 19 (Sacramento: State Printing, 1900), 156.

consisting chiefly of seven ranchos in Southern California but also of massive tracts far to the north in Humboldt County. Scott formed three syndicates to finance and exploit his California properties. The prospectus of the California Petroleum Company promulgated a capital of \$10 million in order to drill on 18,000 acres in the Ojai Valley. The Philadelphia & California Petroleum Company sought to wildcat on 187,000 acres comprising the Simi, San Francisco, and Las Posas ranchos. The Pacific Coast Petroleum Company in San Luis Obispo never progressed beyond the planning stage.⁹

With lofty capitalization and grandiose promotions, Scott's enterprises bore all the marks of the speculative mania so familiar in California's gold mines and Pennsylvania's oilfields. Indeed, seventy-five oil companies formed during the mid-1860s, on paper at least, with authorized capital aggregating upwards of \$50 million. Nevertheless, Scott sank deep investments into California's shallow wells. He shipped drilling and refining equipment from New York around the horn to the California Petroleum Company. "Petroleum fever" stimulated San Francisco metalworkers, as well. The Coffee and Risdon Iron Works in San Francisco used drafts and specifications delivered from Pennsylvania to built tools and machinery for the Philadelphia & California Petroleum Company. The ironworks soon advertised custom drilling tools and refining equipment for California oil prospectors.¹⁰ In addition to land costs, the California Petroleum Company spent about \$200,000 before the speculative bubble burst.¹¹

Throughout California, prospectors siphoned perhaps 12,000 barrels of oil from seeps and wells during 1866. Crude oil production in Pennsylvania, however, had increased over twenty percent between 1864 and 1866, while the price of kerosene dropped 215 percent during the same period.¹² Imports to San Francisco trebled, reaching 132,252 cases of five-gallon tins in 1867 as Californians adopted efficient and inexpensive Eastern kerosene illuminants.¹³ California's first oil boom became a profound bust by the end of 1866, when Scott halted his California operations.

Market perturbations hastened the bust yet the source of California's problems lay deeper beneath the surface. The seeps, pools, and hardened deposits of Pacific Coast petroleum lacked much affinity with the oil springs of the East. As opposed to light, paraffin-based Pennsylvania oil, California's crude was asphaltic, gummy, and awfully heavy. Variants of Pacific Coast petroleum ranged from deep green crude with the consistency of olive oil, to black viscous sludge, to tarry solidified asphaltum. California's convoluted geology bedeviled early oilmen, too. Drillers were plagued, as Bard wrote in 1866, by "bad luck with tar, gravel, boulders, and broken tools and a thousand other ills."¹⁴ Basic eastern techniques and tools proved inadequate. Wildcatters tunneled upwards into Sulphur Mountain seeking the aid of gravity and others heated

⁹ Hutchinson, *Oil, Land and Politics*; White, *Formative Years*, 7, 9; Gerald White, "The Cast of the Salted Sample: A California Oil Industry Skeleton," *Pacific Historical Review* 35, no. 2 (May 1966).

¹⁰ "Oil Well Tools," Advertisement, *Daily Alta California*, July 13, 1865, 2.

¹¹ White, *Formative Years*, 9-13.

¹² *Ibid.*, 16.

¹³ James Williams, *Energy and the Making of Modern California* (Akron, OH: University of Akron Press, 1997), 57.

¹⁴ Quoted in White, *Formative Years*, 10.

wells with steam before attempting to pump crude as oil entrepreneurs experimented with ways to induce the flow of California's stubborn oil.¹⁵

The vexing chemical composition of California petroleum posed perhaps the greatest challenge to the production and commercialization of Pacific Coast oil commodities. Refiners struggled to render the black oil suitable for illumination, then the chief use of petroleum. Only twenty percent of California petroleum yielded illuminating and lubricating oil after distillation, while yields of eastern oil topped eighty percent, half of which consisted of valuable kerosene. High carbon and sulfur contents in Pacific Coast illuminants made a smoky, smelly, and dull flame. The quality of California lubes was even worse. Prospectors shipped crude oil to San Francisco for distillation into lamp and lubricating oils but California's products proved marketable only in the absence of eastern imports. The sharp decline in eastern oil prices, combined with the low yield, the low quality, and high refining costs of California crude made prospects bleak. By the early 1870s, *Harper's Weekly* reported, "the California hydrocarbons are of very little value as regards their products of distillation, and that the difficulty of mining them...is such as to render them of comparatively little commercial value."¹⁶ Regional production sputtered and California remained dependent on eastern imports.

Perhaps more than any other resource, oil shows how "California was both new and different," as McWilliams put it. "Its difficulties consisted not in a meagerness of resources but in the fact that its resources could be unlocked only by untried, freshly devised methods."¹⁷ Indeed, California's most profitable natural resource proved among its most difficult to unlock. Not until the mid-1880s did prospectors demonstrate that tar springs and shallow pools of heavy oil emanated from deeper, lighter deposits.¹⁸ After deepening antecedent wells, the discovery of vast new oilfields in the Los Angeles basin and Kern River district precipitated the celebrated "Black Gold Rush." Crude oil production increased 1,300 percent between 1890 and 1900 and grew approximately six fold during the subsequent three years. The value of California oil increased by nearly 1,000 percent between 1890 and 1900 and grew by another 680 percent by 1910.¹⁹ According to one petroleum industry estimate, oil companies operating in California paid over \$67 million in dividends by 1912.²⁰ Along with natural gas and hydroelectric power, fuel oil freed Californians from expensive imported coal. By 1915, seven million barrels of

¹⁵ Sutter, "California's Oil," 5, 19; "California Petroleum," *Harper's Weekly*, November 22, 1873, 1051.

¹⁶ Quote from "California Petroleum," *Harper's Weekly*, November 22, 1873, 1052; Ralph Andreano, "The Structure of the California Petroleum Industry, 1875-1911," *Pacific Historical Review* 39, no. 2 (May, 1970): 157; Arthur Johnson, "California and the National Oil Industry," *Pacific Historical Review* 39, no. 2 (May, 1970): 155-56. 157; Williams, *Making of Modern California*, 57; White, *Formative Years*, 15-16, Gerald White, "California's Other Mineral," *Pacific Historical Review* 39, no. 2 (May, 1970): 139.

¹⁷ McWilliams, *California*, 88.

¹⁸ Sutter, "California's Oil," 15.

¹⁹ Henry Symons, *California Mineral Production and Directory of Mineral Producers for 1941*, California State Division of Mines, Bulletin 122 (Sacramento: California Division of Mines and Geology, 194), 23.

²⁰ Palmer Oil Company, *California's Greatest Industry: A Review of its Resources and Prospects* (San Francisco: Palmer Union Oil Company, 1912), 81.

California oil burned annually in place of coal, imports of which had dropped by seventy-five percent during the preceding decade.²¹

California became the world's leading oil producer from 1905 until 1930. With the exception of agriculture, a cumulative output worth \$1.7 billion by 1920 (1940s dollars) made oil California's most profitable natural resource.²² The "Black Gold Rush," however, may also be considered the "end of the pipe." The astonishing productivity of the California oil industry in the early 20th century belies the pervasive struggles oil producers faced in discovering, extracting, transporting, refining, and commercializing local petroleum beginning in the 1860s. Fifty years of exploration, experimentation, and innovation greatly conditioned the structure and direction of California's early twentieth century petroleum industry.²³

Unlocking Asphalt

The industry is a very recent one, and even California has a great deal to learn in regard to asphaltum refining, especially in the selection of oils, and in the mechanical manipulation of the distilling process. As no asphaltum was ever made from eastern oils, it can readily be understood why eastern experience has very little application to the California refining methods.

"The California Asphaltum Industry," 1904²⁴

Thomas Scott's nephew and representative, Thomas Bard, arrived in California in 1865, after serving as a lieutenant in the Union Army's Corps of Engineers. He became superintendent of California Petroleum Company and oversaw oil excavation on the banks of San Antonio Creek, about five miles from the town of Ventura. Melvin Beardsley, a Pennsylvania oil expert and driller, accompanied Bard and became a manager of the firm. They drilled a group of six wells collectively known as Ojai No. 6. While they struck no gushers, Ojai No. 6 was as close to success as any California wildcatter got during the 1860s.²⁵ Attempts at refining California crude were even less successful. After separating the meager percentage of kerosene from California's high-gravity oil, a tarry and seemingly valueless derivative remained. The viscous substance constituted up to ninety percent of California crude. Equally troubling, it solidified into a hard, brilliant black mass once cooled. Oilmen called it "black paraffin," the seeming west

²¹ Raymond Bacon and William Hamor, *The American Petroleum Industry*, vol. 2 (New York: McGraw-Hill Book Company, 1916), 504-505.

²² Richard Walker, "California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940," *Annals of the Association of American Geographers* 91, no. 1 (March, 2001): 173.

²³ Nancy Etlinger, "The Roots of Competitive Advantage in California and Japan," *Annals of the Association of American Geographers* 81, no. 3 (September, 1991).

²⁴ F.H. Minnard, "The California Asphaltum Industry," in *The Mineral Industry During 1903* (New York: The Engineering and Mining Journal, 1904), 30 (28-34).

²⁵ White, *Formative Years*, 10; Hutchinson, *Oil, Land and Politics*, 187; Sutter, "California's Oil," 4-5, 28.

coast analogue of the yellowish, translucent paraffine rendered from Pennsylvania crude.²⁶ The substance baffled eastern experts, who were unable to “cut” it, that is, to dissolve it into stable liquid form. Before California led the world in oil production and petroleum fuels helped free western industry from expensive imported coal, black paraffin plagued oil entrepreneurs. It possessed no practical use and consequently no commercial value.

After Scott’s withdrawal from the California oil business, Bard retained many Ventura County wells and land leases. His pipeline built to carry Ojai’s greenish-brown oil to tidewater became the basis of the Mission Transfer Company (1887), which briefly monopolized Ventura County oil transportation and transshipment. Bard then served as the first president of Union Oil Company of California, successor to the Mission Transfer Company, which emerged as one of California’s three biggest producers in the early twentieth century. He also amassed a fortune from speculative land development before becoming California’s Republican U.S. Senator in 1901.²⁷ Beardsley remained at the end of the pipe. He built an early refinery near Ventura and developed innovative methods and equipment later adopted by Standard Oil Company of California.²⁸ Yet the most significant contribution attributed to Beardsley spawned a new material base for novel industries and helped buoy California’s fledgling petroleum industry.

According to PABCO etiology, Beardsley and Truman Pierce, a Santa Barbara chemist, discovered a dissolvent for black paraffin through “as strange a stroke of luck as ever appeared in history.”²⁹ In a small laboratory at the rear of Pierce’s drug store, Beardsley accidentally spilled a can of gopher poison into the tarry residuum and “opened the doorway of a new industry,” as the story goes. The poison contained carbon bisulfide, which dissolved the black residue and rendered a previously unknown form of asphalt.³⁰ Asphalt, also known as bitumen and asphaltum, is a loose term for an array of viscous and semi-solid forms of petroleum. “Oil asphalt,” later referred to as “liquid asphalt,” “petroleum asphalt,” or “manufactured asphalt,” denoted the new product of California petroleum. Naturally occurring deposits of “rock asphalt” or “natural asphalt,” such as the La Brea Tar Pits, were long known and increasingly used throughout Europe and the U.S. for road paving during the second half of the nineteenth century.

Whatever the veracity of corporate lore, Pierce and Beardsley patented the basic byproduct of California petroleum. According to a disgruntled competitor, they named it “maltha,” rather than asphalt, in order to secure the patent. “[Beardsley] might as well just called

²⁶ Lloyd Greenville, “Why ‘Paraffine’?,” *Pabco World* 4, no. 4 (July-August 1928): 6; Peckham, “Petroleum in Southern California,” 75; H. W. Westsmith, “First Pacific Coast Oil Still,” *Mining and Oil Bulletin* 8, no. 9 (September, 1922): 524; “The Refining of Oil,” *Los Angeles Herald*, July 6, 1902, 12.

²⁷ W. A. Goodyear, “Petroleum, Asphaltum, and Natural Gas,” in William Ireland, *Seventh Annual Report of the State Mineralogist for the Year Ending October 1, 1887* (Sacramento: State Office, 1888), 110-111; Hutchinson, *Oil, Land and Politics*; John Ingham, *Biographical Dictionary of American Business Leaders, A-G* (Westport, CN: Greenwood Press, 1983), 45-48; Sutter, “California’s Oil,” 27; White, *Formative Years*, 10.

²⁸ Beardsley’s steam-agitated horizontal still replaced the insufficient upright stills used to refine light Pennsylvania crude. Leib-Keyston, *Paraffine Companies Inc.*; Westsmith, “First Pacific Coast Oil Still,” 524; “The Refining of Oil,” *Los Angeles Herald*, July 6, 1902, 12.

²⁹ Leib-Keyston & Company, *Paraffine Companies Inc.*

³⁰ T.N. Bland, “The Early History of the Organization,” *Pabco World* 3, no. 4 (April, 192): 2-3, 14; Greenville, “Why ‘Paraffine’?,” 6-7; Alvah Sabin, *The Industrial and Artistic Technology of Paint and Varnish* (New York: John Wiley & Sons, 1904), 110-11; Westsmith, “First Pacific Coast Oil Still,” 524.

it ‘butter’ or ‘guava jelly,’” he continued, “for no such definition of maltha was ever given before.”³¹ Pierce and Beardsley also patented the process of dissolving maltha in carbon bisulfide and applying the resulting liquid asphalt to paper. “This patent was also issued, probably for the reason that the Patent Office officials did not understand the misuse of the word ‘maltha,’ and thought that a new substance was being dissolved in carbon disulphide,” the competitor protested.³²

There may have been confusion, if not obfuscation, concerning the chemical composition of liquid asphalt but there could be little doubt about its commercial potential. The solution spread readily, dried rapidly, and possessed great waterproofing capabilities. “They realized at once that they had a compound of merit as a base for roofing material and paint superior to anything of the kind then known,” a corporate booster recounted.³³ Pierce and Beardsley’s patents for new materials, products, and manufacturing techniques led immediately to the formation of PABCO. Before looking at PABCO, however, the scope and scale of California’s asphalt industry warrants a brief discussion. Pierce and Beardsley’s early innovations helped structure California’s petroleum sector and the national paving industry, and therefore the U.S. landscape.

Early struggles rendering profits from Pacific Coast oil engendered experimentation, diversification, and the creation of a differentiated and innovative regional petroleum industry. Specifically, asphalt and fuel oil industries helped keep the petroleum sector afloat and structured industrial organization during the “Black Gold Rush.”³⁴ Unlike other oil regions, California’s petroleum industry was competitive before WWI. No single firm wrested a monopoly like the rapid growth and early dominance of John D. Rockefeller’s Standard Oil (1870) syndicate in the eastern fields, which combined refinery capacity with integration forward to distribution and backward to oil extraction. Scholars generally attribute the decline of Standard Oil’s dominance of the American petroleum industry after 1882 to the unpredictability of crude oil supplies coupled with the narrow range of consumer products, which created periods of crude oil oversupply. Short-term instability created market space and competitive opportunities that attracted new firms to the industry. An array of vertically integrated competitors offered new oil products beyond the grasp of Standard’s control.³⁵

In California, new strikes, or “flush fields,” also induced upstart independents but the dominant firms were entrenched before the truly flush production began, a reversal of the situation in the eastern oil industry (although flush crude production had formed the basis for California’s early firms, it was on a much smaller scale before 1900). Fuel oil and asphalt were especially important in the competitive structure and innovative activity of the California oil industry between 1895 and 1911, before gasoline and naphtha became the leading petroleum products. The original Los Angeles field was the major source of commercial production in California during the 1890s. Edward Doheny, among others, pioneered production in this area

³¹ Peckham, “What is Bitumen?” 174.

³² Ibid., 174.

³³ Leib-Keyston, *Paraffine Companies Inc.*

³⁴ Andreano, “California Petroleum Industry.”

³⁵ Ibid., 172; Johnson, “California and the National Oil Industry,” 155-56.

by selling the heavy grade crude locally as fuel. Output at Los Angeles began slowly in 1893 and 1894, but by the end of the century it had grown to about half the state's total output of 2.6 million barrels.³⁶

From the earliest discoveries in the Los Angeles field, local industries, particularly railroads, welcomed the opportunity to use oil fuel in the face of meager coal supplies. Just as the California Steam Navigation Company had developed engines capable of burning brittle sub-bituminous Mt. Diablo coal (see Chapter 2), California's oil entrepreneurs developed burners capable of generating steam from California petroleum derivatives. After a decade of experimentation, Union Oil Company of California equipped the first locomotive to burn crude oil in 1887. Behind Union Oil's promotional efforts, the Santa Fe Railroad began burning California crude in its engines by the early 1890s. The Southern Pacific soon followed. By 1904, every trunk and local road in the state burned California fuel oil. According to one estimate, the use of fuel oil in lieu of imported coal saved railroad companies \$32 million between 1902 and 1906. Marine vessels augmented railroad demand for fuel oil; the U.S. Navy consumed nearly 750,000 barrels in 1911 alone.³⁷

Before 1900, the city of Los Angeles pioneered oil-burning equipment installed in municipal power plants, which were fed by oil piped from the Los Angeles fields. Use of fuel oil spread rapidly and effectively along the Pacific Coast. By 1901, production emanated from Los Angeles, including refineries near Bakersfield and Coalinga and, by 1911, crude production in California reached a level far in excess of any earlier U.S. oil territory. A minimum of fifty percent, and up to eighty percent, of California's total crude output went towards fuel oil between 1900 and 1911.³⁸

Although refining capacity was mainly important as an adjunct to fuel oil operations, asphalt was also an important product of California crude. Asphalt provided a crucial diversification and market segment for California's early petroleum industry, which found widespread applications and a national market.

Chemical engineers' successes paving Newark, New Jersey's streets in 1870 sparked wide adoption of imported natural asphalt (not oil asphalt) as a paving material, supplanting wood blocks, bricks, macadam crushed-stone roads, and coal tar paving materials. A Trinidadian caldera known as Pitch Lake quickly became the world's foremost source of natural asphalt. Miners gorged chunks of asphalt out of the 115-acre surface of the tarry "lake," only to find the cavities refilled within two days. In time asphalt entrepreneurs constructed a railroad from the deposit to a steel pier, which eased transport onto ocean-going freighters. This seemingly bottomless pit produced ninety percent of the asphalt consumed globally between 1875 and 1900.³⁹ Control of Trinidad output shaped both the asphalt industry and the urban landscape in the U.S.

³⁶ Andreano, "California Petroleum Industry," 177.

³⁷ Ibid., 179-181.

³⁸ Ibid., 174, 177-81 Sutter, "California's Oil," 20; Gerald White, "California's Other Mineral," 142; Williams, *Making of Modern California*, 120-24; Palmer Oil Company, *California's Greatest Industry*, 2.

³⁹ I. B. Holley, Jr., "How Asphalt Paving Came to the Urban United States," *Technology and Culture* 44, no. 4 (October 2003): 728; "The Pitch Lake and the Asphalt Industry of Trinidad," *Scientific American*, March 16, 1901, 166.

The Barber Asphalt Paving Company (1881) purchased raw material from various leaseholders in Trinidad before securing a concession on the entire Pitch Lake in 1888.⁴⁰ Within a decade, Barber Asphalt had paved some fifteen hundred miles of streets in over one hundred U.S. cities and then tried to quash competition by forming the “Asphalt Trust.” The Asphalt Company of America incorporated in 1899 and sold \$30 million worth of bonds, setting aside five percent of the funds for acquiring smaller competitors. When formed, it allegedly controlled about ninety five percent of U.S. natural asphalt manufacturers, as well as paving companies that controlled roughly three-fourths of all U.S. paving contracts (totaling around 2,275 miles of paving annually).⁴¹

Nevertheless, the Trust’s financial and managerial difficulties, combined with a broader understanding of asphalt chemistry and paving techniques, allowed California’s oil asphalt manufacturers to make inroads into the national paving industry at the turn of the century.⁴² Oil asphalt proved a superior binding agent for cements and an excellent surfacing material known as “road oil.” In Pennsylvania, the special refining quality of the oil and market instability (created by episodic variation in the supply of crude) created a spin-off industry and specialized market segment in lubricating oils. What lubricating oils were to Pennsylvania, asphalt was to California. The dynamic and competitive California asphalt industry provided opportunities for new, smaller, and less intensively integrated firms to compete with the larger businesses.⁴³ By 1894, California’s two dozen asphalt mining and refining companies in Kern, Santa Cruz, San Louis Obispo, Santa Barbara, and Ventura counties became the principal producers of both rock and oil asphalt in the U.S.⁴⁴

Production of domestic asphalts increased by about 500 percent between 1899 and 1909, while imports of natural asphalt decreased proportionately (from twenty times that of domestic production to only one-half).⁴⁵ California’s oil asphalt output expanded spectacularly. Production increased by over eighty-five percent between 1901 and 1905, accounting for all U.S. production. Combined with natural asphalt, California accounted for eighty percent of all U.S.

⁴⁰ Barber’s Trinidad Asphalt Company controlled the concession for Pitch Lake. The story of the “Asphalt Trust” has yet to be fully told; see, Henry George, Jr., “Modern Methods of ‘Finance’: Example III.—The Asphalt Trust Catastrophe,” *Pearson’s Magazine*, March 1904, 251-265; Holley, “Asphalt Paving,” 703-33; Brian McBeth, *Gunboats, Corruption, and Claims: Foreign Investment in Venezuela, 1899-1908* (Westport, CT: Greenwood Press, 2001), 41-50; John Moody, *The Truth About Trusts: A Description and Analysis of the American Trust Movement* (New York: Moody Publishing Company, 1904).

⁴¹ Subsequent iterations included National Asphalt Company (1900) and General Asphalt Company (1903). Moody, *The Truth About Trusts*, 295; Holley, “Asphalt Paving,” 709-713.

⁴² Holley, “Asphalt Paving,” 723; F.H. Minnard, “California Asphaltum Industry,” 28-29.

⁴³ Andreano, “California Petroleum Industry,” 181.

⁴⁴ J.J. Crawford, *Twelfth Annual Report of the State Mineralogist, Two Years Ending September 15, 1894* (Sacramento: State Office, 1894), 26-33.

⁴⁵ “Asphaltum. J. W. Howard, New York City, Suggests a New Classification for Asphaltum and its Compounds,” United States Congress, House Committee on Ways and Means, *Tariff Hearings Before the Committee on Ways and Means of the House of Representatives, Sixtieth Congress, Monday, March 1, 1909, (Appendix)* (Washington: Government Printing Office, 1909), 7559.

asphalt production.⁴⁶ The California legislature further stimulated the industry with the first large appropriation (\$18 million) for road paving in 1910.⁴⁷ By 1911, California produced over 150,000 tons of oil asphalt, a two hundred percent increase since 1905.⁴⁸

Between 1895 and 1911, production and distribution of asphalt from California crude was a major activity of independent and generally smaller business units. Many of these firms fully integrated and incorporated into their operations' crude production, small gathering lines, field asphalt refineries, and marketing organizations. Others, who relied on crude supplies from the major producing and transport companies, sold to larger marketing concerns or through intermediaries. Historian Ralph Andreano estimated that approximately twenty-eight plants existed between 1900 and 1911, with an average collective monthly capacity of 30,000 tons.⁴⁹ Nevertheless, during these years three firms dominated all levels of the California oil industry from production through wholesale and retail marketing—Standard Oil Company, Union Oil Company and its affiliates, and the various interest of the Southern Pacific.⁵⁰ Asphalt proved crucial for these large operators, as well.

The Southern Pacific's major petroleum holding, Associated Oil Company of California, produced an average of seventeen percent of California's total crude output between 1904 and 1907 and manufactured only fuel oil and asphalt.⁵¹ Fuel oil and asphalt were also Union Oil Company's main sources of revenue before 1906. By the turn of the century, Union Oil was a completely integrated firm with extensive crude oil production, refining capacity in every major area of California, trunk pipeline connections, a marine fleet, and distribution stations along the Pacific coast and Panama Canal Zone and Pacific Islands. In addition to an array of refined oil, Union Oil Company's two refineries at Oleum (now Rodeo) and Bakersfield produced oil asphaltum, known as "the Maltha brand." Under the leadership of Union's sales department, ten California asphalt producers banded together in the "California Asphaltum Sales Agency" and secured a special \$10 per ton freight rate to Atlantic Seaboard cities. The agency joined with other California producers in effective lobbying efforts for high tariffs on imported natural asphalt (Figure 6.1).⁵² A new market for asphalt enabled Union to generate a larger revenue for each barrel of crude refined. The small refinery yields of the most important consumer products—kerosene and naphtha—could be more than compensated for, in terms of revenues, by sales of asphalt and fuel oils.⁵³

⁴⁶ Edmond Hovey, "Asphaltum and Bituminous Rock," in David Day, *Mineral Resources of the United States; Calendar Year 1905* (Washington, D.C.: Government Printing Office, 1906), 1163; Palmer Oil Company, *California's Greatest Industry*, 84.

⁴⁷ White, *Formative Years in the Far West*, 383.

⁴⁸ Palmer Oil Company, *California's Greatest Industry*, 84.

⁴⁹ Andreano, "California Petroleum Industry," 182-83.

⁵⁰ *Ibid.*, 184.

⁵¹ *Ibid.*, 186, 188-89.

⁵² *Tariff Hearings*, 7845; "The Union Oil Co. of California," *San Francisco Call*, December 17, 1905, 66.

⁵³ Andreano, "California Petroleum Industry," 183.

Standard Oil experienced little growth in California until 1907, when it began increasing direct ownership of oil lands and developed huge pipeline and storage networks and refining of its traditional product, illuminating oil, but did not begin manufacturing petroleum asphalt until 1909. Excess crude supplies, Standard's hesitation in entering the markets, and the speed with which new markets developed all contributed to greater competition for Standard Oil in California. It was the fuel oil and asphalt markets that permitted firms such as Union Oil Company and Associated Oil Company to build their initial market positions. These firms expanded with the spread of new oil fields and broadened their production line to take advantage of new market demands. Standard Oil's California power was limited to kerosene between 1895 and 1911, and this was not a sufficiently important segment of the market to give Standard much leverage in controlling the rate of new firms entering the industry. Rather than Standard extending its national position to California, the "bad" refining quality of the crude and development of indigenous technology helped preclude the incursion of national firms.⁵⁴

U.S. oil asphalt production increased from 161,187 short tons valued at \$2.25 million in 1910 to over 700,000 short tons worth close to \$8 million in 1917 (Figure 6.2).⁵⁵ Nationwide adoption of California asphalt products, however, precipitated the spread of California refining technology. Advances in chemical engineering led to breakthroughs in refining Oklahoman and Mexican oils long thought to be unsuitable for asphalt production. Oklahoma surpassed California in total oil asphalt production by 1919, though California continued to lead all states in value of output.⁵⁶ Asphalt rendered from Mexican petroleum imports posed greater competition to California's asphalt producers. After increasing by close to 500 percent between 1913 and 1919, output from U.S. refiners of Mexican crude outpaced U.S. refiners of domestic petroleum, though asphalt made from domestic oil retained more value (Figure 6.3).⁵⁷

Before the southland's companies paved the way for the eastern expansion of the oil asphalt industry and California technology helped unlock other oil sources, Pierce and Beardsley's innovation in petroleum processing formed the basis for a new industry. The use of oil asphalt as an industrial input in the 1880s had qualitative impacts on California manufacturing technologies. With capital and corporate strategy provided by Bay Region dynamite entrepreneurs, PABCO's commercialization of asphalt-based products represented a key diversification of the Bay Region's dynamic chemicals cluster that quickly spread across eastern and global markets.

Chemicals Capital

With asphalt patents pending, Pierce and Beardsley leveraged connections to explosives manufacturers likely made through oil excavation and asphaltum mining. They turned to a cadre of California's leading mining financiers, who had diversified into dynamite production (see Chapter 3):

⁵⁴ Ibid., 186-87, 192.

⁵⁵ K.W. Cottrell, "Asphalt and Related Bitumens," in G.F. Loughlin, *Mineral Resources of the United States, 1919: Part II—Nonmetals* (Washington: Government Printing Office, 1922), 281-82;

⁵⁶ Cottrell, "Asphalt and Related Bitumens," 281-82; Holley, "Asphalt Paving," 724.

⁵⁷ Loughlin, *Mineral Resources*, 281-82; "Asphalt Production in 1914," *Petroleum Gazette* 20, no. 6 (September 1915): 28.

Probably owing to the fact that it was financed largely by powder men, [PABCO's] original financial structure followed that of the ordinary mining company—it was capitalized at \$1,000,000, divided into 1,000,000 shares of \$1.00 par value each.⁵⁸

Investors actually paid in just \$55,000 and Pierce and Beardsley received \$60,000 in stocks for their “P&B” patents when the Paraffine Paint Company (PABCO) incorporated in 1884.⁵⁹

Ralph L. Shainwald promoted and organized PABCO before becoming its first president. In doing so, he became a key link between the Pennsylvania oilfields and the Bay Region dynamite industry.⁶⁰ Shainwald had managed the regional finances for Culver, Penn & Co., an investment house prominently identified with Pennsylvania's early oil boom. It built pipelines and the Oil City & Pithole Railroad, which supplanted the Allegheny River for transporting Oil Creek petroleum to refineries in Reno, PA (many of which Culver, Penn & Co. financed). With rapid speculation and frantic overproduction, however, the bubble burst by 1867.⁶¹ Amid charges of corruption, Penn, Culver & Co.'s bankruptcy affected northwestern Pennsylvania's banks and oil interests “at every point.”⁶² After a stint in Europe and a decade in international banking, Shainwald arrived in San Francisco and quickly aligned himself with California's foremost mining and dynamite entrepreneurs.⁶³ California's “powder men” supplied PABCO's capital, corporate organization, and two-pronged spatial strategy consisting of Bay Region industrial suburbanization and national market expansion

Thomas Bell helped finance PABCO and, along with Egbert Judson and Lester L. Robinson, he guided Giant Powder Company from two San Francisco locations, to Flemming Point in West Berkeley. Bell, who was also a leader of the Bank of California, joined Judson, Robinson, and PABCO investor Albert Dibblee in the directorship of Atlantic Giant Powder Company, which was formally an autonomous corporation but functionally a Giant Powder

⁵⁸ Leib-Keyston, *Paraffine Companies Inc.*

⁵⁹ Charles Geiger, “The Organization of the Paraffine Companies for Industrial and Commercial Purposes,” *Western Canner and Packer* 13, no. 9 (January 1922): 82; Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930* (San Francisco: H.S. Crocker Co, Inc., 1934).

⁶⁰ Leib-Keyston, *Paraffine Companies Inc.*; *National Cyclopaedia of American Biography*, vol. 16 (New York: James T. White & Company, 1918), 313;

⁶¹ Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Free Press, 1991), 32-34; *The Derrick's Hand-Book of Petroleum: A Complete Chronological and Statistical Review of Petroleum Developments from 1859 to 1898* (Oil City, PA: Derrick Publishing Company, 1898), 64.

⁶² United States Industrial Commission, *Preliminary Report on Trusts and Industrial Combinations* vol. 6, (Washington, DC: Government Printing Office, 1900), 414.

⁶³ Mining financiers also directly entered California oil extraction, transportation, and refining industries. Lloyd Tevis and Charles Felton's Pacific Coast Oil Company bought several older firms in Los Angeles and built a refinery in the city of Alameda. Their successful drilling efforts in the Pico oil district reinvigorated California's sputtering oil sector, increasing state oil production from 13,543 barrels in 1879, to 128,665 barrels in 1882. In 1900, Standard Oil Company (New Jersey), successor to Standard Oil Company of California, bought the Pacific Coast Oil Company. White, *Formative Years*, 59-89; Hutchinson, *Oil, Land and Politics*. vol. 1, 330-339.

branch plant founded in northwestern New Jersey in 1872.⁶⁴ Joseph Powning was president of the California Powder Works Company before becoming PABCO's first president. With the development of Hercules Powder, the state's oldest black powder manufacturer became Giants Powder's first real competitor in the high explosives industry. California Powder Works' Hercules Powder plant moved from San Francisco to Hercules, a company town north of Point Pinole.⁶⁵ California's dynamic and super-profitable high explosives sector engendered heavy investment, rapid innovation, and fierce competition. Upstart companies scrambled to develop new high explosives for the market and to circumvent Giant Powder's patents in the courts. After a falling out among Giant Powder's leaders, Shainwald became secretary of Robinson's new Vulcan Powder Company (1879). Vulcan contracted a Boston nitroglycerin manufacturer to build and operate a dynamite factory on the Truckee River near Reno, Nevada, before relocating to a 250-acre shoreline site in Contra Costa County near Stege (now part of Richmond).⁶⁶ Shainwald and Bell backed Robinson's Tonite Powder Company (1880), a collaboration with the Cotton Powder Company of England to manufacture the first nitrocellulose in the U.S. The firm built a factory just 100 yards from the Vulcan works at Stege and planned to build a second factory on the East Coast but prohibitively expensive specialized cotton imports forced the firm to close in 1885.⁶⁷ Judson fell-out with Giant Powder leaders, as

⁶⁴ Arthus Van Gelder and Hugo Schlatter, *History of Explosives in America* (New York: Columbia University Press, 1927), 490; "A Condensation of Items of Yesterday's News," *Daily Alta California* March 6, 1880, 1.

Applied chemistry also figured heavily in wood pulp and paper production. Dibblee was a director of the Pioneer Pulp Mill, created by Judson and Anthony Chabot in 1885. Investments in new chemistry and wood-grinding technology rendered the first wood pulp manufactured from indigenous timber stock on the Pacific Coast. The mill, located in Towels, Placer County, facilitated the shift from straw and jute and unsatisfactory and expensive eastern dry pulp imports to "wet" California wood pulp for paper production. The Pioneer mill supplied pulp to Judson's California Paper Company mills in Stockton, as well as "wood flour" used as an absorbent for nitroglycerine in Judson's dynamite production. The California Paper Company spun-off the Willamette Pulp and Paper Company of California in 1888, which subsequently absorbed California Paper and pioneered wood pulp production in Oregon (Oregon City, now West Linn). The Oregon mill supplied twenty tons of pulp to the Stockton mills before merging with Crown Columbia Paper Company to form Crown Willamette Paper Company (1914). A subsequent merger with Zellerbach Corporation in 1928 created Crown Zellerbach Corporation, which acquired PABCO in 1956. W. Claude Adam, "History of Papermaking in the Pacific Northwest: I," *Oregon Historical Quarterly* 52, no. 1 (March 1951): 21-37; Glenn Humphreys, "Printing, Publishing, and Ancillary Trades: A Checklist of Manuscript and Archival Holdings in the Edward C. Kemble Collections on Western Printing & Publishing, California Historical Society Library, San Francisco," *California History* 66, no. 1 (March 1987): 64-65; George Tinkham, *A History of Stockton From its Origins Up to the Present Time* (San Francisco: W.M. Hinton & Co., 1880), 385; Wood, *History of Alameda County*, 861-62; *Fibreboard Paper Products Corporation Annual Report, 1956* (San Francisco, 1957); *Thomas' Register of American Manufacturers and First Hands in All Lines* (New York: Thomas Publishing Co., 1905), 808; "California Paper Co.," *San Francisco Chronicle*, January 1, 1888, 23; "Our Factories," *San Francisco Chronicle*, January 1, 1889, 22; "Towles," *San Francisco Chronicle*, June 22, 1890, 28.

⁶⁵ Mae Fisher Purcell, *History of Contra Costa County* (Berkeley: Gillick Press, 1940), 646; Thomas J. Vivian, *The Commercial, Industrial, Agricultural, Transportation, and other Interests of California: Being a Report on that State for 1890 Made to S. G. Brock, Chief of the Bureau of Statistics, Treasury Department*, (Bureau of Statistic, Treasury Department, 1891), 422; *A Memorial and Biographical History of Northern California, Illustrated* (Chicago: The Lewis Publishing Company, 1891), 131.

⁶⁶ Mae Fisher Purcell, *History of Contra Costa County* (Berkeley: Gillick Press, 1940), 646-47.

⁶⁷ Purcell, *History of Contra Costa County*, 647; Van Gelder and Schlatter, *History of Explosives*, 655; Willoughby Walke, *Lectures on Explosives, Prepared Especially as a Manual and Guide in the Laboratory of the U. S. Artillery*

well. Backed by Bell, he incorporated the Judson Dynamite and Powder Company in 1891 and built a sprawling manufacturing complex at the foot of Albany Hill, then known as Noble Station.⁶⁸

Emanating from the first dynamite made in the U.S. at Judson's chemical works at 15th and Valencia streets in San Francisco's Mission District, a cluster of powder manufacturers including Atlas, Eureka, Excelsior, Granite, Safety Nitro, and Vigorit joined Giant, Hercules, Vulcan, and Tonite on the East Bay shoreline. Industrial dispersal from San Francisco created a dynamite district stretching along twenty miles of shoreline from Flemming Point in West Berkeley to Hercules on San Pablo Bay (near the Carquinez Strait). Suppliers and kindred manufacturers added to the Bay Region's expanding dynamite district. Judson's San Francisco Chemical Works not only supplied nitric and sulfuric acid to Giant Powder but also was integrated into the production process at Giant's several locations. Shainwald helped organize and manage Western Chemical Company and the California Cap Company, manufacturers of detonators.⁶⁹ F.J. Fletter was a chief owner of the California Cap Company before becoming PABCO's first general manager. By the turn of the century, Stege alone included Metropolitan Match Company, Union Super Phosphate Company, Pacific Cartridge Company, and several branches of the Stauffer Chemical Company.⁷⁰

Nuisance land use regulations and residential encroachment forced explosives manufacturers to flee the urban core. The necessity of increasingly large factory sites due to advances in production technique also sent dynamite production towards the periphery. But rather than isolated firms dotting the metropolitan edge, flows of capital, technology, and corporate management created an integrated metropolitan dynamite district. Spin-offs and myriad suppliers created connective tissue and helped attract investment and factories, reinforcing the chemicals agglomeration before the Du Pont Company's entry and the centralization of the nation's high explosives sector.

PABCO was in the vanguard of the expansion of the Bay Region's chemicals cluster, initiating a key diversification from explosives to petrochemicals. But rather than technological assets, production processes, linkages, and suppliers, dynamite entrepreneurs provided capital, corporate organization, and an accumulation strategy predicated on Bay Region industrial suburbanization and rapid eastern expansion to create and capture new markets.

School (Fort Monroe, VA: Artillery School Press, 1891), 243; "The City," *Daily Alta California*, 26 Feb. 1880, 1; "General Abbot's Latest Experiments on Explosives," *Engineering and Mining Journal* 37, no. 1 (January 5, 1884): 26-27.

⁶⁸ Van Gelder and Schlatter, *History of Explosives*, 448-50, 681-83; "New Enterprises," *San Francisco Chronicle*, 7 July, 1890, 16; "Millions of Capital," *San Francisco Call*, September 7, 1890, 4; Editorial, *Industry* 3, no. 34, (May 1891): 159.

⁶⁹ *American Biography*, 313.

⁷⁰ Gerald Kutney, *Sulfur: History Technology, Applications & Industry* (Toronto: ChemTec Publishing, 2007), 14; Whitman Symmes, "How Dynamite is Made," *The Chemical Engineer* 5, no. 7 (May 1907): 366.

Innovation and Integration

PABCO created a regional production chain and relied on several specialized suppliers because novel oil inputs were not otherwise available. Bard's Union Oil Company supplied petroleum to PABCO's small refinery near Ventura. PABCO returned the distillate to Union's tanks and shipped the asphalt residue to the Emeryville factory, where it was processed into liquid asphalt, the key input for the initial line of products branded in honor of Pierce and Beardsley. P&B Paint came in red and black. Oakland's California Cotton Mill supplied burlap, which PABCO saturated in asphalt to make P&B Roofing, a pioneering "ready-to-lay" roofing that began supplanting more expensive and labor-intensive "pitch" roofing and metal, slate, and tile shingles.⁷¹ Antioch's California Paper and Board Mill supplied thick straw-based paper, or strawboard, to which PABCO applied asphalt and manufactured "building papers," an effective moisture barrier and insulator when placed between woodwork and plaster.⁷²

PABCO products found an array of applications beyond the building trades, particularly in Western natural resource extraction and processing industries. "Owing to its great resistance to acid and alkali, fume and vapor attack, and to its waterproof and insulating qualities it will be found invaluable," a P&B Paint advertisement claimed.⁷³ Indeed, mining companies used the paint to protect shafts and tunnel timbers from rot and decay, and to guard hoists, pumps, and pipes from corrosion and oxidation. Smelters and refiners from Montana to Arizona quickly adopted P&B paint to defend their shops, vats, and machinery from acidic fumes. "Your paint is as necessary to the success of the cyaniding process as is the cyanide itself," the developers of the revolutionary amalgamation technique reportedly claimed.⁷⁴ Giant Powder Company purchased PABCO waterproof paper *en masse* for dynamite storage and transport. P&B insulating compounds, a variant of the basic paint, shielded dynamos from moisture and safeguarded switchboards from fire. "The Pacific Postal Telegraph Cable Company are painting their bare wires, on the Pacific coast, with 'P. & B.,'" *The Electric Engineer* reported, "it having been demonstrated that wires so painted have worked perfectly during the heaviest rains, and the densest fog, while through the unpainted wires not a tick could be heard at such times."⁷⁵ A \$17,000 contract from the State Harbor Commissioner for protecting San Francisco piers against

⁷¹ Derived from coal tar, "pitch" was used to coat layers of paper or felt, then sprinkled with gravel or other granular materials, or heated with lime, wood, or coal ashes to apply as roofing.

⁷² Dozier Finley, "Petroleum Asphalts in the Roofing and Waterproofing Industries," *Chemical & Metallurgical Engineering* 27, no. 16 (October 18, 1922): 798-99; Goodyear, "Petroleum, Asphaltum, and Natural Gas," 11; Edgar Hinkel and William McCann, *Oakland 1852-1938: Some Phases of the Social, Political and Economic History of Oakland, California, Volume Two* (Oakland: Works Progress Administration, 1939), 838; Leib-Keyston, *Paraffine Companies Inc.*; Peckham, "What is Bitumen?" 174; Seagrave, "East Meets West," 5, 12; Westsmith, "First Pacific Coast Oil Still," 524; Dean Witter, *Paraffine Companies*.

⁷³ "P. & B. Paint," advertisement in *California Mines and Minerals*, (San Francisco: California Miners' Association, 1899): 20.

⁷⁴ Leib-Keyston, *Paraffine Companies Inc.*

⁷⁵ "P.&B. Insulating Compounds," *The Electrical Engineer* 13, no. 192 (January 6, 1892): 25.

teredo, a wormlike bivalve, paved the way for many pile coverings contracts from the U.S. government and several railroad companies.⁷⁶

PABCO's yearly output reached 100,000 gallons of paint, 500,000 yards of building paper, and 75,000 yards of both roofing and pile covering by 1891.⁷⁷ The range of products marketed under the "P & B" brand name included: Ideal Color Paint, Keg Vat and Barrel-Coating Paint, Roof Preservative Paint, and Waterproof Preservative for Brick and Stone; Acid and Alkaline Proof Compounds and Electrical and Insulating Compounds; Ideal Roofing; Building Papers, Insulating Papers, Single-Coat Express Papers (for packaging), and Teredo Proof Pile Covering, "the only successful method used on this coast, and endorsed by prominent experts, and by State and United States officials."⁷⁸

Problem solving and increased technical competence in petroleum manufacturing influenced PABCO's decisions whether to "make or buy," as economist Ronald Coase famously put it.⁷⁹ On-going innovation, diversification, and enhanced technical competence created new production processes and new products. Changing input requirements and the vagaries of specialized supply markets further led to PABCO's piecemeal process of vertical integration in order to generate its own inputs at the Emeryville site.

The Union Oil Company forced PABCO into an asphalt contract after refusing to supply petroleum to PABCO's Ventura County refinery, and then quickly boosted prices. The Asphalt Company of America, successor to the Barber Asphalt Paving Company, also affected the California market by acquiring local asphalt plants, including PABCO's Ventura refinery. With options to contract petroleum from other sources, PABCO relocated its refinery equipment from Ventura to Emeryville and began turning out seventy-five tons of asphalt a month. It was later replaced with a modern refinery, which, though still small-scale, was one of only three refineries in Northern California and one of ten in the state at the turn of the century.⁸⁰

Vagaries in the market for key inputs led to a second major integration at Emeryville, one that keyed a pivotal innovation. PABCO's roofing production relied on burlap made by the California Cotton Mills from Indian jute imports. After enlarging and electrifying its roofing factory, a drought-induced price spike made jute prohibitively expensive. PABCO then developed a new kind of roofing material, Malthoid, which consisted of felt coated in asphalt. Malthoid soon became the national standard for "ready-to-roll" roofing. Water content, however, accounted for about ten percent of the weight of raw felt imported from the east. Rather than paying freight charges for water, PABCO designed and constructed the West's first felt mill at the Emeryville site in 1905, just four months before the earthquake and fires devastated San Francisco. With limited competition and unlimited demand, PABCO's factory

⁷⁶ Finley, "Roofing and Waterproofing Industries," 799; Hinkel and McCann, *Oakland*, 838; Leib-Keyston, *Paraffine Companies Inc.*; "Tracking the Harbor Board," *Daily Alta California*, February 1, 1989, 14; "P.&B. Paint," advertisement in *California Mines and Minerals*, 20.

⁷⁷ "Paraffine Paint Company," *Master Hands in the Affairs of the Pacific Coast* (San Francisco: Western Historical Publishing Company, 1892), 265.

⁷⁸ *Ibid.*

⁷⁹ Ronald Coase, "The Nature of the Firm," *Economica* 4, no. 16 (November, 1937): 386-405.

⁸⁰ Watts, *Oil and Gas Yielding Formations*, 171-72; Westsmith, "First Pacific Coast Oil Still," 524; Leib-Keyston, *Paraffine Companies Inc.*

operated at full capacity and around the clock to manufacture building materials for reconstruction (Figure 6.4).⁸¹

Covering the East

The spectator sees Paraffine constantly pushing the boundaries of the East further Eastward.

*Port of Oakland Compass*⁸²

The value of PABCO's innovations is perhaps most clearly measured by rapid market expansion. Following Giant Powder Company's strategy, Shainwald moved to New York City in 1886, the year PABCO secured its patents, and organized an east coast analogue. Standard Paint Company (SPC) paid PABCO in stock for their P&B patents. Although autonomous corporations, SPC shared PABCO's technological assets, corporate strategies, and finances. Shainwald installed his brother at PABCO and remained a leading stockholder while serving as SPC president for over three decades. He quickly divided the nation into two markets separated by the Rocky Mountains. With inputs from California, SPC began manufacturing asphaltic paint, roofing, and building papers at a factory in Sumerville, New Jersey, located about forty miles southeast of SPC's Manhattan headquarters.⁸³ In this way, California resources, technology, and modes of corporate organization created, and temporarily secured, a national market for asphalt-based paint and building materials.

In addition to P&B paint and building supplies, SPC used California asphalt to manufacture products specialized for industries east of the Rockies, such as insulating roofing for refrigerated railroad cars (Figure 6.5).⁸⁴ SPC's version of Malthoid roofing, Rubberoid, realized immediate and enduring success. Like Kleenex facial tissues or Xerox photocopies, the brand name Rubberoid became a generic category for prefabricated, or "ready-to-roll," roofing regardless of any relationship to the original in manufacturer, formula, or even appearance. Pariod and Rubero headed a long list of roofing products connoting the Rubberoid brandname.⁸⁵

⁸¹ Leib-Keyston, *Paraffine Companies Inc*; Seagrave, "East Meets West," 14-15; Dean Witter, *Paraffine Companies*.

⁸² E. F. Seagrave, "East Meets West," 3.

⁸³ SPC in 1905 acquired 57 percent ownership of PABCO and retained control until 1921. The companies collectively paid stockholders over \$24.5 million in dividends between 1884 and 1935. Geiger, "Organization of the Paraffine Companies," 82; M.V. Montgomery, *Annual Report of the Commissioner of Patents for the Year 1886* (Washington, DC: Government Printing Office, 1887), 256; John Moody, *Moody's Analysis of Investments, Part II: Public Utilities and Industrials* (New York: Moody's Investor Service, 1917), 2061; Peckham, "What is Bitumen?" 174; "Annual Report of Standard Paint Company," classified advertisement in *New York Times*, January 19, 1888, 6; *The Fitch Bond Book, 1921*, (New York: The Fitch Publishing Company, 1921), 1157; *Moody's Manual of Railroads and Corporation Securities; Twenty-Third Annual Number, Industrial Section (Volume II—K to Z)* (New York: Poor's Publishing Company, 1922), 935.

⁸⁴ Finley, "Roofing and Waterproofing Industries," 799; "P.&B." advertisement in John Wait, *The Car-BUILDER's Dictionary* (New York: The Railroad Gazette, 1895), 41.

⁸⁵ Thomas Boorman, *Asphalts, Their Sources and Utilizations* (New York: William T. Comstock, 1908), 160-161; Finley, "Roofing and Waterproofing Industries," 799; "Ruberoïd Roofing," *The Colliery Engineer and Metal Miner* 16, no. 11 (June, 1896): 248.

SPC established branch offices in Boston, Chicago, Denver, Kansas City, Philadelphia, St. Paul. By 1911, the firm had built new factories in South Bound Brook, NJ, and Chicago, which manufactured six types of preservative and waterproofing paints, Rubberoid roofing, colored roofing and flooring, and building, sheathing, and insulating papers. With exports “sold to all parts of the civilized world” and a capital stock topping \$5 million, SPC was considered among the largest firms of its kind well before SPC reincorporated as the Ru-ber-oid Company in 1921.⁸⁶

In addition to dividing the U.S. market between PABCO and SPC, Shainwald oversaw the creation of a global market. After founding the Standard Paint Company of Canada, he organized several European branches, including Rubberoidwerke Atkien Gessellschaft in Hamburg and Berlin, Ruberiod Company of England, Societe Anoyne Ruberiod in Paris, and the Russian Rubberoid Company of Petrograd. The “six companies agreement” in 1903 divided up world markets among the branches (each corporation was restricted in the use of its trademarks to certain territories). Nevertheless, Rubberoid and other P&B building materials were a product of California’s raw resources, pragmatic innovations, capital, and corporate strategy; “It is now recognized that the materials which are best adapted to the manufacture of ready-to-lay roofing must conform in great measure to the standards established by the early work of Pearce and Beardsley in California,” according to one analyst in the early 1920s.⁸⁷

From Asphalt to Agriculture

The Paraffine management early perceived that the natural wealth of California represented by agricultural and dairy products provided a splendid potential market for boxboard products. Paper cartons, folding boxes, shipping cases, paper cans and containers and egg fillers constituted a basic need of the farmers and organizations selling dried and canned California fruits, fish canneries, coffee manufacturers, poultry dealers and the important dairy industry.

Dean Witter & Company, 1936⁸⁸

In 1912, PABCO reached beyond its Emeryville factories and spent \$500,000 to acquire the California Paper and Board Mill in Antioch, the largest paper manufacturer in California and the only manufacturer of strawboard in the West.⁸⁹ PABCO had relied heavily on the mill’s

⁸⁶ John William Leonard ed., *Who’s Who in Finance* (New York: Joseph & Sefton, 1911), 678; *The Fitch Bond Book, 1921*, (New York: The Fitch Publishing Company, 1921), 1157; *Moody’s Manual of Railroads*, 935; *National Cyclopaedia of American Biography, Volume XVI*, (New York: James T. White & Company, 1918), 313; *Sweet’s Catalogue of Building Construction for the Year 1911* (New York: The Architectural Record Co, 1911), 68; “New Companies,” *The Electrician* 57, no. 13 (July 13, 1906): 522; “The Standard Paint Company Gives a House Warming to its Employees,” *Electrical Review* 42, no. 18 (April 25, 1903): 25.

⁸⁷ Finley, “Roofing and Waterproofing Industries,” 799; Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930* (San Francisco: H.S. Crocker Co, Inc., 1930).

⁸⁸ Dean Witter, *Paraffine Companies*.

⁸⁹ Mortimer Belshaw, Judson’s partner in the Cerro Gordo silver strike and Mt. Diablo coal mines, owned the mill, which was leased and expanded by Zellerbach Paper Company interests in 1901. “Paraffine Paint Company Acquires Antioch Mills,” *Paper Trade Journal* 59, no. 13, (March 28, 1912): 38.

boxboard, also referred to as pulp board and paperboard, for production of asphalt-based building materials. The acquisition keyed the diversification of PABCO's product line into non-asphalt building materials, starting with wallboard. Consisting of thick layers of boxboard glued together, wallboard promised to replace lath and plaster in building construction. With the acquisition of a key supplier, or upstream integration, and downstream diversification into non-asphaltic consumer goods, PABCO initiated a "policy of expansion into allied lines, a policy which has made it one of the largest industrial firms on the Pacific Coast" according to a prospectus published in 1926.⁹⁰

Once entered into paper and boxboard manufacturing, PABCO rapidly diversified its product lines and expanded its corporate holdings. In doing so, the firm shifted much of its focus from natural resource manufacturing to making industrial inputs for California's most productive natural resource industry, agribusiness. "The supply of inputs had been a vital site of the emergence of California agribusiness," according to Walker.⁹¹ That is, long-term expansion of output and productivity from California farms required the supplies and technological advances of an array of California industries. Nurseries and breeders grew seeds and stock; machine shops manufactured tools and equipment; ditch companies and irrigation districts tapped the Sierra watershed; and chemical works developed fertilizers and pesticides. Farm technology and supply industries evolved together and continuously, shaping California's distinctive mode of agrarian capitalism.⁹² Although banal compared to new machinery or experimental fertilizers, PABCO's specialized shipping containers provided not only crucial agribusiness inputs but also created a colossal new "home industry." Reliance on imported boxboard and attendant burdensome investments to maintain stock had stymied California boxboard and carton manufacturers. PABCO's entry into the industry "marked the beginning of a new epoch in the box manufacturing and carton industries on the Pacific Coast."⁹³

Through acquisitions, investments, and subsidiaries, within five years PABCO assembled and controlled a production chain stretching from Los Angeles to Seattle that covered all steps of container production. PABCO expanded into the booming Imperial Valley and Los Angeles markets by partnering with previous owners of the Antioch mill in order to build a boxboard mill in Vernon, an industrial suburb one mile south of downtown Los Angeles. Northern expansion began simultaneously with a Seattle sales office followed by the purchase of a mill under construction in Sumner, south of Tacoma, Washington. Boxboard flowed downstream to converting plants and shipping containers and cartons factories that PABCO acquired in Los Angeles and Oakland. Construction of container factories in Port Angeles, Washington and Emeryville soon followed.⁹⁴

⁹⁰ Leib-Keyston, *Paraffine Companies Inc.*

⁹¹ Richard Walker, *The Conquest of Bread: 150 Years of Agribusiness in California* (New York: The New Press, 2004): 200.

⁹² Walker, *Conquest of Bread*, 149-50.

⁹³ Geiger, "Organization of the Paraffine Companies," 83.

⁹⁴ Geiger, "Organization of the Paraffine Companies," 82; Leib-Keyston, *Paraffine Companies Inc.*; Dean Witter, *Paraffine Companies*; *The Commercial and Financial Chronicle* 107, no. 2787 (November 23, 1918): 2014.

PABCO next went back up the production chain in order to generate its own inputs for paper and boxboard manufacture. Instead of relying entirely on in-house strawboard or imported wood pulp for paper and boxboard manufacturing, PABCO constructed its own pulp mill in Port Angeles, adjacent to a lumber plant that supplied cheap spruce and hemlock “mill waste” inputs. Further, PABCO’s development of waste paper inputs for boxboard production created an enormous Pacific Coast recycling industry. PABCO acquired two southern California companies to collect, sort, and process huge volumes of newspapers and paper waste, which previously possessed little commercial value. During WWI shortages, PABCO established paper presses in every Pacific Coast city with a population over 5,000. Eventually, a PABCO subsidiary operated wastepaper collection and processing plants in California’s largest coastal and Central Valley cities, as well as in Tacoma, Spokane, and Vancouver, Washington.⁹⁵

PABCO reincorporated in Delaware in 1917 in order to skirt taxes, as well as centralize management of production and logistics of eight subsidiary companies and a dozen plants that manufactured: paints, varnishes, and enamels; felt, roofing, building papers, insulation, and floor covering; and boxboard, paperboard, paper boxes, and kindred container products.⁹⁶ With ownership of four of five boxboard plants on the Pacific Coast, throughout the 1920s PABCO remained the West’s largest producer of shipping containers and kindred products, an industry reportedly worth \$20 million annually.⁹⁷ Paper trades represented about one-half of PABCO’s \$15 million of “tangible assets.”⁹⁸ The Antioch mill alone produced over 100 different paper products, many of which were converted into cartons and containers at the Emeryville complex, where research and development gave PABCO “a wealth of fundamental knowledge of immense value to the packing industry.”⁹⁹ In one year alone, PABCO fillers secured more than forty-eight million eggs and PABCO manufactured thirty million dried fruit cartons and seven million shipping cases for a single packing company.¹⁰⁰

With corporate centralization and product diversification, PABCO grew into a complex international manufacturing conglomerate (Figure 6.6). PABCO expanded its agribusiness supply business by merging its paperboard manufacturing units with those of Zellerbach Paper Company, another California firm. Fibreboard Products, Inc. (1927), a jointly owned independent firm, quickly expanded into eastern markets by acquiring a converting plant in Philadelphia.¹⁰¹ PABCO manufactured pineapple containers in Hawaii and funded the

⁹⁵ Geiger, “Organization of the Paraffine Companies,” 82; Leib-Keyston, *Paraffine Companies Inc*; Dean Witter, *Paraffine Companies*; *The Commercial and Financial Chronicle* 107, no. 2787 (November 23, 1918): 2014.

⁹⁶ The original Paraffine Paint Company reincorporated as The Paraffine Companies, Inc. *Moody’s Manual of Railroads and Corporate Securities, Twenty-second Annual Number 1921, Industrial Section (Volume II—K to Z)* (New York: Poor’s Publishing Company, 1921), 1329; *The Commercial and Financial Chronicle* 107, no. 2787 (November 23, 1918): 2014.

⁹⁷ Geiger, “The Organization of the Paraffine Companies,” 83.

⁹⁸ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1927* (San Francisco: H.S. Crocker Co, Inc., 1927).

⁹⁹ Geiger, “The Organization of the Paraffine Companies,” 83.

¹⁰⁰ *Ibid.*

¹⁰¹ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1928* (San Francisco: H.S. Crocker Co, Inc., 1928).

Experiment Station of the Hawaiian Sugar Planter's Association, where it developed asphalt-impregnated mulch paper for the California Packing Company (Del Monte) and other producers. With the acquisition of one of the largest independent glass bottle manufacturers in the West, PABCO diversified into dairy industry supplies. Vertical integration continued through partial ownership of two San Francisco companies that decorated and labeled cartons and containers, as well as made color packaging and advertisements.¹⁰²

Diversification of residential and industrial building materials included acquisition of the largest manufacturer of gypsum wallboard west of the Rocky Mountains, as well as investment in manufacturers of refractory ceramics and glass used to line furnaces, kilns, fireplaces, and the like. PABCO also acquired the Plant Rubber and Asbestos Works of California, fabricators of asbestos building materials and industrial components, as well as mechanical rubber goods, with plants in San Francisco and Redwood City.¹⁰³

PABCO infiltrated eastern markets with the purchase of a felt-based flooring manufacturer in New Jersey. With the dissolution of the "six companies agreement" in 1930, PABCO expanded the scope of its international markets, as well. After exporting to Australia and New Zealand for nearly thirty years, and to Asia and South America for fifteen, PABCO organized a branch in Great Britain. PABCO also expanded international production by organizing Sakuma Pabco K.K.K. in Tokyo. With Pabco Products Limited in Sydney, PABCO gained direct control over production and distribution in Australia and New Zealand.¹⁰⁴ By the late 1930s, PABCO had become a multinational conglomeration comprising 17 firms and 55 plants that manufactured everything from oyster pails to "Coolite" reflective house paint and exported everywhere from Nicaragua to Nepal.¹⁰⁵

Plant #1

PABCO's "Plant #1" in Emeryville sat atop a hierarchy of production units, the culmination of fifty years of vertical integration and centralization of building materials production in Emeryville (Figure 6.7). The refinery continued yielding asphalt while the mill reached a 100-ton daily capacity of felt for an array of paints and building material.¹⁰⁶ Built in 1931, PABCO's linoleum plant was one of just four in the U.S. and the only one west of the

¹⁰² Leib-Keyston, *Paraffine Companies Inc*; Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930* (San Francisco: H.S. Crocker Co, Inc., 1930); Dean Witter & Co., *Paraffine Companies*.

¹⁰³ Leib-Keyston, *Paraffine Companies Inc*; Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930* (San Francisco: H.S. Crocker Co, Inc., 1928); Dean Witter, *Paraffine Companies*.

¹⁰⁴ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1931* (San Francisco: H.S. Crocker Co, Inc., 1931); Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1932* (San Francisco: H.S. Crocker Co, Inc., 1932); Dean Witter, *Paraffine Companies*.

¹⁰⁵ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1939* (San Francisco: H.S. Crocker Co, Inc., 1939); Seagrave, "East Meets West," 3, 12, 16.

¹⁰⁶ Seagrave, "East Meets West," 3-4, 5.

Atlantic Seaboard. PABCO imported cork from Spain, Portugal and Northern Africa and specialized burlap came from Dundee, Scotland. Otherwise, all steps of linoleum production occurred at the Emeryville site in a “coordinated control plan” that decreased production costs vis-à-vis decentralized production processes in the east, according to a contemporary assessment.¹⁰⁷ By 1938, PABCO ranked third in the nation as a manufacturer of hard-surfaced floor covering and sold seventy-five percent of floor covering east of the Rocky Mountains.¹⁰⁸ Mass production and wide distribution of four lines of linoleum provided middle class households with architectural materials that were imitative of older, more traditional ones and provided decorative effects previously available only to the rich.¹⁰⁹

PABCO showcased its linoleum and other building materials at the 1939 Golden Gate International Exposition held on Treasure Island in the San Francisco. “The PABCO Home” exhibited how a dwelling could be constructed entirely from the company’s products (Figure 6.8).¹¹⁰ “Eleven plants within one wall” at the Emeryville manufacturing complex comprised three main product divisions: paints, varnishes, lacquers, and enamels; roofing and building material; and linoleum and other hard-surfaced floor coverings. Output from the Emeryville complex collectively accounted for roughly 30 branded product lines and upwards of 6,000 specific products.¹¹¹ The “inexpensive modernized home” was a culmination of PABCO’s efforts to influence both the form and financing of residential architecture. Specifically, PABCO devised numerous strategies for adoption of flat roofs suitable for Malthoid “ready-to-roll” roofing.

Builders quickly adopted flat roofs for commercial and industrial construction because of savings in cost and gains in space. “For large areas like mine buildings, smelters, warehouses and sawmills, it solved the questions of fire and fume resistance, while in city buildings, offices and dwelling, it gave opportunity for new construction and design that was encouraging to the ambitious and original architect,” according to a PABCO in-house publication.¹¹² Residential architecture, “where design was dictated as much by fashion and taste as by economy,” proved a more difficult undertaking.¹¹³ According to promotions, PABCO’s persistent campaign of “advertising and education work” directed mainly at contractors and architects, but also targeting the general public, helped precipitate a shift in public taste from sharp to flat roofs.¹¹⁴ For

¹⁰⁷ Seagrave, “East Meets West,” 4.

¹⁰⁸ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930* (San Francisco: H.S. Crocker Co, Inc., 1930). E.F. Seagrave, “East Meets West,” 3-4, 12.

¹⁰⁹ Pamela Simpson, “Linoleum and Lincrusta: The Democratic Coverings for Floors and Walls,” *Perspectives in Vernacular Architecture, Vol. 7, Exploring Everyday Landscapes* (1997): 281-92.

¹¹⁰ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1940* (San Francisco: H.S. Crocker Co, Inc., 1940).

¹¹¹ Seagrave, “East Meets West,” 3; Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1934* (San Francisco: H.S. Crocker Co, Inc., 1934).

¹¹² S.C. Irving, “Forty-five Years of Progress Reviewed,” *Pabco World* 5, no. 1 (January-February, 1929): 2.

¹¹³ Leib-Keyston, *Paraffine Companies Inc.*

¹¹⁴ *Ibid.*

instance, PABCO, SPC, and Standard Paint Company of Canada jointly published *A Book on California Bungalows for the Prospective Home Builder, Architect or Contractor*, which was distributed at the 1915 World's Panama-Pacific International Exposition in San Francisco. The promotional booklet included photographs, floor plans, and building costs in order to promote the distinctively Californian house form, as well as Rubberoid and Malthoid roofing, available in white, red, green, and grey (Figure 6.9).¹¹⁵ "P&B Roofing put a new life into the building business and at once there came into being the new and modern architecture that has made the West the advance agent of today's construction, from the modest bungalow to the mighty Hoopah business building," according to one company official.¹¹⁶

PABCO also intervened directly into both private financing and government policy in order to increase sales. PABCO branched into the consumer credit business with the creation of the Residential Finance Company, a subsidiary that began targeting both contractors and homeowners in 1928. In the late 1920s, corporations began offering loans, or "deferred payment plans," in order to increase sales, especially of expensive or luxury items, such as cars, radios, and furniture. Through the "Budget-payment-plan," the Residential Finance Company paid contractors to build with PABCO products. In turn, homeowners repaid PABCO in monthly installments at local banks. During the Depression, the Finance Company worked with the Federal Housing Administration to promote federally guaranteed bank loans for house renovations and homeownership.¹¹⁷ In doing so, PABCO sought government aid to stimulate the building industry, rather than to provide public housing, through promotions such as the "low-cost housing drive," which assisted individual homebuilders in purchasing PABCO products.

After selecting a two-acre site in Emeryville and building its first paint factory in 1884, PABCO's leaders could not have anticipated the firm's long-term growth. Fifty years later, some eighty buildings covered thirty-eight acres of bayfill on Emeryville's shoreline. (Figure 6.10) In 1929, Emeryville's city council granted PABCO a lease on a 400-foot wide strip of municipal tidelands, extending from the west edge of PABCO property to U.S. government bulkhead line in the bay (Figure 6.11). The property extended PABCO's deep-water access and spurred plans to develop factory and warehouse sites with rail, truck, and deepwater transportation on about 140 acres of tidelands already owned by the company. According to company plans,

The ultimate plan will embrace a gradual filling in of this area and utilization of the new lands for industrial and terminal sites, both for ourselves and for other concerns who will be attracted to locate upon the property, due to the unusual

¹¹⁵ Malthoid roofed the Greene & Greene's "ultimate bungalow," the Gamble House in Pasadena (1908). *A Book on California Bungalows for the Prospective Home Builder, Architect or Contractor* (San Francisco: The Paraffine Paint Co., The Standard Paint Co., New York, and the Standard Paint Co., Montreal, 1915). Edward Bosley, "The Gamble House: Arts and Crafts Icon Preserved," *American Bungalow*, no. 45 (Spring, 2005).

¹¹⁶ Irving, "Progress Reviewed," 2.

¹¹⁷ Seagrave, "East Meets West," 16; A. F. A. Stedem, "Purpose and History of the Residential Finance Company," *Pabco World* 4, no. 6 (November-December, 1929): 2, 15; Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930* (San Francisco: H.S. Crocker Co, Inc., 1928); Dean Witter, *Paraffine Companies*.

transportation facilities, combined with the strategic location in the center of a growing metropolitan area¹¹⁸

PABCO purchased addition parcels of tidelands in Emeryville, acquiring a total of 175.5 acres extending from the tracks of the Southern Pacific railroad to the bay bulkhead line (giving it both rail and deep water outlets, though only approximately 33 acres were in use).¹¹⁹

In this chapter, I have depicted PABCO's expansion in terms of Emeryville Plant #1, corporate consolidation, diversification into paper goods and agriculture inputs, regional production chains, and new national and global markets based on Bay Region innovations and California resources. This spectacular trajectory could not have been foreseen in the 1880s, when PABCO located in Emeryville. PABCO leaders could not identify an optimal site for routine or easily anticipated production processes. Instead, technological innovation, organizational advance, and high rates of investment unleashed PABCO's creative capacities to develop its own inputs, manufacturing techniques, production processes, and labor supplies. Forced to grapple with, and creatively solve, an array of shop floor problems, PABCO generated production technology *in situ*, vertically integrated in piecemeal fashion, and diversified into unanticipated product lines. PABCO shows how new and innovative firms plot their own jagged paths of growth and, in doing so, recast metropolitan geography by creating new places.

¹¹⁸ "Company Secured Long-Time Lease on Tidelands Channel," *The Pabco World* 5, no. 3 (May-June, 1929): 2-3.

¹¹⁹ Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1927* (San Francisco: H.S. Crocker Co, Inc., 1927).

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SAN FRANCISCO**

**Distributing Stations
NEW YORK
CHICAGO
AND ALL PRINCIPAL CITIES**

Figure 6.1. Bard's Union Oil Company led California petroleum asphalt producers. Source: American Highways Association, *The Official Good Roads Year Book Of the United States* (Baltimore: Waverly Press, 1914), 182.

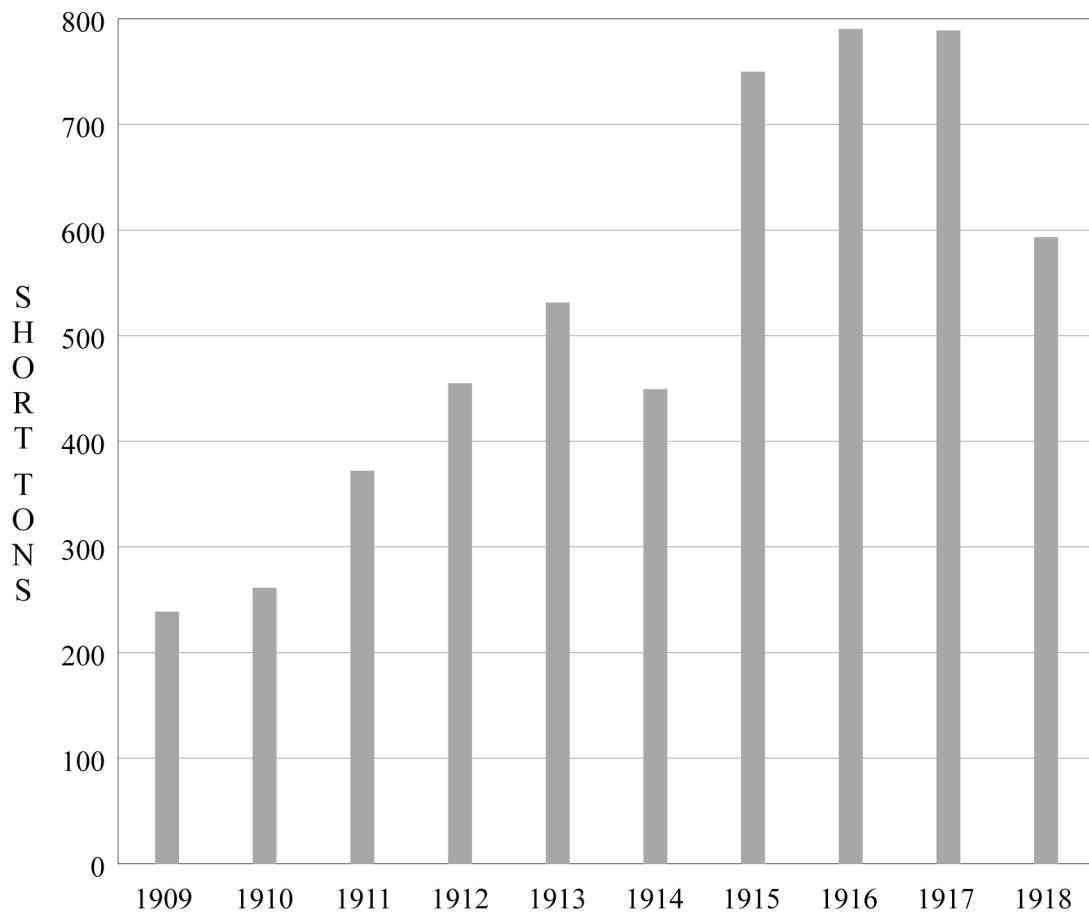


Figure 6.2. Growth of the U.S. asphalt industry, including both natural and oil asphalt, 1909-1918. Short tons in thousands. Source: G.F. Loughlin, *Mineral Resources of the United States, 1918: Part II—Nonmetals* (Washington, D.C.: Government Printing Office, 1922), 450.

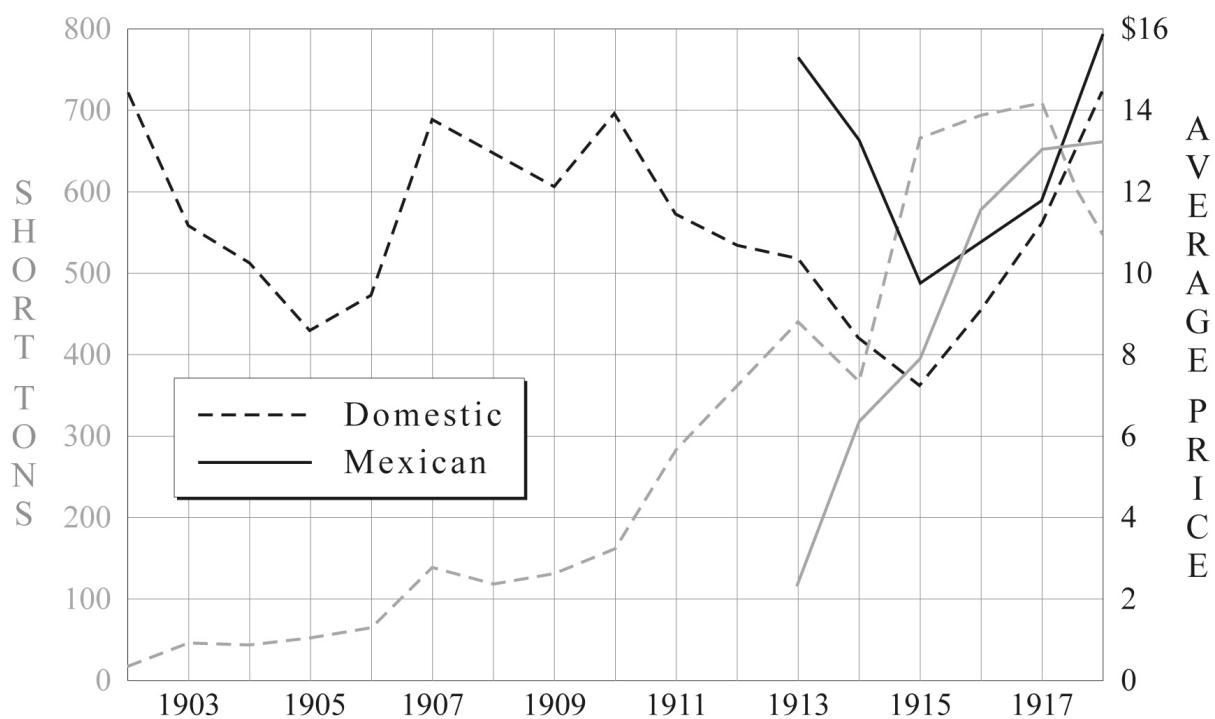


Figure 6.3. Production and price fluctuations in U.S. production of oil asphalt using both domestic and imported Mexican petroleum inputs. Short tons in thousands. Source: G.F. Loughlin, *Mineral Resources of the United States, 1918: Part II—Nonmetals* (Washington, D.C.: Government Printing Office, 1922), 450.

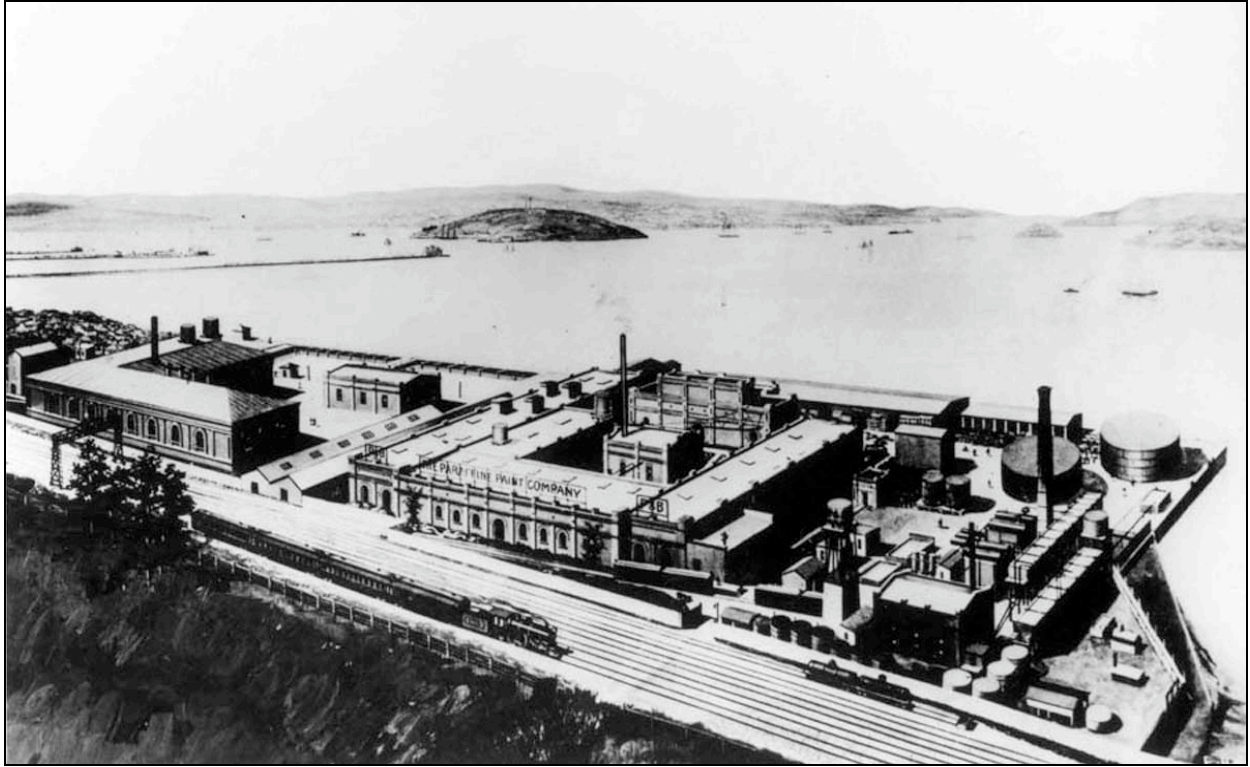


Figure 6.4. PABCO's industrial complex at the foot of Powell Street in Emeryville, c. 1914.
Source: Emeryville Historical Society.

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NOT TO DETERIORATE WITH AGE.



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IS ON ALL OF OUR PACKAGES.

Figure 6.5. Standard Paint Company touts the P&B patents in this late nineteenth century advertisement. Source: *Ice and Refrigeration Illustrated*, February 1896, 121.

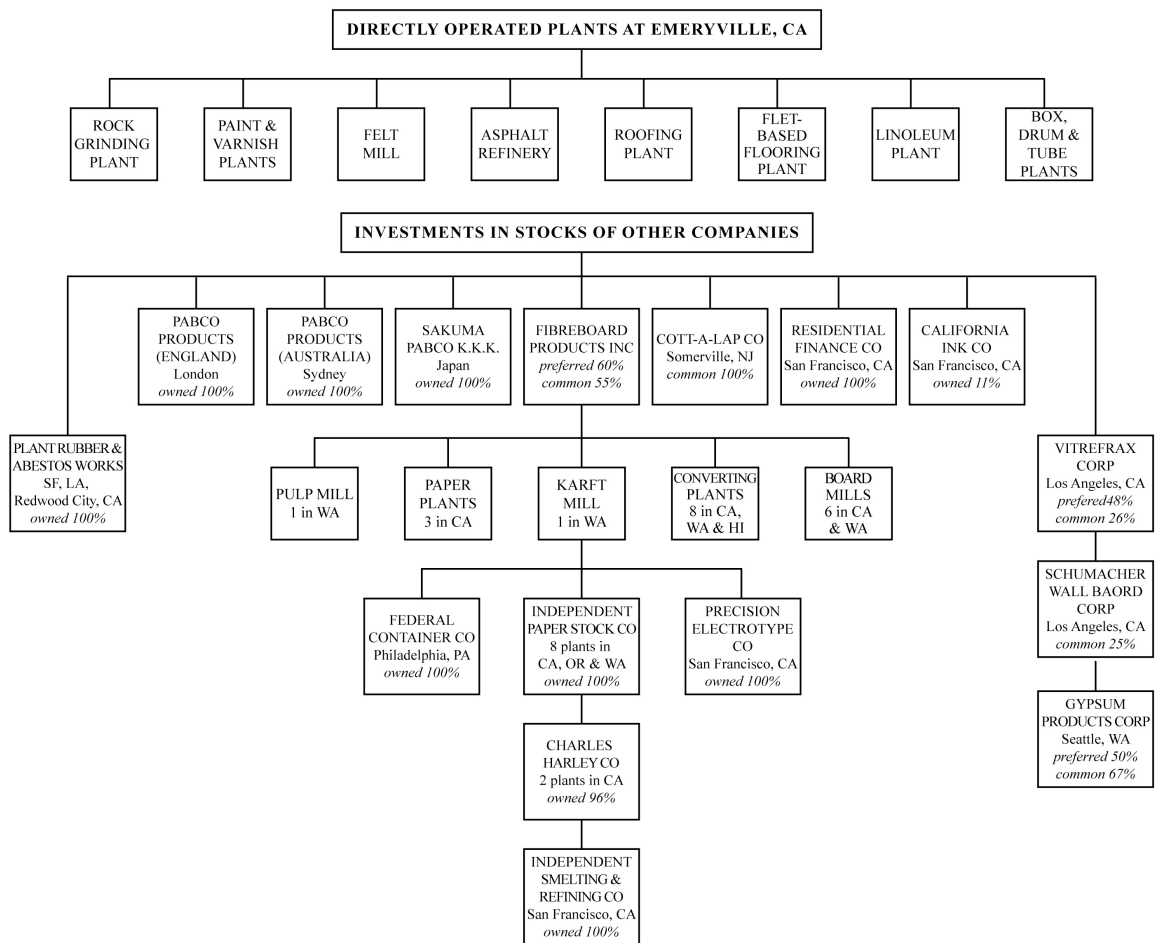


Figure 6.6. PABCO corporate centralization. Source: Chart by author, following Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1932* (San Francisco: H. S. Crocker Co, Inc., 1932).

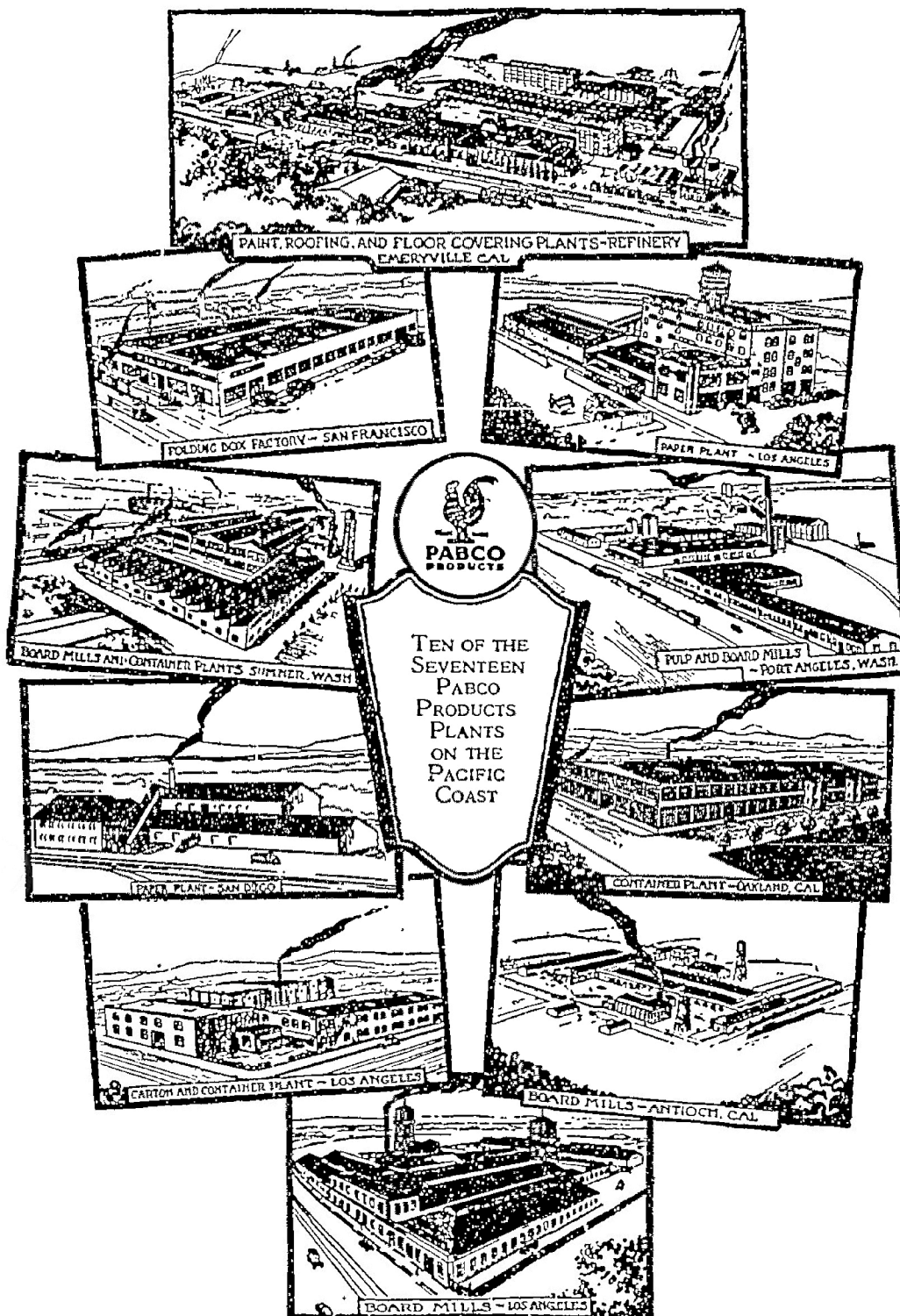


Figure 6.7. Plant #1 in Emeryville sits atop PABCO's West Coast production system for asphalt-based building materials and paper-based agribusiness supplies. Source: Paraffine Paint Companies, Inc., *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1923* (San Francisco: H. S. Crocker Co, Inc., 1923).

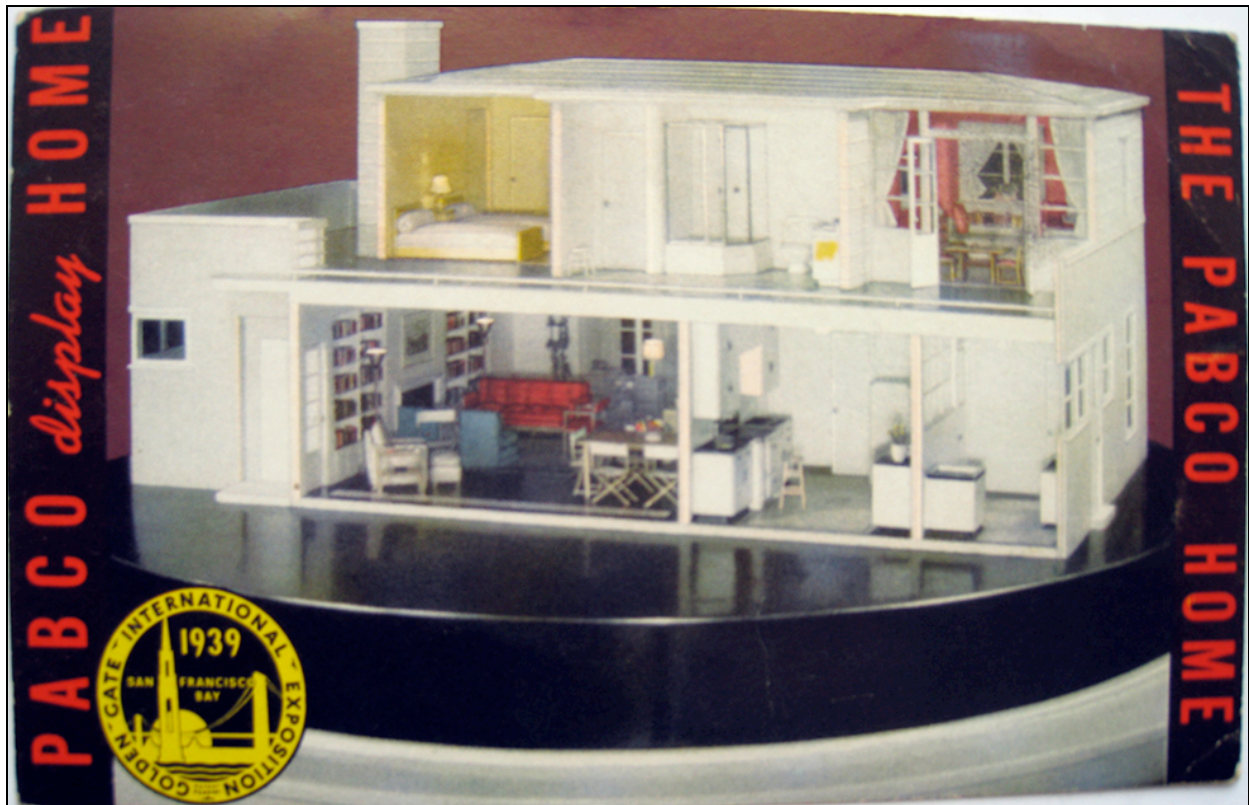


Figure 6.8. A postcard advertising PABCO's "Miniature Model Home" exhibit at the Golden Gate International Exposition in 1939, which demonstrated the array of PABCO building materials suitable for building an "inexpensive modernized home." Text on the verso reminded patrons to visit PABCO's other major 'exhibit,' the San Francisco-Oakland Bay Bridge, which was "entirely protected and beautified with Pabco Paints." Source: Author's collection.



Southern California Bungalow on which either White, Red, Green or Gray can be used with equal effectiveness

The Bungalow is a distinctive feature of Southern California, and our object in publishing this book is to show prospective home builders the beauty of this style of architecture, at the same time showing them what an important part our own products play in their construction.

Examine carefully the different roofs on the photographs and see if they don't attract you. They are RU-BER-OID and MALTHOID, made in colors of White, Red, Green and Gray. MALTHOID and RU-BER-OID show up well on any of the bungalows illustrated.

Figure 6.9. Promotional material jointly published by PABCO, SPC, and the Standard Paint Company of Canada sought to mold residential architecture to P&B building materials. Specifically, part of an pervasive advertisement campaign championing gentling sloping roofs on California craftsmen bungalows, which were amenable to Malthoid and Rubberoid roofing. Source: *A Book on California Bungalows for the Prospective Home Builder, Architect or Contractor* (San Francisco: The Paraffine Paint Co., The Standard Paint Co., New York, and the Standard Paint Co., Montreal, 1915).

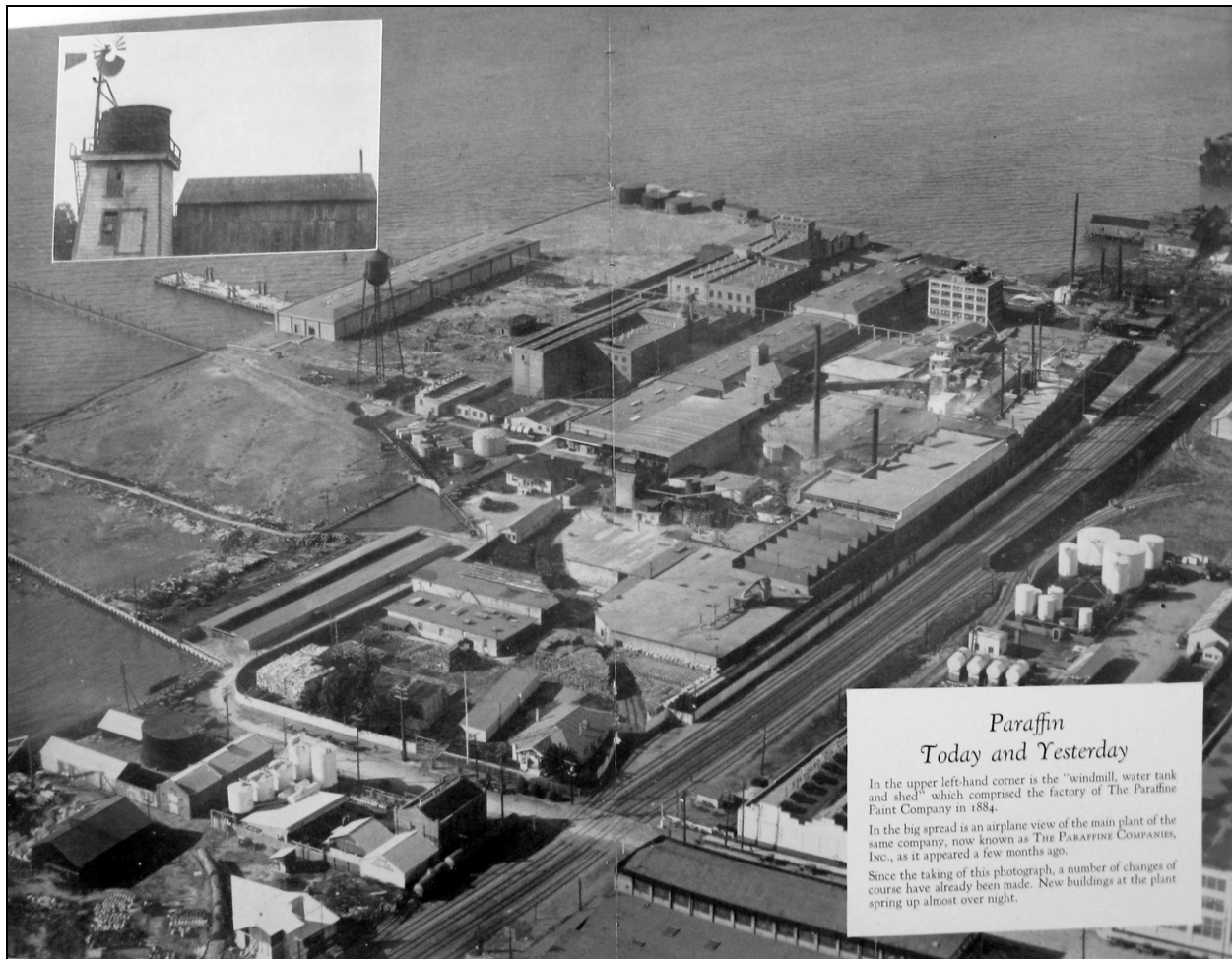


Figure 6.10. From a "windmill, water tank, and shed" (upper left corner) to "eleven plants within one wall" on Emeryville's shoreline. Note the various tanks belonging to petroleum and chemicals firms clustering around PABCO at the foot of Powell Street. Standard Oil's subterranean pipeline ran parallel to the Southern Pacific tracks. Source: *Pabco World* 4, no. 1 (January-February 1928).

Conclusion

The story of early Emeryville illustrates the way industry shaped the metropolis and created specialized suburbs. In nineteenth century California, industry inextricably tied the metropolitan Bay Area to the expansive resource frontier. In Part I of this dissertation, I depicted the role of industry in California's singular path of regional development. I argued that the transition to prospector capitalism commenced with the Gold Rush itself, when conquering Anglo-Americans implanted a new property regime as quickly as they extracted precious metal. The wide and relatively equal distribution of public lands resulted in successive resource rushes. Unfettered access to the public domain simultaneously keyed the formation of a particular type of corporate organization with an accumulation strategy predicated on acquiring productive land and resource rights *en masse*. Through overlapping investment and ownership, as well as competitive and collaborative enterprises, powerful actors and institutions forged another connection between the metropolis and the hinterland. In addition to the striking consolidation of land, California's resource-oriented corporations precipitated technological dynamism and industrial diversification through vertical integration and reinvestment in an array of industrial endeavors. Land in California was the basis for both resource riches and industrial expansion.

The extent of vertical integration and attendant spin-offs cannot be overemphasized. Companies dominated, not only extraction but also on-site processing industries, transportation, housing, and provisioning. Through direct ownership or investment, firms controlled Bay Region smelting and refining industries, as well as supply industries. Machinery, dynamite, and other mining supply industries created a direct link between the Bay Region and extraction sites, as did resource processing sectors. California's dynamic corporations linked together international securities markets, San Francisco boardrooms, Bay Region factories, and resource hinterlands.

My examination of the dynamite industry provides insights into the process of *resource industrialization* based on a symbiotic relation between regional natural resources and localized industrial dynamism. Reinvestment of mining profits financed the development of dynamite, which, in turn, enabled deeper, more efficient, and more profitable extraction activities in a virtuous circle of economic expansion fueled by feedback between resources rushes, capital accumulation (reinvestment), and industrial dynamism. The relationship between industrial dynamism and metropolitan development was clearly shown by the flight of San Francisco's first high explosives manufacturers and the creation of the East Bay dynamite district. Furthermore, the specialized industrial complex perpetuated localized industrial dynamism, which was illustrated by fierce competition and numerous spin offs. Indeed, Giant Powder Company possessed great freedom for industrial suburbanization, a topic I explored in Part II.

Industry helped link cities and suburbs in a single process of metropolitan development—both economic growth and spatial expansion. In addition to the formation of the dynamite district, I showed how machinery and metalworking factories moved southward in San Francisco to Potrero Point before leapfrogging the bay to Emeryville. Specialized resource-intensive sectors and the spatial expansion of agglomerations, particularly metals and chemicals industries, created an integrative metropolitan economy and expanded the contours of the Metropolitan Bay Area. Judson Manufacturing Company, Paraffine Paint Company, and Giant Powder Company, were part of this early wave of Bay Region industrial suburbanization. Emeryville was a new growth periphery spun-off from the center of activity in San Francisco. For San Francisco industrialists and Bay Region capitalists with a lucid vision of metropolitan

development, industrial suburbanization proved both a spatial articulation of industrial dynamism and a geographic strategy for capital accumulation. At the same time, Emeryville and other individual suburban nodes acted as magnets, attracting industrial capital investment and factory location and, in doing so, pulled, stretched, and reconfigured metropolitan space.

Within the broader contexts of regional development and metropolitan expansion, individual firms dispersed from the core manufacturing districts in San Francisco during moments of locational freedom. Land developers set the stage. While boosting and building Oakland, a coalition of powerful suburban landholders sought to expand the metropolitan frame and realize differential rents on the periphery. Industrial development figured prominently in Metropolitan Oakland promotions, yet I show how locational assets, namely transportation in its various guises, were required for the creation of suburban industrial space. Transportation development and industrial real estate speculations were joined at the hip throughout early Emeryville's development.

While Emeryville's first factories required commodious industrial space and transportation connections, I show why innovation, investment, and competition were key factors allowed pioneering factories find profitability on the metropolitan edge. Both Judson Manufacturing Company and PABCO experienced a moment of locational opportunity in the early 1880s.

With proprietary inputs, JMC relied on a new order of efficiency and mechanization, as well as cheap labor, to vertically integrate every step of production for a diverse array of iron goods in Emeryville. With integrated production at the Emeryville site, JMC manufactured its own inputs and machinery. Diversified output required an array of manufacturing platforms and intricate coordination among numerous production units. Labor relations also influenced factory location. A suburban location allowed JMC to draw on the Bay Region's pools of specialized workers and technological assets while simultaneously seeking to circumvent organized labor. Development of an appropriate workforce included the de-skilling of formerly specialized and unionized jobs while realizing new economies of scale and throughput with enhanced mechanization and mass-production techniques.

As opposed to JMC's novel corporate organization and production processes, pragmatic innovations in "unlocking" California petroleum allowed PABCO to use asphalt, a seemingly valueless petroleum derivative, as input for manufacturing new paints and building materials. The rapid unfurling of new products and production techniques led not only to piecemeal vertical integration at the Emeryville factories, but also to a new industry and the creation of new national and international markets. Technological innovation, organizational advance, and high rates of investment unleashed PABCO's creative capacities to develop its own inputs, manufacturing techniques, production processes, and labor supplies. Forced to grapple with, and creatively solve, an array of shop floor problems, PABCO generated production technology *in situ*, vertically integrated in piecemeal fashion, and diversified into unanticipated product lines. Rather than production processes, factory sizes, or industrial sectors, technological innovation, investment, and competition enabled JMC and PABCO to find profitability in suburban autonomy. These pioneering East Bay firms demonstrated how individual firms helped build new suburban places while manufacturing California's natural resources.

Bibliography

Archival and Manuscript Collections

California Business Ephemera Collection. The Bancroft Library. University of California, Berkeley.

California Cultures. The Bancroft Library. University of California, Berkeley.

California Digital Newspaper Collection. Center for Bibliographic Studies. University of California, Riverside.

City of Berkeley Collection. The Bancroft Library. University of California, Berkeley.

Digital Archive of Newark Architecture. Barbara and Leonard Littman Architecture and Design Library. New Jersey Institute of Technology.

Miller & Lux Records, 1869-1965. The Bancroft Library. University of California, Berkeley.

Oakland Miscellany, 1865-1936. The Bancroft Library. University of California, Berkeley.

Robert B. Honeyman, Jr., Collection of Early California and Western American Pictorial Material. The Bancroft Library. University of California. Berkeley.

Research Reports, 1953-1978. Hagley Digital Archives. Hagley Museum and Library. Wilmington, Delaware.

The Hubert Howe Bancroft Collection. The Bancroft Library. University of California, Berkeley.

The 1906 San Francisco Earthquake and Fire Digital Collection. The Bancroft Library. University of California, Berkeley.

Trade Catalogue Collection – Hagley Imprints. Hagley Digital Archives. Hagley Museum and Library. Wilmington, Delaware.

Newspapers and Periodicals

Campanile Weekly (Berkeley)

Chicago Daily Tribune
Daily Alta California
Emeryville Herald
Emeryville Industries Association Bulletin
Livermore Herald
Los Angeles Herald
Los Angeles Times
New York Times
Oakland Enquirer
Oakland Herald
Pacific Rural Press
San Francisco Call
San Francisco Chronicle
Sacramento Daily Union
Sausalito News
Wall Street Journal
Wild West (San Francisco)

Primary Books, Reports, and Articles

A Book on California Bungalows for the Prospective Home Builder, Architect or Contractor. San Francisco: The Paraffine Paint Co., The Standard Paint Co., New York, and the Standard Paint Co., Montreal, 1915.

A Memorial and Biographical History of Northern California, Illustrated. Chicago: The Lewis Publishing Company, 1891.

A Review of the Commercial, Financial, and Mining Interests of the State of California and the Entire Pacific Slope for the Year 1876. San Francisco: John H. Carmany & Company, 1877.

Adams, Edgar. *Private Gold Coinage of California, 1849-55: Its History and Its Uses.* Brooklyn: E.H. Adams, 1913.

Alameda County Development Commission. *Alameda County, California: Where Every Prospect Pleases, Where Rail and Water Meet.* Oakland: Curtis-Baum Advertising Service, 1922. Pamphlet. From The Bancroft Library. University of California Berkeley.

Allen, Louis. *The American Herd Book Containing Pedigrees of Short-Horn Cattle*, vol. 11. Buffalo: Warren, Johnson & Co, 1872.

American Iron and Steel Association. *Directory to the Iron and Steel Works of the United States.* Philadelphia: American Iron and Steel Association, 1884.

Annual Report of the Commissioner of the General Land Office for the Fiscal Year Ending Jun. 30, 1880. Washington, D.C.: Government Printing Office, 1881.

Armstrong, Le Roy. *Financial California: An Historical Review of the Beginnings and Progress of Banking in the State*. San Francisco: The Coast Banker Publishing Company, 1916.

Asbury, Herbert. *The Barbary Coast: An Informal History of the San Francisco Underworld*. New York: Thunder Mountain Press, 1933.

“Asphalt Production in 1914.” *Petroleum Gazette* 20, No. 6 (September, 1915): 28.

Asphaltum: J. W. Howard, New York City, Suggests a New Classification for Asphaltum and its Compounds, Tariff Hearings Before the Committee on Ways and Means of the House of Representatives, 60th Cong. (Mar. 1, 1909, App’x.) Washington, D.C.: Government Printing Office, 1909.

Atchison, Topeka, and Santa Fe Railway Company. *Eighth Annual Report of the Atchison, Topeka, and Santa Fe Railway Company, for the Year Ending June 30, 1903*. New York: C.G. Burgoyne, 1903.

Atlantic Dynamite Co. v. Climax Powder Mauf’g Co., 72 F. 925 (W.D. Penn. 1895).

“Autocratic ‘Associated Employers’-Their Aims.” *American Federationist* 29, no. 7 (July 1922): 487-99.

Bacon, Raymond, and William Hamor. *The American Petroleum Industry*. New York: McGraw-Hill Book Company, 1916.

Baker, Joseph Eugene. *Past and Present of Alameda County, California*, vol. 1. Chicago: S.J. Clarke Publishing Co., 1914.

Ballard, Margaret. “History of Coal Mining in the Mount Diablo Region, 1859-1885.” Master’s thesis, University of California, Berkeley, 1931.

Bancroft, Hubert Howe. *The Works of Hubert Howe Bancroft, Volume XXIV, History of California, Vol. VII, 1860-1890*. San Francisco: The History Company, Publishers, 1890.

----- . *Chronicles of the Builders of the Commonwealth: Historical Character Study*, vols. 1 and 4. San Francisco: The History Company, Publishers, 1892.

Julius Bandmann. “Biographical Materials, Relating to Julius Bandmann; Dictation of Mr. Julius Bandmann, 8/31/89.” The Hubert Howe Bancroft Collection. The Bancroft Library. University of California, Berkeley.

Barney, William. “The Modern Terminal Port.” *Annals of the American Academy of Political and Social Sciences* 59 (May 1915): 245-58.

Barrows, Henry, and Luther Ingersoll. *A Memorial and Biographical History of the Coast Counties of Central California*. Chicago: The Lewis Publishing Company, 1893.

Becker, George. *Geology of the Comstock Lode and the Washoe District with Atlas*. Washington, D.C.: U.S. Geological Survey, 1882.

Blake, Evarts. *Greater Oakland, 1911: A Volume dealing with the Big Metropolis on the Shores of the San Francisco Bay*. Oakland: Pacific Publishing Co., 1911.

Bland, T.N. "The Early History of the Organization." *Pabco World* 3, no. 4 (April 1927): 2-3, 14.

Boorman, Thomas. *Asphalts, Their Sources and Utilizations*. New York: William T. Comstock, 1908.

Borthwick, J.D. *The Gold Hunters: A First-hand Picture of Life in California Mining Camps in the Early Fifties*. Edited by Horace Kephart. New York: International Fiction Library, 1917.

----- . "Three Years in California, Chapter IV." *Hutching's California Magazine*. October 1857.

Bosselmann, Peter and Stefan Pellegrini. "Rebuilding the Urban Structure of the Inner City: A Strategy for the Repair of Downtown Oakland, California." *IURD Working Paper Series, Institute of Urban and Regional Development*. University of California, Berkeley, 2003.

Bowie, Augustus J. Jr. *A Practical Treatise on Hydraulic Mining in California*. New York: D. Van Nostrand Company, 1895.

Bowman, Amos. *Report on the Property and Domain of the California Water Company Situated on the Georgetown Divide: Embracing the Mining, Water and Land Resource of the Country, Between the South and Middle Fork of the American River in El Dorado County, California*. San Francisco: A.L. Bancroft, 1874. Report. From The Bancroft Library. University of California, Berkeley.

Brock, S.G. *Report on the Internal Commerce of the United States for the Year 1890, Part II of Commerce and Navigation*. Washington, D.C.: Government Printing Office, 1891.

Brooklyn League Committee on Industrial Advancement. *Brooklyn: A National Center of Commerce and Industry*. New York: Brooklyn League, 1914.

Brown, J. Ross. *Mineral Resources of the States and Territories West of the Rocky Mountains*. Washington, D.C.: Government Printing Office, 1868.

Calderwood, G.W. and G.T. Loofbourow. *Oakland: "Athens of the Pacific": Facts and Figures of Alameda County*. Oakland: G.T. Loofbourow, 1896.

California Iron and Steel Company. *Prospectus of the California Iron and Steel Company*. San Francisco: The Bosqui Engraving and Printing Co., 1882. Report. From The Bancroft Library. University of California Berkeley.

“California Petroleum.” *Harper’s*. November 22, 1873, 1051.

California Powder Works. “Hercules Powder: Sporting, Cannon, and Mining Powder.” California Powder Works, 1897. Trade Catalogue Collection, Hagley Imprints, index.cpc. Hagley Digital Archives. Hagley Museum and Library.

California Public Utilities Commission, California Railroad Commission. “Decision No. 7801.” *Decisions of the Railroad Commission of the State of California, Volume XVIII, April 1, 1920 to October 131, 1920*. Sacramento: State Printing Office, 1921, 424-29.

California Taxpayers’ Association. “Proceedings of a meeting of the taxpayers of Oakland, held at Dietz Hall, April 1st, 1876.” San Francisco: J. Winterburn & Co, 1876. Oakland Miscellany, 1865-1936. The Bancroft Library. University of California, Berkeley.

California Wire Works. *The Mechanical Miners’ Guide Issued by the California Wire Works, Successor to A. S. Hallidie, Manufacturers of Wire and Wire Rope and the Four Pointed Steel Barb Fence Wire*. San Francisco: California Wire Works, 1882.

Carnegie, Andrew. *Autobiography of Andrew Carnegie*. Boston: Houghton Mifflin Company, 1920.

Census Bureau, Department of Commerce. *Bulletin 92, Census of Manufacturers, 1905, Chemicals and Allied Products*. Washington, D.C.: Government Printing Office, 1908.

----- . *Ninth Census, 1870, Vol. III, Statistics of Wealth and Industry*. Washington, D.C.: Government Printing Office, 1870.

Bureau of the Mint. *Report of the Director of the Mint Upon the Production of Precious Metals in the United States During the Calendar Year 1883*. Washington, D.C.: Government Printing Office, 1884.

Census Office, Department of the Interior. *Statistics of Manufacturers Tenth Census, Vol. II*. Washington, D.C.: Government Printing Office, 1880.

----- . *Report on the Manufacturers of the United States at the Tenth Census (Jun. 1, 1880)*. Washington, D.C.: Government Printing Office, 1883.

----- . *Tenth Census of the United States, Vol. II, Statistics of Manufacturers, 1880*. Washington, D.C.: Government Printing Office, 1880.

----- . *Report on the Manufacturing Industries of the United States at the Eleventh Census, 1890, Vol. VI, Pt. III*. Washington, D.C.: Government Printing Office, 1895.

------. *Twelfth Census of the United States, Vol. VIII, Manufacturing, Pt. III, States and Territories*. Washington, D.C.: Government Printing Office, 1900.

------. *Census Bulletin No. 210: Manufacturers, Chemicals and Allied Products*. Washington, D.C.: Government Printing Office, 1902.

------. *Thirteenth Census of the United States, Taken in the Year 1910, Vol. 10, Manufacturers, 1909; Reports for Principal Industries*. Washington, D.C.: Government Printing Office, 1913.

Central Pacific Railroad Company. *Answers to the Central Pacific Railroad Company Submitted by Leland Stanford, President, at San Francisco, CA, Jul. 28-29, 1887*. Communication of the U.S. Pacific Railway Commission. New York: H.S. Crocker & Co., 1887.

Clark, William. *Gold Districts of California*. California Division of Mines and Geology, Bulletin 193. Sacramento: California Division of Mines and Geology, 1970.

“Coining Money, at the San Francisco Branch Mint.” *Hutchings’ California Magazine*. October 1856, 145-53.

Commercial and Financial Chronicle 107, no. 2787 (November 23, 1918).

Conmy, Peter Thomas. *The Beginnings of Oakland, California, A.U.C.* Oakland: Oakland Public Library, 1961.

Conservation Commission of the State of California. *Report of the Conservation Commission of the State of California, Jan. 1, 1913*. Sacramento: California State Printing Office, 1912.

Corran, W.H.L., ed. *Langley’s San Francisco Directory For the Year Commencing May, 1887*. San Francisco: Francis, Valentine & Co. Printers, 1887.

Cottrell, K.W. *Asphalt and Related Bitumens*. Mineral Resources of the United States, 1919: Part II – Nonmetals. Washington, D.C.: Government Printing Office, 1922.

Crawford, J.J. *Twelfth Annual Report of the State Mineralogist, Two Years Ending September 15, 1894*. Sacramento: California State Printing Office, 1894.

Cronise, Titus Fey. *The Natural Wealth of California*. San Francisco: H. H. Bancroft & Company, 1868.

Davis, Alfred Howe. “The Romance of California Oil: Before the Gusher Era, In Two Parts, Part I.” *Overland Monthly and Out West Magazine*. February 1913, 124-34.

Dean Witter & Company. *The Paraffine Companies, Inc.* New York: Dean Witter and Company, 1936.

DeGroot, Henry. "Hydraulic and Drift Mining." In *Second Report of the State Mineralogist of California, from Dec. 1, 1880, to Oct. 1, 1882*, Henry Hanks. Sacramento: California State Printing Office, 1882.

Derbec, Etienne. *A French Journalist in the California Gold Rush: The Letters of Etienne Derbec*. Edited by A.P. Nasatir. Georgetown, CA: Talisman Press, 1964.

Directory of the Township and the City of Oakland, Together with the Townships of Brooklyn and Alameda, For the Year 1869. Oakland: B.F. Stillwell, 1869.

Drake, Francis. "Early Smelting at Cerro Gordo." *Mining and Scientific Press* 10, no. 21. (May 21, 1910): 745-46.

Drinker, Henry. *A Treatise on Tunneling, Explosive Compounds, and Rock Drills*. New York: John Wiley & Sons, 1878.

Du Pont, Bessie Gardner. *E.I. du Pont de Nemours & Company, A History, 1802-1902*. Boston: Houghton Mifflin Company, 1920.

Eaves, Lucile. *A History of California Labor Legislation*. Berkeley: University Press, 1910.

Ebright, George. "The Effects of Nitroglycerine on those Engaged in its Manufacture." *Journal of the American Medical Association* 62, no. 3 (1914): 201-2.

Edwards, Richard. "Hercules Powder Company." *Industries of Cleveland: Trade, Commerce and Manufacturers for the Year 1878*. Cleveland: Richard Edwards, 1879.

Eilers, A. "Contributions to the Records of Lead-Smelting in Blast Furnaces," *Transactions of the American Institute of Mining Engineers*, vol. 1. Philadelphia: American Institute of Mining Engineers, 1873, 388.

Elliot, W. W. & Co. *Oakland and Surroundings Illustrated and Described, Showing its Advantages for Residence or Business*. Oakland: W. W. Elliot, 1885.

Ellis, Randall. "The Story of Electra, Recalled to Memory by the Recent Destruction of the Famous Boarding-House." *Pacific Service Magazine* 6, no. 11 (April 1915): 341-46.

"Emeryville Building New Industrial Plants." *The Building Review*, 22, no. 1. (July 1922): 11.

Emeryville Historical Society, ed. *Early Emeryville Remembered: Historical Essays & Photographs; Compiled and Edited by the Emeryville Historical Society*, 1997.

Emeryville Industries Association. *Facts and Factories*. Emeryville: Emeryville Industries Association, 1925. Report. From The Bancroft Library. University of California, Berkeley.

----- . *A Roster of Emeryville Industries*. Emeryville: Emeryville Industries Association, 1936.

Enos, John. *Second Biennial Report of the Bureau of Labor Statistics of the State of California for the Years 1885 and 1886*. Sacramento: California State Printing Office, 1887.

Evans, Taliesin. "Hydraulic Mining in California." *Century Illustrated Magazine*. January 1883, 232-39.

Fay, Albert. *A Glossary of the Mining and Mineral Industry*. Washington, D.C.: Government Printing Office, 1947.

Federal Writers' Project of the Works Progress Administration of Northern California. *California: A Guide to the Golden State*. New York: Hastings House, 1939.

Ferrier, William Warren. *Berkeley, California: The Story of the Evolution of a Hamlet into a City of Culture and Commerce*. Berkeley: William Warren Ferrier, 1933.

Fibreboard Paper Products Corporation Annual Report, 1956. San Francisco, 1957.

Finley, Dozier. "Petroleum Asphalts in the Roofing and Waterproofing Industries." *Chemical & Metallurgical Engineering* 27, no. 16 (October 18, 1922): 798-803.

Fisher, R.E. "An Old Established California Industry: The Judson Manufacturing Company." *Pacific Service Magazine* 8, no. 6 (November 1916): 221-25.

Geiger, Charles. "The Organization of the Paraffine Companies for Industrial and Commercial Purposes." *Western Canner and Packer* 13, no. 9 (January 1922): 82-3.

"General Abbot's Latest Experiments on Explosives." *Engineering and Mining Journal* 37, no. 1 (January 5, 1884): 26-27.

George, Henry, Jr. "Modern Methods of 'Finance': Example III.-The Asphalt Trust Catastrophe." *Pearson's Magazine*. March 1904, 251-265.

George Spaulding & Co. *Gold Mines and Mining in California: A New Gold Era Dawning on the State*. San Francisco: George Spaulding & Co., 1885.

Giant Powder Co. v. Vulcan Powder Co., 2 vols. (D. Cal. 1879)

Giant Powder Company. "Giant Powder, Manufactured Exclusively but the Giant Powder Company, San Francisco, Cal." San Francisco: Franklin Printing, 1868.

Gilliss, John. "Tunnels of the Pacific Railroad." *Van Nostrand's Electric Engineering Magazine* 3 (April 1870): 418-23.

Goodyear, Watson. *The Coal Mines of the Western Coast of the United States*. A.L. Bancroft & Company, 1877.

------. *Petroleum, Asphaltum, and Natural Gas, Seventh Annual Report of the State Mineralogist for the Year Ending Oct. 1, 1887*. Sacramento: California State Printing Office, 1888.

Gosrow, R. C. "Notes on Iron Ore Smelting in California." *Chemical and Metallurgical Engineering* 27, no. 10 (September 6, 1922): 490-93.

"Great Gold Bars." *Scientific American*. December 9, 1882, 377.

Greenville, Lloyd. "Why 'Paraffine'?" *Pabco World* 4, no. 4 (July-August 1928): 6-7, 13.

Grove, Karl Gilbert. *Hydraulic Mining Debris in the Sierra Nevada*. Department of the Interior, U.S. Geological Survey, Professional Paper 105. Washington, D.C.: Government Printing Office, 1917.

Guinn, James Miller. *A History of the State of California and Biographical Record of Oakland and Environs*, vol. II. Los Angeles: Historic Record Company, 1907.

------. *History of the State of California and Biographical Record of the Coast Counties, California*. Chicago: Chapman Publishing Co., 1904.

Hackett, Frederick, ed. *The Industries of San Francisco: Her Rank, Resources, Advantages, Trade, Commerce, & Manufacturers*. San Francisco: Payot, Upham & Co., 1884.

Halley, William. *The Centennial Year Book of Alameda County, California*. Oakland: William Haley, 1876.

Hallidie, Andrew. "Invention of the Cable Railroad." In San Francisco Mechanists' Institute, *A Brief History of the Cable Railway System: Its Origins and Progress, and Papers in Connection Therewith*. (San Francisco 1890): 4-17.

Hamilton, Fletcher. *Report XVII of the State Mineralogist: Mining in California During 1920*. Sacramento: California State Printing Office, 1921.

Hanks, Henry. *First Annual Report of the State Mineralogist, from Jun. 1, 1880, to Dec. 1, 1880*. Sacramento: California State Printing Office, 1880.

------. *Second Report of the State Mineralogist of California, from Dec. 1, 1880, to Oct. 1, 1882*. Sacramento: California State Printing Office, 1882.

Harland, Bartholomew, and Associates. *A Proposed Plan for a System of Major Traffic Highways, Oakland, California; For the Major Highway and Traffic Committee of One Hundred*. Oakland: The Committee, 1927.

Harpending, Asbury. *The Great Diamond Hoax and Other Stirring Incidents in the Life of Asbury Harpending*. San Francisco: The James H. Barry Co., 1913.

Harrison, Edward. *History of Santa Cruz County, California*. San Francisco: Pacific Press Publishing Company, 1892.

Hatton, Robert. "Pacific Coast Rolling Mill: A Historical Sketch, Part II." *Pacific Maritime Review* 16 (July 1919): 127-30.

Hegemann, Werner. *Report on a City Plan for the Municipalities of Oakland & Berkeley*. Oakland: The Kelley-Davis Co. 1915.

Henry Hall, ed. *America's Successful Men of Affairs: A Contemporaneous Biography*. New York: The New York Tribune, 1896.

Helper, Hinton. *The Land of Gold: Reality Versus Fiction*. Baltimore: Sherwood & Co., 1855.

Hinkel, Edgar, and William McCann. *Oakland 1852-1938: Some Phases of the Social, Political and Economic History of Oakland, California*, vol. 2. Oakland: Works Progress Administration, 1939.

"History of Pig Iron Manufacture on the Pacific Coast." *Washington Historical Quarterly* 7, no. 3 (July 1926).

Hittel, John. *The Resources of California*. San Francisco: Roman & Company, 1863.

----- . *A History of the City of San Francisco and Incidentally of California*. San Francisco: A. L. Bancroft, 1878.

----- . *The Commerce and Industries of the Pacific Coast of North America*. San Francisco: A. L. Bancroft & Co., 1882.

Hittell, Theodore. *History of California*, vol. III. San Francisco: N.J. Stone & Company, 1897.

----- . *History of California*, vol. IV. San Francisco: N.J. Stone & Company, 1898.

----- . *William Alvord*. San Francisco: California Academy of Sciences, 1905.

Hodges, A.D. *Amalgamation at the Comstock Lode, Nevada*. New York: American Institute of Mining Engineers, 1890.

"Home and Foreign Gossip." *Harper's*. May 12, 1868, 327.

"Home Items." *Light, Heat and Power* 4, no. 14 (November 1, 1888): 474.

Hoover, A. Pearson. "The Industrial Terminal and its Relation to the City Plan," *The City Plan* 8, no. 1 (April 1917): 4-11.

Hovey, Edmond. *Asphaltum and Bituminous Rock*. Mineral Resources of the United States, Calendar Year 1905. Washington, D.C.: Government Printing Office, 1906.

"How the Miner's Dynamite is Made." *Mining and Scientific Press*, 94, no. 10 (March 9, 1907): 313-15.

Hulaniski, Frederick, ed. *The History of Contra Costa County, California*. Berkeley: Elms Publishing Company, 1917.

Ingham, John. *Biographical Dictionary of American Business Leaders, A-G*. Westport, CN: Greenwood Press, 1983.

Irelan, William. *Eighth Annual Report of the State Mineralogist*. Sacramento: California State Printing Office, 1888.

----- *Eleventh Report of the State Mineralogist, Two Years Ending Sept. 15, 1892*. Sacramento: California State Printing Office, 1893.

"Irving M. Scott: Builder of Some of America's Best Battleships." *The Successful American*. February 1901, 64-65.

Irving, S.C. "Forty-five Years of Progress Reviewed." *Pabco World* 5, no. 1 (January-February 1929): 2-3, 16.

Ivey, Dean. "The Beginnings of the High Explosives Industry in the United States." Research Reports, 1953-1978, MS1643 43.pdf. Hagley Digital Archives. Hagley Museum and Library. Wilmington, Delaware.

Judson v. Giant Powder Co., No. 15792 (Cal. Jun. 28, 1895).

"Judson Powder Company." *Alameda County: The Eden of the Pacific; The Flower Garden of California*. Oakland: Oakland Tribune, 1898, 221.

Judson Pacific-Murphy Corporation. *A Romance of Steel in California*. San Francisco: Clavering Press, 1946.

Kenderline, Stevens. *California Revisited, 1858-1879*. Doylestown, PA: Doylestown Publishing Company, 1898.

Key System Transit Company. *Year Book and Annual Report, For the Year Ended December 31, 1925*.

King, Clarence, Samuel Emmons, and George Becker. *Statistics and Technology of the Precious Metals 6, Part III*. Washington, D.C.: Government Printing Office, 1885.

King, Joseph. *History of the San Francisco Stock and Exchange Board*. San Francisco: The Stanley-Taylor Company, 1910.

Knopf, Adolph. *The Darwin Silver-Lead Mining District, California*. Department of the Interior, U.S. Geological Survey, Bulletin 580-A. Washington, D.C.: Government Printing Office, 1914.

------. "Mineral Resources of the Inyo and White Mountains, California." In *Contributions to Economic Geology; Short Papers and Preliminary Reports, Part I: Metals and Nonmetals Extract Fuels*, edited by David White, 81-120. Washington, D.C.: Government Printing Office, 1914.

Laidlaw, C.H. "Cerro Gordo." *Mining Reporter* 53, no.7 (February 15, 1906): 168.

Lakes, Arthur. *Prospecting for Gold and Silver*. Scranton, PA: The Colliery Engineer Co, 1895.

Langley, Henry, ed. *The Pacific Coast Business Directory for 1867*. San Francisco: Henry G. Langley Publisher, 1867.

------. *The San Francisco Directory For the Year Commencing December, 1869*. San Francisco: Henry G. Langley, Publisher, 1869.

------. *A Directory of the City of Oakland and the Town of Alameda, For the Year Ending December 31st, 1874*. Oakland: Henry G. Langley Publisher, 1874.

LeCount & Strong's Directory for San Francisco for 1854. San Francisco: San Francisco Herald, 1854.

Leib-Keyston & Company. *The Paraffine Companies Inc.: A Story of Paint*. San Francisco, 1926.

Lindgren, Waldemar. *The Tertiary Gravels of the Sierra Nevada of California*. Department of the Interior, U.S. Geological Society, Professional Paper 73. Washington, D.C.: Government Printing Office, 1911.

"Local Notes." *Industry, A Magazine Devoted to Science, Engineering and Mechanical Arts, Especially on the Pacific Coast*. February 1893, 86.

Lloyd, Benjamin. *Lights and Shades in San Francisco*. San Francisco: A.L. Bancroft & Company, 1876.

Lock, Charles George Warnford. *Practical Gold-Mining*. London: E & F. N. Spon, 1889.

Logan, Clarence. *Mother Lode Gold Belt of California*. Bulletin No. 108 of the Division of Mines, State Department of Natural Resources, Nov. 1934. Sacramento: California State Printing Office, 1935.

Lord, Eliot. *Comstock Mines and Miners*. Washington, D.C.: U.S. Geological Survey, 1883.

Lord, George. "Building A County with Explosives." *Harper's*, May 18, 1912, 13.

Lyman, George. *Ralston's Ring: California Plunders on the Comstock Lode*. New York: Charles Scribner's Sons, 1937.

------. *The Saga of the Comstock Lode: Boom Days in Virginia City*. New York: Charles Scribner's Sons, 1934.

MacDonald, George William. *Historical Papers on Modern Explosives*. New York: Whittaker & Co., 1912.

Malone, Dumas, ed. *Dictionary of American Biography*, vol. X. New York: Charles Schribner's Son, 1933.

Marryat, Frank. *Gold Quartz Mining in California: Practical Observations During a Residence of Two Years, 1850-51, and 1852, in the Mining Districts of the Country*. London: Smith, Elder, and Co., 1852.

Marshall, Arthur. *A Short Account of Explosives*. Philadelphia: P. Blakiston's Son and Co., 1912.

Master Hands in the Affairs of the Pacific Coast; Historical, Biographical and Descriptive: A Resume of the Builders of Our Material Progress. San Francisco: Western Historical and Publishing Co., 1892.

Mendell, George H. *Report on the Various Projects for the Water Supply of San Francisco, Cal.: Made to the Mayor, the Auditor, and the District Attorney, Constituting the Board of Water Commissioners*. San Francisco: Spaulding & Barto, Stream Book and Job Printers, 1877.

Millard, Baily. *History of the San Francisco Bay Region*, vol. I. Chicago: The American Historical Society, Inc., 1924.

Minnard, F. H. "The California Asphaltum Industry." In *The Mineral Industry During 1903*. New York: The Engineering and Mining Journal, 1904.

Moody, John, ed. *Moody's Analysis of Investments, Part II: Public Utilities and Industrials*. New York: Moody's Investor Service, 1917.

Moody, John. *The Truth About Trusts: A Description and Analysis of the American Trust Movement*. New York: Moody Publishing Company, 1904.

Moody's Manual of Railroads and Corporate Securities, Twenty-Second Annual Number 1921, Industrial Section (Volume II-K to Z). New York: Poor's Publishing Company, 1921.

Moody's Manual of Railroads and Corporation Securities, Twenty-Third Annual Number 1922, Industrial Section (Volume II-K to Z). New York: Poor's Publishing Company, 1922.

Montgomery, M.V. *Annual Report of the Commissioner of Patents for the Year 1886.* Washington, D.C.: Government Printing Office, 1887.

Morrison, Robert Stewart. *Mining Rights on the Public Domain: Lode and Placer Claims.* Denver: The Smith-Brooks Printing Company, 1908.

Mowbray, George. *Tri-Nitro-Glycerin as Applied in the Hoosac Tunnel.* New York: D. Van Nostrand, 1874.

Nash, Gerald. *State Government and Economic Development: A History of Administrative Policies in California, 1849-1933.* Berkeley: Institute of Governmental Studies, University of California, 1964.

National Cyclopaedia of American Biography, vol. 16. New York: James T. White & Company, 1918.

Nevada Division of Environmental Protection. "Location of Comstock Lode Mills," United States Environmental Protection Agency." *Carson River Mercury Superfund Site.* San Francisco: EPA, 2011.

"New Companies." *The Electrician* 57, no. 13 (July 13, 1906): 522.

New Coso Mining Company. *Report of L. L. Robinson, President of the New Coso Mining Company on the Properties of the Company at Darwin, Inyo Co., Cal., Dec., 1875.* San Francisco: B.F. Sterett, 1875. Report. From The Bancroft Library. University of California, Berkeley.

New York, New Jersey Port and Harbor Development Commission. *Joint Report with Plan and Recommendations.* Albany: J. B. Lyon Company, Printers, 1920.

Norton, L.A. *Life and Adventures of Col. L. A. Norton.* Oakland: Pacific Press Publishing House, 1877.

Oakland, Alameda, and Berkeley City Directory, 1889-1890. San Francisco: F. M. Husted Publisher, 1889.

Oakland Board of Trade. *Oakland, California; Issued by the Board of Trade.* Oakland: Oakland Board of Trade, 1886. Pamphlet. From The Bancroft Library. University of California, Berkeley.

Oakland Chamber of Commerce Industrial Department. *Report for School of Business, Columbia University*. Oakland, Dec. 29, 1930.

Oakland Chamber of Commerce. *We Selected Oakland, Alameda County California: Being the Statements by Many Nationally-Known Concerns of the Advantages They Enjoy by Operating in the Leading Industrial District of the Pacific Coast*. Oakland: Oakland Chamber of Commerce, 1927. Pamphlet. From The Bancroft Library. University of California, Berkeley.

“P. & B. Insulating Compounds.” *Electrical Engineer* 13, no. 192 (January 6, 1892): 25.

Palmer Oil Company. *California's Greatest Industry: A Review of its Resources and Prospects*. San Francisco: Palmer Union Oil Company, 1912.

Paraffine Paint Companies, Inc. *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1927*. San Francisco: H.S. Crocker Co, Inc., 1927.

----- *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1928*. San Francisco: H.S. Crocker Co, Inc., 1928.

----- *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1930*. San Francisco: H.S. Crocker Co, Inc., 1930.

----- *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1931*. San Francisco: H.S. Crocker Co, Inc., 1931.

----- *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1932*. San Francisco: H.S. Crocker Co, Inc., 1932.

----- *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1934*. San Francisco: H.S. Crocker Co, Inc., 1934.

----- *Annual Statement of the Paraffine Companies, Incorporated, For the Fiscal Year Ended June 30, 1939*. San Francisco: H.S. Crocker Co, Inc., 1939.

“Paraffine Paint Company Acquires Antioch Mills.” *Paper Trade Journal* 59, no. 13 (March 28, 1912): 38.

Pardee, E.H. *Report of the Committee on Public Grounds and Buildings on the Institution for the Deaf, Dumb, and Blind, in Appendix to Journals of State and Assembly of the Nineteenth Session of the Legislature of the State of California, Vol. II*. Sacramento: California State Printing Office, 1872.

Parker, Edward. “Coal.” In *Material Resources of the United States: Part II—Nonmetals*, Department of the Interior, U.S. Geological Survey. Washington, D.C.: Government Printing Press, 1911.

Peckham, S. F. "Petroleum in Southern California." *Science*. February 9, 1884, 74-75.

Pederson, Eldor. "Land Subdivision, Land Speculation, and Urban Form: An Essay on Urban Morphology." PhD diss., University of California, Berkeley, 1974.

Phelps, Alonzo. *California's Representative Men*. San Francisco: A. L. Bancroft and Company, 1881.

Platt, Charles. *Dover Dates, 1722-1922: A Bicentennial History of Dover, New Jersey*. Morristown, NJ: The Jerseyman Press, 1927.

"Progress in Science and the Arts." *Engineering and Mining Journal* 32, no. 7 (August 13, 1881): 107.

Purcell, Mae Fisher. *History of Contra Costa County*. Berkeley: Gillick Press, 1940.

Quinan, W.R. "Publisher's Department: Report on Vigorit Powder." *Overland Monthly and Out West Magazine*. August 1881, 1-20.

------. *High Explosives*. London: Sir Issac Pitman & Sons, 1912.

Redpath, Lionel V. *Petroleum in California: A Concise and Reliable History of the Oil Industry of the State*. Los Angeles: Lionel V. Redpath, 1900.

Robinson, Lester. *Remarks of L. L. Robinson Before the House Committee on Water Rights and Drainage, February 17, 1887: In Support of the Assembly Bill 451, Relating to the Impounding Reservoirs for mining and Other Debris* (1887).

Report of the Joint Committee on State Prison Affairs. Appendix to Assembly Journals of the Ninth Session of the Legislature of the State of California. Sacramento: California State Printing Office, 1858.

Report of the Twelfth Industrial Exhibition Under the Auspices of the Mechanics' Institute of the City of San Francisco. San Francisco: Thomas' Cosmopolitan Steam Printing House, 1878, 176.

Rhode, Paul. *The Evolution of California Manufacturing*. San Francisco: Public Policy Institute of California, 2001.

Rossiter, Raymond. *Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains*. Washington, D.C.: Government Printing Office, 1870.

------. *Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains*. Washington, D.C.: Government Printing Office, 1874.

"Ruberoid Roofing." *The Colliery Engineer and Metal Miner* 16, no. 11 (June, 1896): 248.

Ryan, William. *Personal Adventures in Upper and Lower California in 1848-1849*, vol. II. London: William Shoberl, Publisher, 1850.

Sabin, Alvah. *The Industrial and Artistic Technology of Paint and Varnish*. New York: John Wiley & Sons, 1904.

San Francisco Board of Supervisors. "Subsequent Personal Property Assessment." In *San Francisco Municipal Reports for the Fiscal Year 1879-80, Ending June 30, 1880*. San Francisco: W. M. Hinton & Co., 1880, 1002-03, 1006.

------. *San Francisco Municipal Reports for the Fiscal Year 1872-73*. San Francisco: Spaulding & Barto Printers, 1873.

------. "Report to the Surveyor-General." In *San Francisco Municipal Reports for the Fiscal Year 1871-72, Ending June 30, 1872*. San Francisco: Cosmopolitan Printing Company, 1880.

------. *San Francisco Municipal Reports for the Fiscal Year 1874-5, Ending June 30, 1875*. San Francisco: Spaulding & Barto Printers, 1875.

San Francisco: Its Builders Past and Present, vol. 2. San Francisco: The S. J. Clarke Publishing Co., 1913.

Sanborn Map Company. *Sanborn Fire Insurance Maps*. Berkeley Volume 2, 1903, 1911 and 1953, Oakland Volumes 1 and 3, 1903, 1911. Pelham, NY: Sanborn Map Company.

Santa Cruz County, California: Illustrations. San Francisco: Wallace W. Elliot & Company, 1879.

Sappers, Vernon. *From Shore to Shore: The Key Route*. Oakland: Peralta Associates Publisher. 1948.

Seager, Henry, and Charles Gulick. *Trust and Corporation Problems*. New York: Harper & Brothers, 1929.

Seagrave, E.F. "East Meets West." *Port of Oakland Compass* 12, no. 2 (February, 1938), 3-5, 11-16.

John L. N. Shepard. "Notes Furnished by J.N.L. Shepard Concerning the Life and Interest of Mr. Egbert Judson. San Francisco, Oct. 28, 1886." The Hubert Howe Bancroft Collection. The Bancroft Library. University of California, Berkeley.

Shinn, Charles. *The Story of the Mine as Illustrated by the Great Comstock Lode of Nevada*. New York: D. Appleton and Company, 1903.

------. *Mining Camps: A Study in American Frontier Government*. New York: Charles Scribner's Sons, 1885.

Sipes, William. *The Pennsylvania Railroad: Its Origin, Construction, Conditions, and Connections*. Philadelphia: The Passenger Department, 1876.

Smythe, Dallas. "An Economic History of Local and Interurban Transportation in the East Bay Cities with Particular Reference to the Properties Developed by F. M. Smith." PhD diss., University of California, Berkeley, 1937.

Snelling, Walter and Christian Storm. *Analysis of Black Powder and Dynamite*. Bureau of Mines, Bulletin 51. Washington, D.C.: Government Printing Office, 1913.

"Some of the Shops of San Francisco." *American Machinist* 15, no. 25 (June 23, 1892), 4-5.

Soul'e, Frank, John Gihon, and James Nisbet. *The Annals of San Francisco*. New York: D. Appleton and Company, 1854.

Stalder, Walter. "A Contribution to California Oil and Gas History." *California Oil World*, November 12, 1941.

Statutes of California Passed at the Seventeenth Session of the Legislature, 1867-68. Sacramento: California State Printing Office, 1868.

Stedem, A. F. A. "Purpose and History of the Residential Finance Company." *Pabco World* 4, no. 6 (November-December 1929): 2, 15.

Steele, James. "Report on the Drug Market of San Francisco." In *Proceedings of the American Pharmaceutical Association at the Twenty-seventh Annual Meeting Held in Indianapolis, Ind., September, 1879*. Philadelphia: Sherman & Co., Printers, 1880.

Stretch, Richard, Charles Waldeyer, and Hamilton Smith, Jr. "Reports on the Spring Valley Hydraulic Gold Company Comprising the Cherokee Flat Blue Gravel and Spring Valley Mining and Irrigating Company's Property, Situated at Cherokee Flat, Butte County, California." New York: John Caulon Printers, 1879. Report. From The Bancroft Library. University of California, Berkeley.

Sturgeon, Jack. "A History of Cherokee Flat, Butte County, California." Master's thesis, Chico State University, 1961.

Sutro, Adolph. *Why Does the Bank of California Oppose the Sutro Tunnel?* Washington, D.C.: M'Gill and Witherow, 1872.

Sutter, Ted. "California's Oil." *American Petroleum Institute Quarterly*, 18 (April 1948).

Sweet's Catalogue of Building Construction for the Year 1911. New York: The Architectural Record Co, 1911.

Symmes, Whitman. "How Dynamite is Made." *The Chemical Engineer* 5, no. 7 (May 1907): 364-74.

Symons, Henry. *California Mineral Production and Directory of Mineral Producers for 1941*. California State Division of Mines, Bulletin 122. Sacramento: California Division of Mines and Geology, 1941.

"Testimony Taken of the Committee on Mining Debris as Reported to the Assembly, Twenty-Second Session, 1877-78." *Appendix to the Journals of the State and Assembly of the Twenty-Second Session of the Legislature of the State of California IV*. Sacramento: State Office, 1878.

The Bay of San Francisco: The Metropolis of the Pacific Coast and its Suburban Cities, vol. 2. Chicago: Lewis Publishing Company, 1892.

The Builders of a Great City: San Francisco's Representative Men; The City, Its History and Commerce, vol. 1. San Francisco: San Francisco Journal of Commerce Publishing Co., 1891.

The Derrick's Hand-Book of Petroleum: A Complete Chronological and Statistical Review of Petroleum Developments from 1859 to 1898. Oil City, PA: Derrick Publishing Company, 1898.

The Fitch Bond Book, 1921. New York: Fitch Publishing Company, 1921.

"The Late Egbert Judson." *Mining and Scientific Press*. January 14, 1893, 1.

"The Pitch Lake and the Asphalt Industry of Trinidad." *Scientific American*. March 16, 1901, 166.

The Railroad System of California: Oakland and Vicinity. San Francisco: J.H. Carmany & Co., 1871.

The San Francisco Directory for the Year 1852-53. San Francisco: James M. Parker, 1852.

"The Standard Paint Company Gives a House Warming to its Employees." *Electrical Review* 42, no. 18 (April 25, 1903): 25.

The System of Wire-Cables Railways for Cities and Towns. New York: National Cable Railway Company, 1887.

Thomas' Register of American Manufacturers and First Hands in All Lines. New York: Thomas Publishing Co., 1905.

Thompson, Merle. *Trust Dissolution*. Boston: Gorham Press, 1919.

Thompson, Thomas, and Albert West. *Historical Atlas of Alameda County, California* (Bicentennial Reprint). Fresno: Valley Publishers, 1976.

------. *History of Placer County, California*. Oakland: Pacific Press Publishing House, 1882.

Tinkham, George. *A History of Stockton From its Origins Up to the Present Time*. San Francisco: W.M. Hinton & Co., 1880.

Union Iron Works, California: Statement of Irving M. Scott, Report of the Select Committee on Ordnance and War Ships, with an Appendix. Washington, D.C.: Government Printing Office, 1886.

U.S. Industrial Commission. *Preliminary Report on Trusts and Industrial Combinations Vol. 6*. Washington, D.C.: Government Printing Office, 1900.

United States Annual Mining Review and Stock Ledger for the Year 1879: Part II, Pacific Coast. New York: The Mining Review Publishing Company, 1879, 49.

Vivian, Thomas J. *The Commercial, Industrial, Agricultural, Transportation, and other Interests of California: Being a Report on that State for 1890 Made to S. G. Brock, Chief of the Bureau of Statistics, Treasury Department*. Washington, D.C.: Government Printing Office, 1891.

Wait, John. *The Car-Builder's Dictionary*. New York: The Railroad Gazette, 1895.

Walke, Willoughby. *Course of Instruction for Artillery Gunners; Gunpowder and High Explosives*. Washington, D.C.: Government Printing Office, 1893.

Watts, William. *Oil and Gas Yielding Formations of California*. California State Mining Bureau, Bulletin No. 19. Sacramento: California State Printing Office, 1900.

Wells, Harry, Frank Gilbert, W. L. Chambers. *History of Butte County, California*. San Francisco: Harry L. Wells, 1882, 212.

“What is Dynamite.” *Frank Leslie's Popular Monthly*. December 1884, 765.

Wheeler, Benjamin Ide. “A Forecast for California and the Pacific Coast.” *The Outlook*. September 23, 1911, 167-74.

Wheeler, George. *Preliminary Report Concerning the Explorations and Surveys Principally in Nevada and Arizona*. Washington, D.C.: Government Printing Office, 1871.

Whitney, J.D. *Geological Survey of California, An Address Delivered Before the Legislature of California at Sacramento, Mar. 12, 1861*. San Francisco: Towne & Bacon, Book, Card and Fancy Job Printers, 1861.

William, Leonard John, ed. *Who's Who in Finance*. New York: Joseph & Sefton, 1911.

Wood, M.W. *History of Alameda County, California*. Oakland: Holmes Book Co., 1969.

Wright, William. *A History of the Comstock Lode & Mines*. Virginia, NV: F. Boegle, A.L. Bancroft & Co., 1889.

Yale, Charles G. *Iron on the Pacific Coast*. Mineral Resources of the United States, Calendar Year 1885. Washington, D.C.: Government Printing Office, 1886.

------. "The Mineral Industry of California." In *California Mines and Minerals; Published by the California Miners' Association Under the Direction of Edward H. Benjamin, Secretary of the California Meeting of the American Institute of Mining Engineers*, California Miners' Association. San Francisco: Press of L. Roesch Company, 1899.

Secondary Sources

Adam, W. Claude. "History of Papermaking in the Pacific Northwest: I." *Oregon Historical Quarterly* 52, no. 1 (March 1951): 21-37.

Aldrich, Mark. "Regulating Transportation of Hazardous Substances." *Business History Review* 76, no. 2 (Summer 2002): 267-97.

Almaguer, Tomas. *Racial Fault Lines: The Historical Origins of White Supremacy in California*. Berkeley: University of California Press, 1994.

Amsden, Alice. *The Rise of "the Rest": Challenges to the West from Late-Industrializing Economies*. New York: Oxford University Press, 2001.

Andreano, Ralph. "The Structure of the California Petroleum Industry, 1875-1911." *Pacific Historical Review* 39, no. 2 (May 1970): 171-92.

Ansari, Mary. *Comstock Place Names: The Names of Store County, Nevada*. Reno: Camp Nevada, 1986.

Bagwell, Beth. *Oakland: The Story of a City*. Oakland: Oakland Heritage Alliance, 1996.

Baird, Joseph Armstrong, Jr. *Times Wondrous Changes: San Francisco Architecture, 1776-1915*. San Francisco: California Historical Society, 1962.

Barsness, Richard. "Iron Horses and an Inner Harbor at San Pedro Bay, 1867-1890." *Pacific Historical Review* 34, no. 2 (August 1965): 289-303.

Beauregard, Robert. *When American Became Suburban*. Minneapolis: University of Minnesota Press, 2006.

Beilharz, Edwin, and Carlos Lopez. *We Were 49ers! Chilean Accounts of the California Gold Rush*. Pasadena, CA: Ward Ritchie Press, 1976.

Berry, Sara. "Social Institutions and Access to Resources." *Africa: Journal of the International Africa Institute* 59, no. 1 (1989): 41-55.

Blomley, Nicholas. "Law, Property, and the Geography of Violence: The Frontier, The Survey, and the Grid." *Annals of the Association of American Geographers* 93, no. 1 (March 2003): 121-41.

Bloomfield, Anne. "The Real Estate Associates: A Land and Housing Developer of the 1870s in San Francisco." *Journal of the Society of Architectural Historians* 39, no.1 (March 1978): 13-33.

Bohlke, J. K. "Mother Lode Gold." In *Classic Cordilleran Concepts: A View From California, Geological Society of America Special Papers 338*, edited by Eldridge Moores, Doris Sloan, and Dorothy Stout, 55-68. Boulder, CO: Geological Society of America, 1999.

Bookspan, Shelley. *A Germ of Goodness: The California State Prison System, 1851-1944*. Lincoln, NE: University of Nebraska Press, 1991.

Boschma, Ron, and K. Frenken. "Why is Economic Geography not an Evolutionary Science? Towards an Evolutionary Economic Geography." *Journal of Economic Geography* 6, no. 3 (2006): 273-302.

Boschma, Ron, and Jan Lambooy. "Evolutionary Economics and Economic Geography." *Journal of Evolutionary Economics* 9, no. 4 (1999): 411-429.

Boschma, Ron, and G.A. van der Knaap. "New Technology and Windows of Location Opportunity." In *Economics and Evolution*, edited by Jan Reijnders, 171-202. Lyme, NH: Edward Elgar, 1997.

Bosley, Edward. "The Gamble House: Arts and Crafts Icon Preserved." *American Bungalow*, no. 45 (Spring 2005).

Boorstin, Daniel. *The Americans: The National Experience*. New York: Vintage Books, 1965.

Brechin, Gray. *Imperial San Francisco: Urban Power, Earthly Ruin*. Berkeley: University of California Press, 1999.

Brown, David. *Southern Outcast: Hilton Rowan Helper and the Impending Crisis of the South*. Baton Rouge: Louisiana State University Press, 2006.

Brown, George. *Big Bang: A History of Explosives*. New York: Sutton Publishing, 1998.

Brown, Stephen. *A Most Damnable Invention: Dynamite, Nitrates, and the Making of the Modern World*. Toronto: Viking Canada, 2005.

Buchanan, Brenda. "Editor's Introduction: Setting the Context." In *Gunpowder, Explosives, and the State: A Technological History*, edited by Brenda Buchanan, 1-18. Aldershot, England: Ashgate Publishing Company, 2006.

Bullough, William. *The Blind Boss and His City: Christopher Augustine Buckley and Nineteenth-Century San Francisco*. Berkeley: University of California Press, 1979.

Bullough, William, Richard Orsi, and Richard Rice, eds. *The Elusive Eden: A New History of California*. New York: McGraw-Hill, 1996.

Burgess, Sherwood. "Oakland's Water War: Competing Private Utilities Bring Water--and Chaos--to Oakland in the 1890s." *California History* 64, no. 1 (Winter, 1985): 34-41.

------. *The Water King: Anthony Chabot, His Life and Times*. Davis, CA: Panorama Publishing Co., 1992.

Carr, William. *The DuPonts of Delaware: A Fantastic Dynasty*. New York: Dodd, Mead & Company, 1964.

Carranco, Lynwood, and Estle Beard. *Genocide and Vendetta: The Round Valley Wars of Northern California*. Norman: University of Oklahoma Press, 1981.

Chandler, Alfred DuPont, Jr. *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*. Cambridge, MA: MIT Press, 1962.

------. *The Visible Hand: The Managerial Revolution in American Business*. Cambridge, MA: Belknap Press, 1977.

------. *Shaping the Industrial Century: The Remarkable Story of the Evolution of the Modern Chemical and Pharmaceutical Industries*. Cambridge, MA: Harvard University Press, 2005.

Chandler, Alfred DuPont, Jr., and Stephen Salisbury. *Pierre S. Du Pont and the Making of the Modern Corporation*. Washington: Beard Books, 2000.

Chandler, Robert. "An Uncertain Influence: The Role of the Federal Government in California, 1846-1880." *California History*, 81, no. 3/4 (2003): 224-271.

Churella, Albert. *The Pennsylvania Railroad. Vol. I, Building an Empire, 1846-1917*. Philadelphia: University of Pennsylvania Press, 2013.

Clay, Karen Bradley. "Trade Without Law: Private-Order Institutions in Mexican California." *Journal of Law, Economics, and Organization* 13, no. 1 (April 1997): 202-232.

Cleland, Robert, and Osgood Hardy. *March of Industry: California*. San Francisco: Powell Publishing Company, 1929.

Coase, Ronald. "The Nature of the Firm." *Economica* 4, no. 16 (November 1937): 386-405.

Cox, Kevin, and A.J. Mair. "Locality and Community in the Politics of Local Economic Development." *Annals of the Association of American Geographers* 78, no. 2 (1988): 307-25.

Cornford, Daniel, ed. *The Working People of California*. Berkeley: University of California Press, 1995.

------. "'We Live More Like Brutes than Humans': Labor and Capital in the Gold Rush." *California History* 77, no. 4 (1998/99): 78-104.

Crapol, Edward. *James C. Blaine: Architect of Empire*. Wilmington, DE: Scholarly Resources Inc., 2000

Cronon, William. *Nature's Metropolis: Chicago and the Great West*. Chicago: WW Norton, 1991.

Cross, Ira. *Financing an Empire: A History of Banking in California*, vol. I. San Francisco: The S. J. Clarke Publishing Company, 1927.

------. *The History of the Labor Movement in California*. Berkeley: University of California Press, 1935.

Dale, Ernest. "Du Pont: Pioneer in Systematic Management." *Administrative Science Quarterly* 2, no. 1 (June 1957): 25-59.

Dalin, David, and Charles Fracchia. "Forgotten Financier: Francois L.A. Pioche." *California Historical Quarterly* 53, no. 1 (Spring 1974): 17-24.

Daniels, Joseph. "History of Pig Iron Manufacture on the Pacific Coast." *Washington Historical Quarterly* 7, no. 3 (July 1926): 168-89.

Davis, Mike. *City of Quartz: Excavating the Future in Los Angeles*. New York: Vintage Books, 1992.

------. "Sunshine and the Open Shop: Ford and Darwin in 1920s Los Angeles." In *Metropolis in the Making: Los Angeles in the 1920s*, edited by Tom Sitton and William Deverell, 96-122. Berkeley: University of California Press, 2001.

Devoto, Bernard. "The West: A Plundered Province." *Harper's*. August 1934, 355-64.

Dolan, John, and Stanley Langer, eds. *Explosives in the Service of Man: The Nobel Heritage*. Cambridge: Royal Society of Chemistry, 1996.

Dopfer, Kurt, and Jason Potts. "Evolutionary Realism; A New Ontology for Economics." *Journal of Economic Methodology* 11, no. 2 (2004): 195-212.

Doti, Lynne Pierson, and Larry Schweikart. "From Hard Money to Branch Banking: California Banking in the Gold Rush Economy." In *A Golden State: Mining and Economic Development in Gold Rush California*, edited by James Rawls and Richard Orsi, 209-232. Berkeley: University of California Press, 1999.

Duncan, James, and Nancy Duncan. *Landscapes of Privilege: The Politics of the Aesthetic in an American Suburb*. New York: Routledge, 2004.

Dunn, Robert. *The Americanization of Labor: The Employees Offensive Against Trade Unions*. New York: International Publishers, 1927.

Dyer, Davis, and David Sicilia. *Labors of a Modern Hercules: The Evolution of a Chemical Company*. Boston: Harvard Business School Press, 1990.

Eifler, Mark. *Gold Rush Capitalists: Greed and Growth in Sacramento*. Albuquerque: University of New Mexico Press, 2002.

Elliott, Russell. *History of Nevada*. Lincoln, NE: University of Nebraska Press, 1987.

Elzinga, Kenneth. "Predatory Pricing: The Case of the Gunpowder Trust." *Journal of Law and Economics* 13, no. 1 (April 1970): 223-40.

Etlinger, Nancy. "The Roots of Competitive Advantage in California and Japan." *Annals of the Association of American Geographers* 81, no. 3 (September 1991): 391-407.

Fant, Kenne. *Alfred Noble: A Biography*. Translated by Marianne Ruuth. New York: Arcade Publishing, 1993.

Fields, Gary. *Territories of Profit: Communications, Capitalist Development, and the Innovative Enterprises of G. F. Swift and Dell Computer*. Stanford: Stanford Business Books, 2004.

Fishman, Robert. *Bourgeois Utopias: The Rise and Fall of Suburbia*. New York: Basic Books, 1987.

Fogelson, Robert. *Bourgeois Nightmares: Suburbia, 1870-1930*. New Haven: Yale University Press, 2005.

Foley, Doris, and S. Griswold Morley. "The 1833 Flood on the Middle Yuba River." *California Historical Society Quarterly* 28, no. 3 (September 1949): 233-42.

Fracchia, Charles. "The Founding of the San Francisco Mining Exchange." *California Historical Society Quarterly* 48, no. 1 (March 1969): 3-18.

Fradkin, Philip. *The Seven States of California: A Natural and Human History*. Berkeley: University of California Press, 1995.

Friedricks, William. *Henry E. Huntington and the Creation of Southern California*. Columbus, OH: Ohio State University Press, 1992.

Gates, Paul. *Land and Law in California: Essays on Land Policies*. Ames: Iowa State University Press, 1991.

Gordon, David. "Capitalist Development and the History of American Cities." In *Marxism and the Metropolis: New Perspectives On Urban Political Economy*, edited by William Tabb and Larry Sawyers, 113-38. New York: Oxford University Press, 1984.

Gottdiener, Mark. *The Social Production of Urban Space*. Austin: University of Texas Press, 1985.

Gottdiener, Mark, Claudia Collins, and David Dickens. *Las Vegas: The Social Production of an All-American City*. Malden, MA: Blackwell Publishers, 1999.

Greenland, Powell. *Hydraulic Mining in California: A Tarnished Legacy*. Spokane, WA: The Arthur H. Clark Company, 2001.

Greer, James. *Colonel Jack Hays: Texas Frontier Leader and California Builder*. New York: E.P. Dutton & Company, 1952.

Hanson, Erle. *The True Story of the California and Nevada Railroad*. Northampton, PA: R&S Printers, 1988.

------. "California and Nevada Railroad." *Western Railroader* 21 (1958): 3-15.

Harding, Alan. "Elite Theory and Growth Machines." In *Theories of Urban Politics*, edited by David Judge, Gerry Stoker, and Harold Wolman, 35-53. Thousand Oaks, CA: SAGE Publications, 1998.

Harris, Richard. *Unplanned Suburbs: Toronto's American Tragedy, 1900 to 1950*. Baltimore: Johns Hopkins University Press, 1996.

------. *Creeping Conformity: How Canada Became Suburban*. Toronto: University of Toronto Press, 2004.

Harvey, David. *The Condition of Postmodernity: An Enquiry into the Origins of Social Change*. Cambridge, MA: Blackwell, 1989.

- . *The Limits to Capital*. Oxford: Basil Blackwell Publishers, 1999.
- . *A Brief History of Neoliberalism*. Oxford: Oxford University Press, 2005.
- Hayden, Dolores. *Building Suburbia: Green Fields and Urban Growth, 1820-2000*. New York: Vintage Books, 2003.
- Henderson, George. *California and the Fictions of Capital*. New York: Oxford University Press, 1999.
- Hildebrand, George. *Borax Pioneer: Francis Marion Smith*. San Diego: Howell-North Books, 1982.
- Hill, Mary. "Geology of the Sierra Nevada." *California Natural History Guides* 37. Berkeley: University of California Press, 1975.
- Hilton, George. *American Narrow Gauge Railroads*. Stanford, CA: Stanford University Press, 1990.
- Hise, Greg. "Sixty Stories in Search of a City." *California History* 83, no. 3 (2006): 8-26.
- . *Magnetic Los Angeles: Planning the Twentieth-Century Metropolis*. Baltimore: Johns Hopkins University Press, 1997.
- Hobsbawm, Eric. *Industry and Empire: The Birth of the Industrial Revolution*. New York: The New Press, 1999.
- Holley, I.B., Jr. "How Asphalt Paving Came to the Urban United States." *Technology and Culture* 44, no. 4 (October 2003): 703-33.
- Holliday, J.S. *The World Rushed In: The California Gold Rush Experience*. Norman: University of Oklahoma Press, 2002.
- Hoover, Edgar. *The Location of Economic Activity*. New York: McGraw-Hill Book Co., 1948.
- Hounshell, David, and John Kenly Smith, Jr. *Science and Corporate Strategy: Du Pont R&D, 1902-1980*. New York: Cambridge University Press, 1988.
- Houston, James. "From El Dorado to the Pacific Rim: The Place Called California." *California History* 68, no. 4 (Winter 1989/90): 172-81.
- Howard, Robert West. *The Great Iron Trial: The Story of the First Trans-Continental Railroad*. New York: G. P. Putnam's Sons, 1962.
- Humphreys, Glenn. "Printing, Publishing, and Ancillary Trades: A Checklist of Manuscript and Archival Holdings in the Edward C. Kemble Collections on Western Printing & Publishing,

California Historical Society Library, San Francisco.” *California History* 66, no. 1 (March 1987): 55-67.

Hurtado, Albert. *Indian Survival on the California Frontier*. New Haven: Yale University Press, 1988.

Hutchinson, William. *Oil, Land and Politics: The California Career of Thomas Robert Bard*, 2 vols. Norman, OK: University of Oklahoma Press, 1965.

David Igler, “The Industrial Far West: Region and Nation in the Late Nineteenth Century,” *Pacific Historical Review* 69, no. 2 (May 2000): 159-92.

----- . *Industrial Cowboys: Miller & Lux and the Transformation of the American West*. Berkeley: University of California Press, 2001.

----- . “Alta California, the Pacific, and International Commerce Before the Gold Rush.” In *A Companion to California History*, edited by William Devereell and David Igler, 116-26. Malden, MA: Blackwell Publishing, 2008.

Isenberg, Andrew. *Mining California: An Ecological History*. New York: Hill and Wang, 2005.

Issel, William, and Robert Cherny. *San Francisco, 1865-1932: Politics, Power, and Urban Development*. Berkeley: University of California Press, 1986.

Jackson, Kenneth. *Crabgrass Frontier: The Suburbanization of the United States*. New York: Oxford University Press, 1985.

James, Ronald. *The Roar and the Silence: A History of Virginia City and the Comstock Lode*. Reno: University of Nevada Press, 1998.

James, Ronald, and Elizabeth Raymond, eds. *Comstock Women: The Making of a Mining Community*. Reno: University of Nevada Press, 1998.

Johnson, Arthur. “California and the National Oil Industry.” *Pacific Historical Review* 39, no. 2 (May 1970): 155-69.

Johnson, J.W. “Early Engineering Center in California.” *California Historical Society Quarterly* 29, no. 3 (September 1950): 193-209.

Jonas, Andrew, and David Wilson, eds. *The Urban Growth Machine: Critical Perspectives Two Decades Later*. Albany: State University of New York Press, 1999.

Jung, Maureen. “Capitalism Comes to the Diggings: From Gold-Rush Adventure to Corporate Enterprise.” *California History*, 77, no. 4 (1998/99): 52-77.

Kahn, Edgar. "Andrew Smith Hallidie." *California Historical Society Quarterly* 19, no. 2 (June 1940): 144-156.

Kay, Neil. "Hercules and Penrose." *Contributions to Political Economy* 18, no. 1 (December 1999): 67-86.

Kazin, Michael. "Doing What We Can: The Limits and Achievements of American Labor Politics." *New Labor Forum*, no. 5 (Fall-Winter 1999): 20-31.

Kelley, Robert. *Gold vs. Grain: The Hydraulic Mining Controversy in California's Sacramento Valley; A Chapter in the Decline of the Concept of Laissez Faire*. Glendale, CA: The Arthur H. Clark Company, 1959.

Kirker, Harold. *California Architectural Frontier: Style and Tradition in the Nineteenth Century*. Santa Barbara, CA: Peregrine Smith, 1973.

Kirkpatrick, L. Owen, and Michael Peter Smith. "The Infrastructural Limits to Growth: Rethinking the Urban Growth Machine in Times of Fiscal Crisis." *International Journal of Urban and Regional Research* 35, no. 2 (May 2011): 477-503.

Kowaleski, Michael. "Romancing the Gold Rush: The Literature of the California Frontier." In *Rooted in Barbarous Soil: People, Culture, and Community in Gold Rush California*, edited by Kevin Starr and Richard Orsi, 204-25. Berkeley: University of California, 2000.

Kutney, Gerald. *Sulfur: History Technology, Applications & Industry*. Toronto: ChemTec Publishing, 2007.

Lannon, Albert. *Fight or Be Slaves: The History of the Oakland-East Bay Labor Movement*. New York: University Press of America, 2000.

Lewis, Peirce. "Common Houses, Cultural Spoor." In *Re-Reading Cultural Geography*, edited by Kenneth Foote, Peter J. Hugill, Kent Mathewson, and Jonathan M. Smith, 82-110. Austin: University of Texas Press, 1994.

Lewis, Robert, ed. *Manufacturing Suburbs: Building Home on the Metropolitan Fringe*. Philadelphia: Temple University Press, 2004.

------. *Chicago Made: Factory Networks in the Industrial Metropolis*. Chicago: University of Chicago Press, 2008.

Likes, Robert. *Looking Back at Cerro Gordo*. Pittsburgh: Rosedog Books, 2010.

Limbaugh, Ronald. "Making Old Tools Work Better: Pragmatic Adaptation and Innovation in Gold-Rush Technology." *California History* 77, no. 4 (Winter, 1998/99): 24-51.

Linteau, Paul André. *The Promoters' City: Building the Industrial Town of Maisonneuve, 1883-1918*. Translated by Robert Chodos. Toronto: J. Lorimer, 1985.

Lingenfelter, Richard. *The Hardrock Miners: A History of the Mining Labor Movement in the American West, 1863-1893*. Berkeley: University of California Press, 1974.

Logan, John, and Harvey Molotch. *Urban Fortunes: The Political Economy of Place*. Berkeley: University of California Press, 1987.

Lotchin, Roger. *San Francisco, 1846-1856: From Hamlet to City*. New York: Oxford University Press, 1974.

Lyman, Edward Leo. "The Beginnings of Anglo-American Local Government in California." *California Historical Society Quarterly* 81, no. 3/4 (2003): 199-223.

Madley, Benjamin. "Yuki Indians: Defining Genocide in Native American History." *The Western Historical Quarterly*, 39, no. 3 (Autumn 2008): 303-32.

Makley, Michael. *The Infamous King of the Comstock: William Sharon and the Gilded Age in the West*. Reno: University of Nevada Press, 2006.

----- . *John Mackay: Silver King in the Gilded Age*. Reno: University of Nevada Press, 2009.

Mann, Ralph. *After the Gold Rush: Society in Grass Valley and Nevada City, California, 1849-1970*. Stanford: Stanford University Press, 1982.

Markusen, Ann. "Sticky Places in Slippery Space: A Typology of Industrial Districts." *Economic Geography* 72, no. 2 (1996): 293-313.

Martin, Ron, and Peter Sunley. "Path Dependence and Regional Economic Evolution." *Journal of Economic Geography* 6, no. 3 (2006): 395-437.

Marx, Karl. *Capital: A Critique of Political Economy*. Vol. I, *The Process of Production of Capital*. New York: International Publishers, 1967.

----- . *Capital: A Critique of Political Economy*. Vol. III, *The Process of Capitalist Production as a Whole*. New York: International Publishers, 1967.

McBeth, Brian. *Gunboats, Corruption, and Claims: Foreign Investment in Venezuela, 1899-1908*. Westport, CT: Greenwood Press, 2001.

McDowell, Andrea. "From Commons to Claims: Property Rights in the California Gold Rush." *Yale Journal of Law & Humanities* 14, no. 1 (2002). <http://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1249&context=yjlh>.

------. "Real Property, Spontaneous Order, and Norms in the Gold Mines." *Law & Social Inquiry* 29, no. 4 (Autumn 2004): 771-828.

McKanna, Clare, Jr. "The Origins of San Quentin, 1851-1880." *California History* 66, no. 1 (March 1987): 49-50.

McLaughlin, Glenn. *Why Industry Moves South; A Study of Factors Influencing the Recent Location of Manufacturing Plants in the South*. NPA Committee of the South, 1949.

McNamee, Stephen. "Du Pont-State Relations." *Social Problems* 34, no. 1 (February 1987): 1-17.

McWilliams, Carey. *California: The Great Exception*. Berkeley: University of California Press, 1998.

Merlin, Imelda. *Alameda: A Geographical History*. Alameda, CA: Friends of the Alameda County Library, 1977.

Mins, Leonard, trans. and ed. "Unpublished Letters of Karl Marx and Friedrich Engels to Americans." *Science and Society* 2, no. 2 (Spring 1938): 218-31.

Mitchell, Don. *The Lie of the Land: Migrant Workers and the California Landscape*. Minneapolis: University of Minnesota Press, 1996.

Mokyr, Joel. *The Lever of Riches: Technological Creativity and Economic Progress*. New York: Oxford University Press, 1990.

Molotch, Harvey. "The Political Economy of Growth Machines." *Journal of Urban Affairs* 15, no. 1 (1993): 29-53.

Montgomery, Gayle, and James W. Johnson. *One Step from the White House: The Rise and Fall of Senator William F. Knowland*. Berkeley: University of California Press, 1998.

Morgan, Kevin. "The Exaggerated Death of Geography." *Geography* 89, no. 1 (January 2004): 32-49.

Mumford, Lewis. *Technics and Civilization*. Chicago: University of Chicago Press, 2010.

Nasaw, David. *Andrew Carnegie*. New York: Penguin Books, 2006.

Nash, Gerald. *The American West in the Twentieth Century: A Short History*. Englewood Cliffs, NJ: Prentice-Hall, 1973.

Nadeau, Remi. *City-Makers: The Story of Southern California's First Boom, 1868-76*. Los Angeles: Trans-Anglo Books, 1965.

- Nelson, Howard. "The Vernon Area, California: A Study of the Political Factor in Urban Geography." *Annals of the Association of American Geographers* 42, no. 2 (June 1952): 177-191.
- Nicolaides, Becky. *My Blue Heaven: Life and Politics in the Working-Class Suburbs of Los Angeles, 1920-1965*. Chicago: University of Chicago Press, 2002.
- Orsi, Richard. *The Sunset Limited: The Southern Pacific Railroad and the Development of the American West, 1850-1930*. Berkeley: University of California Press, 2007.
- Paul, Rodman. *Mining Frontiers of the Far West, 1848-1880*. New York: Holt, Rinehart and Winston, 1963.
- . *California Gold: The Beginnings of Mining in the Far West*. Lincoln, NE: University of Nebraska Press, Bison Books, 1968.
- Paul, Rodman and Michael Malone. "Tradition and Challenge in Western Historiography." *Western Historical Quarterly* 16, no. 1 (January 1985): 27-35.
- Peck, Gunther. "Manly Gamblers: The Politics of Risk on the Comstock Lode, 1860-1880." *Journal of Social History* 26, no. 4 (Summer 1993): 701-23.
- Penrose, Edith. "The Growth of the Firm—A Case Study: The Hercules Powder Company." *The Business History Review* 34, no. 1 (Spring 1960): 1-23.
- . *The Theory and Growth of the Firm*. New York: Oxford University Press, 1995.
- Peterson, Jan. *Black Diamond City: Nanaimo, The Victorian Era*. Surrey, Canada: Heritage House Publishing, 2002.
- Pettitt, George. *History of Berkeley*. Berkeley: Alameda County Historical Society, 1976.
- . *Berkeley: The Town and Gown of It*. Berkeley: Howell-North Books, 1973.
- Petty, Claude. "John S. Hittell and the Gospel of California." *Pacific Historical Review* 24, no. 1 (February 1955): 1-16.
- Pfaelzer, Jean. *Driven Out: The Forgotten War Against Chinese Americans*. Berkeley: University of California Press, 2008.
- Pomeroy, Earl. *The Pacific Slope: A History of California, Oregon, Washington, Idaho, Utah, and Nevada*. Reno: University of Nevada Press, 2004.
- Phillips, George Harwood. *Indians and Indian Agents: The Origins of the Reservation System in California*. Norman: University of Oklahoma Press, 1997.

Pincetl, Stephanie. *Transforming California: A Political History of Land Use and Development*. Baltimore: The Johns Hopkins University Press, 1999.

Pitt, Leonard. *Decline of the Californios: A Social History of the Spanish-Speaking Californians, 1846-1890*. Berkeley: University of California Press, 1998.

Polanyi, Karl. *The Great Transformation: The Political and Economic Origins of Our Time*. Boston: Beacon Press, 2001.

Polanyi, Michael. *The Tacit Dimension*. Chicago: University of Chicago Press, 2009.

Pred, Allan. *Urban Growth and City-System Development in the United States, 1840-1860*. Cambridge, MA: Harvard University Press, 1980.

Pred, Allan, and Michael Watts. *Reworking Modernity: Capitalisms and Symbolic Discontents*. New Brunswick, NJ: Rutgers University Press, 1992.

Rawls, James. *Indians of California: The Changing Image*. Norman: University of Oklahoma Press, 1986.

Razeen, Sally. *Classical Liberalism and International Economic Order: Studies in Theory and Intellectual History*. London: Routledge, 1998.

Rhomberg, Chris. *No There There: Race, Class, and Political Community in Oakland*. Berkeley: University of California Press, 2004.

Robbins, William. "'Plundered Province' Thesis and the Recent Historiography of the American West." *Pacific Historical Review* 55, no. 4 (November 1986): 577-79.

Robinson, William. *Land in California: The Story of Mission Lands, Ranchos, Squatters, Mining Claims, Railroad Grants, Land Scrip, Homesteads*. Berkeley: University of California Press, 1979.

Rohe, Randall. "Origins & Diffusion of Traditional Placer Mining in the West." *Material Culture* 18, no. 3 (Fall 1986): 127-166.

Rolle, Andrew. *John Charles Fremont: Character as Destiny*. Norman: University of Oklahoma Press, 1991.

Rose, Carol. *Property & Persuasion: Essays on the History, Theory, and Rhetoric of Ownership*. Boulder, CO: Westview Press, 1994.

Saxenian, Anna Lee. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press, 1996.

- Saxton, Alexander. *The Indispensable Enemy: A Study of Anti-Chinese Movements in California*. Berkeley: University of California Press, 1967.
- Scott, Alan. *Metropolis: From the Division of Labor to Urban Form*. Berkeley: University of California Press, 1988.
- . *On Hollywood: The Place, The Industry*. Princeton: Princeton University Press, 2005.
- Scott, Alan, and Michael Storper. "Regional Development Reconsidered." In *Regional Development and Contemporary Industrial Response: Extending Flexible Specialisation*, edited by Huib Ernste and Verena Meier, 3-24. London: Belhaven, 1992.
- Scott, Mel. *The San Francisco Bay Area: A Metropolis in Perspective*. Berkeley: University of California Press, 1959.
- Schlesinger, Arthur. *The Politics of Hope*. Boston: Houghton Mifflin, 1963.
- Schumpeter, Joseph. "The Creative Response in Economic History." *Journal of Economic History* 7, no. 2 (November 1947): 149-59.
- . *Capitalism, Socialism, and Democracy*. London: George Allen and Unwin, 1976.
- Self, Robert. *American Babylon: Race and the Struggle for Postwar Oakland*. Princeton, NJ: Princeton University Press, 2003.
- Sentence, P. David. *Cricket in America, 1710-2000*. Jefferson, NC: McFarland & Company, 2006.
- Shoup, Laurence. *Rulers and Rebels: A People's History of Early California, 1769-1901*. New York: iUniverse Books, 2010.
- Short, John Rennie. "Urban Imagineers: Boosterism and the Representatin of Cities." In *The Urban Growth Machine: Critical Perspectives Two Decades Later*, edited by Andrew Jonas and David Wilson, 37-54. Albany: State University of New York Press, 1999.
- Shover, Michele. "John Bidwell and the Rancho Chico Indian Treaty of 1852: Seduction, Betrayal, and Redemption." *Dogtown Territory Quarterly*, no. 42 (Summer 2000).
- Shumway, Burgess. *California Ranchos: Patented Private Land Grants, Listed by County*. San Bernardino, CA: Borgo Press, 1988.
- Singer, J.W. "Property and Social Relations: From Title to Entitlement." In *Property and Values: Alternatives to Public and Private Ownership*, edited by Charles Geisler and Gail Daneker, 3-20. Washington, DC: Island Press, 2000.
- Signor, John. *Southern Pacific's Western Division*. Wilton, CA: Signature Press, 2004.

Smith, Grant. *The History of the Comstock Lode, 1850-1920*. Reno: Nevada Bureau of Mines and Mackay Scholl of Mines, 1966.

Smith, James R. *San Francisco's Lost Landmarks*. Sanger, CA: Word Dancer Press, 2005.

St. Clair, David. "New Almaden and California Quicksilver in the Pacific Rim Economy." *California History* 73, no. 4 (Winter 1994/1995): 278-295.

------. "The Gold Rush and the Beginnings of California Industry." *California History*, 77, no. 4 (Winter 1998/99): 185-208.

Stapleton, Darwin. "Eleve des Poudres: E.I. du Pont's Multiple Transfer of French Technology." In *Gunpowder, Explosives, and the State: A Technological History*, edited by Brenda Buchanan, 230-38. Aldershot: Ashgate Publishing Company, 2006.

Stevens, William. "The Powder Trust, 1872-1912." *Quarterly Journal of Economics* 26, no. 3 (May 1912): 444-81.

------. "The Dissolution of the Powder Trust." *Quarterly Journal of Economics* 27, no. 1 (November 1912): 202-07.

Stilgoe, John. *Borderland: Origins of the American Suburb*. New Haven: Yale University Press, 1988.

Stillson, Richard. *Spreading the Word: A History of Information in the California Gold Rush*. Lincoln, NE: University of Nebraska Press, 2006.

Storper, Michael. *The Regional World: Territorial Development in a Global Economy*. New York: The Guilford Press, 1997.

Storper, Michael, and Richard Walker. *The Capitalist Imperative: Territory, Technology and Industrial Growth*. Oxford: Basil Blackwell, 1989.

Studer, Jack. "The First Map of Oakland, California: An Historical Speculation as Solution to an Enigma." *California Historical Society Quarterly* 48, no. 1 (March 1969): 59-71.

------. "Julius Kellersberger: A Swiss Surveyor and City Planner in California, 1851-1857." *California Historical Quarterly* 47, no. 1 (March 1968): 3-14.

Sullivan, Raymond, and John Watters. "History of Mount Diablo Coalfield, Contra Costa County." *California Geology* 33, no. 3 (March 1980): 51-59.

Taft, Philip. *Organized Labor in American History*. New York: Harper & Row, 1964.

Taylor, Graham. *Satellite Cities: A Study of Industrial Suburbs*. New York: Appleton, 1915.

Teisch, Jessica. "Greater Western Powder, 'White Coal,' and Industrial Capitalism in the West." *Pacific Historical Review* 70, no. 2 (May 2001): 221-53.

Theising, Andrew. *Made in the USA: East St. Louis*. St. Louis: Virginia Publishing, 2003.

Trachtenberg, Alan. *The Incorporation of American: Culture and Society in the Gilded Age*. New York: Hill and Wang, 1982.

Tutorow, Norman. *The Governor: The Life and Legacy of Leland Stanford, a California Colossus*, vol. I. Spokane, WA: Arthur H. Clark Co., 2004.

Utey, Robert. "The Texas Ranger Tradition Established: Jack Hays and Walker Creek." *Montana: The Magazine of Western History* 52, no. 1 (Spring 2002): 2-11.

Van Gelder, Arthur Pine and Hugo Schlatter. *History of the Explosives Industry in America*. New York: Columbia University Press, 1927.

Vent, Glenn, and Cynthia Birk. "Insider Trading and Accounting Reform: The Comstock Case." *The Accounting Historians Journal* 20, no. 2 (1993): 67-82.

Voegelin, Eric. "Liberalism and its History." Translated by Mary Algozin and Keith Algozin. *Review of Politics* 35, no. 4 (October 1974): 504-20.

Walker, Richard. "Urban Ground Rents: Building a New Conceptual Framework." *Antipode* 6, no. 1 (1974): 51-58.

------. *The Conquest of Bread: 150 Years of Agribusiness in California*. New York: The New Press, 2004.

------. "A Theory of Suburbanization: Capitalism and the Construction of Urban Space in the United States." In *Urbanization and Urban Planning in a Capitalist System*, edited by Michael Dear and Allen J. Scott, 383-430. New York: Methuen & Co., 1981.

------. "California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848-1940." *Annals of the Association of American Geographers* 91, no. 1 (March 2001): 184-85.

------. "Industry Builds Out the City: The Suburbanization of Manufacturing in the San Francisco Bay Area." In *Manufacturing Suburbs: Building Work and Home on the Metropolitan Fringe*, edited by Robert Lewis, 94-95. Philadelphia: Temple University Press, 2004.

Wall, Joseph. *Alfred I. Du Pont: The Man and His Family*. New York: Oxford University Press, 1990.

Walton, John. *Western Times and Water Wars: State Culture, and Rebellion in California*. Berkeley: University of California Press, 1992.

Ward, James. "Power and Accountability on the Pennsylvania Railroad, 1846-1879." *The Business History Review* 49, no. 1 (Spring 1975): 57-59.

Warner, Sam Bass, Jr. *Streetcar Suburbs: The Process of Growth in Boston, 1870-1900*. Cambridge: Harvard University Press, 1962.

Watson, Douglas. "Herald of the Gold Rush." *California Historical Society Quarterly* 10, no. 3 (September 1931): 298-301.

Weber, Alfred. *Theory of the Location of Industries*. Chicago: University of Chicago Press, 1929.

White, James W., Robert, Lammot, and Rodmond Gibbons. "Great Expectations: The Business Correspondence of Gibbons & Lammot, Gold Rush Black Powder Merchants." *California Historical Quarterly* 55, no. 4 (Winter 1976/1977): 290-305.

White, Gerald. *Formative Years in the Far West: A History of Standard Oil Company of California and Predecessors Through 1919*. New York: Appleton-Century-Crofts, 1962.

------. "The Cast of the Salted Sample: A California Oil Industry Skeleton." *Pacific Historical Review* 35, no. 2 (May 1966): 153-82.

------. "California's Other Mineral." *Pacific Historical Review* 39, no. 2 (May 1970): 135-54.

Wilkinson, Norman. *Lammot Du Pont and the American Explosives Industry*. Charlottesville, VA: University of Virginia Press, 1984.

Williams, James. *Energy and the Making of Modern California*. Akron, OH: University of Akron Press, 1997.

Woodbury, C. A., and W. C. Holmes. "Commercial Explosives Industry." *Industrial and Engineering Journal* 27 (1935): 632-37.

Young, Otis, Jr. *Western Mining: An Informal Account of Precious-Metals Prospecting, Placering, Lode Mining, and Milling on the American Frontier from Spanish Times to 1893*. Norman: University of Oklahoma Press, 1970.

Yergin, Daniel. *The Prize: The Epic Quest for Oil, Money, and Power*. New York: Free Press, 1991.

Young, Terence. *Building San Francisco's Parks, 1850-1930*. Baltimore: The Johns Hopkins University Press, 2004.

Zhu, Liping. "No Need to Rush: The Chinese, Placer Mining, and the Western Environment." *Montana: The Magazine of Western History* 49, no. 3 (Autumn 1999): 42-57.

Ziebarth, Marilyn. "California's First Environmental Battle." *California History* 63, no. 4 (Fall 1984): 274-79.